Pythonect for *Security Professionals*

Itzik Kotler

Pythonect

- *Pythonect* is a portmanteau of the words Python and Connect
- New, experimental, general-purpose dataflow programming language based on Python
- Current “stable“ version (True to Feb 12 2013): 0.4.1
- Made available under 'Modified BSD License'
- Influenced by: Unix Shell Scripting, Python, Perl
- Cross-platform (should run on any Python supported platform)
- Website: http://www.pythonect.org/

A few words on the Development

- Written purely in Python (2.7)
  - Works on CPython 2.x, and Jython 2.7 implementations
- Tests written in PyUnit
- Hosted on GitHub
- Commits tested by Travis CI

Installing and Using The Pythonect Interpreter

- Install directly from PyPI using easy_install or pip:
  - `easy_install Pythonect`

    OR
  - `pip install Pythonect`
- Clone the git repository:
  - `git clone git://github.com/ikotler/pythonect.git`
  - `cd pythonect`
  - `python setup.py install`

The Pythonect Interpreter

- Written and integrated with the Python environment:

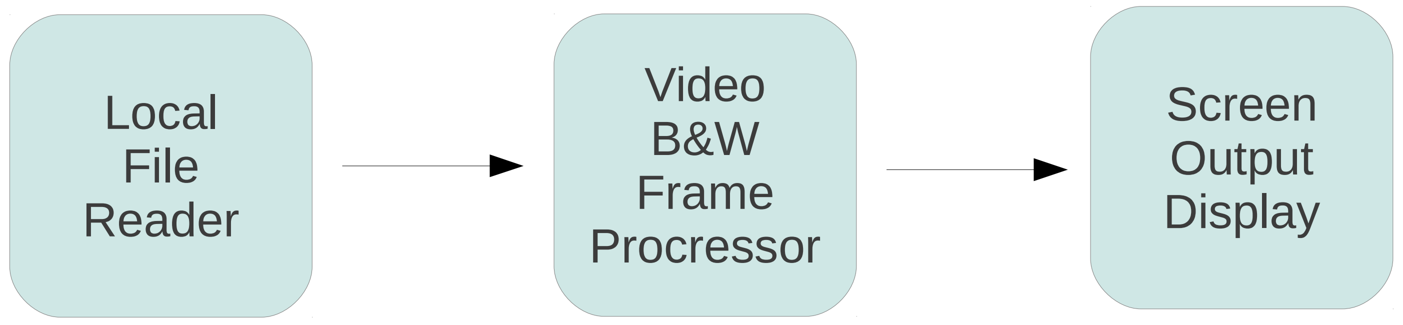
```
% pythonect
Pythonect 0.4.1
>>>
```

Dataflow Programming

- Programming paradigm that treats data as something that originates from a source, flows through a number of components and arrives at some final destination
- Most suitable when developing applications that are themselves focused on the "flow" of data.

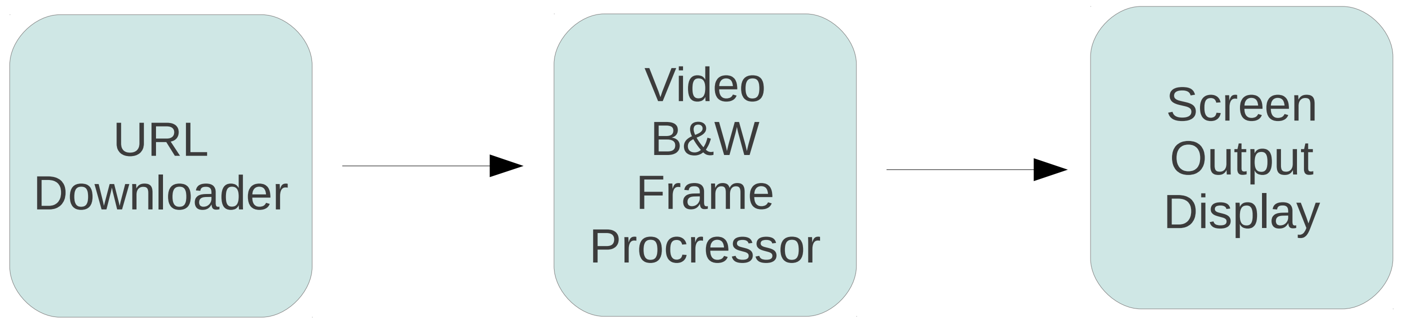
Dataflow Example

- A video signal processor which perhaps starts with a video input, modifies it through a number of processing components (video filters), and finally outputs it to a video display.



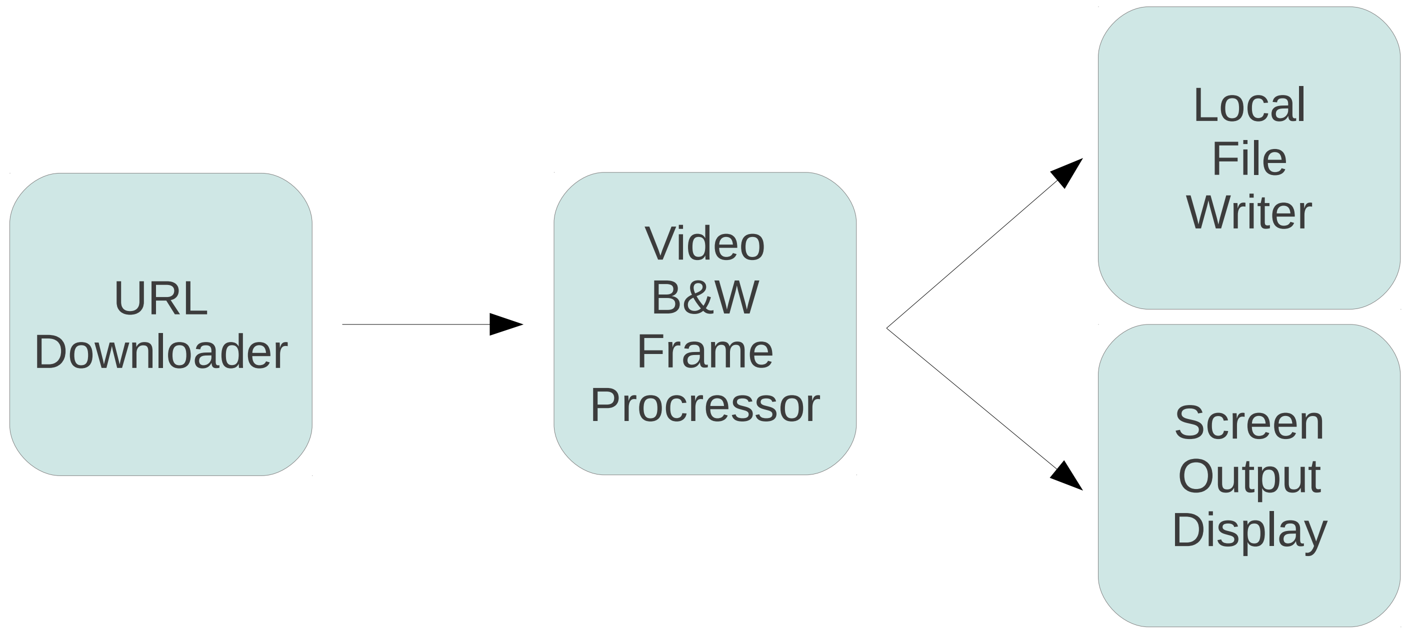
Dataflow Example

- Let's say we want to change our feed from a local file to a remote file on a Website? No problem!



Dataflow Example

- Let's say we want to write the Video B&W Frame Processor output to both a screen and a local file? No problem!

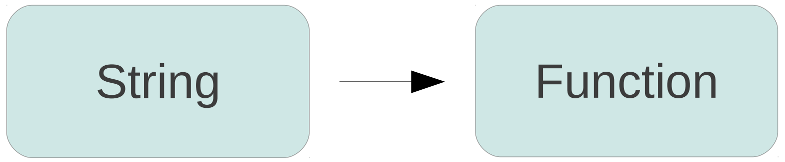


Dataflow Programming Advantages

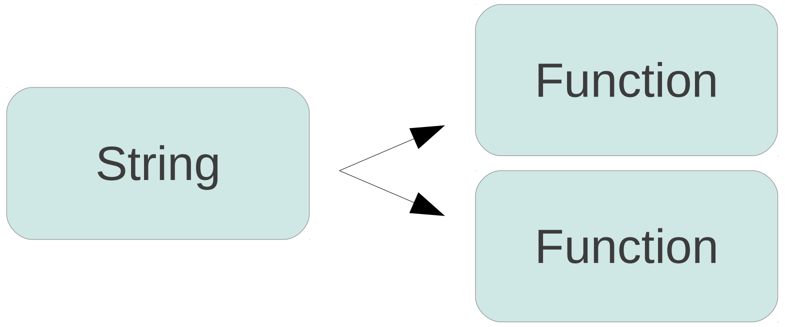
- Promotes some good programming practices
- Makes development and maintenance very intuitive
- Programs can be divided between threads, processors, or computers more easily

<Pythonect Examples>

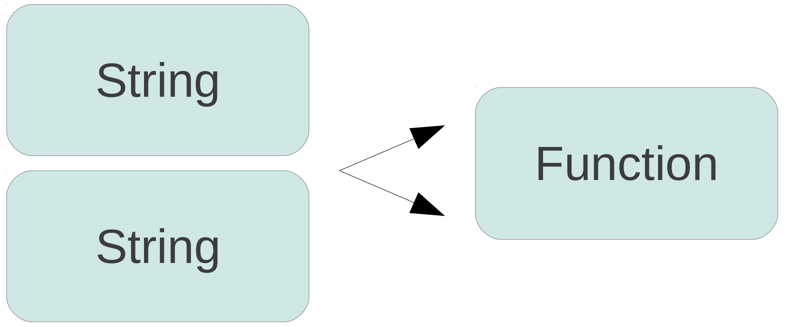
```
'Hello, world' -> print
```



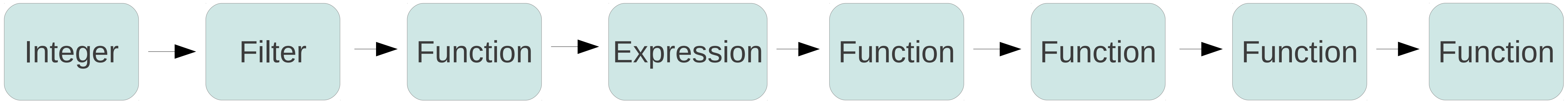
```
"Hello, world" -> [print, print]
```



```
["Hello, world", "Hello, world"] -> print
```



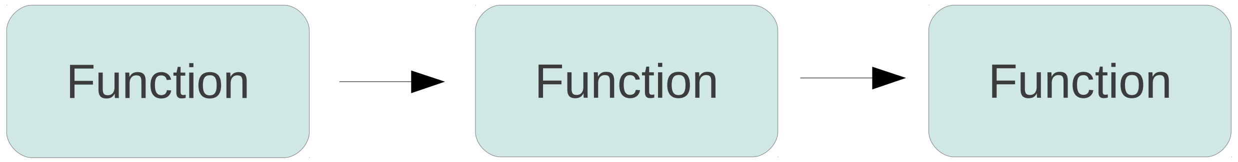
```
range(99, 0, -1) \
    | [ _ % 2 == 0 ] \
        -> str \
        -> _ + " bottle(s) of beer on the wall," \
        -> print \
        -> _.split(' on')[0] + '.' \
        -> print \
        -> print("Take one down, pass it around,")
```



<Pythonect Security Scripts/Examples>

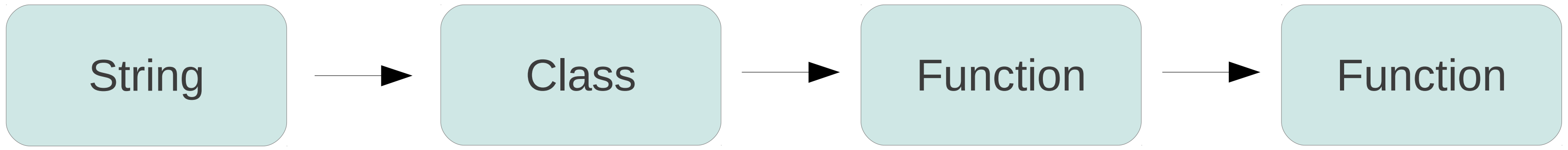
ROT13 Encrypt & Decrypt

```
raw_input() -> _.encode('rot13') -> print
```



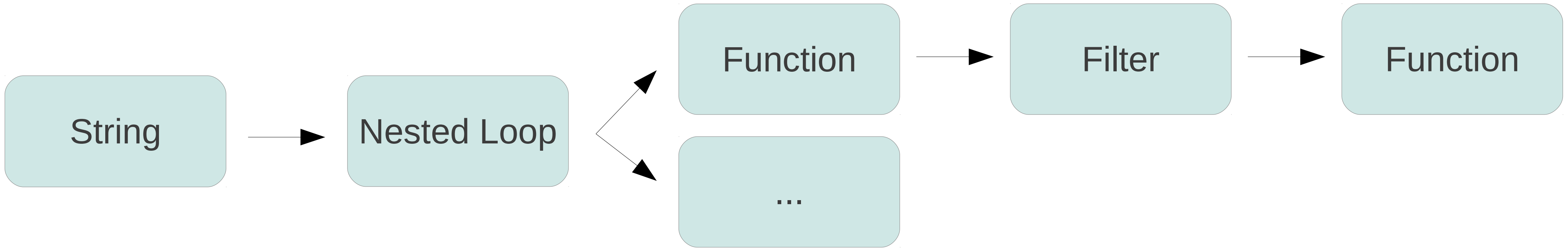
Check if FTP server supports Anonymous Login

```
'ftp.gnu.org'
    -> ftplib.FTP
    -> _.login()
    -> print("Allow anonymous")
```



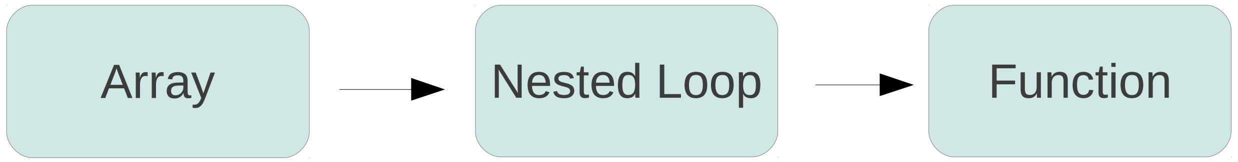
(Multi-thread) HTTP Directory Brute-force

```
sys.argv[1] \
    -> [str(_ + '/' + x) for x in open(sys.argv[2],'r').read().split('\n')] \
    -> [(_, urllib.urlopen(_))] \
    -> _[1].getcode() != 404 \
    -> print "%s returns %s" % (_[0], _[1], _[1].getcode())
```



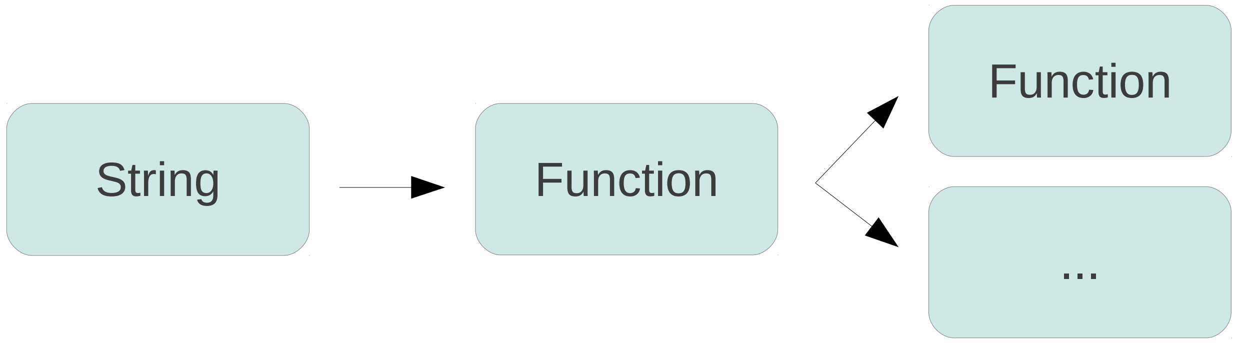
Command line Fuzzer

```
['%s', '%n', 'A', 'a', '0', '!', '$', '%', '*', '+', ',', '-', '.', '/', ':'] \
    | [_ * n for n in [256, 512, 1024, 2048, 4096]] \
        | os.system('/bin/ping ' + _)
```



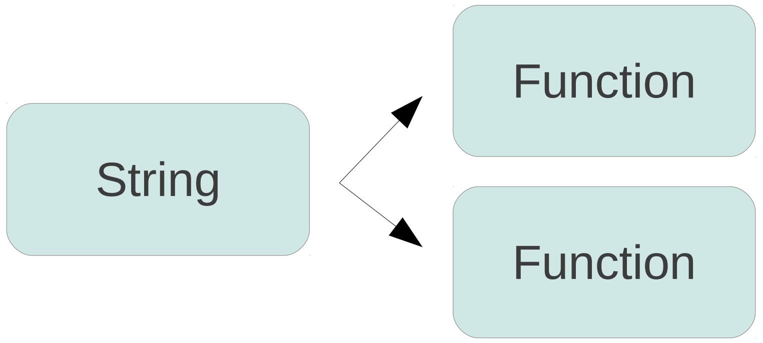
(Multi-thread) Generic File format Fuzzer

```
open('dana.jpg', 'r').read() \
    -> itertools.permutations \
        -> open('output_' + hex(_.__hash__()) + '.jpg', 'w').write(''.join(_))
```



Compute MALWARE.EXE's MD5 & SHA1

```
"MALWARE.EXE"
    -> [os.system("/usr/bin/md5sum " + _), os.system("/usr/bin/sha1sum " + _)]
```



Compute MALWARE.EXE's Entropy

- *Entropy.py:*

```
import math
def entropy(data):
    entropy = 0
    if data:
        for x in range(2**8):
            p_x = float(data.count(chr(x))) / len(data)
            if p_x > 0:
                entropy += - p_x * math.log(p_x, 2)
    return entropy
```

- *Pythonect:*

```
"MALWARE.EXE" \
    -> open(_, 'r').read() \
        -> entropy.entropy \
            -> print
```

References / More Examples

- My Blog
  - Scraping LinkedIn Public Profiles for Fun and Profit
  - Fuzzing Like A Boss with Pythonect
  - Automated Static Malware Analysis with Pythonect
- LightBulbOne (Blog)
  - Fuzzy iOS Messages!

Pythonect Roadmap

- Support Python 3k
- Support Stackless Python
- Support IronPython
- Support GPU Programming
- Fix bugs and etc.

Questions?

Thanks!

Website: http://www.pythonect.org
Mailing list: pythonect@googlegroups.com