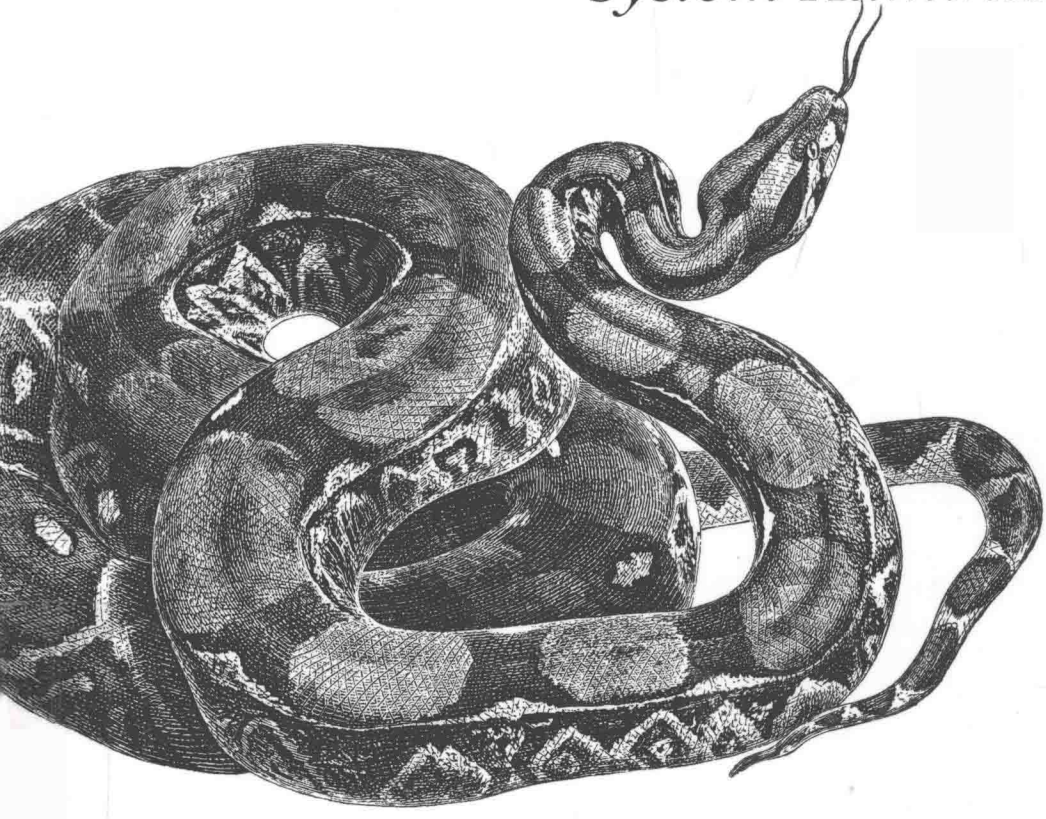
*Python*在*Unix*和*Linux*系统管理中的应用（影印版）

Python

for Unix and Linux System Administration



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Noah Gift & Jeremy M. Jones 著

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Python for Unix and Linux System Administration

Noah Gift & Jeremy M. Jones

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Foreword

I was excited to preview this book on using Python for system administration. I remembered how I felt when I discovered Python after many years of programming in other languages: it was like a breath of spring air and the warmth of the sun after a long winter indoors. Code was suddenly easy and fun to write again, and I finished programs much more quickly than before.

As a system administrator, most of my own Python use is for system and network management tasks. I already knew how useful a good book focusing on system administration with Python would be. I am happy to say that this is that book. Overall, Noah and Jeremy have created an interesting, intelligent work on Python that is planted firmly in the system administration sphere. I found the book both very useful and enjoyable to read.

The two opening chapters are a great introduction to Python for system administrators (and others) who are new to Python. I consider myself an intermediate Python programmer, and I learned a lot from the book. I suspect even Python wizards will come across a few new tricks in here. I can especially recommend the chapters on networking and managing network services, SNMP, and management of heterogeneous systems as particularly useful and well focused on nontrivial, real-world tasks that system administrators face every day.

—Æleen Frisch, July 2008

Preface

Conventions Used in This Book

The following typographical conventions are used in this book:

Italic
: Indicates new terms, URLs, email addresses, filenames, and file extensions.

`Constant width`
: Used for program listings, in text to refer to program elements, such as variable or function names, databases, data types, environment variables, statements, utilities, keywords, utilities, and modules.

`Constant width bold`
: Shows commands or other text that should be typed literally by the user.

`Constant width italic`
: Shows text that should be replaced with user-supplied values or by values determined by context.

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This icon indicates a warning or caution.

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Shannon Behrens has a heart of solid gold, a mind as sharp as a razor, and a knowledge of Python that is truly scary. I first met Shannon through Titus, ironic again, but he and I became quick friends. Shannon is the real deal in every sense of the word, and has taught me a tremendous amount about Python, in fact, staggering would be a better word. His help with Python, and editing this book has been incredible, and I owe him tremendously. I shudder to think of what it would have looked like without him. I can't ever imagine a company being foolish enough to let him get away, and I look forward to helping him with his first book. Finally, he is just an incredible technical reviewer. You can read his blog here: *http://jjinux.blogspot.com/*.

Doug Hellmann was our other star technical reviewer and was exceptionally productive and helpful. Jeremy and I are extremely fortunate to get someone of his caliber to review the book. He went above and beyond his call of duty, and is truly a force of efficiency

to reckon with. He was also a great source of motivation while we worked together at Racemi. You can read his blog here: *http://blog.doughellmann.com/*.

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Humans can create their own reality if they truly believe in themselves, and I would encourage everyone to give themselves a chance to do what they truly want to do.

Finally, thanks to O'Reilly and Tatiana Apandi, for believing in my original pitch for a book on Python and Systems Administration. You took a chance and believed in me and Jeremy, and I thank you for that. Although Tatiana left O'Reilly near the end of our book to pursue her dreams, her impact was still felt. I also want to thank our new editor Julie Steele, who has been supportive and helpful every step of the way. You have really provided a sea of calm that I personally appreciated greatly. I look forward to hearing great things in the future from Julie, and I'm excited to work with her again.

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I want to thank our team of reviewers. I think that Noah has already thanked all of you, but I want to thank everyone that I can: Doug Hellman, Jennifer Davis, Shannon JJ Behrens, Chris McDowell, Titus Brown, and Scott Leerseen. You guys were awesome. There were times when I thought that I had something spot-on and you readjusted my thinking. Or you just brought a completely different perspective to the book and helped me see my work through a different set of eyes. (That was mostly you, Jennifer. If the text processing chapter is useful for sysadmins, it's mostly because of you.) Thank you all.

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Table of Contents

CHAPTER 1
Introduction

Why Python?

If you are a system administrator, it is likely that you have encountered Perl, Bash, ksh, or some other scripting language. You may have even used one or more yourself. Scripting languages are often used to do repetitive, tedious work at a rate and with an accuracy that far surpass what you could accomplish without them. All languages are tools. They are simply a means to get work done. They have value only insofar as they help you get your job done better. We believe that Python is a valuable tool, specifically because it enables you to get your work done efficiently.

So is Python better than Perl, Bash, Ruby, or any other language? It's really difficult to put that sort of qualitative label on a programming language, since the tool is so closely tied to the thought process of the programmer who is using it. Programming is a subjective, deeply personal activity. For the language to be excellent, it must fit the person using it. So we're not going to argue that Python is better, but we will explain the reasons that we believe Python can be an excellent choice. We'll also explain why it is a great fit for performing sysadmin tasks.

The first reason that we think that Python is excellent is that it is easy to learn. If a language can't help you become productive pretty quickly, the lure of that language is severely diminished. Why would you want to spend weeks or months studying a language before you are able to write a program that does something useful? This is especially the case for sysadmins. If you are a sysadmin, your work can pile up faster than you can unpile it. With Python, you can start writing useful scripts literally in hours rather than in days or weeks. If you can't learn a language quickly enough to start writing scripts with it almost immediately, you should strongly question whether you should be learning it.

However, a language that is easy to learn but doesn't allow you to do fairly complex tasks isn't worth much either. So the second reason that we consider Python to be an excellent programming language is that, while it lets you start simply, it also allows you to perform tasks that are as complex as you can imagine. Do you need to read through a logfile line by line and pull out some pretty basic information? Python can handle

that. Or do you need to parse through a logfile, extract every piece of information that it provides, compare usage from each IP address in this logfile to usage in each logfile (which are stored in a relational database, by the way) from the past three months, and then store the results to a relational database? Sure, Python can do that as well. Python is being used on some pretty complex problems, such as analysis of genomic sequences, multithreaded web servers, and heavy duty statistical analysis. You may never have to work on anything like that, but it's nice to know that when you need to do complex things, the language is able to work with you.

Additionally, if you are able to perform complex operations, but the maintainability of your code suffers along the way, that isn't a good thing. Python doesn't prevent code maintenance problems, but it does allow you to express complex ideas with simple language constructs. Simplicity is a huge factor in writing code that is easy to maintain later. Python has made it pretty simple for us to go back over our own code and work on it after we haven't touched it in months. It has also been pretty simple for us to work on code that we haven't seen before. So the language, that is the language's syntax and common idioms, are clear and concise and easy to work with over long periods of time.

The next reason we consider Python to be an excellent language is its readability. Python relies on whitespace to determine where code blocks begin and end. The indentation helps your eyes quickly follow the flow of a program. Python also tends to be "word-based." By that we mean that while Python uses its share of special characters, features are often implemented as keywords or with libraries. The emphasis on words rather than special characters helps the reading and comprehension of code.

Now that we've outlined a few of Python's benefits, we'll show some comparisons of code examples in Python, Perl, and Bash. Along the way, we'll also look at a few more of Python's benefits. Here is a simple example, in Bash, of showing all the combinations of 1, 2 and a, b:

```
#!/bin/bash

for a in 1 2; do
    for b in a b; do
        echo "$a $b"
    done
done
```

And here is a comparable piece of Perl:

```
#!/usr/bin/perl

foreach $a ('1', '2') {
    foreach $b ('a', 'b') {
        print "$a $b\n";
    }
}
```

This is a pretty simple nested loop. Let's compare these looping mechanisms with a `for` loop in Python: