Reading Files

Chapter 7

Python for Informatics: Exploring Information
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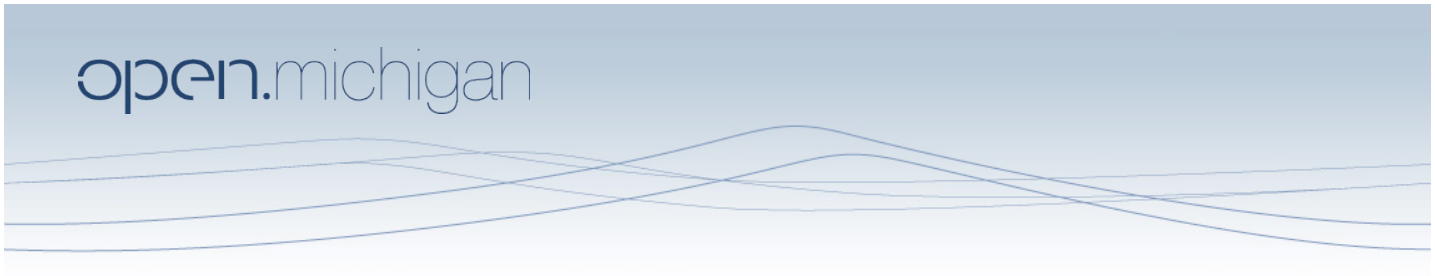

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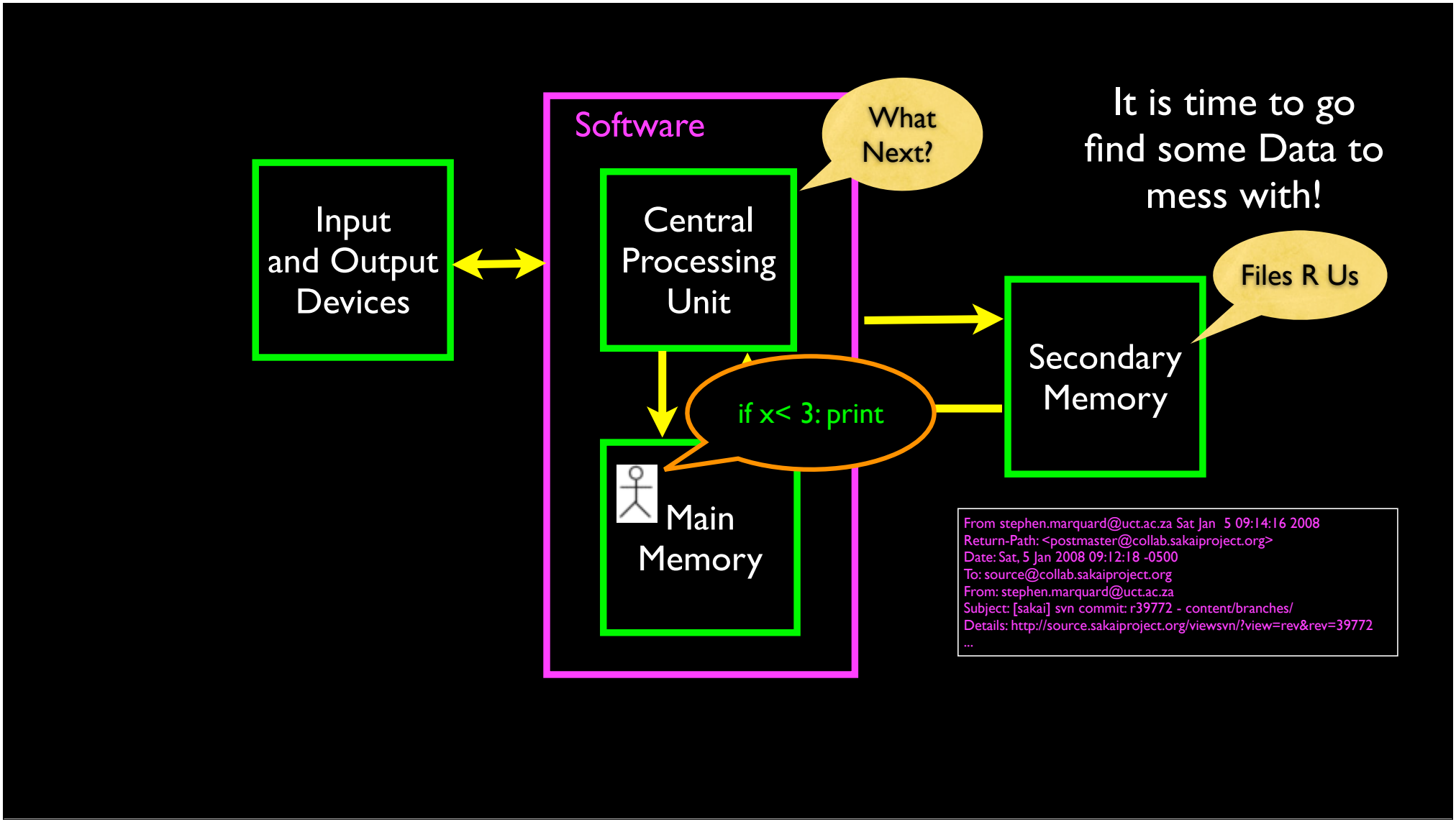
Input and Output Devices
Software
What Next?
Central Processing Unit
Main Memory
if x< 3: print
Secondary Memory
Files R Us
It is time to go find some Data to mess with!
From stephen.marquard@uct.ac.za Sat Jan 5 09:14:16 2008
Return-Path: <postmaster@collab.sakaiproject.org>
Date: Sat, 5 Jan 2008 09:12:18 -0500
To: source@collab.sakaiproject.org
From: stephen.marquard@uct.ac.za
Subject: [sakai] svn commit: r39772 - content/branches/
Details: http://source.sakaiproject.org/viewsvn/?view=rev&rev=39772
...

File Processing

- A text file can be thought of as a sequence of lines

```
From stephen.marquard@uct.ac.za Sat Jan  5 09:14:16 2008
Return-Path: <postmaster@collab.sakaiproject.org>
Date: Sat, 5 Jan 2008 09:12:18 -0500
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```

http://www.py4inf.com/code/mbox-short.txt

Opening a File

- Before we can read the contents of the file we must tell Python which file we are going to work with and what we will be doing with the file
- This is done with the open() function
- open() returns a "file handle" - a variable used to perform operations on the file
- Kind of like "File -> Open" in a Word Processor

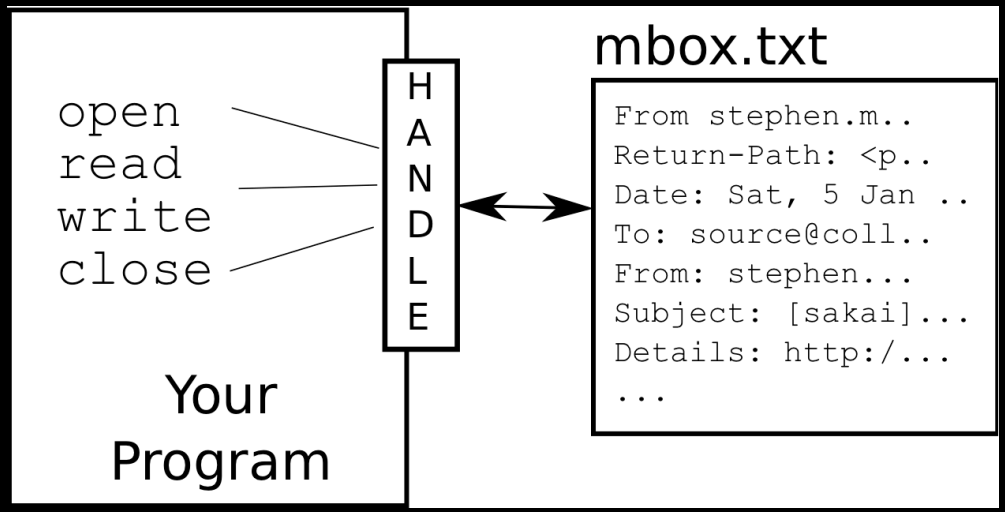
Using open()

- handle = open(filename, mode) fhand = open('mbox.txt', 'r')
  - returns a handle use to manipulate the file
  - filename is a string
  - mode is optional and should be 'r' if we are planning reading the file and 'w' if we are going to write to the file.

http://docs.python.org/lib/built-in-funcs.html

What is a Handle?

```
>>> fhand = open('mbox.txt')
>>> print fhand
<open file 'mbox.txt', mode 'r' at 0x1005088b0>
```



When Files are Missing

```
>>> fhand = open('stuff.txt')
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
IOError: [Errno 2] No such file or directory: 'stuff.txt'
```

The newline Character

- We use a special character to indicate when a line ends called the "newline"
- We represent it as \n in strings
- Newline is still one character - not two

```
>>> stuff = 'Hello\nWorld!'
>>> stuff
'Hello\nWorld!'
>>> print stuff
Hello
World!
>>> stuff = 'X\nY'
>>> print stuff
X
Y
>>> len(stuff)
3
```

File Processing

- A text file can be thought of as a sequence of lines

```
From stephen.marquard@uct.ac.za Sat Jan  5 09:14:16 2008
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Details: http://source.sakaiproject.org/viewsvn/?view=rev&rev=39772
```

File Processing

- A text file has newlines at the end of each line

```
From stephen.marquard@uct.ac.za Sat Jan  5 09:14:16 2008\n
Return-Path: <postmaster@collab.sakaiproject.org>\n
Date: Sat, 5 Jan 2008 09:12:18 -0500\n
To: source@collab.sakaiproject.org\n
From: stephen.marquard@uct.ac.za\n
Subject: [sakai] svn commit: r39772 - content/branches/\n
Details: http://source.sakaiproject.org/viewsvn/?view=rev&rev=39772\n
```

File Handle as a Sequence

- A file handle open for read can be treated as a sequence of strings where each line in the file is a string in the sequence
- We can use the for statement to iterate through a sequence
- Remember - a sequence is an ordered set

```
xfile = open('mbox.txt')

for cheese in xfile:
    print cheese
```

Counting Lines in a File

- Open a file read-only
- Use a for loop to read each line
- Count the lines and print out the number of lines

```
fhand = open('mbox.txt')
count = 0
for line in fhand:
    count = count + 1

print 'Line Count:', count
```

```
python open.py
Line Count: 132045
```

Reading the *Whole* File

- We can read the whole file (newlines and all) into a single string.

```
>>> fhand = open('mbox-short.txt')
>>> inp = fhand.read()
>>> print len(inp)
94626
>>> print inp[:20]
From stephen.marquar
```

Searching Through a File

- We can put an if statement in our for loop to only print lines that meet some criteria

```
fhand = open('mbox-short.txt')
for line in fhand:
    if line.startswith('From:') :
        print line
```

OOPS!

What are all these blank lines doing here?

From: stephen.marquard@uct.ac.za

From: louis@media.berkeley.edu

From: zqian@umich.edu

From: rjlowe@iupui.edu

...

OOPS!

What are all these blank lines doing here?

The print statement adds a newline to each line.

Each line from the file also has a newline at the end.

From: stephen.marquard@uct.ac.za\n
\n
From: louis@media.berkeley.edu\n
\n
From: zqian@umich.edu\n
\n
From: rjlowe@iupui.edu\n
...

Searching Through a File (fixed)

- We can strip the whitespace from the right hand side of the string using rstrip() from the string library
- The newline is considered "white space" and is stripped

```
fhand = open('mbox-short.txt')
for line in fhand:
    line = line.rstrip()
    if line.startswith('From:') :
        print line
```

```
From: stephen.marquard@uct.ac.za
From: louis@media.berkeley.edu
From: zqian@umich.edu
From: rjlowe@iupui.edu
....
```

Skipping with continue

- We can convienently skip a line by using the continue statement

```
fhand = open('mbox-short.txt')
for line in fhand:
    line = line.rstrip()
    # Skip 'uninteresting lines'
    if not line.startswith('From:') :
        continue
    # Process our 'interesting' line
    print line
```

Using in to select lines

- We can look for a string anywhere in a line as our selection criteria

```
fhand = open('mbox-short.txt')
for line in fhand:
    line = line.rstrip()
    if not '@uct.ac.za' in line :
        continue
    print line
```

```
From stephen.marquard@uct.ac.za Sat Jan  5 09:14:16 2008
X-Authentication-Warning: set sender to stephen.marquard@uct.ac.za using -f
From: stephen.marquard@uct.ac.za
Author: stephen.marquard@uct.ac.za
From david.horwitz@uct.ac.za Fri Jan  4 07:02:32 2008
X-Authentication-Warning: set sender to david.horwitz@uct.ac.za using -f
...
```

```
fname = raw_input('Enter the file name:  ')
fhand = open(fname)
count = 0
for line in fhand:
    if line.startswith('Subject:') :
        count = count + 1
print 'There were', count, 'subject lines in', fname
```

Prompt for File Name

```
Enter the file name:  mbox.txt
There were 1797 subject lines in mbox.txt

python search6.py
Enter the file name: mbox-short.txt
There were 27 subject lines in mbox-short.txt
```

Bad File Names

```
fname = raw_input('Enter the file name:  ')
try:
    fhand = open(fname)
except:
    print 'File cannot be opened:', fname
    exit()
count = 0
for line in fhand:
    if line.startswith('Subject:') :
        count = count + 1
print 'There were', count, 'subject lines in', fname
```

```
Enter the file name: mbox.txt
There were 1797 subject lines in mbox.txt

Enter the file name: na na boo boo
File cannot be opened: na na boo boo
```

Summary

- Secondary storage
- Opening a file - file handle
- File structure - newline character
- Reading a file line-by-line with a for loop
- Reading the whole file as a string
- Searching for lines
- Stripping white space
- Using continue
- Using in as an operator
- Reading a file and splitting lines
- Reading file names
- Dealing with bad files