

System Development with Python: Week 9

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Side Note:

Python Module of the Week

<http://pymotw.com/>

Nice summaries and examples of standard library modules

Desktop GUIs: wxPython

Desktop GUIs

Traditional Graphical User Interface Applications

Run entirely on machine – interactive, interface and logic code in one process

Advantages:

- Easier to write – all in one program
- Faster – data/interface direct communication
- Faster display: direct to screen (or even OpenGL, etc.)
- Runs without network
- Save/Manipulate local files
- Familiar install/start/stop/run, etc.

Python Options

Multiple GUI frameworks available:

- PyGTK
- PYQT / PySide
- TkInter
- wxPython
- PyGame
- Native GUIs: Cocoa (PyObject), PythonWin
- Some more minor ones...

wxPython

Why wxPython?

- Python wrapper around C++ toolkit (wxWidget)
- wxWidgets is a wrapper around *native* toolkit:
 - Windows: Win32 (64)
 - OS-X: Cocoa
 - Linux: GTK
- Native look and feel
- License: (modified) LGPL

Legacy: it was the best option for me when I first needed something... See <http://www.wxpython.org> for more information

Installing

wxPython is a big complicated build:
can't do pip or easy_install

Windows or OS-X:
use the binaries on
<http://wxpython.org/download.php>

Linux: use your system's package
NOTE: there are some issues with some packages:

- May be old version
- May use standard wx build – more crash prone!
(some run-time checking turned off)

Versions

“Stable” version: 2.8.12.1

(“stable” means stable API, not less likely to crash)

“Development” version: 2.9.4.0

(Under active development, API may change (but not much))

wx project very slow to do official releases – You probably want to use the development version: it's getting more attention

“Phoenix”: next generation version: new bindings, Py3 support, etc.

– Still experimental

<http://wiki.wxpython.org/ProjectPhoenix>

Documentation

“Docs and Demos”: download these!

“wxPython Demo” – run this!

Examples of every Widget available

Primary wx docs:

Written for C++, with Python notes...

<http://wxpython.org/onlinedocs.php>

This may help:

<http://wiki.wxpython.org/C%2B%2BGuideForwxPythoneers>

Semi-experimental Sphinx docs:

<http://xoomer.virgilio.it/infinity77/wxPython/>

The wxPython wiki: lots of good stuff here

<http://wiki.wxpython.org/>

Some starting points

How to learn wxPython

<http://wiki.wxpython.org/How%20to%20Learn%20wxPython>

wxPython Style Guide

<http://wiki.wxpython.org/wxPython%20Style%20Guide>

The wxpython-users mailing list is a great resource
(and great community):

[https://groups.google.com/forum/?fromgroups#!forum/
wxpython-users](https://groups.google.com/forum/?fromgroups#!forum/wxpython-users)

My own repository of samples:

<https://github.com/PythonCHB/wxPythonDemos>

Event-Driven programming

On app startup, the `.MainLoop()` method is called.

The mainloop takes control – monitoring for events, then dispatching them

Events can come from the system, or user interaction: keyboard, mouse, etc.

All the work of your app is done in response to events

You only need to response to (Bind) the events you care about

Not so different than a web app, except events are finer-grained
(every mouse move, etc.)

wx.Window

Pretty much everything you see on the screen is a `wx.Window`

It is the superclass for all the “widgets”, “controls”, or whatever you want to call them

It is essentially a rectangle on the screen that catches events

You generally don't use it by itself, though you may derive from it to make a new widget

(Historical Note: `wxWidgets` was called `wxWindows` – until Microsoft threatened to sue them.)

wx.Window

Since everything is a `wx.Window`, it's good to know its methods and signature:

```
def __init__(parent,  
             id=-1,  
             pos=wx.DefaultPosition,  
             size=wx.DefaultSize,  
             style=0,  
             name=wx.PanelNameStr)
```

```
parent (wx.Window)
```

```
id (int)
```

```
pos (wx.Point)
```

```
size (wx.Size)
```

```
style (long)
```

```
name (string)
```

```
http://xoomer.virgilio.it/infinity77/wxPython/
```

wx.Window

Methods types:

- Appearance: Colors, Fonts, Labels, Styles
- Geometry: Size, Position, IsShown, Move, etc
- Layout: Sizers, etc.
- Many others!

<http://xoomer.virgilio.it/infinity77/wxPython/Widgets/wx.Window.html>

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wx.App

Every wx app has a single wx.App instance:

```
app = wx.App(False)
frame = DemoFrame(None, title="Micro App")
frame.Show()
app.MainLoop()
```

(the False means: “don’t re-direct stdout to a Window”)
And you almost always start the ‘MainLoop’

wx.Frame

`wx.Frame` is a “top level” Window: One with a title bar, min-max buttons, etc.

Most apps have a single `wx.Frame` – central interaction with the app.

This is where menu bars, etc are placed, and often the core GUI logic of app.

```
class TestFrame(wx.Frame):  
    def __init__(self, *args, **kwargs):  
        kwargs.setdefault('title', "Simple test App")  
        wx.Frame.__init__(self, *args, **kwargs)
```

demo: `code\basic_app_1.py`

Menus

A `wx.Frame` has a menu bar you can add items to:

```
# create the menu bar object
menuBar = wx.MenuBar()

# add a menu to it
fileMenu = wx.Menu()

# add an item to the menu
openMenuItem = fileMenu.Append(wx.ID_ANY, "&Open", "Open")
#bind a handler to the menu event
self.Bind(wx.EVT_MENU, self.onOpen, openMenuItem)

self.SetMenuBar(menuBar)
```

demo: code\basic_app_2.py

Event Handlers

Event handlers have a common signature:

```
def onOpen(self, evt=None):  
    print "open menu selected"  
    self.app_logic.file_open()
```

The second parameter is the `wx.Event` object that initiated the call – it holds information about the event that can be useful

I like to give the event parameter a default `None`, so the handler can be called from other parts of the code as well.

demo: `code\basic_app_2.py`

Title

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Title

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Long Running Tasks

The UI is locked up while an event is being handled

So you want all event handlers to run fast.

But what if there is significant work to do?

Enter: threading and multi-processing

But: wxPython is not thread-safe: almost all wx methods must be called from within the same thread.

Thread-safe operations: Creating and Posting Events

CallAfter

Easiest way to communicate with threads:
`wx.CallAfter`

Puts an event on the event stack, calls the designated function or method when the stack is cleared:

```
wx.CallAfter(function_to_call, *args, **kwargs)
```

```
# *args, **kwargs are passed on to FunctionToCall
```

(see also: `wx.CallLater()`)

<http://wiki.wxpython.org/LongRunningTasks>

BILS

Browser **I**nterface, **L**ocal **S**erver

Web app: Server runs on local machine

Browser is the interface – but all running local

Can wrap the Browser window in a desktop app:
Chrome Embedded Framework, wxWebkit, etc.

Good way to get both a web app and desktop app
with one codebase

Example: Cameo Chemicals

Wrap up

Next Week:

Student Project Presentations

Project Time!

Final wrap up

Put it together

Get ready to present

Presentation: focus on code!