Android Application Development for the Intel[®] Platform

Ryan Cohen, Lead Project Editor Tao Wang, Lead Contributing Author

apress

Contents

About the Lead Project Editor	xvii
About the Lead Contributing Author	xix
About the Technical Reviewer	xxi
Introduction	xxiii
Chapter 1: Overview of Embedded Application Develop for Intel Architecture	ment 1
Introduction to Embedded Systems	1
Mobile Phones	3
Consumer Electronics and Information Appliances	3
Definition of an Embedded System	4
Limited Resources	4
Real-Time Performance	4
Robustness	5
Integrated Hardware and Software	5
Power Constraints	5
Difficult Development and Debugging	5
Typical Architecture of an Embedded System	6
Typical Hardware Architecture	6
Microprocessor Architecture of Embedded Systems	9
Typical Software Architecture	15
Special Difficulties of Embedded Application Development	17
Summary	

Chapter 2: Intel Embedded Hardware Platform	
Intel Atom Processor	19
Intel Atom Processor Architecture	20
Features of the Intel Atom Processor	24
Other Technologies Used by the Intel Atom Processor	28
Intel Embedded Chipset	29
Intel System on Chip (SoC)	30
Medfield	31
Bay Trail	32
64-Bit Android OS on Intel Architecture	32
64 Bits vs. 32-bit Android	32
Memory and CPU Register Size	
Reference Platform for Intel Embedded Systems	34
Internet of Things (IoT) and Next Unit of Computing (NUC)	34
Smartphones	
Tablets	39
In-Vehicle Infotainment	
Other Application Platforms and Fields	42
Robotics	43
Summary	45
Chapter 3: Android Application Development Processes and Tool Chains for Intel® Architecture	47
Android Application Development	
Development Environment of Android Applications	
The Android Application Development Process	
The Anaroid Application Development Flocess	
Debugying and Simulation of Anarola Systems	

Typical Development Tool Chains	60
Editor	62
Compiler and Linker	62
Debugger	63
Build Manager	63
Makefile Auto Generation Tool	63
Optimizing Tools gprof	64
Overview, Installation, and Configuration of Android Applicatio Development Tool Chains on Intel® Architecture	n 65
Intel Environment Setup for Android (OS X Host)	72
Android Development on Linux-based Host Machines	73
Intel [®] Integrated Native Developer Experience beta	73
Tools and Libraries	74
Setup	
Intel INDE Installation	
Summary	
BChapter 4: Real Device Environment Installation	
BummaryBummary	
Summary	
Summary Belling the USB Driver on the Host Machine Installing the USB Driver on the Host Machine	
Summary Be and the USB Driver on the Host Machine and the Target Machine Developing Android Applications	
Summary Bit in the installation installation installation installation installation installation installing the USB Driver on the Host Machine interaction between the Host Machine and the Target Machine and the Ta	
Summary Bit is a standard for the	
Summary But in the installation installation installation installation installation installation installing the USB Driver on the Host Machine interaction between the Host Machine and the Target Machine a	
Summary Bit is a second	
Summary Bit is an auton and the set of	
Summary Biter NUCL Installation Summary Biter 4: Real Device Environment Installation Mobile Phone Setting Installing the USB Driver on the Host Machine Installing the USB Driver on the Host Machine and the Target Machine Interaction between the Host Machine and the Target Machine Developing Android Applications Debugging Android Applications Intel Auxiliary Tools for Android Application Development Intel C++ Compiler (Intel ICC) Intel Graphics Performance Analyzers for Android OS Intel System Studio Intel Project Anarchy: a Free Mobile Game Engine by Havok	
Summary Be Chapter 4: Real Device Environment Installation Mobile Phone Setting Installing the USB Driver on the Host Machine Interaction between the Host Machine and the Target Machine Developing Android Applications Debugging Android Applications Intel Auxiliary Tools for Android Application Development Intel C++ Compiler (Intel ICC) Intel Graphics Performance Analyzers for Android OS Intel System Studio Intel Project Anarchy: a Free Mobile Game Engine by Havok	
Summary Summary Chapter 4: Real Device Environment Installation Mobile Phone Setting Installing the USB Driver on the Host Machine Installing the USB Driver on the Host Machine and the Target Machine Developing Android Applications Debugging Android Applications Debugging Android Applications Intel Auxiliary Tools for Android Application Development Intel C++ Compiler (Intel ICC) Intel Graphics Performance Analyzers for Android OS Intel System Studio Intel Project Anarchy: a Free Mobile Game Engine by Havok Intel Performance Libraries Summary	

Chapter 5: The Android OS	131
Android Overview	131
Android Architecture	133
Basic Android Functionality from a Programming Perspective .	134
Android System Interface	134
Common Linux Commands and Operations	140
Using the Android Development and Auxiliary Tools	151
Using the Emulator	151
Accept "yes" for custom hw and choose x86 for hw.cpu.arch propertyU the Help File	sing 156
Using DDMS	160
Using adb at Command Prompt	
Using Android Commands	
Using Telnet for Emulator Commands	
Summary	190
Chapter 6: Customization and Installation of Android	191
Tailoring and Customization of an Embedded OS	191
Overview of Android Customization	192
ROM Package/Image	
Overview of Android Image Customization	
Example of Android Image Customization	
Installation/Reflash of the Android Image	
Image Installation Example	200
Intel Build Tools Suite	201
Summary	202

203
203
204
208
208
209
210
213
214
214
214
228
231
231
232
233
235
235
235
240
244

The Relationship between Applications and Activities	247
The Basic Android Application Interface	247
GuiExam Application Code Analysis	
Using Layouts as Interfaces	253
Using the View Directly as an Interface	255
Component ID	257
Buttons and Events	259
Inner Class Listener	
Using ImageView	
Exit Activities and Application	
Summary	269
Chapter 9: GUI Design for Android Apps, Part 3: Designing Complex Applications	271
Applications with Multiple Activities	271
Triggering an Explicit Match of Activities with No Parameters	
Triggering Explicit Matching of an Activity with Parameters of Different Applications	
Implicit Matching of Built-In Activities	
Implicit Match that Uses a Custom Activity	
Summary	304
Chapter 10: GUI Design for Android Apps, Part 4: Graphic Interface and Touchscreen Input	305
Display Output Framework	305
Drawing Framework for Responding to Touchscreen Input	310
Multi-Touch Code Framework	313

Dialog Boxes in Android	322
Using an Activity's Dialog Theme	
Using a Specific Dialog Class	323
Using Toast Reminders	323
Dialog Box Example	323
Application Property Settings	328
Summary	333
Chapter 11: Performance Optimization for Android	
Applications on x86	335
Principles of Performance Optimization	335
Reducing Instructions and Execution Frequency	
Selecting Faster Instructions	336
Improving the Degree of Parallelism	337
Using the Register Cache Effectively	
Performance Optimization Methodology	
Performance Optimization Approaches	338
Intel Graphics Performance Analyzers (Intel GPA)	341
Introduction to Intel GPA	
Installing Intel GPA	344
Using Intel GPA on Android	
Android Multithreaded Design	355
Android Framework of a Thread	356
Thread Synchronization	
Thread Communication	
Principles of Multithreaded Optimization for the Intel Atom Processor	

Case Study: Intel GPA-Assisted Multithreaded Optimization for an Android Application	373
Original Application and Intel GPA Analysis	374
Optimized Application and Intel GPA Analysis	381
Summary	390
Chapter 12: NDK and C/C++ Optimization	. 391
Introduction to JNI	391
Java Methods and C Function Prototype Java	394
Introduction to NDK	397
Installing NDK and Setting Up the Environment	401
Installing CDT	401
NDK Examples	403
Using the Command Line to Generate a Library File	403
Generating a Library File in the IDE	411
Workflow Analysis for NDK Application Development	417
NDK Compiler Optimization	419
Machine-Independent Compiler Switch Options	420
Intel Processor-Related Compiler Switch Options	422
Optimization with Intel Integrated Performance Primitives (Intel IPP) 426
NDK Integrated Optimization Examples	427
C/C++: Accelerating the Original Application	427
Extending Compiler Optimization	436
Comparing Compiler Optimizations	441
Summary	443

Chapter 13: The Low-Power Design of Android Application and Intel Graphics Performance Analyzers (Intel GPA):
Assisted Power Optimization 445
Overview of Low-Power Design
The Basics of Consumption
Power Consumption Control Technology
Linux Power-Control Mechanism454
Tickless Idle
PowerTOP
Intel Power-Optimization Aids 456
Low-Power Considerations in Application Design
The Most Basic Principle of Low-Power Optimization
General Recommendations: High Performance = Low Power Consumption 460
Use Low-Power Hardware as Much as Possible to Achieve the Task
Polling Is the Enemy of Low-Power Optimization
Event-Driven Programming462
Reduce Periodic Operations Similar to Polling in Application Programs
Low-Power Recommendations for Data Acquisition and Communications
Establishing a Power-Aware Program463
Case Study 1: Intel GPA Assisted Power Optimization for an Android Application
Original Application and Intel GPA Power Analysis
Optimized Applications and an Intel GPA Power Analysis
Case Study 2: Timer Optimization and Intel GPA Power Analysis 475
Book Summary 481
Index