

Python

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Who am I?

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Introduction

- ❖ Swift
- ❖ Easy
- ❖ Grace
- ❖ Object-oriented
- ❖ Strong module support
- ❖ Default built in most environment
- ❖ Script language



Installation

❖ Debian GNU / Linux

- ❖ apt-get install python
- ❖ apt-get install python-dev

// install additional header file and static library

➤ Windows

Sorry

Getting Started

- ❖ From terminal type python
python
- ❖ Save file with file extension .py and type python print.py
python print.py
- ❖ Add first line `#!/usr/bin/env python`
- ❖ Add executable privilege to file and `./filename` execute it
`./print.py`

Version

- ❖ Python2 or Python3?
- ❖ I recommended use Python3
- ❖ Almost the same
- ❖ Except for print and some package

Print

- ❖ End with newline character
- ❖ Format output

```
print "%d" % (100)
```

```
print "{0}{1}".format('hello', 'world')
```

If you want to manually control
output use `sys.stdout.write()` instead

- Python2

```
>>> print "Hello World"  
Hello_World
```

- Python3

```
>>> print("Hello World")  
Hello_World
```

Input

- ❖ raw_input()
- ❖ Read a line from stdin and strip a trailing newline

- Python2

```
>>> s = raw_input()
zzz
>>> s
'zzz'
```

- Python3

```
>>> s = input()
zzz
>>> s
'zzz'
```

Difference: Python3 will run eval(input()) and return

Object

- ❖ Everything in Python is object
 - ❖ an identity (use id to observe it)
 - ❖ a value (immutable and mutable)
- ❖ Immutable: Integer, String, Tuple
- ❖ Mutable: List , Dictionary
- ❖ When immutable value change id will be different
- ❖ When mutable value change id will be the same

```
>>> a = 1
>>> id(a)
139693565145432
>>> a = 2
>>> id(a)
139693565145408
```

Integer

- ❖ Declare a variable i = 1 or i = 0x5566
- ❖ Print integer as hex

```
i = 0x5566 hex(i)
```

```
# '0x5566'
```

```
chr(0x61)
```

```
# 'a'
```

- ❖ Change hex string to integer
- ❖ s = '0x5566'
- ❖ i = int(s,16)
- ❖ print str(i) # 21862
- ❖ Convert character to integer
- ❖ ord('a')
- ❖ # 97

String

◆ `s.strip()`

將字串頭尾的newline和space
去掉

◆ `s.find('string')`

return找到string的index

◆ `s.replace('old', 'new', [max])` 將old字串取代成new
最多取代max次

◆ `s[0:len(s)]`

`s='abcde'`

`len(s) # 5`

`s=s[0:2] # s= 'ab'`

`s[::-2] # 'ace'`

`s[:-1] # 'abcd'`

`s[::-1] # 'edcba'`

`s[:] # 'abcde'`

List

- ❖ Declare with []
- ❖ l = []
- ❖ l.append(element)
- ❖ l = [element]
- ❖ lis.remove(element)
- ❖ lis.sort()
- ❖ lis.reverse()
- ❖ Split string include spaces
- ❖ s = 'a b c d e'
- ❖ l = s.split(' ')
- ❖ # l = ['a', 'b', 'c', 'd', 'e']
- ❖ map(function_name, sequence)

```
def f(x):  
    return x**2
```

```
map(f,range(10))
```

```
[0, 1, 4, 9, 16, 25, 36, 49, 64, 81]
```

Arithmetic

❖ Add

+

❖ Minus

-

❖ Multiply

*

❖ Divide

/

❖ Power

**

Ex: $2^{**}3 = 8$

❖ Module

%

Ex : $8 \% 3 = 2$

Conditional and Comment

- ❖ if condition:
statement
- ❖ elif condition:
statement
- ❖ else:
statement
- ❖ Single line comment begins
with
character
- #Code to be commented out
- Multiple line comment
- """"
- Code to be commented out
- Code to be commented out
- """"

Loop and function

- ❖ for i in range(N):
 print i

will print 0 to N-1

- ❖ for x in string:
 print x

will print every character in the
string appended with newline

- ❖ While condition:
 statement

in the loop we could use break or
continue to control the loop

- ❖ def function_name (parameter):
 statement
 return

Module

- ❖ import module
 - ❖ module.name
 - ❖ module.attribute
- ❖ Imports the module X, and creates a reference to that module in the current namespace. Then you need to define completed module path to access a particular attribute or method from inside the module (e.g.: X.name or X.attribute)

```
>>> import os
>>> import os.path
>>> os.path.isfile()
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
TypeError: isfile() missing 1 required positional argument: 'path'
>>> os.path.isfile("~")
False
```

Module

- ❖ from module import *
- ❖ Name
- ❖ Attribute

```
>>> from os import path
>>> path.isfile("~/")
False
>>> █
```

- ❖ Imports the module X, and creates references to all public objects defined by that module in the current namespace (that is, everything that doesn't have a name starting with _) or whatever name you mentioned.
- ❖ This makes all names from the module available in the local namespace.

Socket

```
from socket import *
from telnetlib import *
ip = '134.208.97.233'
port = 10000
s = socket(AF_INET,
SOCK_STREAM)
s.connect((ip, port))
```

```
t = Telnet()
t.sock = s
t.interact()
```

Socket

- ◆ `s.recv(buf_size)`

收 `buf_size` 長度的字串

- ◆ `buf = s.recv(4096)`

- ◆ `s.send(string)`

將 `string` 送過去

- ◆ `s.send(payload)`

- ◆ `s.close()`

關閉 socket

Struct

- ❖ Pack the integer into little-indian or big-indian

- ❖ import struct

```
address = 0x0804aabb
```

```
payload = struct.pack('<I', address)
```

- ❖ #payload = "xbbxaax04x08"

```
address = struct.unpack('<I', payload)[0]
```

```
hex(address)
```

- ❖ # address = 0x804aabb

Pwntools

- ❖ Installation
- ❖ apt-get update
- ❖ apt-get install python3 python3-pip python3-dev git libssl-dev libffi-dev build-essential
- ❖ python3 -m pip install --upgrade pip
- ❖ python3 -m pip install --upgrade pwntools
- ❖ Getting started

```
from pwn import *
```

Pwntools

- ❖ Context - Setting runtime variables

```
context.update(arch='i386', os='linux')
```

i386 is 32bits, amd64 is 64bits

- ❖ If you don't want to see the notice

```
context.log_level = 'error'
```

Pwntools

- ❖ ip = '134.208.97.233'
- ❖ port = 10000
- ❖ s = socket(AF_INET, SOCK_STREAM)
- ❖ s.connect((ip, port))
- ❖ s = remote(ip, port)
- ❖ t = Telnet()
- ❖ t.sock = s t.interact()
- ❖ s.interactive()

Pwntools

- ❖ Packing integer

address = 0x0804aabb

```
payload = struct.pack('<I', address)
```

- ❖ Payload = p32(0x0804aabb)

- ❖ 8 bytes?

- ❖ Payload = p64(0x0804aabb)

- ❖ Unpack string to integer

- ❖ payload = "xbbxaax04x08"

- ❖ address = struct.unpack('<I', payload)[0]

Pwntools

- ❖ Too much to list
- ❖ Shellcode
- ❖ Working with elf
- ❖ Working with gdb
- ❖ Memory leak
- ❖ Rop chain
- ❖ Translate assembly to string
- ❖ Shellcode

Practice

❖ ROP

wget 134.208.97.233/ROP

Practice

- ❖ Hackerrank <https://www.hackerrank.com/>
- ❖ picoCTF - CMU Cybersecurity Competition
- ❖ ångstromCTF (angstromctf.com)
- ❖ <https://pwnable.tw/challenge/>

Reference

- ❖ 90% of Python in 90 Minutes
- ❖ <http://www.slideshare.net/MattHarrison4/learn-90>
- ❖ Angelboy's CTF note
- ❖ <http://angelboy.logdown.com/posts/245988-ctf-notes>
- ❖ Pwntools document
- ❖ <https://pwntools.readthedocs.org/en/2.2/about.html>
- ❖ Bamboofox
- ❖ <https://bamboofox.cs.nctu.edu.tw/>

Thank you

- ❖ The more knowledge about Linux : <http://linux.vbird.org/>