

# Foundations of GTK+ Development



Andrew Krause

## **Foundations of GTK+ Development**

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*I dedicate this book to Mrs. Kaminsky, for never allowing me to settle for anything but my best. I hope you can look at this book and see everything that you have done for me, even though I have yet to broaden the scope of my writing beyond technology.*



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# About the Author



■ **ANDREW KRAUSE** is the creator of OpenLDev, an integrated development environment that focuses on C, C++, and GTK+ projects. He is currently attending Pennsylvania State University with a major in computer engineering. Since 1998, Andrew has been developing with many computer and web programming languages, including C, C++, Perl, and PHP, as well as the graphical design libraries GTK+, Gtkmm, and Qt. He also designed flight hardware for the Low Ionosphere Measurement Satellite project at Penn State. More information about

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# Introduction

**O**ne of the most important aspects of an application is the interface that is provided to interact with the user. With the unprecedented popularity of computers in society today, people have come to expect those user interfaces to be graphical, and the question of which graphical toolkit to use quickly arises for any developer. For many, the cross-platform, feature-rich GTK+ library is the obvious choice.

Learning GTK+ can be a daunting task, because many features lack documentation, and even more are difficult to understand from only the API documentation. *Foundations of GTK+ Development* aims to decrease the learning curve and set you on your way to creating cross-platform graphical user interfaces for your applications.

Each chapter in this book contains multiple examples that will help you further your understanding. In addition to these examples, the final chapter of this book provides five complete applications that incorporate topics from the previous chapters. These applications will show you how to bring together what you have learned to accomplish various projects.

The beginning of each chapter provides an overview of what that chapter will cover, so that you are able to skip around if you want. Most chapters also contain exercises to test your understanding of the material. I recommend that you complete all of the exercises before continuing, because the best way to learn GTK+ is to use it.

At the end of this book, you will find multiple appendixes that can serve as references for various aspects of GTK+. These appendixes include tables listing signals, styles, and properties for every widget in GTK+ and a complete list of stock items and GError types. These appendixes will remain a useful reference even after you have finished reading the book and begin creating your own applications. In addition, Appendix F contains explanations of the solutions to all of the exercises throughout the book.

## Who Should Read This Book

Because this book begins with the basics and works up to more difficult concepts, you do not need any previous knowledge of GTK+ development to use this book. This book *does* assume that you have a decent grasp of the C programming language. You should also be comfortable with running commands and terminating applications (Ctrl+C) in a Linux terminal.

In addition to a grasp of the C programming language, some parts of this book may be difficult to understand without some further knowledge about programming for Linux in general. You will get more out of this book if you already comprehend basic object-oriented concepts. It is also helpful to know how Linux handles processes.

You can still use this book if you do not already know how to implement object orientation or manage processes in Linux, but you may need to supplement this book with one or more online resources. A list of helpful links and tutorials can be found on the book's web

site, which is located at [www.gtkbook.com](http://www.gtkbook.com). You can also find more information about the book at [www.apress.com](http://www.apress.com).

## How This Book Is Organized

*Foundations of GTK+ Development* is composed of 13 chapters. Each chapter will give you a broad understanding of its topic. For example, Chapter 3 covers container widgets and will introduce many of the most important widgets derived from the `GtkContainer` class.

Because of this structure, some chapters can be somewhat lengthy. Do not feel as though you have to complete a whole chapter in one sitting, because it can be difficult to remember all of the information presented. Also, because many examples span multiple pages, consider focusing on just a few examples at a time and really trying to understand their syntax and intent.

Each chapter provides important information and unique perspectives that will help you to become a proficient GTK+ developer. They are as follows:

Chapter 1 teaches you how to install the GTK+ libraries and their dependencies on your Linux system. It also gives an overview of each of the GTK+ libraries including GLib, GObject, GDK, GdkPixbuf, Pango, and ATK.

Chapter 2 steps through two “Hello World” applications. The first shows you the basic essentials that are required by every GTK+ application. The second expands on the first while also covering signals, callback functions, events, and child widgets. You will then learn about widget properties and the `GtkButton` widget.

Chapter 3 begins by introducing the `GtkContainer` structure. Next, it teaches you about horizontal and vertical boxes, tables, fixed containers, horizontal and vertical panes, notebooks, and event boxes.

Chapter 4 covers basic widgets that provide a way for you to interact with users. These include toggle buttons, specialized buttons, text entries, and spin buttons.

Chapter 5 introduces you to the vast array of built-in dialogs available to you. It also teaches you how to create your own custom dialogs.

Chapter 6 is a general overview of the most useful features in GLib. It covers many of the data types available to you. It also introduces idle functions, timeouts, spawning processes, loading dynamic modules, file utility functions, timers, and other general utility functions.

Chapter 7 introduces you to scrolled windows. It also gives in-depth instructions on using the text view widget. Other topics include the clipboard and the `GtkSourceView` library.

Chapter 8 covers two types of widgets that use the `GtkTreeModel` object. It gives an in-depth overview of the tree view widget and shows you how to use combo boxes with tree models or strings.

Chapter 9 provides two methods of menu creation: manual and dynamic. It covers menus, toolbars, pop-up menus, keyboard accelerators, and the status bar widget.

Chapter 10 is a short chapter about how to design user interfaces with the Glade User Interface Builder. It also shows you how to dynamically load your user interfaces using Libglade.

Chapter 11 teaches you how to create your own custom GTK+ widgets by deriving them from other widgets or creating them from scratch. It also introduces you to implementing and using interfaces.

Chapter 12 covers many of the remaining widgets that do not quite fit into other chapters. This includes several widgets that were introduced in GTK+ 2.10 including recent files and tray icon support.

Chapter 13 gives you a few longer, real-world examples. They take the concepts you have learned throughout the book and show you how they can be used together.

In addition to the chapters, six appendixes are provided as references to widget properties, signals, styles, stock items, GError types, and descriptions of exercise solutions.

## Conventions

This book uses various typefaces to help you distinguish between GTK+ code and regular English phrases. Actual code is typeset in a monospace font. This can include whole lines of code or function names, signals, and properties in a paragraph.

There are other types of conventions used in this book, which follow.

### Exercise 0-0. Sample Exercise

These boxes show exercises that test your understanding of the material in the section. They can include questions, code challenges, or various other types of material.

You should complete each of these exercises before proceeding, because they will help you practice the concepts you have learned throughout the current chapter and put them together with concepts from past chapters.

---

**Note** These boxes give important notes, tips, and cautions. It is essential that you pay attention to them, because they give you information that you will need when developing your own applications.

---

---

Textual output in the terminal is shown in a monospace font between these lines, although most output will be in the form of an image, since GTK+ is graphical.

---

## What You Need

Before proceeding, you will need a few things: a compiler, a text editor, a terminal emulator, the GTK+ libraries, the pkg-config application, and this book.

All compiler commands provided by this book are for the GCC compiler available at <http://gcc.gnu.org> or through your package manager. Most standard C or C++ compilers will work, but if you use a compiler other than GCC, you will have to use a different set of commands than those provided.

Any text editor will do, so you should choose the one that suits you best. Some popular text editors that you might consider include Vim, Emacs, Leafpad, and GEdit. Vim and Emacs are terminal-based editors, while Leafpad and GEdit are graphical text editors.

Instructions on installing the GTK+ libraries and the pkg-config application are provided in the last section of Chapter 1.

## Official Web Site

You can find additional resources on the book's official web site, found at [www.gtkbook.com](http://www.gtkbook.com). This web site includes up-to-date documentation, links to useful resources, and articles that will supplement what you learn in this book. You can also find at this site a link to the downloadable source code for every example in this book. The Apress web site, found at [www.apress.com](http://www.apress.com), is another great place to find more information about this book.

When you unzip the source code from the web site, you will find a folder that contains the examples in each chapter and an additional folder that holds exercise solutions. You can run `make` to build all of the files within the current folder. It is also possible to make a single file by using the `compile` command given in Chapter 2 or by running `make sourcefile`. For example, to build `exercise2-1.c`, you should type `make exercise2-1`.