Cloud Native Go

Building Web Applications and Microservices for the Cloud with Go and React

Kevin Hoffman
Dan Nemeth

AAddison-Wesley

Boston • Columbus • Indianapolis • New York • San Francisco • Amsterdam • Cape Town
Dubai • London • Madrid • Milan • Munich • Paris • Montreal • Toronto • Delhi
Mexico City • Sao Paulo • Sidney • Hong Kong • Seoul • Singapore • Taipei • Tokyo

Contents at a Glance

1 The Way of the Cloud 1

2 Getting Started 11

3 Go Primer 17

4 Delivering Continuously 35

5 Building Microservices in Go 53

6 Using Backing Services 71

7 Creating a Data Service 95

8 Event Sourcing and CQRS 113

9 Building a Web Application with Go 137

10 Security in the Cloud 151

11 Working with WebSockets 167

12 Building Web Views with React 177

13 Creating IIIs that Scale with Flux 195

14 Creating a Full Application—*World of FluxCraft* 209

15 Conclusion 223

A Troubleshooting Cloud Applications 227

Index 231

NOTE: To register this product and gain access to bonus content, go to www.informit.com/register to sign in and enter the ISBN. After you register the product, a link to the additional content will be listed on your Account page, under Registered Products.

Contents

1 The Way of the Cloud 1

The Virtues of the Way of the Cloud 2

- Favor Simplicity 2
- Test First, Test Everything 3
- Release Early, Release Often 5
- Automate Everything 6
- Build Service Ecosystems 7

Why Use Go? 8

- Simplicity 8
- Open Source 8
- Easy Automation and IDE Freedom 9

Summary 9

2 Getting Started 11

The Right Tools for the Job 11

Setting Up Git 12

- Installing Homebrew 12
- Installing the Git Client 13
- Installing Mercurial and Bazaar 13
- Creating a GitHub Account 13

Setting Up Go 14

- Configuring your Go Workspace 14

Testing Your Environment 15

Summary 16

3 Go Primer 17

Building Hello Cloud 18

Using Basic Functions 19

Working with Structs 22

Introducing Go Interfaces 25

Adding Methods to Structs 25

- Exploiting Dynamic Typing in Go with Interfaces

Working with Third-Party Packages 28

Creating Your Own Packages 30

Exporting Functions and Data 31

Creating a Package 31

Summary 34

4 Delivering Continuously 35

Introducing Docker 36

Why use Docker? 36

Installing Docker 36

Running Docker Images 38

Continuous Integration with Wercker 39

Continuous Integration Best Practices 39

Why use Wercker? 40

Creating a Wercker Application 41

Installing the Wercker CLI 42

Creating a Wercker Configuration File 43

Running a Wercker Build 47

Deploying to DockerHub 49

Reader Exercise: Create a Full Development Pipeline 50

Advanced Challenge: Integrate Third-Party Library 52

Summary 52

5 Building Microservices in Go 53

Designing Services API First 54

Designing the Matches API 54

Creating an API Blueprint 54

Testing and Publishing Documentation with Apiary 56

Scaffolding a Microservice 57

Building Services Test First 60

Creating a First, Failing Test 61

Testing the Location Header 64

Epic Montage—Test Iterations 65

Deploying and Running in the Cloud 68

Creating a PWS Account 68

Setting up PCF Dev 68

Pushing to Cloud Foundry 69

Summary 70

6 Using Backing Services 71

Designing Service Ecosystems 72

Building Dependent Services Test-First 73

Creating the Fulfillment Service 74

Creating the Catalog Service 77

Sharing Structured Data Among Services 84

Client Imports Server Package 84

Client Duplicates Server Structure 84

Client And Server Import Shared Package 85

Using Service Bindings to Externalize URLs and Metadata 86

Discovering Services 89

Dynamic Service Discovery 90

Service Discovery with Netflix's Eureka 90

Reader Exercise 92

Bonus Activity 93

Summary 93

7 Creating a Data Service 95

Creating a MongoDB Match Repository 96

Why MongoDB? 96

Updating the Repository Pattern 96

Communicating with MongoDB in Go 97

Writing a MongoDB Repository Test-First 98

Integration Testing a Mongo-Backed Service 103

Integrating with a Transient MongoDB Database 103

Writing an Integration Test 106

Running in the Cloud 110

Configuring a Backing Service 110

Summary 112

8 Event Sourcing and CQRS 113

Reality is Event Sourced 114

Idempotent 115

Isolated 115

Testable 116

Replayable and Recoverable 116

Big Data 117 '

Embracing Eventual Consistency 117

Introducing Command Query Responsibility Segregation 118

Event SourcIngliifr Cases 120

Weather Monitoring >120

Connected 121

Social Media Feed Processing 121

Code Sample: Managing a Drone Army 121

Creating a Command Handler Service 122

Introduction tO^abbitMQ 122

Building the Command Handler Service 126

Building the Event Processor 128

Integration Testing the Event Processor 133

Creating the Query Handler Service 133

Summary 135

9 Building a Web Application with Go 137

Serving Static Files and Assets 138

Supporting JavaScript Clients 139

Using Server-Side Templates 142

Processing Forms 145

Working with Cookies and Session State 145

Writing Cookies 146

Reading Cookies 147

Build and Deploy with Wercker 147

Summary 149

10 Security in the Cloud 151

Securing a Web Application 151

Web Application Security Options 152

Setting up an AuthO Account 153

Building an OAuth-Secured Web App 154

Running the SecureWeb Application 158

Securing Microservices 160

Overview of the Client Credentials Pattern 160

Securing a Microservice with Client Credentials 161

A Note on SSL 163

A Word on Privacy and Data Security 163

Hackers Can't Get What You Don't Have 164

Reader Exercise 165

Summary 166

11 Working with WebSockets 167

Demystifying WebSockets 168

How WebSockets Work 168

WebSockets vs. Server-Sent Events 169

Designing a WebSocket Server 169

On WebSockets and Cloud Nativity 170

Building a WebSocket App with a Messaging Provider 172

A Note on JavaScript Frameworks 175

Running the WebSockets Sample 175

Summary 176

12 Building Web Views with React 177

JavaScript State of the Union 178

Why React? 178

The Virtual DOM 179

Component Composition 180

Reactive Data Flow 180

Narrow Focus 180

Ease* of Use 181

Anatomy of a React Application 181

The package.json File 181

Webpack.config.js 182

The .babelrc File 183

Understanding JSX and Webpack 183

React Components 184

Building a Simple React Application 184

What We Didn't Like 191

Testing React Applications 192

Further Reading 192

React Websites 192

React Books 193

Other Materials 193

Summary 193

13 Creating IIIs that Scale with Flux 195

Introducing Flux 195

Dispatcher 196

Store 196

View 197

Action 197

Source 197

Complexity in Flux 197

Building a Flux Application 198

Summary 207

14 Creating a Full Application—*World of FluxCraft* 209

Introducing *World of FluxCraft* 210

Architectural Overview 211

Independent Scaling, Versioning, and Deployment 213

Databases are not the Integration Tier 213

One-Way Immutable Data Flow 213

The Flux GUI 214

The Go UI Host Service 215

Sample Player Move Sequence 216

Processing Commands 217

Processing Events 218

Maintaining Reality 219

Map Management 219

Automating Acceptance Tests 220

Summary 222

15 Conclusion 223

What we Learned 223

Go Isn't Just a Niche Language 223

How Micro Should a Microservice Be? 224

Continuous Delivery and Deployment 224

Test Everything 224

Release Early, Release Often 224

Event Sourcing, CQRS, and More Acronyms 225

Next Steps 225

A Troubleshooting Cloud Applications 227

Index 231