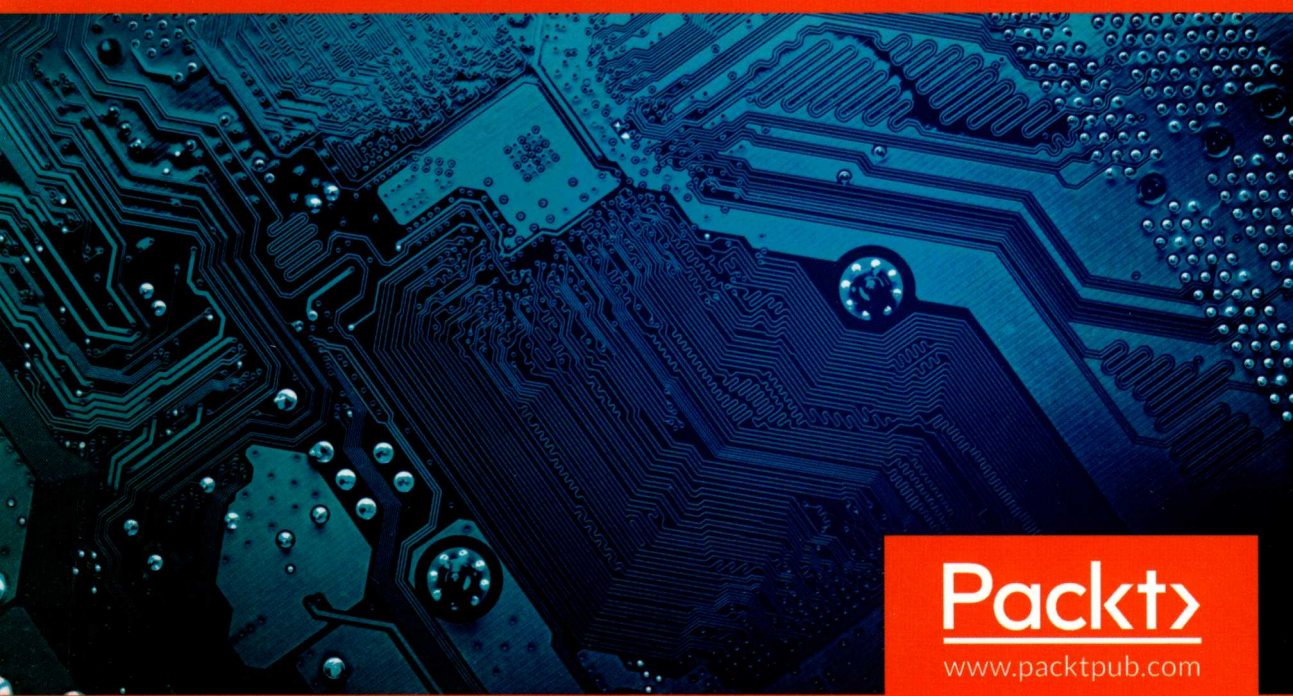
Mastering Python Networking, 2nd Edition

精通Python网络编程

第2版（影印版）

Eric Chou 著



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Contributors

About the author

Eric Chou is a seasoned technologist with over 18 years of industry experience. He has worked on and helped managed some of the largest networks in the industry while working at Amazon AWS, Microsoft Azure, and other companies. Eric is passionate about network automation, Python, and helping companies build better security postures. Eric is the author of several books and online classes on networking with Python and network security. He is the proud inventor of two patents in IP telephony. Eric shares his deep interest in technology through his books, classes, and his blog, and contributes to some of the popular Python open source projects.

I would like to thank the open source and Python community members for generously sharing their knowledge and code with the public. Without their contribution, many of the projects referenced in this book would not have been possible.
I would like to thank the Packt Publishing team for the opportunity to work on the second edition of the book, and the technical reviewer, Rickard Körkkö, for generously agreeing to review the book.
To my wife and best friend, Joanna, I won the lottery the day I met you. To my two girls, Mikaelyn and Esmie, you make me so proud, I love you both dearly.

About the reviewer

Rickard Körkkö, CCNP (Routing and Switching) and Cisco Network Programmability Design and Implementation Specialist, is a NetOps consultant at SDNit, where he's part of a group of experienced technical specialists with a great interest in and focus on emerging network technologies. His daily work includes working with orchestration tools such as Ansible to manage network devices. He's a self-taught programmer with a primary focus on Python. He has also served as a technical reviewer for the book *A Practical Guide to Linux Commands, Editors, and Shell Programming, Third Edition* by Mark G. Sobell.

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Table of Contents

Preface

As Charles Dickens wrote in *A Tale of Two Cities, "It was the best of times, it was the worse of times, it was the age of wisdom, it was the age of foolishness."* His seemingly contradictory words perfectly describe the chaos and mood felt during a time of change and transition. We are no doubt experiencing a similar time with the rapid changes in the fields of network engineering. As software development becomes more integrated into all aspects of networking, the traditional command-line interface and vertically integrated network stack methods are no longer the best ways to manage today's networks. For network engineers, the changes we are seeing are full of excitement and opportunities and yet challenging, particularly for those who need to quickly adapt and keep up. This book has been written to help ease the transition for networking professionals by providing a practical guide that addresses how to evolve from a traditional platform to one built on software-driven practices.

In this book, we use Python as the programming language of choice to master network engineering tasks. Python is an easy-to-learn, high-level programming language that can effectively complement network engineers' creativity and problem-solving skills to streamline daily operations. Python is becoming an integral part of many large-scale networks, and through this book, I hope to share with you the lessons I've learned.

Since the publication of the first edition, I have been able to have interesting and meaningful conversations with many of the readers of the book. I am humbled by the success of the first edition of the book and took to the heart of the feedback I was given. In the second edition, I have tried to make the examples and technologies more relevant. In particular, the traditional OpenFlow SDN chapters were replaced with some of the Network DevOps tools. I sincerely hope the new addition is useful to you.

A time of change presents great opportunities for technological advancement. The concepts and tools in this book have helped me tremendously in my career, and I hope they can do the same for you.

Who this book is for

This book is ideal for IT professionals and operations engineers who already manage groups of network devices and would like to expand their knowledge on using Python and other tools to overcome network challenges. Basic knowledge of networking and Python is recommended.

What this book covers

`Chapter 1`, *Review of TCP/IP Protocol Suite and Python*, reviews the fundamental technologies that make up internet communication today, from the OSI and client-server model to TCP, UDP, and IP protocol suites. The chapter will review the basics of Python languages such as types, operators, loops, functions, and packages.

`Chapter 2`, *Low-Level Network Device Interactions*, uses practical examples to illustrate how to use Python to execute commands on a network device. It will also discuss the challenges of having a CLI-only interface in automation. The chapter will use the Pexpect and Paramiko libraries for the examples.

`Chapter 3`, *APIs and Intent-Driven Networking*, discusses the newer network devices that support **Application Programming Interfaces** (**APIs**) and other high-level interaction methods. It also illustrates tools that allow abstraction of low-level tasks while focusing on the intent of the network engineers. A discussion about and examples of Cisco NX-API, Juniper PyEZ, and Arista Pyeapi will be used in the chapter.

`Chapter 4`, *The Python Automation Framework – Ansible Basics*, discusses the basics of Ansible, an open source, Python-based automation framework. Ansible moves one step further from APIs and focuses on declarative task intent. In this chapter, we will cover the advantages of using Ansible, its high-level architecture, and see some practical examples of Ansible with Cisco, Juniper, and Arista devices.

`Chapter 5`, *The Python Automation Framework – Beyond Basics*, builds on the knowledge in the previous chapter and covers the more advanced Ansible topics. We will cover conditionals, loops, templates, variables, Ansible Vault, and roles. It will also cover the basics of writing custom modules.

`Chapter 6`, *Network Security with Python*, introduces several Python tools to help you secure your network. It will discuss using Scapy for security testing, using Ansible to quickly implement access lists, and using Python for network forensic analysis.

`Chapter 7`, *Network Monitoring with Python – Part 1*, covers monitoring the network using various tools. The chapter contains some examples using SNMP and PySNMP for queries to obtain device information. Matplotlib and Pygal examples will be shown for graphing the results. The chapter will end with a Cacti example using a Python script as an input source.

`Chapter 8`, *Network Monitoring with Python – Part 2*, covers more network monitoring tools. The chapter will start with using Graphviz to graph the network from LLDP information. We will move to use examples with push-based network monitoring using Netflow and other technologies. We will use Python to decode flow packets and ntop to visualize the results. An overview of Elasticsearch and how it can be used for network monitoring will also be covered.

`Chapter 9`, *Building Network Web Services with Python*, shows you how to use the Python Flask web framework to create our own API for network automation. The network API offers benefits such as abstracting the requester from network details, consolidating and customizing operations, and providing better security by limiting the exposure of available operations.

`Chapter 10`, *AWS Cloud Networking*, shows how we can use AWS to build a virtual network that is functional and resilient. We will cover virtual private cloud technologies such as CloudFormation, VPC routing table, access-list, Elastic IP, NAT Gateway, Direct Connect, and other related topics.

`Chapter 11`, *Working with Git*, we will illustrate how we can leverage Git for collaboration and code version control. Practical examples of using Git for network operations will be used in this chapter.

`Chapter 12`, *Continuous Integration with Jenkins*, uses Jenkins to automatically create operations pipelines that can save us time and increase reliability.

`Chapter 13`, *Test-Driven Development for Networks*, explains how to use Python's unittest and PyTest to create simple tests to verify our code. We will also see examples of writing tests for our network to verify reachability, network latency, security, and network transactions. We will also see how we can integrate the tests into continuous integration tools, such as Jenkins.

To get the most out of this book

To get the most out of this book, some basic hands-on network operation knowledge and Python is recommended. Most of the chapters can be read in any order, with the exceptions of chapters 4 and 5, which should be read in sequence. Besides the basic software and hardware tools introduced at the beginning of the book, new tools relevant to each of the chapters will be introduced.

It is highly recommended to follow and practice the examples shown in your own network lab.

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The code bundle for the book is also hosted on GitHub at `https://github.com/PacktPublishing/Mastering-Python-Networking-Second-Edition`. In case there's an update to the code, it will be updated on the existing GitHub repository.

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