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Online Library

Practical Linux

Programming

Device Drivers

Embedded

Systems and The

Linux system

About This Book

Learn to develop

customized Linux

device drivers

Learn the core

concepts of

device drivers

such as memory

management,

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**kernel caching,  
advanced IRQ  
management,  
and so on.**

**Practical  
experience on  
the embedded  
side of Linux**

**Who This Book Is  
For This book  
will help anyone  
who wants to get  
started with  
developing their**

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Embedded Linux

users will benefit

highly from this

book. This book

covers all about

device driver

development,

from char drivers

to network

device drivers to

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Programming  
**memory  
management.**

**What You Will  
Learn Use kernel  
facilities to  
develop powerful  
drivers Develop  
drivers for widely  
used I2C and SPI  
devices and use  
the regmap API  
Write and  
support  
devicetree from**

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**within your  
drivers Program  
advanced drivers  
for network and  
frame buffer  
devices Delve  
into the Linux  
irqdomain API  
and write  
interrupt  
controller drivers  
Enhance your  
skills with  
regulator and**

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**PWM  
frameworks  
Develop  
measurement  
system drivers  
with IIO  
framework Get  
the best from  
memory  
management and  
the DMA  
subsystem  
Access and  
manage GPIO**

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Practical Linux  
Programming  
subsystems and  
develop GPIO  
controller drivers  
In Detail Linux  
kernel is a  
complex,  
portable,  
modular and  
widely used piece  
of software,  
running on  
around 80% of  
servers and  
embedded



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Systems and The

World. Device

drivers play a

critical role in

how well a Linux

system performs.

As Linux has

turned out to be

one of the most

popular

operating

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**systems used, the  
interest in  
developing  
proprietary  
device drivers is  
also increasing  
steadily. This  
book will initially  
help you  
understand the  
basics of drivers  
as well as  
prepare for the  
long journey**

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Practical Linux  
Programming  
**through the  
Linux Kernel.**  
This book then  
covers drivers  
development  
based on various  
Linux subsystems  
such as memory  
management,  
PWM, RTC, IIO,  
IRQ  
management,  
and so on. The  
book also offers

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**a practical  
approach on  
direct memory  
access and  
network device  
drivers. By the  
end of this book,  
you will be  
comfortable with  
the concept of  
device driver  
development and  
will be in a  
position to write**

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**any device driver  
from scratch  
using the latest  
kernel version  
(v4.13 at the  
time of writing  
this book). Style  
and approach A  
set of engaging  
examples to  
develop Linux  
device drivers  
Over the last few  
years, Linux has**

**grown both as an  
operating system  
and a tool for  
personal and  
business use.**

**Simultaneously  
becoming more  
user friendly and  
more powerful as  
a back-end  
system, Linux  
has achieved new  
plateaus: the  
newer**

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**filesystems have solidified, new commands and tools have appeared and become standard, and the desktop--including new desktop environments--have proved to be viable, stable, and readily accessible to**

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**even those who  
don't consider  
themselves  
computer gurus.  
Whether you're  
using Linux for  
personal  
software  
projects, for a  
small office or  
home office  
(often termed  
the SOHO  
environment), to**



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**provide services  
to a small group  
of colleagues, or  
to administer a  
site responsible  
for millions of  
email and web  
connections each  
day, you need  
quick access to  
information on a  
wide range of  
tools. This book  
covers all aspects**

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**of administering  
and making  
effective use of  
Linux systems.  
Among its topics  
are booting,  
package  
management,  
and revision  
control. But  
foremost in  
Linux in a  
Nutshell are the  
utilities and**

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**commands that  
make Linux one  
of the most  
powerful and  
flexible systems  
available. Now in  
its fifth edition,  
Linux in a  
Nutshell brings  
users up-to-date  
with the current  
state of Linux.  
Considered by  
many to be the**

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**most complete  
and authoritative  
command  
reference for  
Linux available,  
the book covers  
all substantial  
user,  
programming,  
administration,  
and networking  
commands for  
the most  
common Linux**

Online Library  
Practical Linux  
Programming  
distributions.

**Comprehensive  
but concise, the  
fifth edition has  
been updated to  
cover new  
features of major  
Linux**

**distributions.  
Configuration  
information for  
the rapidly  
growing  
commercial**

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**network services  
and community  
update services  
is one of the  
subjects covered  
for the first time.  
But that's just  
the beginning.  
The book covers  
editors, shells,  
and LILO and  
GRUB boot  
options. There's  
also coverage of**

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**Apache, Samba,  
Postfix,  
sendmail, CVS,  
Subversion,  
Emacs, vi, sed,  
gawk, and much  
more. Everything  
that system  
administrators,  
developers, and  
power users need  
to know about  
Linux is  
referenced here,**

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Programming  
Device Drivers  
and they will  
turn to this book  
again and again.

Embedded Systems And The  
Internet  
Programming  
Series  
Describes the  
concepts of  
programming  
with Linux,  
covering such  
topics as shell  
programming,  
file structure,  
managing  
memory, using  
MySQL,



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**debugging,  
processes and  
signals, and  
GNOME.**  
**Master the  
techniques  
needed to build  
great, efficient  
embedded  
devices on Linux**  
**About This Book**  
**Discover how to  
build and  
configure**

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Programming  
**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**

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**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**

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**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**

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Programming  
**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**

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**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**

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Interact with the

hardware without

having to write

kernel device

drivers Debug

devices remotely

using GDB, and

see how to

measure the

performance of

the systems

using powerful

tools such as

perk, ftrace, and

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**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**



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Practical Linux

Programming

Device Drivers

Embedded 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

Online Library  
Practical Linux  
Programming  
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

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**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**

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**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**

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**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**

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**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**

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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

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**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.  
First Step  
Towards Device**



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**Driver  
Programming  
A Guide for the  
Intrepid  
Practical recipes  
to help you  
leverage the  
power of Yocto to  
build exciting  
Linux-based  
systems, 2nd  
Edition  
A Comprehensive  
Guide for**

Online Library  
Practical Linux  
Programming  
Engineers and  
Device Drivers  
Programmers  
Talking Directly  
to the Kernel and  
C Library

Device drivers make it possible for your software to communicate with your hardware, and because every operating system has specific requirements, driver writing is nontrivial.

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When developing for FreeBSD, you've probably had to scour the Internet and dig through the kernel sources to figure out how to write the drivers you need. Thankfully, that stops now. In *FreeBSD Device Drivers*, Joseph Kong will teach you how to master everything from the basics of building

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and running loadable kernel modules to more complicated topics like thread synchronization. After a crash course in the different FreeBSD driver frameworks, extensive tutorial sections dissect real-world drivers like the parallel port printer driver. You'll learn: –All about Newbus, the infrastructure used by

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FreeBSD to manage the hardware devices on your system –How to work with ISA, PCI, USB, and other buses –The best ways to control and communicate with the hardware devices from user space –How to use Direct Memory Access (DMA) for maximum system performance –The inner workings of

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the virtual null modem terminal driver, the USB printer driver, the Intel PCI Gigabit Ethernet adapter driver, and other important drivers –How to use Common Access Method (CAM) to manage host bus adapters (HBAs)  
Concise descriptions and extensive annotations walk you through the many code

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examples. Don't waste time searching man pages or digging through the kernel sources to figure out how to make that arcane bit of hardware work with your system.

FreeBSD Device Drivers gives you the framework that you need to write any driver you want, now.

Learn how to write high-

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quality kernel module  
Device Drivers  
code, solve common  
Embedded  
Linux kernel  
programming issues,  
Systems And The  
and understand the  
Internet  
fundamentals of Linux  
Programming  
kernel internals Key  
Series  
Features Discover how  
to write kernel code  
using the Loadable  
Kernel Module  
framework Explore  
industry-grade  
techniques to perform



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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

# Online Library Practical Linux Programming

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

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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. You'll start the journey by learning how to build the kernel from the source. Next, you'll write your first kernel module using the powerful Loadable

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Kernel Module (LKM) framework. The following chapters will cover key kernel internals topics including Linux kernel architecture, memory management, and CPU scheduling. During the course of this book, you'll delve into the fairly complex topic of concurrency within the kernel, understand the

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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

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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

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and build a kernel from  
sourceExplore the Linux

kernel architectureGet  
to grips with key The

internals regarding

memory management  
within the

kernelUnderstand and

work with various

dynamic kernel memory

alloc/dealloc

APIsDiscover key

internals aspects

regarding CPU

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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. If you're a  
Linux kernel and driver



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developer looking to overcome frequent and common kernel development issues, or understand kernel intervals, you'll find plenty of useful information. You'll need a solid foundation of Linux CLI and C programming before you can jump in. Linux® is being adopted by an

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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

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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

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Programming

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

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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

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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

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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

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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,



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BusyBox, U-Boot,  
OpenSSH, tthttpd, tftp,  
strace, and gdb are  
among the packages  
discussed.

## LINUX DRIVER DEVELOPMENT FOR EMBEDDED PROCESSORS - SECOND EDITION -

The flexibility of Linux  
embedded, the  
availability of powerful,  
energy efficient

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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

# Online Library Practical Linux Programming

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

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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

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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

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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

# Online Library Practical Linux Programming

processor to control external devices. To easy the development of some of these drivers, you will use different types of Frameworks: Miscellaneous framework, LED framework, UIO framework, Input framework and the IIO industrial one. This second edition has been updated to the v4.9 LTS



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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 ATSAMAD27-SOM1-EK1 evaluation platform; the ATSAMAD27-SOM1-

# Online Library Practical Linux Programming Device Drivers

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.

The Linux Kernel  
Module Programming  
Guide

Linux Driver  
Development for  
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Through the  
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examples,  
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students learn  
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applications  
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for graphical  
user  
interfaces.  
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easy and  
friendly way  
of learning  
device driver  
programming .  
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fundamentals  
of Linux  
device driver.  
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should start

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device driver

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from this book

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**Commands Linux**

**Kernel Linux**

**Kernel**

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s of Device  
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Embedded  
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passing  
Parameter  
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program

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Character  
Device Driver  
Major and  
Minor number  
API to

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registers a  
device Program  
to show device  
number

Character  
Driver File  
Operations

File operation  
program.

Include .h  
header

Functions in

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**module.h file**

Device Drivers

**Important code**

Embedded

**snippets**

Systems And The

**Summary of**

Internet

**file**

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**operations PCI**

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**Device Driver**

**Direct Memory**

**Access Module**

**Device Table**

**Code for Basic**

**Device Driver**

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Device Driver

program

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USB Device

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device Driver  
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Using URB  
Simple data  
transfer



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read and write**

**Important code  
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**Device Driver**

**Program**

**Skeleton**

**Driver Program**

**Special USB**

**3.0 USB 3.0**

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Series  
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Exclusion  
Semaphore Spin  
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Device Driver  
Frame buffer

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Systems And The  
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Driver summary  
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Allocation  
Kmalloc  
Vmalloc

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Series  
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Programming  
Tips Softirqs,  
Tasklets, Work  
Queues I/O

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Complete  
memory Driver  
Complete  
Parallel Port

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Debugger  
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Systems And The  
Ksets, and  
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Subsystems DMA  
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I/O  
Series  
Learn to  
develop  
customized  
device drivers  
for your  
embedded Linux

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Programming  
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systemAbout  
This Book\*  
Embedded  
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Systems And The  
develop

Internet  
customized  
Programming  
Linux device  
Series  
drivers\* Learn  
the core  
concepts of  
device drivers  
such as memory  
management,



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Programming  
kernel  
Device Drivers  
caching,  
Embedded  
advanced IRQ  
Systems And The  
management,  
Internet  
and so on.\*  
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Practical  
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experience on  
the embedded  
side of  
LinuxWho This  
Book Is  
ForThis book

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will help  
anyone who  
wants to get  
started with  
developing  
their own  
Linux device  
drivers for  
embedded  
systems.  
Embedded Linux  
users will

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benefit highly  
from this  
book. This book  
covers all  
about device  
driver  
development,  
from char  
drivers to  
network device  
drivers to  
memory managem

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Programming

ent. What You

Will Learn\*

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Use kernel

Systems And The

facilities to

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powerful

Series

drivers\*

Develop

drivers for

widely used

I2C and SPI

devices and

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API\* Write and

Embedded

support

Systems And The

devicetree

Internet

from within

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your drivers\*

Series

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advanced

drivers for

network and

frame buffer

devices\* Delve

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into the Linux  
Device Drivers  
irqdomain API  
Embedded  
and write  
Systems And The  
interrupt  
Internet  
controller  
Programming  
drivers\*  
Series  
Enhance your  
skills with  
regulator and  
PWM  
frameworks\*  
Develop

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Practical Linux  
Programming  
measurement  
Device Drivers  
system drivers  
Embedded  
with IIO  
Systems And The  
framework\* Get  
Internet  
the best from  
Programming  
memory  
Series  
management and  
the DMA  
subsystem\*  
Access and  
manage GPIO  
subsystems and

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Device Drivers  
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drivers In  
Systems And The  
Detail Linux  
Internet  
kernel is a  
Programming  
complex,  
Series  
portable,  
modular and  
widely used  
piece of  
software,  
running on



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around 80% of servers and embedded systems in more than half of devices throughout the World. Device drivers play a critical role in how well a Linux system

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Embedded  
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performs. As  
Linux has  
turned out to  
be one of the  
most popular  
operating  
systems used,  
the interest  
in developing  
proprietary  
device drivers  
is also

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increasing  
steadily. This  
book will  
initially help  
you understand  
the basics of  
drivers as  
well as  
prepare for  
the long  
journey  
through the

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Programming

**Linux Kernel.**

Device Drivers

**This book then**

Embedded

**covers drivers**

Systems And The

**development**

Internet

**based on**

Programming

**various Linux**

Series

**subsystems**

**such as memory**

**management,**

**PWM, RTC, IIO,**

**IRQ**

**management,**

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and so on. The

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book also

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offers a

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approach on

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access and

network device

drivers. By the

end of this

book, you will

be comfortable

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with the  
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concept of  
Embedded  
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a position to  
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write any  
device driver  
from scratch  
using the  
latest kernel  
version (v4.13

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at the time of  
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book). Style  
and approach  
set of  
engaging  
examples to  
develop Linux  
device drivers  
Newly updated  
to include new  
calls and

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resource for  
those who want  
to support  
computer  
peripherals  
under the



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driver for a  
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broad spectrum  
of devices,  
including  
character  
devices,  
network

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**interfaces,  
and block  
devices.  
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and Driver  
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Practical Labs  
Building  
Embedded Linux  
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features of  
Rust 2018 for  
building fast  
and secure  
apps**

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Programming  
Part 2 - Char  
Device Drivers  
and Kernel Syn**

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**chronization**  
Device Drivers  
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Embedded  
**Development**  
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system,  
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devices,  
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block devices.

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Original.  
(Intermediate).  
This book is  
broken into  
four primary  
sections  
addressing key  
topics that  
Linux  
programmers  
need to master:  
Linux nuts and  
bolts, the

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get readers up  
to speed with  
building  
software on a  
Linux-based  
system while  
using the tools



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and utilities  
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that contribute  
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to streamlining  
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virtualization  
technologies  
for kernel  
development and  
application

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insights aimed  
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at helping  
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understand how  
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applications  
code fits in  
with the rest  
of the software  
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Linux projects  
(such as  
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Utopia), and  
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alization  
capabilities  
present in the  
GNOME desktop

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Module  
Embedded  
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Internet  
people who want  
to write kernel  
modules. It  
takes a hands-  
on approach  
starting with  
writing a small  
"hello, world"  
program, and

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Integrating  
Linux Kernel  
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lively style  
that entertains  
while it  
educates. An

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of free  
software and

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Tools and  
Techniques for  
Building with  
Embedded Linux  
Beginning Linux  
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Practical Linux

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Systems Programming  
Architecture

The Raspberry Pi makes an ideal match for the Internet of Things. To put it to good use in IoT you need



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two areas of expertise, electronics and programming and this presents a barrier to getting started. However, there is an overlooked route that can provide a shortcut. Pi OS, the Raspberry Pi's operating system is Linux based and

# Online Library Practical Linux Programming

Linux drivers are available for many off-the-shelf IoT devices. These provide a very easy-to-use, high-level way of working.

The problem that this book solves is that there is very little documentation to help you get started. In it Harry

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Fairhead explains the principles so that you can tackle new devices and he also guides you through of using external hardware via standard Linux drivers. Throughout this book you will find a practical approach to understanding electronic circuits

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and datasheets  
and translating this  
to code, specifically  
using the C  
programming  
language. The main  
reason for choosing  
C is speed, a  
crucial factor when  
you are writing  
programs to  
communicate with  
the outside world  
and if you are

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Programming  
familiar with  
Device Drivers  
another  
Embedded  
programming  
Systems, C  
language, C  
shouldn't be hard  
Internet  
to pick up. After a  
Programming  
quick tour of the  
Series  
Raspberry Pi  
ecosystem, Visual  
Studio Code (VS  
Code) and how it  
can be used to  
develop remotely,  
is introduced. The

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first IoT program anyone writes is "blinky" to flash an LED and this book is no exception, but it might not be quite what you expect. Instead of using a GPIO line it uses the Linux LED driver - no hardware and no fuss. The GPIO isn't left out, however,

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as the next three chapters focus on its use via the new GPIO character driver, which replaces the old and very common sysfs GPIO driver. This is the way to do modern GPIO. A key component in any look at Linux and its relationship to hardware is the

# Online Library Practical Linux Programming

relatively new  
Device Tree. While  
most accounts of  
this resource are  
aimed at device  
driver writers, this  
one is aimed at  
device driver users  
and to this end we  
look at the DHT22  
temperature and  
humidity driver.  
After a brief detour  
into some basic



# Online Library Practical Linux Programming Device Drivers: Evolution

electronics, we look at Pulse Width Modulation supported via a driver rather than needing to be implemented using the GPIO. From here we tackle the two standard buses, I2C and SPI, first going through the basics and then looking at the two

# Online Library Practical Linux Programming Device Drivers

attempts to impose  
a higher

organization, the

hardware

monitoring system,

Hwmon, and

Industrial I/O, IIO.

The third standard

bus, although

generally not

supported in

hardware is the

1-Wire bus. This is

covered in detail

# Online Library Practical Linux Programming

and even includes an introduction to using Netlink, which uses the sockets API to send messages to and from the kernel to access the driver.

The final chapter takes things to the next level and considers creating your own custom overlays by writing

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fragments to the device tree. Harry Fairhead has worked with microprocessors, and electronics in general, for many years and is an enthusiastic proponent of the IoT. He is the author of Raspberry Pi IoT in C, which has

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**Programming**  
recently been  
**Device Drivers**  
republished in its  
**Embedded**  
second edition,  
**Systems And The**  
updated for  
**Internet**  
Raspberry Pi 4 and  
**Programming**  
co-author of  
**Series**  
Raspberry Pi IoT in  
Python Using GPIO  
Zero. His other  
recent books  
include Micro: bit  
IoT in C,  
Fundamental C:  
Getting Closer To

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The Machine and  
Device Drivers  
Applying C For The  
IoT With Linux.

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wide ranging and  
complete Linux  
device driver book  
I’ve read.” --Alan

Cox, Linux Guru  
and Key Kernel  
Developer “Very  
comprehensive and  
detailed, covering  
almost every single

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Linux device driver  
type." --Theodore

Ts'o, First Linux

Kernel Developer in

North America and

Chief Platform

Strategist of the

Linux Foundation

The Most Practical

Guide to Writing

Linux Device

Drivers Linux now

offers an

exceptionally

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development: with

today's kernels,

what once required

years of

development time

can be

accomplished in

days. In this

practical, example-

driven book, one of

the world's most

experienced Linux



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Linux Device

Drivers is for any  
programmer with a  
working knowledge  
of operating  
systems and C,  
including

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programmers who  
have never written  
drivers before.

Sreekrishnan  
Venkateswaran  
focuses on the  
essentials, bringing  
together all the  
concepts and  
techniques you  
need, while  
avoiding topics that  
only matter in  
highly specialized

# Online Library Practical Linux Programming

situations.

Venkateswaran

begins by

reviewing the Linux

2.6 kernel

capabilities that

are most relevant

to driver

developers. He

introduces simple

device classes;

then turns to serial

buses such as I2C

and SPI; external

# Online Library Practical Linux Programming

buses such as PCMCIA, PCI, and USB; video, audio, block, network, and wireless device drivers; user-space drivers; and drivers for embedded Linux—one of today's fastest growing areas of Linux development. For each,

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Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
Programming  
Series

Venkateswaran explains the technology, inspects relevant kernel source files, and walks through developing a complete example.

□ Addresses drivers discussed in no other book, including drivers for I2C, video, sound, PCMCIA,

Online Library

Practical Linux

Programming

and different types  
of flash memory □

Demystifies

essential kernel

services and

facilities, including

kernel threads and

helper interfaces □

Teaches polling,

asynchronous

notification, and I/O

control □

Introduces the

Inter-Integrated

## Online Library

## Practical Linux

## Programming

## Device Drivers

## Embedded

## Systems And The

## Internet

## Programming

## Series

Circuit Protocol for embedded Linux drivers □ Covers multimedia and device drivers using the Linux-Video subsystem and Linux-Audio framework □ Shows how Linux implements support for wireless technologies such as Bluetooth,

# Online Library

## Practical Linux

### Programming

#### Device Drivers

Infrared, WiFi, and  
cellular networking

□ Describes the  
entire driver

development

lifecycle, through

debugging and

maintenance □

Includes reference

appendixes

covering Linux

assembly, BIOS

calls, and Seq files

In-depth instruction



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**Practical Linux**  
**Programming**  
and practical  
**Device Drivers**  
techniques for  
**Embedded**  
building with the  
**Systems And The**  
BeagleBone  
**Internet**  
embedded Linux  
**Programming**  
platform Exploring  
**Series**  
BeagleBone is a  
hands-on guide to  
bringing gadgets,  
gizmos, and robots  
to life using the  
popular BeagleBon  
eembedded Linux  
platform.

# Online Library Practical Linux

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 foundational

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**Device Drivers**  
**Embedded**  
**Systems And The**  
**Internet**  
**Programming**  
**Series**

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 instruction

Online Library  
Practical Linux  
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al videos, source  
Device Drivers  
code, discussion  
Embedded  
forums, and more,  
Systems And The  
to ensure that you  
Internet  
have everything  
Programming  
you need. The  
Series  
BeagleBone's small  
size, high  
performance, low  
cost, and extreme  
adaptability have  
made it a favorite d  
evelopment platfor  
m, and the Linux

Online Library  
Practical Linux  
Programming  
software base  
Device Drivers  
allows for complex  
Extended  
yet flexible  
Systems And The  
functionality. The  
Internet  
BeagleBone has  
Programming  
applications in  
Series  
smart buildings,  
robot control,  
environmental  
sensing, to name a  
few; and, expansion  
boards and  
peripherals  
dramatically

Online Library  
Practical Linux  
Programming  
increase  
the possibilities.  
Exploring  
BeagleBone  
Systems And The  
Internet  
Programming  
Series  
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,

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electronics,  
Device Drivers  
and programming  
Master interfacing  
electronic circuits,  
Systems And The  
buses and  
Internet  
modules,  
Programming  
with practical  
Series  
examples Explore  
the Internet-  
connected  
BeagleBone and  
the  
BeagleBone with a  
display Apply the

# Online Library Practical Linux Programming Device Drivers

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,



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Programming  
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

**Online Library**  
**Practical Linux**  
**Programming**  
practical handbook  
**Device Drivers**  
for the popular  
**Embedded**  
computing  
**Systems And The**  
platform.  
**Internet**  
Over 79 hands-on  
**Programming**  
recipes for  
**Series**  
professional  
embedded Linux  
developers to  
optimize and boost  
their Yocto Project  
know-how Key  
Features Optimize  
your Yocto setup to

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Embedded

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Internet

Programming

Series

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

Online Library  
Practical Linux  
Programming  
system Book  
Device Drivers  
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

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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,

# Online Library Practical Linux Programming

data, scripts, and  
Device Drivers  
configuration files  
Embedded  
to your system.

Systems And The  
Internet  
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

# Online Library Practical Linux Programming

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

Online Library

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Programming

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Series

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



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Programming  
kernel and its  
Device Drivers  
Customize your  
root filesystem  
Systems And The  
with already-  
Internet  
supported and new  
Programming  
Yocto packages  
Series  
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

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Programming  
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

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Programming  
development.

Mastering Linux

Device Driver

Development And The

Create user-kernel

Internet  
interfaces, work  
with peripheral I/O,

Series  
and handle

hardware

interrupts

Professional Linux

Kernel Architecture

Create fast and

reliable embedded

Online Library  
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Programming  
solutions with  
Linux 5.4 and the  
Yocto Project 3.1  
(Dunfell)  
Systems And The  
Raspberry Pi IoT In  
Internet  
C Using Linux  
Programming  
Drivers  
Series  
Learn to Develop  
Linux Embedded  
Drivers with Kernel  
4. 9 LTS

*Up-to-the-Minute,  
Complete Guidance for  
Developing Embedded*

*Page 181/339*

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Practical Linux  
Programming  
Solutions with Linux  
Device Drivers  
Linux has emerged as  
today's #1 operating  
Embedded  
Systems And The  
Internet  
Programming  
Series  
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

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Programming  
Device Drivers,  
Embedded  
Systems And The  
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*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*

Online Library  
Practical Linux  
Programming  
you're new to embedded  
Device Drivers  
addresses today's most  
Embedded  
important development  
Systems And The  
challenges and  
Internet  
demonstrates how to  
Programming  
solve the problems you're  
Series  
most likely to encounter.  
You'll learn how to build  
a modern, efficient  
embedded Linux  
development  
environment, and then  
utilize it as productively



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*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*

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*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*

# Online Library Practical Linux

*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*

Online Library

Practical Linux

Programming

*coverage of the USB*

*subsystem. Introduces the*

*latest open source*

*embedded Linux build*

*systems. Reference*

*appendices include U-*

*Boot and BusyBox*

*commands.*

*Harness the power of*

*Linux to create versatile*

*and robust embedded*

*solutions Key*

*Features Learn how to*

*develop and configure*

Online Library  
Practical Linux  
Programming  
robust embedded Linux  
Device Drivers  
devices Explore the new  
features of Linux 5.4  
Embedded  
Systems And The  
Yocto Project 3.1  
Internet  
Programming  
Series  
(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.

Online Library  
Practical Linux

*Mastering Embedded  
Device Drivers  
Linux 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,*

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Programming

*and the root filesystem.*

Device Drivers

*After that, you will learn*

Embedded

*how to create each of*

Systems And The

*these elements from*

Internet

*scratch and automate the*

Programming

*process using Buildroot*

Series

*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*

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Embedded Linux  
Systems And The  
Internet  
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*deployed. You'll also learn about the key aspects of writing code for embedded Linux, such as how to access hardware from apps, the implications of writing multi-threaded code, and techniques to manage memory in an efficient way. The final chapters demonstrate how to debug your code, whether it resides in apps*



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Programming  
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*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*

Online Library  
Practical Linux  
Programming  
*learn Use Buildroot and  
Device Drivers  
the Yocto Project to  
create embedded Linux  
Systems Troubleshoot  
The  
BitBake build failures  
and streamline your  
Yocto development  
workflow Update IoT  
devices securely in the  
field using Mender or  
balenaPrototype  
peripheral additions by  
reading schematics,  
modifying device trees,*

Online Library

Practical Linux

Programming

*soldering breakout*

*boards, and probing pins*

*with a logic*

*analyzer* Interact with

*hardware without having*

*to write kernel device*

*drivers* Divide your

*system up into services*

*supervised by BusyBox*

*runit* Debug devices

*remotely using GDB and*

*measure the performance*

*of systems using tools*

*such as perf, ftrace,*

Online Library

Practical Linux

Programming

*eBPF, and Callgrind Who*

*this book is for If you're*

*a systems software*

*engineer or system The*

*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,*

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Practical Linux  
Programming

*who 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.*

# Online Library Practical Linux

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

## *Embedded Systems*

*Architecture is a practical and technical guide to understanding the components that make up an embedded system's*

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Practical Linux  
Programming

*architecture. This book is perfect for those starting out as technical professionals such as engineers, programmers and designers of embedded systems; and also for students of computer science, computer engineering and electrical engineering. It gives a much-needed 'big picture' for recently graduated*

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Programming

Device Drivers

of real-world systems for

the first time, and

provides professionals

with a systems-level

picture of the key

elements that can go into

an embedded design,

providing a firm

foundation on which to

build their skills. Real-

world approach to the

fundamentals, as well as



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Practical Linux  
Programming  
*the design and  
architecture process,  
makes this book a  
popular reference for the  
daunted or the  
inexperienced: if in  
doubt, the answer is in  
here! Fully updated with  
new coverage of FPGAs,  
testing, middleware and  
the latest programming  
techniques in C, plus  
complete source code and  
sample code, reference*

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*designs and tools online  
make this the complete  
package Visit the  
companion web site at [http://booksite.elsevier.com/  
9780123821966/](http://booksite.elsevier.com/9780123821966/) for  
source code, design  
examples, data sheets  
and more A true  
introductory book,  
provides a  
comprehensive get up  
and running reference  
for those new to the*

Online Library

Practical Linux

Programming

*field, and updating skills:  
assumes no prior*

*knowledge beyond*

*undergrad level electrical*

*engineering Addresses*

*the needs of practicing*

*engineers, enabling it to*

*get to the point more*

*directly, and cover more*

*ground. Covers*

*hardware, software and*

*middleware in a single*

*volume Includes a library*

*of design examples and*

Online Library

Practical Linux

Programming

*design tools, plus a  
complete set of source*

*code and embedded*

*systems design tutorial*

*materials from*

*companion website*

*Linux Device Drivers, 3E*

*A comprehensive guide to*

*kernel internals, writing*

*kernel modules, and*

*kernel synchronization*

*Interfacing to the Real*

*World with Embedded*

*Linux*

*Linux*

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Programming

*Embedded Linux Primer*

*FreeBSD Device Drivers*

*Linux System*

*Programming*

*Device drivers*

*literally drive*

*everything you're*

*interested in--disks,*

*monitors,*

*keyboards,*

*modems--everything*

*outside the*

*computer chip and*

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Practical Linux

Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
System programming  
Simulation

*memory. And writing device drivers is one of the few areas of programming for the Linux operating system that calls for unique, Linux-specific knowledge. For years now, programmers have relied on the classic Linux Device Drivers from O'Reilly*

Online Library  
Practical Linux  
Programming

*to master this critical subject. Now in its third edition, this bestselling guide provides all the information you'll need to write drivers for a wide range of devices.*

*This book contains the practical labs corresponding to the "Linux Kernel and*

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Programming

Device Drivers

Embedded

Systems And The

Internet

Programming

Systems

*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*



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Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
Programming  
S  
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

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Programming  
Device Drivers  
Embedded  
Systems And The  
Internet

*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.*

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Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
Programming  
Systems

*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*

# Online Library Practical Linux

*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*

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Practical Linux

Programming

Device Drivers

Embedded

Systems And The

Internet

Programming

Systems

efficiency. The new

edition of

Understanding the

Linux Kernel takes

you on a guided tour

through the most

Online Library  
Practical Linux

*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.*

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Embedded

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Internet

Programming

System

*Relevant segments*

*of code are*

*dissected and*

*discussed line by*

*line. The book*

*covers more than*

*just the functioning*

*of the code, it*

*explains the*

*theoretical*

*underpinnings for*

*why Linux does*

*things the way it*

Online Library  
Practical Linux

*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*



Online Library  
Practical Linux  
Programming

*whole new classes  
of hardware devices  
have been added.*

*The authors explore  
each new feature in  
detail. Other topics  
in the book include:*

*Memory  
management  
including file  
buffering, process  
swapping, and  
Direct memory*

Online Library  
Practical Linux  
Programming  
Access (DMA) The  
Device Drivers  
Virtual Filesystem  
Embedded  
and the Second  
Systems And The  
Extended  
Filesystem Process  
creation and  
scheduling Signals,  
interrupts, and the  
essential interfaces  
to device drivers  
Timing  
Synchronization in  
the kernel

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Practical Linux  
Programming  
Interprocess  
Device Drivers  
Communication  
Embedded  
(IPC) Program  
Systems And The  
execution

Understanding the  
Linux Kernel,

Second Edition will  
acquaint you with all  
the inner workings  
of Linux, but is more  
than just an  
academic exercise.

You'll learn what

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Programming

*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*

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Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
Programming  
environments. If  
knowledge is power,  
then this book will  
help you make the  
most of your Linux  
system.

Linux Driver

Development with  
Raspberry Pi -  
Practical Labs  
Embedded systems  
have become an  
integral part of our

# Online Library Practical Linux

*Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
Development  
Signage, medical  
imaging, automotive  
infotainment and  
many other  
industrial  
applications. The  
use of embedded*

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Practical Linux  
Programming

*systems is growing exponentially. Many of these embedded systems are powered by an inexpensive yet powerful system-on-chip (SoC) that is running a Linux operating system.*

*The BCM2837 from Broadcom is one of these SoCs, running*

Online Library  
Practical Linux  
Programming  
quad ARM Cortex  
Device Drivers  
A53 cores at  
Embedded  
1.2GHz. This is the  
Systems And The  
SoC used in the  
Internet  
popular Raspberry  
Pi 3 boards. This  
Programming  
book follows the  
Systems  
learning by doing  
approach, so you  
will be playing with  
your Raspberry Pi  
since the first  
chapter. Besides the



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*Raspberry Pi board, you will use several low-cost boards to develop the hands-on examples. In the labs, it is described what each step means in detail so that you can use your own hardware components adapting the content of the book to your*

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Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
Programming  
Site

*needs. You will learn how to develop Linux drivers for the Raspberry Pi boards. You will start with the simplest ones that do not interact with any external hardware, then you will develop Linux drivers that manage*

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Programming  
Device Drivers

*different kind of devices:*

*Accelerometer,  
DAC, ADC, RGB  
LED, Buttons,  
Joystick controller,  
Multi-Display LED  
controller and I/O  
expanders  
controlled via I2C  
and SPI buses. You  
will also develop  
DMA drivers, USB*

# Online Library Practical Linux Programming

*device drivers,  
drivers that manage  
interrupts and  
drivers that write  
and read on the  
internal registers of  
the SoC to control  
its GPIOs. To ease  
the development of  
some of these  
drivers, you will use  
different types of  
Linux kernel*

Online Library  
Practical Linux  
Programming

*subsystems:*

*Miscellaneous, LED,  
UIO, USB, Input and  
Industrial I/O. More  
than 30 kernel*

*modules have been  
written (besides  
several user*

*applications), which  
can be downloaded  
from the book's  
GitHub repository.*

*This book uses the*

Online Library

Practical Linux

Programming

*Long Term Support*

*(LTS) Linux kernel*

*5.4, which was*

*released on*

*November 2019 and*

*will be maintained*

*until December*

*2025. The Linux*

*drivers and*

*applications*

*developed in the*

*labs have been*

*ported to three*

*different Raspberry  
Pi boards:*

*Raspberry Pi 3*

*Model B, Raspberry*

*Pi 3 Model B+ and*

*Raspberry Pi 4*

*Model B. This book*

*is a learning tool to*

*start developing*

*drivers without any*

*previous knowledge*

*about this field, so*

*the intention during*

Online Library

Practical Linux

Programming

*its writing has been  
to develop drivers*

*without a high level  
of complexity that*

*both serve to*

*reinforce the main*

*driver development*

*concepts and can*

*be a starting point to*

*help you to develop*

*your own drivers.*

*And, remember that*

*the best way to*



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Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
Programming  
Srinivas  
develop a driver is not to write it from scratch. You can reuse free code from similar Linux kernel mainline drivers. All the drivers written throughout this book are GPL licensed, so you can modify and redistribute them under the

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Programming

*same license.*

Device Drivers

*Develop customized*

Embedded

*drivers for*

Systems And The

*embedded Linux*

Professional Linux

Programming

*Programming*

Communication,

*Communication,*

Concurrency, and

*Concurrency, and*

Threads

*Threads*

Linux Device Driver

*Linux Device Driver*

Development

*Development*

Cookbook

*Cookbook*

Linux Device

*Linux Device*

Online Library  
Practical Linux  
Programming  
*Drivers*  
Device Drivers  
Embedded  
World Approach  
Systems And The  
Master the art of  
Internet  
developing  
customized device  
drivers for your  
embedded Linux  
systems Key  
Features Stay up to  
date with the Linux  
PCI, ASoC, and  
V4L2 subsystems

Online Library  
Practical Linux  
Programming  
and write device  
Device Drivers  
drivers for them  
Embedded  
to grips with the  
Systems And The  
Linux kernel power  
Internet  
management  
infrastructure  
Adopt  
a practical approach  
to customizing your  
Linux environment  
using best  
practices  
Book  
Description Linux is  
one of the fastest-

Online Library

Practical Linux

Programming

Device Drivers

Embedded

Systems And The

Internet

Engineering

Support a wide

variety of embedded

devices with its

improved subsystems

and a range of new

features. With this

book, you'll find out

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Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
By  
Linux  
Linux Device Driver  
Development  
provides complete  
coverage of kernel  
topics, including  
video and audio  
frameworks, that

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Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
Bergamini  
Serafini

**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,**

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Programming

Device Drivers

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Internet

Programming

Series

helpers, you'll

advance to working

with special device

types such as Multi-

Function Devices

(MFD) followed by



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Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
Device Drivers  
Sizing

**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**

Online Library  
Practical Linux  
Programming  
learnExplore and  
Device Drivers  
adopt Linux kernel  
Embedded  
helpers for locking,  
Systems And The  
work deferral, and  
Internet  
interrupt manageme  
ntUnderstand the  
Regmap subsystem  
to manage memory  
accesses and work  
with the IRQ  
subsystemGet to  
grips with the PCI  
subsystem and write

Online Library  
Practical Linux  
Programming  
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

Online Library

Practical Linux

Programming

Device Drivers,

Embedded

Systems And The

Internet Who

this book is for This

book is for

embedded

developers, Linux

system engineers,

and system

programmers who

want to explore  
**Linux kernel**

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Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
Solving  
frameworks and  
subsystems. C  
programming skills  
and a basic  
understanding of  
driver development  
are necessary to get  
started with this  
book.

**Over 30 recipes to  
develop custom  
drivers for your  
embedded Linux**

Online Library

Practical Linux

Programming

Device Drivers

Embedded

Systems And The

Internet

Programming

Security

of developing device

drivers Program a

custom character

device to get access

to kernel internals

**Book Description**

**Linux is a unified**

Online Library

Practical Linux

Programming

Device Drivers

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Internet

Programming

Systems

used, the interest in

developing

proprietary device

drivers has also

increased. Device

drivers play a critical





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Embedded

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Internet

Programming

Security

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,**

Online Library  
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Device Drivers  
Embedded  
Systems And The  
Internet  
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

Online Library  
Practical Linux  
Programming

**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**

Online Library  
Practical Linux  
Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
Programming  
Systems

**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**

Online Library  
Practical Linux  
Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
Reverse Engineering  
Security

**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**

Online Library  
Practical Linux  
Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
Programming  
Series

**for embedded systems. Having basic hand-on with Linux operating system and embedded concepts is necessary.**

**Expand Raspberry Pi capabilities with fundamental engineering principles Exploring Raspberry Pi is the**

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Practical Linux  
Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
Programming  
Security

**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**



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Programming

Device Drivers

Embedded

Systems And The

Internet

"learning by doing"

approach that caters

to both beginners

and experts. The

book begins with

basic Linux and

programming skills,

and helps you stock

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Device Drivers  
Embedded  
Systems And The  
Internet  
Programming  
Security

**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  
components you use.  
The companion  
website provides a  
full repository that  
structures all of the**

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Device Drivers  
Embedded  
Systems And The  
Internet  
Programming  
Security

**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**

Online Library  
Practical Linux  
Programming  
applications, and  
Device Drivers  
using the Linux OS  
Embedded  
expands the  
Systems And The  
Internet  
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

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Programming

Device Drivers

Embedded

Systems And The

Internet

Basic applications

**Build your inventory**

**of parts so you can**

**always "make it**

**work" Understand**

**interfacing,**

**controlling, and**

**communicating with**

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Practical Linux  
Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
Programming  
Systems  
almost any  
component Explore  
advanced  
applications with  
video, audio, real-  
world interactions,  
and more Be free to  
adapt and create  
with Exploring  
Raspberry Pi.  
Discover how to  
write high-quality  
character driver

Online Library  
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Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
Programming  
Hardware interrupts  
and kernel  
synchronization Key  
Features Delve into  
hardware interrupt  
handling, threaded  
IRQs, tasklets,

Online Library  
Practical Linux  
Programming  
softirqs, and  
Device Drivers  
understand which to  
Embedded  
use when  
Systems And The  
powerful techniques  
Internet  
to perform user-  
kernel interfacing,  
peripheral I/O and  
use kernel  
mechanisms  
Work  
with key kernel  
synchronization  
primitives to solve  
kernel concurrency



Online Library  
Practical Linux  
Programming  
issuesBook  
Description Linux  
Embedded  
Kernel  
Programming Part 2  
- Char Device  
Drivers and Kernel  
Synchronization is  
an ideal companion  
guide to the Linux  
Kernel  
Programming book.  
This book provides a  
comprehensive

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Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
Programming  
Signals

**introduction for  
those new to Linux  
device driver  
development and will  
have you up and  
running with writing  
misc class character  
device driver code  
(on the 5.4 LTS  
Linux kernel) in next  
to no time. You'll  
begin by learning  
how to write a simple**

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Programming  
and complete misc  
Device Drivers  
class character  
Embedded  
driver before  
Systems And The  
interfacing your  
Internet  
driver with user-  
Programming  
mode processes via  
Security  
procfs, sysfs,  
debugfs, netlink  
sockets, and ioctl.  
You'll then find out  
how to work with  
hardware I/O  
memory. The book

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Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
covers working with  
hardware interrupts  
in depth and helps  
you understand  
interrupt request  
(IRQ) allocation,  
threaded IRQ  
handlers, tasklets,  
and softirqs. You'll  
also explore the  
practical usage of  
useful kernel  
mechanisms, setting

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Programming

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Internet

Programming

Synchronization

with Locking

Technologies

(mutexes, spinlocks,

and atomic/refcount

operators), including

more advanced

topics such as cache

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Internet

Programming

techniques. By the

end of this Linux

kernel book, you'll

have learned the

fundamentals of

writing Linux

character device

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Embedded

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Internet

Programming

**Device Model**

**(LDM) Write a**

**simple yet complete**

**misc class character**

**device**

**driver Perform user-**

**kernel interfacing**

Online Library  
Practical Linux  
Programming  
using popular  
Device Drivers  
methods Understand  
Embedded  
and handle  
Systems And The  
hardware interrupts  
Internet Perform  
confidently Perform  
I/O on peripheral  
programming  
hardware chip  
memory Explore  
kernel APIs to work  
with delays, timers,  
kthreads, and workq  
ueues Understand  
kernel concurrency



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Programming  
issues Work with key  
Device Drivers  
kernel  
Embedded  
synchronization  
Systems And The  
primitives and  
Internet how to  
detect and avoid  
deadlock Who this  
book is for An  
understanding of the  
topics covered in the  
Linux Kernel  
Programming book  
is highly

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Programming

Device Drivers

Embedded

Systems And The

Internet

Beginning to find

their way with device

driver development.

Linux device driver

developers looking to

overcome frequent

and common

kernel/driver

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Programming

**development issues,  
as well as perform  
common driver tasks  
such as user-kernel  
interfaces,**

**performing**

**peripheral I/O,**

**handling hardware**

**interrupts, and**

**dealing with**

**concurrency will**

**benefit from this**

**book. A basic**

Online Library

Practical Linux

Programming

understanding of

Linux kernel

internals (and

common APIs),

kernel module

development, and C

programming is

required.

Write custom device

drivers to support

computer

peripherals in Linux

operating systems

Online Library

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Programming

**Exploring Raspberry  
Pi**

**Essential Linux**

**Device Drivers**

**Rust Programming**

**Cookbook**

**Embedded Linux**

**Development Using**

**Yocto Project**

**Cookbook**

**Develop custom**

**drivers for your**

**embedded Linux**

Online Library  
Practical Linux  
Programming  
**applications**  
Device Drivers  
Embedded  
Systems And The  
Internet  
Programming  
Solutions  
bull; Learn UNIX  
essentials with a  
concentration on  
communication,  
concurrency, and  
multithreading  
techniques bull;  
Full of ideas on  
how to design and  
implement good  
software along  
with unique

Online Library  
Practical Linux  
Programming  
projects  
throughout bull;  
Embedded  
Excellent  
Systems And The  
Stevens' Advanced  
UNIX System  
Programming  
Practical solutions  
to overcome  
challenges in  
creating console  
and web  
applications and

Online Library  
Practical Linux  
Programming  
working with  
Device Drivers  
systems-level and  
Embedded code,  
Systems And The  
network  
Internet  
programming,  
deep neural  
networks, and  
much more. Key  
Features  
Work  
through recipes  
featuring  
advanced  
concepts such as



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Programming

concurrency,

Device Drivers,

unsafe code, and

Embedded

macros to migrate

Systems And The

your codebase to

the Rust

programming

language Learn

how to run

machine learning

models with Rust

Explore error

handling, macros,

and

and

and

and

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Programming

modularization to  
write maintainable

codeBook

Description Rust

2018, Rust's first

major milestone

since version 1.0,

brings more

advancement in

the Rust language.

The Rust

Programming

Cookbook is a

Online Library

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Programming

practical guide to  
help you overcome

challenges when

writing Rust code.

This Rust book

covers recipes for

configuring Rust

for different

environments and

architectural

designs, and

provides solutions

to practical

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Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
Programming  
Systems

problems. It will also take you through Rust's core concepts, enabling you to create efficient, high-performance applications that use features such as zero-cost abstractions and improved memory management. As

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Programming  
you progress,  
Device Drivers  
you'll delve into  
Embedded  
more advanced  
Systems And The  
topics, including  
Internet  
channels and  
actors, for building  
Scalable,  
production-grade  
applications, and  
even get to grips  
with error  
handling, macros,  
and

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Internet

Programming

So you can overcome

roadblocks when

using Rust for

systems

programming, IoT,

web development,

and network

programming.

# Online Library Practical Linux

Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
Programming  
Series

Finally, you'll discover what Rust 2018 has to offer for embedded programmers. By the end of the book, you'll have learned how to build fast and safe applications and services using Rust. What you will

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Internet

Programming

Secure

problemsGrasp

the core concepts

of Rust to develop

fast and safe appli

cationsExplore the

possibility of

integrating Rust



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Programming  
units into existing  
Device Drivers  
applications for  
Embedded  
improved  
Systems And The  
efficiencyDiscover  
Internet  
how to achieve  
Better programming  
parallelism  
and security with  
RustWrite Python  
extensions in  
RustCompile  
external assembly  
files and use the  
Foreign Function

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Programming

Interface (FFI)Build

Device Drivers  
web applications

Embedded  
and services using

Systems And The  
Rust for high

Internet  
performanceWho

this book is for

The Rust

cookbook is for

software

developers looking

to enhance their

knowledge of Rust

and leverage its

Online Library  
Practical Linux  
Programming  
Device Drivers  
Embedded  
Systems And The  
Internet of Things

features using  
modern  
programming  
practices.

Familiarity with  
Rust language is  
expected to get the  
most out of this  
book.

Master the  
techniques needed  
to build great,  
efficient embedded

Online Library

Practical Linux

Programming

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

Online Library

Practical Linux

Programming

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

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Programming

is for you. It is also  
Device Drivers  
for Linux

Embedded  
developers and

Systems And The  
system

Internet  
programmers who

are familiar with  
Beginning

Embedded  
Systems

systems and want

to learn and

program the best

in class devices. It

is appropriate for

students studying

Online Library  
Practical Linux  
Programming  
embedded  
Device Drivers  
techniques, for  
Embedded  
developers  
Systems And The  
implementing  
Internet  
embedded Linux  
devices, and  
Programming  
engineers  
Supporting  
supporting  
existing Linux  
devices. What You  
Will Learn\*  
Evaluate the Board  
Support Packages

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Programming

Device Drivers

Embedded

Systems And The

Internet\* Use

Buildroot and the

Yocto Project to

create embedded

Linux systems

quickly and

efficiently\* Update

IoT devices in the

field without



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Programming

compromising  
Device Drivers  
security\* Reduce

Embedded  
Systems And The  
Internet  
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

# Online Library Practical Linux Programming

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

Detail Embedded  
Linux runs many

Online Library

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Programming

Device Drivers

Embedded

Systems And The

Internet

Programming

Controllers - all of

them have Linux at

their heart. Linux

is a core

technology in the

implementation of

the inter-

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Practical Linux  
Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
Programming  
Solved

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

Online Library  
Practical Linux  
Programming  
fundamental  
Device Drivers  
elements that  
Embedded  
underpin all  
Systems And The  
embedded Linux  
Internet:  
projects: the  
toolchain, the  
bootloader, the  
kernel, and the  
root filesystem.  
You'll see how to  
create each of  
these elements  
from scratch, and

# Online Library Practical Linux Programming Device Drivers Embedded Systems 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

# Online Library Practical Linux Programming

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

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Programming

manage memory in  
an efficient way.

Device Drivers

Embedded

Systems And The

Internet

Programming

Applications and in

the Linux kernel,

and how to profile

the system so that

you can look out

for performance

bottlenecks. By the



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Programming

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

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Programming

analysis of the  
Device Drivers  
implementation of  
Embedded

Systems And The

Internet  
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

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Practical Linux  
Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
& UNIX TCL/TK.

Write software that  
makes the most  
effective use of the  
Linux system,  
including the  
kernel and core  
system libraries.  
The majority of

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Practical Linux  
Programming  
Device Drivers  
Embedded  
Systems And The  
Internet  
both Unix and  
Linux code is still  
written at the  
system level, and  
this book helps  
you focus on  
everything above  
the kernel, where  
applications such  
as Apache, bash,  
cp, vim, Emacs,  
gcc, gdb, glibc, ls,  
mv, and X exist.

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Practical Linux

Programming

Written primarily  
for engineers

looking to program  
at the low level,

this updated

edition of Linux

System

Programming

gives you an

understanding of

core internals that

makes for better

code, no matter

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Programming

where it appears in  
the stack. --

Device Drivers

Embedded

Systems And The

Internet

Mastering

Embedded Linux

Programming

Device Drivers,

Embedded

Systems, and the

Internet

Mastering

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