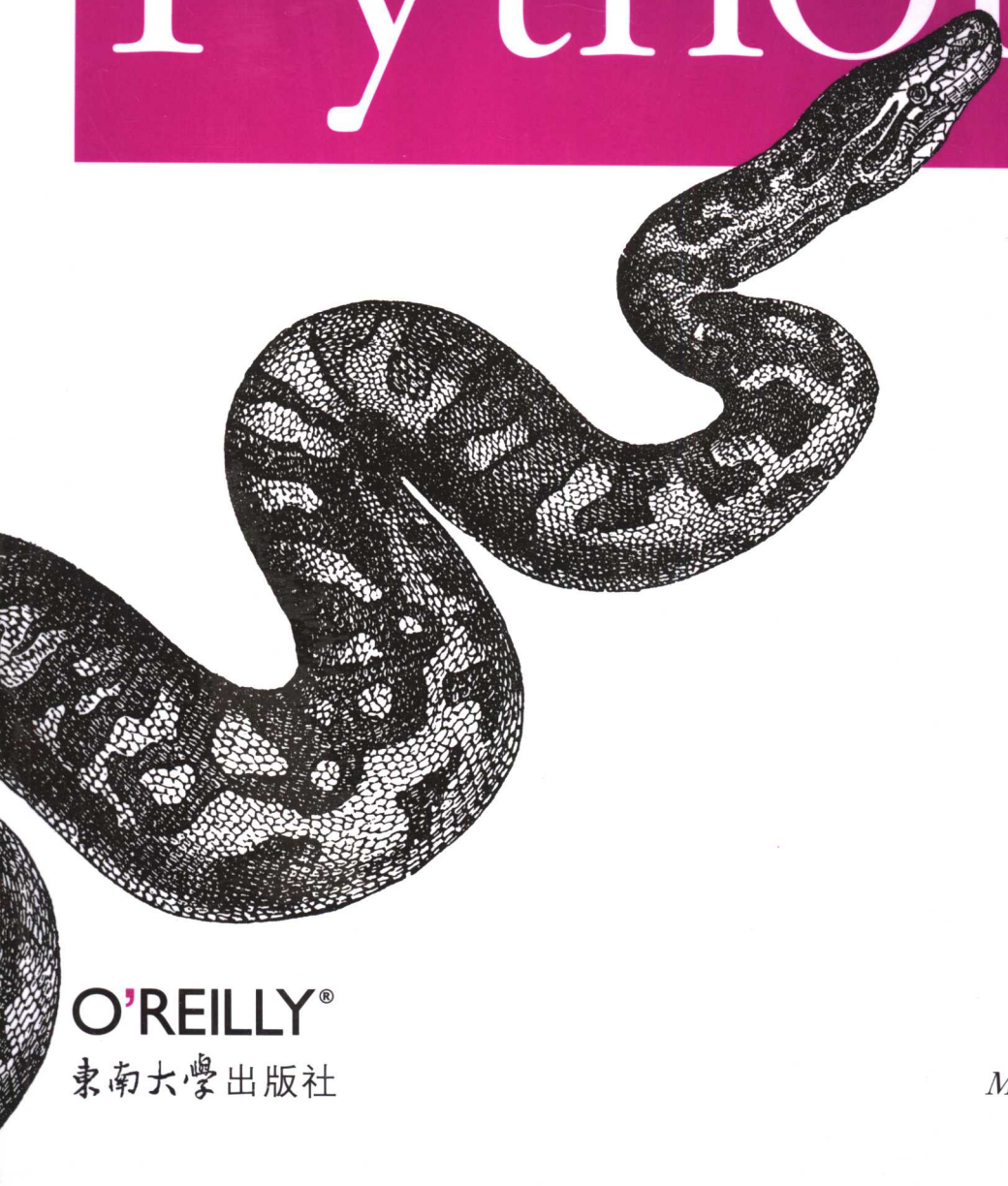
Python 编程（影印版）

3rd Edition
下册

Programming

Python



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Mark Lutz 著

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Mark Lutz

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About the Author

Mark Lutz is the world leader in Python training, the author of Python's earliest and best-selling texts, and a pioneering figure in the Python community.

Mark is also the author of the O'Reilly book *Python Pocket Reference*, and coauthor of *Learning Python*, all currently in second or third editions. Involved with Python since 1992, he started writing Python books in 1995 and began teaching Python classes in 1997. As of mid-2006, he has instructed more than 170 Python training sessions.

In addition, he holds B.S. and M.S. degrees in computer science from the University of Wisconsin, and over the last two decades has worked on compilers, programming tools, scripting applications, and assorted client/server systems.

Whenever Mark gets a break from spreading the Python word, he leads an ordinary, average life in Colorado. Mark can be reached by email at *lutz@rmi.net*, or on the Web at *http://www.rmi.net/~lutz*.

Colophon

The animal on the cover of *Programming Python* is an African rock python, one of approximately 18 species of python. Pythons are nonvenomous constrictor snakes that live in tropical regions of Africa, Asia, Australia, and some Pacific Islands. Pythons live mainly on the ground, but they are also excellent swimmers and climbers. Both male and female pythons retain vestiges of their ancestral hind legs. The male python uses these vestiges, or spurs, when courting a female.

The python kills its prey by suffocation. While the snake's sharp teeth grip and hold the prey in place, the python's long body coils around its victim's chest, constricting tighter each time it breathes out. They feed primarily on mammals and birds. Python attacks on humans are extremely rare.

The cover image is a 19th-century engraving from the *Dover Pictorial Archive*. The cover font is Adobe ITC Garamond. The text font is Linotype Birka; the heading font is Adobe Myriad Condensed; and the code font is LucasFont's TheSans Mono Condensed.

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CHAPTER 13

Network Scripting

"Tune In, Log On, and Drop Out"

Over the last decade, the Internet has virtually exploded onto the mainstream stage. It has rapidly grown from a simple communication device used primarily by academics and researchers into a medium that is now nearly as pervasive as the television and telephone. Social observers have likened the Internet's cultural impact to that of the printing press, and technical observers have suggested that all new software development of interest occurs only on the Internet. Naturally, time will be the final arbiter for such claims, but there is little doubt that the Internet is a major force in society, and one of the main application contexts for modern software systems.

The Internet also happens to be one of the primary application domains for the Python programming language. It has been a decade since the first edition of this book was written as well, and in that time the Internet's growth has strongly influenced Python's tool set and roles. Given Python and a computer with a socket-based Internet connection today, we can write Python scripts to read and send email around the world, fetch web pages from remote sites, transfer files by FTP, program interactive web sites, parse HTML and XML files, and much more, simply by using the Internet modules that ship with Python as standard tools.

In fact, companies all over the world do: Google, Yahoo!, Walt Disney, Hewlett-Packard, JPL, and many others rely on Python's standard tools to power their web sites. For example, the Google search engine—widely credited with making the web usable—makes extensive use of Python code. And the BitTorrent peer-to-peer file transfer system—written in Python and already downloaded by tens of millions of users—leverages Python's networking skills to share files among clients and remove server bottlenecks.

Many also build and manage their sites with the Zope web application server, which is itself written and customizable in Python. Others build sites with the Plone content management system, which is built upon Zope and delegates site content to its users. Still others use Python to script Java web applications with Jython (formerly

known as JPython)—a system that compiles Python programs to Java bytecode, exports Java libraries for use in Python scripts, and allows Python code to serve as web applets downloaded and run in a browser.

More recently, XML-RPC and SOAP interfaces for Python, such as xmlrpclib and SOAPy, have enabled web service programming; frameworks such as CherryPy, Webware, TurboGears, and Django have emerged as convenient tools for constructing web sites; the new XML package in Python's standard library provides a suite of XML processing tools; and the new IronPython implementation promises to provide seamless .NET/Mono integration for Python code.

As the Internet has grown, so too has Python's role as an Internet tool. Python has proven to be well suited to Internet scripting for some of the very same reasons that make it ideal in other domains. Its modular design and rapid turnaround mix well with the intense demands of Internet development. In this part of the book, we'll find that Python does more than simply support Internet scripts; it also fosters qualities such as productivity and maintainability that are essential to Internet projects of all shapes and sizes.

Internet Scripting Topics

Internet programming entails many topics, so to make the presentation easier to digest, I've split this subject over the next six chapters of this book. This chapter introduces Internet fundamentals and explores sockets, the underlying communications mechanism of the Internet. From there, later chapters move on to discuss the client, the server, web site construction, and more advanced topics.

Each chapter assumes you've read the previous one, but you can generally skip around, especially if you have any experience in the Internet domain. Since these chapters represent a substantial portion of this book at large, the following sections go into a few more details about what we'll be studying.

What we will cover

In conceptual terms, the Internet can roughly be thought of as being composed of multiple functional layers:

Low-level networking layers
: Mechanisms such as the TCP/IP transport mechanism, which deal with transferring bytes between machines, but don't care what they mean

Sockets
: The programmer's interface to the network, which runs on top of physical networking layers like TCP/IP

Higher-level protocols
: Structured communication schemes such as FTP and email, which run on top of sockets and define message formats and standard addresses

Server-side web scripting (CGI)
: Higher-level client/server communication protocols between web browsers and web servers, which also run on top of sockets

Higher-level frameworks and tools
: Third-party systems such as Zope and Jython, which address larger problem domains

In this chapter and in Chapter 14, our main focus is on programming the second and third layers: sockets and higher-level protocols. We'll start this chapter at the bottom, learning about the socket model of network programming. Sockets aren't strictly tied to Internet scripting, but they are presented here because this is their primary role. As we'll see, most of what happens on the Internet happens through sockets, whether you notice or not.

After introducing sockets, the next two chapters make their way up to Python's client-side interfaces to higher-level protocols—things like email and FTP transfers, which run on top of sockets. It turns out that a lot can be done with Python on the client alone, and Chapters 14 and 15 will sample the flavor of Python client-side scripting. The next two chapters then go on to present server-side scripting—programs that run on a server computer and are usually invoked by a web browser. Finally, the last chapter in this part, Chapter 18, briefly introduces even higher-level tools such as Jython and Zope.

Along the way, we will also put to work some of the operating-system and GUI interfaces we studied earlier (e.g., processes, threads, signals, and Tkinter), and we'll investigate some of the design choices and challenges that the Internet presents.

That last statement merits a few more words. Internet scripting, like GUIs, is one of the sexier application domains for Python. As in GUI work, there is an intangible but instant gratification in seeing a Python Internet program ship information all over the world. On the other hand, by its very nature, network programming imposes speed overheads and user interface limitations. Though it may not be a fashionable stance these days, some applications are still better off not being deployed on the Net. In this part of the book, we will take an honest look at the Net's trade-offs as they arise.

The Internet is also considered by many to be something of an ultimate proof of concept for open source tools. Indeed, much of the Net runs on top of a large number of such tools, such as Python, Perl, the Apache web server, the sendmail program, MySQL, and Linux.* Moreover, new tools and technologies for programming the Web sometimes seem to appear faster than developers can absorb them.

* In fact, there is even a common acronym for this today: LAMP, for the Linux operating system, the Apache web server, the MySQL database system, and the Python, Perl, and PHP scripting languages. It's possible, and even very common, to put together an entire enterprise-level web server with open source tools. Python users would probably also like to include systems like Zope, Plone, Webware, and CherryPy in this list, but the resulting acronym might be a bit of a stretch.