Node.js in Practice

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foreword

You have in your hands a book that will take you on an in-depth tour of Node.js. In the pages to come, Alex Young and Marc Harter will help you grasp Node's core in a deep way: from modules to real, networked applications.

Networked applications are, of course, an area where Node.js shines. You, dear reader, are likely well aware of that; I daresay it is your main reason for purchasing this tome! For the few of you who actually read the foreword, let me tell you the story of how it all began.

In the beginning, there was the C10K problem. And the C10K problem raised this question: if you want to handle 10,000 concurrent network connections on contemporary hardware, how do you go about that?

You see, for the longest time operating systems were terrible at dealing with large numbers of network connections. The hardware was terrible in many ways, the software was terrible in other ways, and when it came to the interaction between hardware and software … linguists had a field day coming up with proper neologisms; plain *terrible* doesn't do it justice. Fortunately, technology is a story of progress; hardware gets better, software saner. Operating systems improved at managing large numbers of network connections, as did user software.

We conquered the C10K problem a long time ago, moved the goal posts, and now we've set our sights on the C100K, C500K, and C1M problems. Once we've comfortably crossed those frontiers, I fully expect that the C10M problem will be next.

Node.js is part of this story of ever-increasing concurrency, and its future is bright: we live in an increasingly connected world and that world needs a power tool to connect everything. I believe Node.js is that power tool, and I hope that, after reading this book, you will feel the same way.

Ben Noordhuis
Cofounder, StrongLoop, Inc.

preface

When Node.js arrived in 2009, we knew something was different. JavaScript on the server wasn't anything new. In fact, server-side JavaScript has existed almost as long as client-side JavaScript. With Node, the speed of the JavaScript runtimes, coupled with the event-based parallelism that many JavaScript programmers were already familiar with, were indeed compelling. And not just for client-side JavaScript developers, which was our background—Node attracted developers from the systems level to various server-side backgrounds, PHP to Ruby to Java. We all found ourselves inside this movement.

At that time, Node was changing a lot, but we stuck with it and learned a whole lot in the process. From the start, Node focused on making a small, low-level core library that would provide enough functionality for a large, diverse user space to grow. Thankfully, this large and diverse user space exists today because of these design decisions early on. Node is a lot more stable now and used in production for numerous startups as well as established enterprises.

When Manning approached us about writing an intermediate-level book on Node, we looked at the lessons we had learned as well as common pitfalls and struggles we saw in the Node community. Although we loved the huge number of truly excellent third-party modules available to developers, we noticed many developers were getting less and less education on the core foundations of Node. So we set out to write *Node in Practice* to journey into the roots and foundations of Node in a deep and thorough manner, as well as tackle many issues we personally have faced and have seen others wrestle with.

acknowledgments

We have many people to thank, without whose help and support this book would not have been possible.

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Thanks to the entire Manning team for helping us every step of the way, especially our development editor Cynthia Kane, our copyeditor Benjamin Berg, our proofreader Katie Tennant, and everyone else who worked behind the scenes.

Special thanks to Ben Noordhuis for writing the foreword to our book, and to Valentin Crettaz and Michael Levin for their careful technical proofread of the book shortly before it went into production.

Alex Young

I couldn't have written this book without the encouragement and support of the DailyJS community. Thanks to everyone who has shared modules and libraries with me over the last few years: keeping up to date with the Node.js community would have been impossible without you. Thank you also to my colleagues at Papers who have allowed me to

use my Node.js skills in production. Finally, thanks to Yuka for making me believe I can do crazy things like start companies and write books.

Marc Harter

I would like thank Ben Noordhuis, Isaac Schlueter, and Timothy Fontaine for all the IRC talks over Node; you know the underlying systems that support Node in such a deep way that learning from you makes Node even richer. Also, I want to thank my coauthor Alex; it seems rare to have such a similar approach to writing a book as I did with Alex, plus it was fun for a Midwestern US guy to talk shop with an English chap. Ultimately my heart goes out to my wife, who really made this whole thing possible, if I'm honest. Hannah, you are loved; thank you.

about this book

Node.js in Practice exists to provide readers a deeper understanding of Node's core modules and packaging system. We believe this is foundational to being a productive and confident Node developer. Unfortunately, this small core is easily missed for the huge and vibrant third-party ecosystem with modules prebuilt for almost any task. In this book we go beyond regurgitating the official Node documentation in order to get practical and thorough. We want the reader to be able to dissect the inner workings of the third-party modules they include as well as the projects they write.

This book is not an entry-level Node book. For that, we recommend reading Manning's *Node.js In Action*. This book is targeted at readers who already have experience working with Node and are looking to take it up a notch. Intermediate knowledge of JavaScript is recommended. Familiarity with the Windows, OS X, or Linux command line is also recommended.

In addition, we're aware that many Node developers have come from a client-side JavaScript background. For that reason, we spend some time explaining less-familiar concepts such as working with binary data, how underlying networking and file systems work, and interacting with the host operating system—all using Node as a teaching guide.

Chapter roadmap

This book is organized into three parts.

Part 1 covers Node's core fundamentals, where we focus our attention on what's possible using only Node's core modules (no third-party modules). Chapter 1 recaps

Node.js's purpose and function. Then chapters 2 through 8 each cover in depth a different core aspect of Node from buffers to streams, networking to child processes.

Part 2 focuses on real-world development recipes. Chapters 9 through 12 will help you master four highly applicable skills—testing, web development, debugging, and running Node in production. In addition to Node core modules, these sections include the use of various third-party modules.

Part 3 guides you through creating your own Node modules in a straightforward manner that ties in all kinds of ways to use npm commands for packaging, running, testing, benchmarking, and sharing modules. It also includes helpful tips on versioning projects effectively.

There are 115 techniques in the book, each module covering a specific Node.js topic or task, and each divided into practical Problem/Solution/Discussion sections.

Code conventions and downloads

All source code in the book is in a `fixed-width font like this`, which sets it off from the surrounding text. In many listings, the code is annotated to point out the key concepts, and numbered bullets are sometimes used in the text to provide additional information about the code.

This book's coding style is based on the Google JavaScript Style Guide.[1] That means we've put `var` statements on their own lines, used `camelCase` to format function and variable names, and we always use semicolons. Our style is a composite of the various JavaScript styles used in the Node community.

Most of the code shown in the book can be found in various forms in the sample source code that accompanies it. The sample code can be downloaded free of charge from the Manning website at www.manning.com/Node.jsinPractice, as well as from GitHub at the following link: https://github.com/alexyoung/nodeinpractice.

Author Online forum

Purchase of *Node.js in Practice* includes free access to a private web forum run by Manning Publications where you can make comments about the book, ask technical questions, and receive help from the authors and from other users. To access the forum and subscribe to it, point your web browser to www.manning.com/Node.jsinPractice. This page provides information on how to get on the forum once you're registered, what kind of help is available, and the rules of conduct on the forum.

The Author Online forum and the archives of previous discussions will be accessible from the publisher's website as long as the book is in print.

You can also contact the authors at the following Google Group URL: https://groups.google.com/forum/#!forum/nodejsinpractice.

[1] https://google-styleguide.googlecode.com/svn/trunk/javascriptguide.xml

about the cover illustration

The caption for the illustration on the cover of *Node.js in Practice* is "Young Man from Ayvalik," a town in Turkey on the Aegean Coast. The illustration is taken from a collection of costumes of the Ottoman Empire published on January 1, 1802, by William Miller of Old Bond Street, London. The title page is missing from the collection and we have been unable to track it down to date. The book's table of contents identifies the figures in both English and French, and each illustration bears the names of two artists who worked on it, both of whom would no doubt be surprised to find their art gracing the front cover of a computer programming book ... two hundred years later.

The collection was purchased by a Manning editor at an antiquarian flea market in the "Garage" on West 26th Street in Manhattan. The seller was an American based in Ankara, Turkey, and the transaction took place just as he was packing up his stand for the day. The Manning editor didn't have on his person the substantial amount of cash that was required for the purchase, and a credit card and check were both politely turned down. With the seller flying back to Ankara that evening, the situation was getting hopeless. What was the solution? It turned out to be nothing more than an old-fashioned verbal agreement sealed with a handshake. The seller simply proposed that the money be transferred to him by wire, and the editor walked out with the bank information on a piece of paper and the portfolio of images under his arm. Needless to say, we transferred the funds the next day, and we remain grateful and impressed by this unknown person's trust in one of us. It recalls something that might have happened a long time ago.

We at Manning celebrate the inventiveness, the initiative, and, yes, the fun of the computer business with book covers based on the rich diversity of regional life of two centuries ago, brought back to life by the pictures from this collection.