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Go Programming Language

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Wei-Meng Lee
Author of *SwiftUI For Dummies*

Go Programming Language

by Wei-Meng Lee

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Published by: **John Wiley & Sons, Inc.,** 111 River Street, Hoboken, NJ 07030-5774, www.wiley.com

Published simultaneously in Canada

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Library of Congress Control Number: 2021934091

ISBN 978-1-119-78619-1 (pbk); ISBN 978-1-119-78620-7 (ebk); ISBN 978-1-119-78621-4 (ebk)

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Introduction

Today, if you're a programmer, you have lots of options when it comes to choosing a programming language. Popular programming languages include C++, C#, Go, Java, JavaScript, Python, R, Swift, and many more. Each language is designed to solve a different set of problems and, depending on what you're going to create (mobile apps, web apps, desktop apps), you may end up learning one or more of these languages.

So, why Go? Turns out that three engineers at Google were frustrated with the various toolsets that they were working on and set out to design a new language that would address the criticisms of other languages while at the same time keeping their useful features.

Go was designed to

- Use static typing and have the run-time efficiency of C
- Have the readability and usability of languages like Python and JavaScript
- Exhibit great performance in networking and multiprocessing

The problems with existing languages forced the team at Google to design a new language from the ground up, creating a lean and mean language designed for massive multithreading and concurrency.

This book covers the basics of Go (also known as Golang), one of the fastest-growing programming languages specifically designed to build faster and more scalable applications.

About This Book

In this code-intensive book, you're encouraged to try out the various examples, which are designed to be compact, easy to follow, and easy to understand. But you don't have to read the book from the first page to the last. Each chapter is designed to be independent, so you can dive in wherever you want and find the topics that you want to start learning.

If you're short on time, you can safely skip sidebars (text in gray boxes) or anything marked with the Technical Stuff icon (more on that in "Icons Used in This Book," later in this Introduction). They're interesting, but they aren't essential to understanding the subject at hand.

Within this book, you may note that some web addresses break across two lines of text. If you're reading this book in print and want to visit one of these web pages, simply key in the web address exactly as it's noted in the text, pretending as though the line break doesn't exist. If you're reading this as an e-book, you've got it easy — just click the web address to be taken directly to the web page.

Foolish Assumptions

This book is for people who are new (or relatively new) to Go. I don't assume that you're familiar with Go programming, but I do assume the following:

- You're familiar with the basics of programming.
- You're familiar with the concept of data structures, such as dictionary, arrays, and structs.
- You have a computer that you can use to try out the examples in this book.

Icons Used in This Book

Like other books in the *For Dummies* series, this book uses icons, little pictures in the margin to draw your attention to certain kinds of material. Here are the icons that I use:

REMEMBER Whenever I tell you something useful or important enough that you'd do well to store the information somewhere safe in your memory for later recall, I flag it with the Remember icon.

TECHNICAL STUFF The Technical Stuff icon marks text that contains some for-nerds-only technical details or explanations that you're free to skip.

TIP The Tip icon marks shortcuts or easier ways to do things, which I hope will make your life easier.

WARNING The Warning icon marks text that contains a friendly but unusually insistent reminder to avoid doing something. You've been warned.

Beyond the Book

In addition to what you're reading right now, this product comes with a free access-anywhere Cheat Sheet

that tells you how to try Go online without installing any additional software, how to use the online tools to convert JSON to Go structs, and how to use Go in Docker. To get this Cheat Sheet, go to www.dummies.com and type **Go Programming Language For Dummies Cheat Sheet** in the Search box.

This book includes some downloadable content as well. Go to www.dummies.com/go/goprogramminglanguagefd to download all the code in the book.

Where to Go from Here

If you're totally new to Go, you may want to start from the first chapter and follow through to the end. If you already have some basic knowledge of Go, you may want to head to Part 5, where you see Go in action. Regardless of how much experience you have, you can always turn to the index or table of contents to find the subjects that interest you most.

Finally, my advice to all beginners is: Practice, practice, practice. Type in the code in each chapter and make mistakes. The more mistakes you make, the better you'll understand and remember the topics discussed.

Good luck and enjoy your newfound knowledge!

Part 1
Getting Started with Go

IN THIS PART ...

Write your first Go program.

Discover the basic data types in Go and find out how to declare variables and constants.

Explore the various logical and comparison operators and use them to make decisions.

Understand how looping works and how you can execute code repeatedly.

Use functions to create Go programs that are easy to maintain and understand.

Chapter 1

Hello, Go!

IN THIS CHAPTER

- **Understanding why Go is the wave of the future**
- **Installing Go on your computer**
- **Working with an integrated development environment**
- **Writing a Go program and understanding how it works**
- **Seeing how Go compares to other languages**

Go is an open-source programming language — one of the fastest-growing programming languages around — released by Google in 2009. It's a multipurpose programming language specifically designed to build fast, scalable applications.

Go comes from a pretty impressive team of people: Ken Thompson (designer and creator of Unix and C), Rob Pike (cocreator of UTF-8 and Unix format), and Robert Griesemer (a Google engineer). If you're technically inclined, you may want to check out an article called "Go at Google: Language Design in the Service of Software Engineering" (https://talks.golang.org/2012/splash.article), which discusses how Go was initially conceived to solve problems at Google.

In this chapter, I explain why learning Go is important for your career, where Go can be used, and how to get started with Go programming.

TIP Go is often referred to as Golang because of its web address: https://golang.org. However, the official name of the language is Go, so that's how I refer to it throughout this book.

Seeing What Learning Go Can Do for You

You can learn many programming languages today, but Go stands out from the others for a few reasons:

- **Go is easy to learn.** Go's syntax makes it a readable language. It has no support for object-oriented programming (OOP), which means you don't have to worry about classes and inheritance and the complexities that come with that.

  

  TECHNICAL STUFF Object-oriented programming (OOP) is a programming paradigm that is based on the concept of *objects* (data). Instead of focusing on the functions and logics, OOP organizes software around data, or objects. A key concept in OOP is *classes* (sort of like templates). Suppose you want to display buttons in your application. Instead of writing the code to display each button individually, you can create a class to represent a generic button and use it to create buttons to display in your application. Each

button has its own *properties* (characteristics). Using the concept of *inheritance* in OOP, you can create multiple *subclasses* of the button class to create different types of buttons, such as a rounded button, a rectangular button, and so on.

- **Go has fewer features than other programming languages.** You don't have to worry about the best way to solve a problem — there is only one right way to solve a problem in Go. This makes your codebase easy to maintain.
- **Go excels in concurrent programming.** Go's support for *Goroutines* makes it extremely easy to run multiple functions concurrently.

TIP Go has no support for *generics* (the ability to specify the actual data type until it's actually used), but this may change as the language evolves.

If you still aren't convinced that you should learn Go, perhaps this next bit of news will motivate you: In the Stack Overflow Developer Survey 2019 (https://insights.stackoverflow.com/survey/2019), Go developers were the third highest paid in the industry, behind Clojure and F# developers.

Although Go has been around for quite a while (since 2009), only recently did it get wide adoption by developers, thanks to the proliferation of cloud computing and microservices. Today, Go has been widely used by major companies such as Dailymotion, Dropbox, Google, and Uber.

Here are some examples of where Go can be used:

- **Cloud services:** You can build scalable apps using Go on the Google Cloud Platform (GCP).
- **Networking apps:** With Go's support for Goroutines, you can use Go to build distributed servers and application programming interfaces (APIs).
- **Web services:** You can use Go to build scalable and efficient web services.
- **Command-line apps:** Because Go runs on multiple platforms, you can compile the same codebase and target different platforms (such as those running on macOS and Windows).

Installing Go on Your Machine

You're probably very eager to get started with Go programming on your machine, so let's get to it!

The easiest way to install Go is to go to `https://golang.org/doc/install`. This website automatically detects the operating system (OS) you're using and shows you the button to click to download the Go installer (see Figure 1-1).

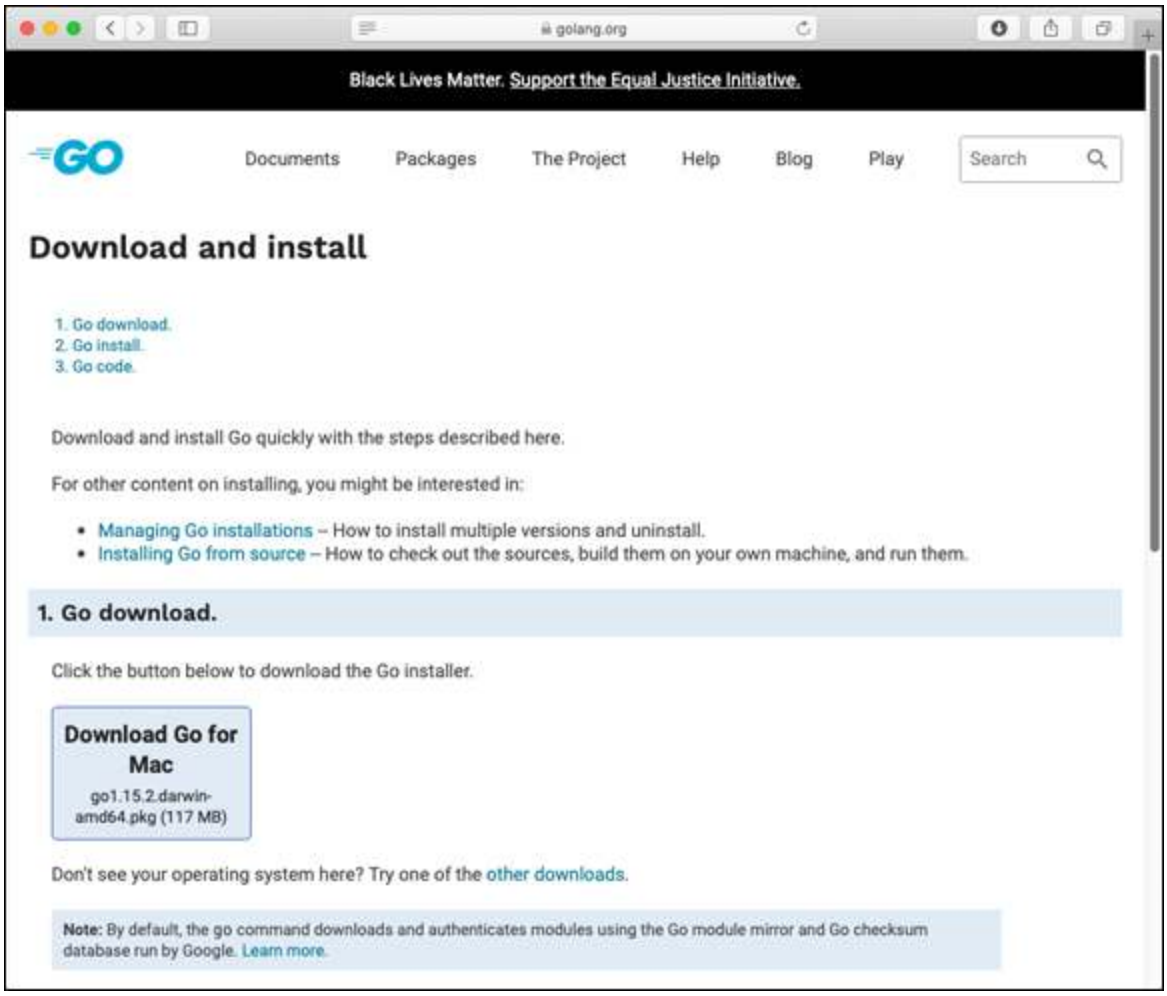

FIGURE 1-1: Downloading the Go installer.

TIP This book code has been written and tested using Go version 1.15. When you're reading this book, a new version of Go may have been released. In order to ensure that you can follow the examples in this book, I strongly suggest that you install the same version of Go that I've used. You can find it here:

- **macOS:** https://golang.org/dl/go1.15.8.darwin-amd64.pkg
- **Windows:** https://golang.org/dl/go1.15.8.windows-amd64.msi

If you want to be able to choose the Go installer for each of the supported operating systems (Linux, macOS, and Windows), and even see the source code for Go, go to https://golang.org/dl/.

After you've downloaded the Go installer, double-click the installer to start the straightforward installation process. I recommend that you just use the default installation settings — you don't need to change any of those settings.

In the following sections, I show you how to verify that your installation is performed successfully on macOS and Windows.

macOS

On macOS, the Go installer installs the Go distribution in the `/usr/local/go` directory. It also adds the `/usr/local/go/bin` directory to your `PATH` environment variable. You can verify this by entering the following command in the Terminal app (which you can find in the `Applications/Utilities` folder):

```
$ echo $PATH
```

You should see something like the following output (note the added path, highlighted in bold):

```
/Users/weimenglee/opt/anaconda3/bin:/Volumes/SSD/opt/anaco
nda3/condabin:/Users/weimenglee/flutter/bin:/Users/weimeng
lee/go/bin:/Users/weimenglee/.nvm/versions/node/v9.2.0/bin
:/usr/local/bin:/usr/bin:/bin:/usr/sbin:/sbin:/usr/local/g
o/bin:/usr/local/share/dotnet:~/.dotnet/tools:/Library/App
le/usr/bin:/Library/Frameworks/Mono.framework/Versions/Cur
rent/Commands
```

TIP Make sure to restart the Terminal app after you've installed Go in order for the changes to take effect.

To verify that the installation is correct, type the following command in Terminal:

```
$ go version
```

You should see the version of Go installed on your system:

```
go version go1.15.8 darwin/amd64
```

Windows

On Windows, the Go installer installs the Go distribution in the `C:\Go` directory. It also adds the `C:\Go\bin` directory to your `PATH` environment variable. You can verify this by entering the following command in Command Prompt (which you can find by typing **cmd** in the Windows search box):

```
C:\Users\Wei-Meng Lee>path
```

You should see something like the following output (note the added path, highlighted in bold):

```
PATH=C:\WINDOWS\system32;C:\WINDOWS;C:\WINDOWS\System32\
Wbem;C:\WINDOWS\System32\WindowsPowerShell\v1.0\;C:\WIND
OWS\System32\OpenSSH\;C:\Program Files\dotnet\;C:\Program
Files\Microsoft SQL Server\130\Tools\Binn\;C:\Go\bin;
C:\Program Files\Git\cmd;C:\Program Files\Graphviz
 2.44.1\bin;C:\Program Files\CMake\bin;C:\Program
Files\Docker\Docker\resources\bin;C:\ProgramData\DockerDes
ktop\version-bin;C:\Program Files\MySQL\MySQL Shell
8.0\bin\;C:\Users\Wei-Meng Lee\AppData\Local\
Microsoft\WindowsApps;;C:\Users\Wei-Meng Lee\
AppData\Local\Programs\Microsoft VS Code\bin;C:\Users\Wei-
Meng Lee\.dotnet\tools;C:\Users\Wei-Meng Lee\go\bin
```

TIP Make sure to restart the Command Prompt window after you've installed Go in order for the changes to take effect.

To verify that the installation is correct, type the following command in Command Prompt:

```
C:\Users\Wei-Meng Lee>go version
```

You should now see the version of Go installed on your computer:

```
go version go1.15.8 windows/amd64
```

Using an Integrated Development Environment with Go

To develop applications using Go, you just need a text editor (such as Visual Studio Code, TextEdit on macOS, or even the old trusty NotePad), and you're good to go (pun unintended). However, many developers prefer to use integrated development environments (IDEs) that can help them organize their code, as well as provide debugging support. Here is a partial list of IDEs that work with Go:

- **Visual Studio Code (https://code.visualstudio.com):** Visual Studio Code from Microsoft is the mother of all code editors (and my personal favorite). Visual Studio Code is a full-featured code editor that supports almost all programming languages under the sun. Perhaps one of the most useful features of Visual

Studio Code is IntelliSense, which helps to complete your statement as you type. It also comes with debugger support and an interactive console, as well as Git integration. Best of all, Visual Studio Code is free and has a very active community of Go developers, allowing you to extend its functionalities through the various plug-ins.

- **GoLand (www.jetbrains.com/go/):** GoLand is a cross-platform IDE by JetBrains. It comes with coding assistance, a debugger, an integrated Terminal, and more. GoLand is a commercial IDE, and it has a 30-day trial.
- **The Go Playground (https://play.golang.org):** The Go Playground (which isn't really an IDE, but is worth a mention here) is a web service that runs on Go's servers. It receives a Go program, compiles, links, runs it inside a sandbox, and then returns the output. The Go Playground is very useful when you need to test out some Go code quickly using a web browser.

TIP In this book, I use Visual Studio Code for Go development. To download Visual Studio Code, go to https://code.visualstudio.com/download. After you've downloaded and installed Visual Studio Code, launch it, and you should see the screen shown in Figure 1-2.

TIP In order for Visual Studio Code to recognize your Go language syntax, you also need to install an extension for it. Follow these steps to install the Go extension:

1. **In Visual Studio Code, click the Extensions icon on the Activity Bar (see Figure 1-3).**

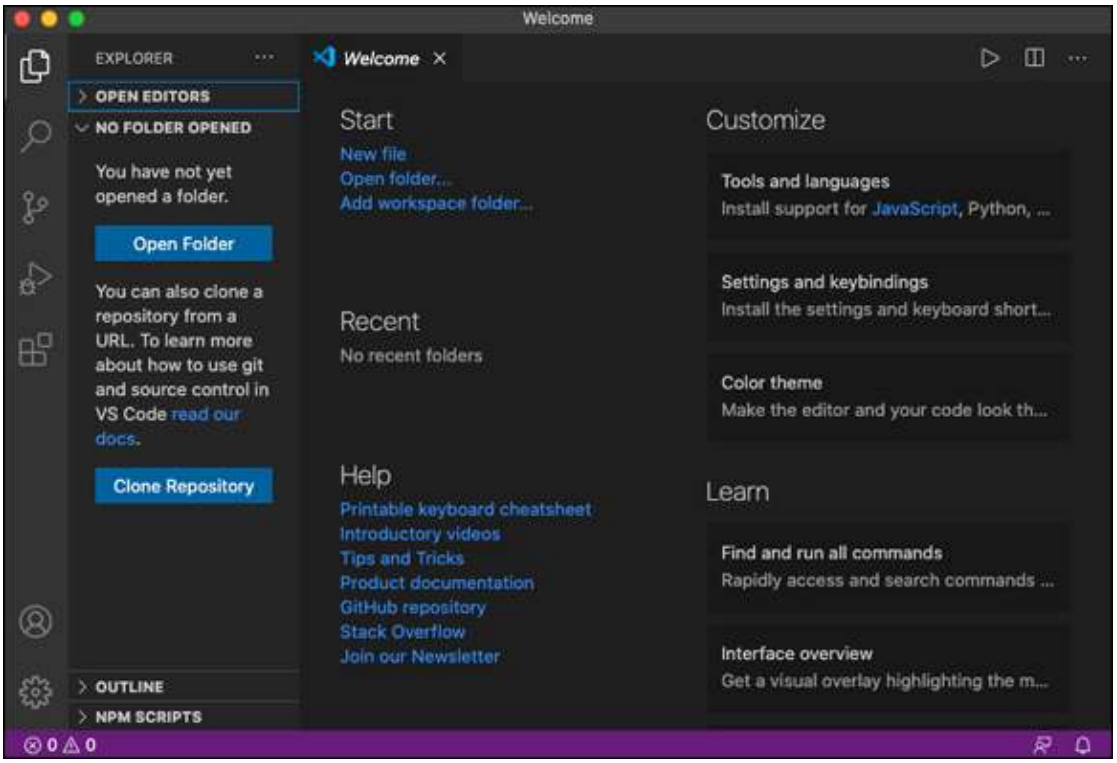

FIGURE 1-2: Launching Visual Studio Code for the first time.

FIGURE 1-3: The Extensions icon is located at the bottom of the Activity Bar.

2. **In the Search box for the Extensions panel, type** Go**.**

   You see a list of the Go extensions available (see Figure 1-4).

3. **Select the first extension and click the Install button on the right.**

   That's it! You're ready to write your first program!

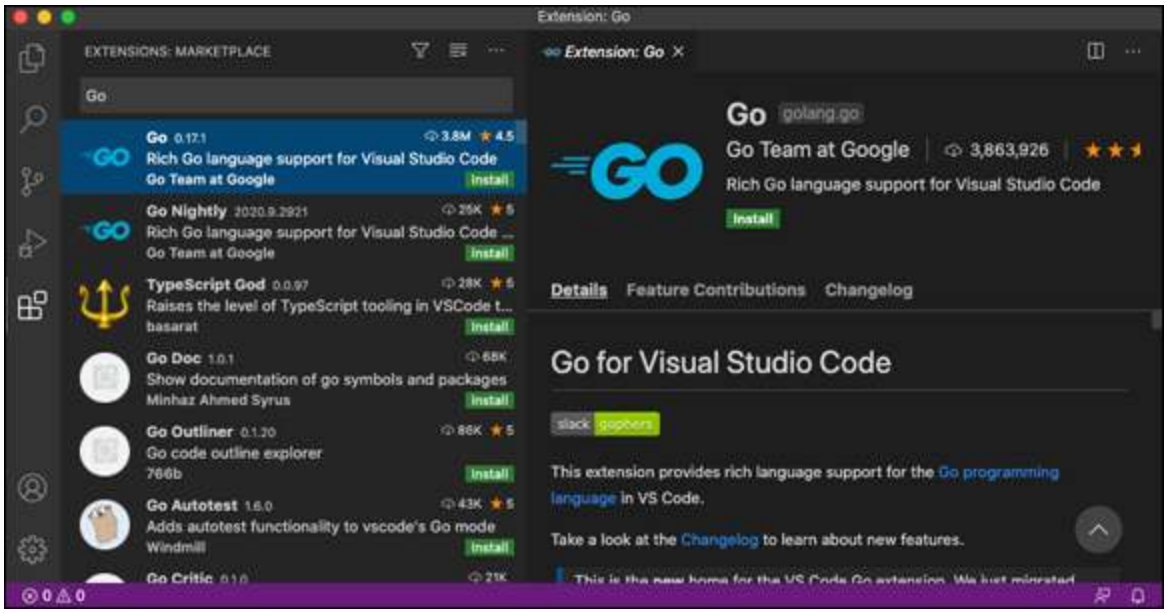

FIGURE 1-4: Searching for Go extensions for Visual Studio Code.

Writing Your First Go Program

To write your first Go program, create a new file in Visual Studio Code by choosing File ⇒ New File. Then enter the following statements (see Figure 1-5):

```
package main

import "fmt"

func main() {
```