

Python verses similar tools

- is more powerful than Tcl
 - applicable to larger systems development
- has cleaner syntax than Perl
 - easier to maintain
- does not compete head on with Java
 - python is a scripting language
 - Java is a systems language like C++

Python can be simple

```
#!/usr/bin/python
print "hello world"
```

Python Modules allow for problem decomposition

- similar to Modula-2

```
#!/usr/bin/python
title = "hello world"
```

- above is called `myfile.py`

```
#!/usr/bin/python
import myfile
print myfile.title
```

- when run prints hello world

Alternative import

```
#!/usr/bin/python
from myfile import title
print title
```

- note that all python modules need to be saved as *name.py*
 - so in our example the module `myfile` was saved into a file called `myfile.py`

Python builtin types

- python contains many builtin types
 - use them..
- builtin objects make simple programs easy to understand
 - lists, dictionaries, exist, don't reinvent the wheel
- built in objects are more efficient than custom data types

Builtin objects

- numbers 3.14159, 1234
- strings 'spam', "fred's"
- lists [1, [2, 'three'], 4]
- dictionaries {'food': 'spam', 'taste': 'yum'}
- tuples (1, 'spam', 4, 'U')
- files text=open('/etc/passwd', 'r').read()

Expression operators

- | | |
|--|---|
| <p>or, and, not</p> <p><, <=, >, >=, ==, <>, !=</p> <p>x y</p> <p>z & y</p> <p>x << y</p> <p>x >> y</p> <p>x[i]</p> <p>x[i:y]</p> <p>x.y</p> <p>x(y)</p> | <p>logical operators (short circuit)</p> <p>comparison operators</p> <p>bitwise or</p> <p>bitwise and</p> <p>shift left by y bits</p> <p>shift right by y bits</p> <p>indexing</p> <p>slicing</p> <p>qualifying (imports)</p> <p>function calls</p> |
|--|---|

Strings

- concatenation via +
 - repeated via *

```
#!/usr/bin/python
print "hi " * 4
```

- yields

```
hi hi hi hi
```

Slicing

- given a string, `S = "hello world"`
 - can obtain portion of string via: `s[2:5]`
 - yields: `llo`
- first character has index 0
 - and also -11
 - last character index is 10 in this example
 - last character index is also -1
- negative values start at right and move to the left
- strings can be sliced using positive and negative values

Using dir

- often you may wish to see what methods a module provides
 - run python interactively

```
$ python
Python 1.5.2
>>> import string
>>> dir(string)
['capitalize', 'capwords', 'center', 'count', \
'digits', 'expandtabs', 'find', 'hexdigits', \
'index', 'index_error', 'join', 'joinfields', \
'letters', 'ljust', 'lower', 'lowercase', \
'lstrip', 'maketrans', 'octdigits', 'replace', \
'rfind', 'rindex', 'rjust', 'rstrip', 'split', \
'splitfields', 'strip', 'swapcase', \
'upper', 'uppercase', 'whitespace', 'zfill']
```

- displays methods available
 - in the above example many methods have been removed for brevity

Methods and documentation

- [python online docs](http://floppsie.comp.glam.ac.uk/python/html/index.html) (`<http://floppsie.comp.glam.ac.uk/python/html/index.html>`)
 - under GNU/Linux
- tutorial/laboratory
 - read through the online tutorial under the web address above
 - read about functions and scope rules
 - name resolution, LGB rule
 - local, global, builtin scope

Statements

- assignment, calls, print, if/else/elif, for, while, break/continue
- try, except, raise,
- def, return
 - function definitions and returning values

Statements

- class
- assert
- exec
- del
- global

Example 8 times table

```
#!/usr/bin/python
for n in range(1, 13):
    print n, "x 8 =", n*8
```

Example 8 times table

```
■ $ python eight.py
1 x 8 = 8
2 x 8 = 16
3 x 8 = 24
4 x 8 = 32
5 x 8 = 40
6 x 8 = 48
7 x 8 = 56
8 x 8 = 64
9 x 8 = 72
10 x 8 = 80
11 x 8 = 88
12 x 8 = 96
```

Example of for loop

```
#!/usr/bin/python
for n in range(2, 10):
    print 'n is', n
else:
    print 'finished for loop, n is', n
```

Example of for loop

```

$ ./py7.py
n is 2
n is 3
n is 4
n is 5
n is 6
n is 7
n is 8
n is 9
finished for loop, n is 9

```

Example code

```

#!/usr/bin/python
for n in range(2, 10):
    print 'n is', n, ', range(2, n) is', range(2, n)
    for x in range (2, n):
        print 'x is', x, ', n % x == ', n % x
        if n % x == 0:
            print n, 'equals', x, '*', n/x
            break
    else:
        print n, 'is a prime number'

```

Output of code with debugging

```

n is 2 , range(2, n) is []
2 is a prime number
n is 3 , range(2, n) is [2]
x is 2 , n % x == 1
3 is a prime number
n is 4 , range(2, n) is [2, 3]
x is 2 , n % x == 0
4 equals 2 * 2
n is 5 , range(2, n) is [2, 3, 4]
x is 2 , n % x == 1
x is 3 , n % x == 2
x is 4 , n % x == 1
5 is a prime number

```

Output of code without debugging

```

$ ./py6.py
2 is a prime number
3 is a prime number
4 equals 2 * 2
5 is a prime number
6 equals 2 * 3
7 is a prime number
8 equals 2 * 4
9 equals 3 * 3

```

Killer Application for us at Univ of Glam

- we needed a graphical method to alert new GNU/Linux users to the availability of OpenOffice
 - could write a program in Java, C/Motif, C/gnome etc
- prefer a simple scripting solution

Killer Application for us at Univ of Glam

```
#!/usr/bin/python
import os.path
from Tkinter import *

def makebutton(message):
    w = Button(text=message, command='exit')
    w.pack()
    w.mainloop()

if not os.path.isdir(\
    os.path.expandvars('$HOME/OpenOffice.org1.0.3')):
    makebutton("You might be interested \
in OpenOffice (a word clone) which can be \
invoked from the RedHat menu")
```

Some simple examples

- finding all lines starting with #

```
#!/usr/bin/python
import sys
for line in sys.stdin.readlines():
    if line[0] == '#':
        print line
```

Fifth column of /etc/passwd

```
fred:llk:1000:1000:Fred,,,:/home/fred:/bin/bash
bob:wei:1001:1001:Bob,,,:/home/bob:/bin/bash
alice:kjh:1002:1002:Alice,,,:/home/alice:/bin/bash
mary:asd:1003:1003:Mary,,,:/home/mary:/bin/bash
```

```
#!/usr/bin/python
import sys, string

for line in open('/etc/passwd').readlines():
    words = string.split(line, ':')
    if len(words) >= 5:
        print words[4]
```

```
Fred
Bob
Alice
Mary
```

Tutorial

- to undertake these tutorials you will need to refer to the [python online docs](http://floppsie.comp.glam.ac.uk/python/html/index.html) (`http://floppsie.comp.glam.ac.uk/python/html/index.html`)
- write a program using a while loop
 - to write out the nine times table
- write a program using a for loop
 - to write out the seven times table
- write a program using a function and if else statement
 - to write out the 3 times table

Tutorial

- read the manual page about `/etc/passwd`
 - you can do this by typing:

```
$ man 5 passwd
```
 - in the terminal and pressing 'q' to quit.
- write a program to extract a list of the usernames on the machine
- write a program to list all users on the machine and also display their UIDs
- now write a program to list all users and display a simple message to say whether their password is held in the `/etc/shadow` file

Tutorial

- improve the OpenOffice advert such that an additional button appears, called
 - 'never tell me again'
 - make this take appropriate action!