The Pragmatic Programmers

Automate Your Home Using Go

Build a Personal Data Center with Raspberry Pi, Docker, Prometheus, and Grafana

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Introduction

Welcome to a new way of thinking about using the Go programming language to automate various facets of your home.

In this book, we walk you through building your Personal Data Center running on a Raspberry Pi. It will use a number of Go-based tools that are commonly employed to monitor large enterprises. Because of Go's remarkable scalability and simplicity, you can install these world-class open source tools that are found in Fortune 500 data centers on a Raspberry Pi, and obtain the same benefits as DevOps engineers and IT professionals across the globe.

Once your management applications are up and running on a Raspberry Pi, we will proceed with building several home automation projects that use the personal data center as a central monitoring and alerting system.

You'll improve your skills by building upon what was learned with each successive chapter, giving you a solid foundation of how to create your own projects afterward. By the end of the book, you will have the skills to automate nearly anything that uses electrical current in your home, turning dumb appliances into smart ones while using best-in-class Go-based software to monitor, report, and when desired, alert on any activities that might arise during the operation of your solutions.

Who This Book Is For

This book is for developers familiar with the Go programming language who want to do more with it than just the usual integration and microservices that Go is typically used for.

It is also for home automation tinkerers and electronics hobbyists interested in learning how a language like Go can be more powerful and make software projects easier to build and maintain, especially when compared to other languages used in home automation like Perl and Python.

What's in This Book

In Chapter 1, Getting Started, on page ?, you'll review the hardware and software requirements necessary to follow along with building the projects in this book. You'll also learn how to configure some of the software prerequisites and how to select and configure a code editor to write your Go programs.

Next, in Chapter 2, Building a REST API Server, on page ?, you'll use the Go programming language to build a basic REST API service and deploy it on a Raspberry Pi. You'll use this API server later in the book to send notifications from your home automation projects.

In Chapter 3, Deploying Your Personal Data Center, on page ?, you'll deploy your personal data center by assembling and configuring software on a Raspberry Pi that includes the key components for the enterprise-level monitoring and alerting environment. You'll learn how to build containers, capture and report on metrics, and pick up some of our own best practices experiences working with these tools along the way.

Then, in Chapter 4, Networking a Temperature Monitor, on page ?, you'll build your first automation project: a networked temperature monitor that uses a tiny Raspberry Pi Pico W and TinyGo to gather the ambient temperature and send it to your central monitoring application running on your personal data center.

In Chapter 5, Checking the (Garage) Door, on page ?, you'll build a garage door checker that uses a magnetic switch sensor and the Raspberry Pi Zero 2 GPIO interface to report whether your garage door is open or closed.

Next, in Chapter 6, Lighting the Weather, on page ?, you'll design a dynamic lighting solution that offers a unique way to visually identify the current outdoor temperature in your area by controlling the colors on a Hue lighting system via APIs.

As the final project, in Chapter 7, Watching the Birds, on page ?, you'll discover how to build a custom bird feeder that captures high-resolution images of birds—and other wildlife—perched at the feeder, and send those images as attachments to your own designated Discord server channel.

Finally, in Chapter 8, Go Build, on page ?, you'll review some ideas on how to further improve your skills and how to use the knowledge and experience acquired in this book in other projects.

About the Hardware

Our objective for the book was to avoid as much electrical engineering and wiring as possible. You can complete each project in this book without ever picking up a soldering gun. While it's commendable to use one for appropriate cases, this book focuses more on software than hardware. We also didn't want to have hardware components fail as a result of poor soldering or confusing wiring diagrams, so we opted to make the hardware configuration for these projects as simple as possible to avoid any frustration or expensive mistakes.

As you gain more confidence in your home automation skills using Go, we recommend expanding your horizons with a good basic electronics tutorial and a quality soldering gun. We also recommend continuing to advance your newly acquired skills by experimenting with a variety of electric components found on popular electronics project websites.

About the Code

While it's the goal of this book that you learn something new in Go by working on these featured home automation projects, this book will not cover some of the basics of the language. To follow the examples in this book, we expect you to know how to write basic Go programs that include variables, loops, if conditions, and functions. Many resources are available to help you understand the basics of the language. Among those, we suggest:

- A tour of Go:[1] An interactive guided tour covering Go's main features.
- Powerful Command-Line Applications in Go:[2] Learn Go by building command line applications.
- Go Brain Teasers:[3] Explore more advanced language concepts through 25 brain teasers.

Online Resources

You can find more about this book, as well as download the complete project source code online on the Pragmatic Bookshelf website.[4] You'll find the book

1. https://go.dev/tour/list
2. https://pragprog.com/titles/rggo/powerful-command-line-applications-in-go/
3. https://pragprog.com/titles/d-gobrain/go-brain-teasers/
4. https://pragprog.com/titles/gohome

forum there, where you can talk with other readers and with us. If you find any mistakes, please report them on the errata page.

We hope you enjoy building the projects as much as we did, and look forward to your comments and photos of your creations along the way. Most of all, have fun bringing life to your ideas using the Go programming language.