More

Enough background to launch a rocket

---

by

David Roubinet , Feb14

Presentation powered by reveal.js

home

Zen of python

```
import this
```

Beautiful is better than ugly.

Explicit is better than implicit. Simple is better than complex.

Complex is better than complicated.

Flat is better than nested. Sparse is better than dense.

Special cases aren't special enough to break the rules.

In the face of ambiguity, refuse the temptation to guess.

Now is better than never.

If the implementation is hard to explain, it's a bad idea.

If the implementation is easy to explain, it may be a good idea.

by Tim Peters

Lists

Mapping, Comprehension

Expression	Result
`zip(["A","B","C"],[17,23,47])`	`[('A',17),('B',23),('C',47)]`
`[ 2*x+1 for x in [1,2,3,4] ]`	`[3, 5, 7, 9]`
`[ x for x in [1,2,3,4] if x%2==1 ]`	`[1, 3]`
`[ x*y for x in [1,2,3] for y in [3,4]]`	`[3, 4, 6, 8, 9, 12]`

Specialized lists

Tuples: immutable sequences

```
>>> 1, # or (1,) coma is mandatory, parenthesis are optional
(1,)
>>> ("A","B","C",)[0:2]
('A','B')
>>> # ("A","B","C",)[0]='D' # Error !
```

Sets: unordered unique elements

Expression	Result
`set("ABCDABC")`	`set(['A', 'C', 'B', 'D'])`
`set("ABCDABC")&set("DEF")`	`set(['D'])`
`set("ABCD")[0]`	*Error*

Dictionaries

```
mydict = {
    'keyword' : 'B',  # A string can be a key
     67       : 'E' , # or integer
    (1,2)     : 'E'   # or a tuple
    myObj     : 'R'   # or anything providing a hash() method
}
```

Selection is based on hash() matching

```
>>>"ABC".__hash__()
826005955
```

Quiz

Is a list usable as a key ?

Answer

A list cannot be a key, as it cannot be hashable meaningfully

```
>>> hash(tuple([1,2]))
1299869600
>>> hash([1,2])
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
TypeError: unhashable type: 'list'
```

```
mylist=["A","B"]

hash(mylist)= hash([ pointer0, pointer1])

mylist[0]="C"

hash(mylist) => same result !
```

Generators

yield

```
def dataGen(seed,size): # <- First call starts here
    cnt = 0
    val = seed
    while cnt < size:
        val = (val*100)%(97)
        yield val               # if yield keyword => generator
        cnt += 1                # <- 2sd call starts here
```

```
gen=dataGen(12,1000)
print gen.next(),
print gen.next(),
print gen.next()
```

```
36 11 33
```

```
for data in dataGen(17,10): print data,
```

```
51 56 71 19 57 74 28 84 58 77
```

Quiz

Write a generator giving the color of a traffic light

Answer

```
def trafficlight():
    while 1:
        yield "red"
        yield "green"
        yield "orange"

g1=trafficlight()
g2=trafficlight()
print g1.next(),
print g1.next(),
print g2.next(),
print g1.next()
```

red green red orange

Objects

class

```
class rect():

    def __init__(self,w,h): # A function in a class = method
        self.w=int(w)
        self.h=int(h)

    def area(self):    i
        return self.w*self.h
```

```
>>> r1 = rect(5,3)
>>> print r1.area() # Call method with r1 as self
```

```
15
```

Inheritance

```
class square(rect): # <- Meaning: A square is a rectangle except ....

    def __init__(self,s):
        self.w = s
        self.h = s
```

```
>>> sq1=square(12)
>>> print sq1.area()
```

```
144
```

Magic Methods

```
    ...
    def __repr__(self): return ("*"*self.w +"\n")*self.h

    def __iter__(self):
        for y in range(self.h):
            for x in range(self.w):
                 yield x,y
```

```
>>> print r1
+++++
+++++
+++++
>>> for x,y in r1: print "%r:%r"%(x,y),
0:0 1:0 2:0 3:0 4:0 0:1 1:1 2:1 3:1 4:1 0:2 1:2 2:2 3:2 4:2
```

+ → `__add__()`,

in → `__contain__()`

...

Exceptions

`try` → process error

```
try:
    f = file("filename.txt")
except:
    raise SystemError,"Sorry file not found"
```

`with` → auto-clean on error

```
with open("filename.txt") as f:
    for line in f: # f will be closed on exception
        ...
```

Module

Built-in `make` mechanism

`import foo`

1. Tries to find an up-to-date byte-code `foo.pyc`
2. Else generates the byte-code from `foo.py`
3. Keep it for later in `foo.pyc`
4. Executes byte-code

`file.pyc`

portable , but for a given python revision x.y

Byte-code

```
code_src = """
x = 23
print x + 17
"""
code_obj = compile(code_src,'<string>','exec')
exec code_obj
```

The real thing: `str(code_obj.co_code)`

`'d\x00\x00Z\x00\x00e\x00\x00d\x01\x00\x17GHd\x02\x00S'`

Disassembled: `dis.dis(code_obj)`

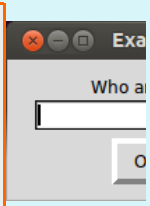
```
  2           0 LOAD_CONST               0 (23)
              3 STORE_NAME               0 (x)

  3           6 LOAD_NAME                0 (x)
              9 LOAD_CONST               1 (17)
             12 BINARY_ADD
             13 PRINT_ITEM
             14 PRINT_NEWLINE
             15 LOAD_CONST               2 (None)
             18 RETURN_VALUE
```

Gui

Native, legacy of tcl-tk

```
import Tkinter as tk
```

```
def dialog(gui) :
    gui.geometry('200x100')
    gui.title('Example')
    gui.zone = tk.Frame(gui, padx=10, pady=10)
    gui.zone.pack(fill=tk.BOTH, expand=True)

    tk.Label(gui.zone, text="Who are you:").pack(side=tk.TOP)
    gui.User = tk.Entry(gui.zone, width=16)
    gui.User.pack(side=tk.TOP, padx=10, fill=tk.BOTH)

    ok = tk.Button(gui.zone, borderwidth=4, text="OK")
    ok["command"]= lambda : gui.quit()
    ok.pack(side=tk.BOTTOM)

    gui.User.focus_set()
    gui.mainloop()
```



```
gui=tk.Tk()
dialog(gui) #<- blocked here until OK
print gui.User.get()
```

Advanced

- Qt (wrapped)
- Not sure web front-end vs desktop ?
  - `pyjamas`

Sockets

```
import socket
```

server.py

```
s = socket.socket()
s.bind((socket.gethostname(), 12345))
s.listen(5) # Now wait for client connection.
while True:
   c, addr = s.accept() # Establish connection with client.
   print 'Got connection from', addr
   c.send('Thank you for connecting')
   c.close()            # Close the connection
```

client.py

```
mysocket = socket.socket()
mysocket.connect((socket.gethostname(), 12345))
print mysocket.recv(1024)
mysocket.close
```

Server

Web server for static files

```
python -m SimpleHTTPServer
```

Application servers

```
web.py, cherry.py, flask.py, bottle.py
```

```
from bottle import default_app, route

@route('/static/<filepath:path>')
@route('/static')
def serve_this_folder(filepath="index.html"):
    return static_file(filepath,root=__file__+"../path/to/folder")

@route('/data')
def sendData(): # <- The dictonary will be sent as json :)
    return { "colors"  : ["blue",  "red",   "green"],
             "animals" : ["snake", "fox",   "dog"],
             "fruits"  : ["banana","orange","kiwi"], }
```

On-line functions

Server

```
from SimpleXMLRPCServer import *

class My_Web_Service:
    def __init__(self): pass
    def add(self, x, y): return x + y
    def mul(self, x, y): return x * y

if __name__ == "__main__":
    server = SimpleXMLRPCServer(("localhost", 8080))
    server.register_instance(My_Web_Service())
    server.serve_forever()
```

Client

```
import xmlrpclib
server = xmlrpclib.Server('http://localhost:8080')
print server.add(3, 4)
print server.mul(3, 4)
```

Https

`urllib2`

password manager, attached to an url stub

```
rooturl  = 'https://myserver/mysite'
username = 'myname'
password = '******' # Get it from a cache or a gui

import urllib2
passman = urllib2.HTTPPasswordMgrWithDefaultRealm()
passman.add_password(None, rooturl, username, password)
authhandler = urllib2.HTTPBasicAuthHandler(passman)
opener  = urllib2.build_opener(authhandler)
urllib2.install_opener(opener)

page = urllib2.urlopen(rooturl+'/this/page.html')
```

2 vs 3

!!! Syntax Not backward compatible !!!

2 to 3

```
$ 2to3 -w myscript.py
```

2.x →	3.x
`print "ABC",`	`print("ABC",end=" ")`
`import Queue`	`import queue`
`import SimpleHTTPServer`	`import http.server`
`while 1:`	`while True:`
`import package`	`from . import package`

Extending

`disutils` → install

download new package

install it: `( sudo ) python setup.py install`

`pip` → package manager

download `get-pip.py`

install: `python get-pip.py`

usage:

- `pip install requests`
- `pip search xml`
- `pip show beautifulsoup4`
- `pip uninstall requests`

Wrapping C

swig + disutil

Steps	Generated Files
original project	`foo.c`,`foo.h`
Make a swig control file (get example.i)	`foo.i`
`$ swig -python foo.i`	`foo_wrap.c`
Make a disutil control file (get a template)	`setup.py`
`$ python setup.py build_ext --inplace`	`_foo.so(pyd)`,`foo.py`

```
import foo
foo.myfunc()
```

Wrapping Shared Libs

```
import ctypes
```

```
import ctypes
from ctypes.util import find_library

ssl    = ctypes.CDLL(find_library('ssl'))           # Loading *.so,*.dll
key    = ctypes.create_string_buffer(255)           # Declaring char[255]
ssl.DES_string_to_key("12345678",ctypes.byref(key)) # i.e. byref = &key
```

```
print ssl._name
print '12345678'.encode('hex')
print key.value.encode('hex')
```

```
libssl.so.1.0.0

'3132333435363738'

'8a626479a1160291'
```

SQL & al

Interface @ code.google.com/p/pyodbc

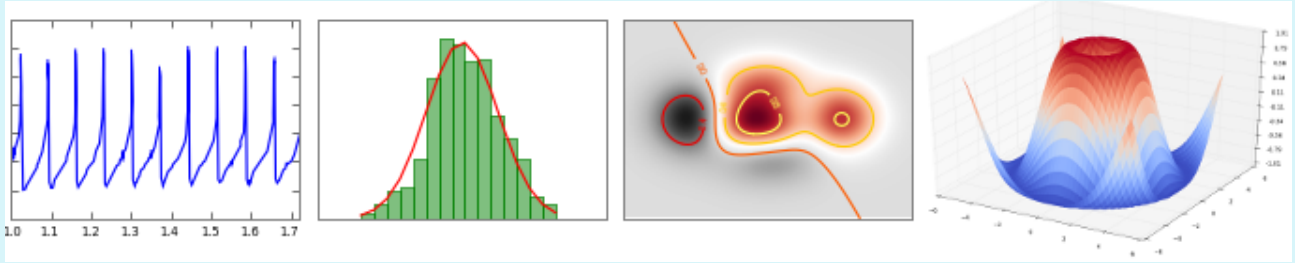
```
import pyodbc
```

```
cnxn = pyodbc.connect(
            driver='{SQL Server}',
            server='localhost',
            database='test',
            uid='me',
            pwd='me2')
cursor = cnxn.cursor()
```

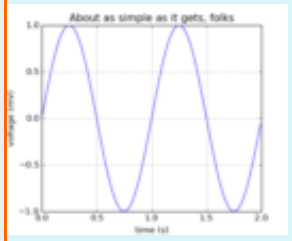
```
for row in cursor.execute("""
    select user_id, user_name
        from users
            where last_logon < ?
                and bill_overdue = ?
    """,
    '2001-01-01', 'y'):

    print row.user_id, row.user_name
```

Plots

www.matplotlib.org, visit on-line gallery




```
from pylab import *
t = arange(0.0, 2.0, 0.01)
s = sin(2*pi*t)
plot(t, s)
xlabel('time (s)')
ylabel('voltage (mV)')
title('About as simple as it gets, folks')
grid(True)
savefig("test.png")
show()
```



PDF

`http://www.reportlab.com`, visit on-line samples

Full stack:

- Low level primitives: `labels`,`lines`,`images` → templates
- High level primitives: `charts` → data driven images
- Text flow: `title`,`chapters` → toc, pagination
- Mix: `python`+blabla → loops, import csv, variables....

SmartCards

`http://pyscard.sourceforge.net`, visit on-line user guide

Stacks over PCSC(lite)

```
>>> from smartcard.System import readers
>>> from smartcard.util import toHexString
>>>
>>> r=readers()
>>> print r
['SchlumbergerSema Reflex USB v.2 0', 'Utimaco CardManUSB 0']
>>> connection = r[0].createConnection()
>>> connection.connect()
>>> SELECT = [0xA0, 0xA4, 0x00, 0x00, 0x02]
>>> DF_TELECOM = [0x7F, 0x10]
>>> data, sw1, sw2 = connection.transmit( SELECT + DF_TELECOM )
>>> print "%x %x" % (sw1, sw2)
9f 1a
>>>
```

Lab

Hangman game

1. A word server
    1. Builds a collection of 8-letter words from an on-line book/article.
    2. Acts as a remote generator and gives one word on demand.
2. A game server
    1. Get a new word from word server on new game request
    2. Give a feedback on letter proposal
    3. Give a score on word proposal
3. A game client
    1. Gui with proposal entry and text zone
    2. Display current guess status in text zone

- Ready to look at ↓ ↓ solution ↓ ↓

Word server

```
import SimpleXMLRPCServer
import urllib
import re

class wordGen:
    def __init__(self):
        url = "http://www.gutenberg.org/files/44955/44955-h/44955-h.htm"
        txt = urllib.urlopen(url).read()
        words = re.findall(r'\b[a-zA-Z]{8}\b',txt,re.M)
        words = [word.lower() for word in words ]
        self.words = set(words)
        print "Ready with %d words in stock"%(len(words))
    def next(self):
        if not self.words: self.__init__()
        return self.words.pop()
```

```
if __name__ == "__main__":
    server = SimpleXMLRPCServer.SimpleXMLRPCServer(("localhost", 8080))
    server.register_instance(wordGen())
    server.serve_forever()
```

Game server

```
import SimpleXMLRPCServer
import xmlrpclib
class hangMan:
    def __init__(self):
        self.wordServer  = xmlrpclib.Server('http://localhost:8080')
        self.secret = self.wordServer.next()
    def new(self):
        self.secret = self.wordServer.next()
        return True
    def guess(self,propal):
        if   len(propal)==1:
            return [i for i,c in enumerate(self.secret) if c==propal]
        elif len(propal)==8: return propal==self.secret
        else               : return -1
```

```
if __name__ == "__main__":
    server = SimpleXMLRPCServer.SimpleXMLRPCServer(("localhost", 8081))
    server.register_instance(hangMan())
    server.serve_forever()
```

Game Client

Call-backs

```
import Tkinter as tk
import xmlrpclib

def new():
    server.new()
    guess.set("-"*8)
```

```
def submit():
    propalValue = propal.get()
    result=server.guess(propalValue)
    if len(propalValue)==1:
        letters=list(guess.get())
        for index in result: letters[index]=propalValue
        guess.set("".join(letters))
    else:
        if result: message = "Congrats"
        else:      message = "No luck"
        guess.set(message)
```

Game Client cont'd

Main loop

```
server = xmlrpclib.Server('http://localhost:8081')

gui=tk.Tk()
propal = tk.StringVar()
guess  = tk.StringVar()
guess.set("-"*8)

tk.Label( gui,text="1 Letter or 8-letter word:").pack()
tk.Entry( gui,textvariable=propal              ).pack()
tk.Label( gui,textvariable=guess               ).pack()
tk.Button(gui,text="Submit",command=submit     ).pack()
tk.Button(gui,text="New",command=new           ).pack()

gui.mainloop()
```