Restful Interfaces to Third-Party Websites with Python

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My (pythonic) Background

- learned of python in 96 <– Vim Editor
- started pyFltk
- PyGallery – an early online static photo gallery generators
- wxGlade plugin– floatspin
- hardware tester for embedded system
- desktop – ErgMate, ErgTweeter

Motivation – Why REST?

- consuming a SOAP web-service in J2EE

  Simple call – get list of bank officers

  Generated / modified: 33 files over 5 directories!
- easy to get started (rest-like) creating interface
  - harder to be strict
- lighweight
- cross-platform
- tools/libraries widely available
  - view headers and content – browser/proxy

REST – Review

- architectural style
  - here (nearly everywhere) as applied to HTTP
- Representational State Transfer
  - resources have unique URI
  - client retrieves representations (views) of resources via url
  - representations control state of the client
- Roy Fielding dissertation
- leverages existing web infrastructure and protocols

REST – As Applied to HTTP

- Get
- Head
  - last modified / meta / existence
- Put
  - specify all data, complete resource
- Delete
- Post
  - update all/partial existing, server assigned
  - not idempotent
- Options - discovery

Adding API to Website that has None

- Web (Screen) Scraping
  - programmatic web browser
- Some problems with this technique
  - brittle – tightly coupled
  - tedious
  - dynamic websites

Managing Risks of Screen-Scraping

- brittle
  - testing
    - parser, domain, api
- tedious
  - library/toolset choice
- dynamic
  - library
  - browser automation

Python Tools: Mechanize

- John J. Lee
- programmatic browser in python
  - cookies
  - redirects / refresh
  - honors robots.txt
  - forms
  - proxies

Python Tools: Beautiful Soup

- Leonard Richardson
- html/xml parser
  - accepts broken input
  - pure python (no native module)

"You didn't write that awful page. You're just trying to get some data out of it. Right now, you don't really care what HTML is supposed to look like. Neither does this parser."

- Ruby port: Rubyful Soup.

Python Tools: Nose

- Jason Pellerin
- unit-test runner
  - collects tests automatically – no need for suites
  - parametric tests using generators
    - example1.py
  - coverage, profile, debugger, attributes …
  - plugins
    - http://nose-plugins.jottit.com/

Python Tools: Nosy

- Jeff Winkler
- watches files
- runs nosy when code changes
- simple script -> ~20 lines of code

Python Tools: Nosy Reloaded

- Doug Latornell
- enhanced Nosy script
- supports config files
  - directories/file glob patterns to watch for changes
    - *, ?, and character ranges expressed with []
  - list of options to send to nose
    - attributes -> id sets of tests to run

Python Tools: django-piston

- framework helps with REST implementation
- dispatch -> HTTP verbs
- authorization
  - basic, open-auth, custom
- many formats
  - json, yaml, xml, pickled python objects
- throttling
  - user id, ip-address
  - global or grouped

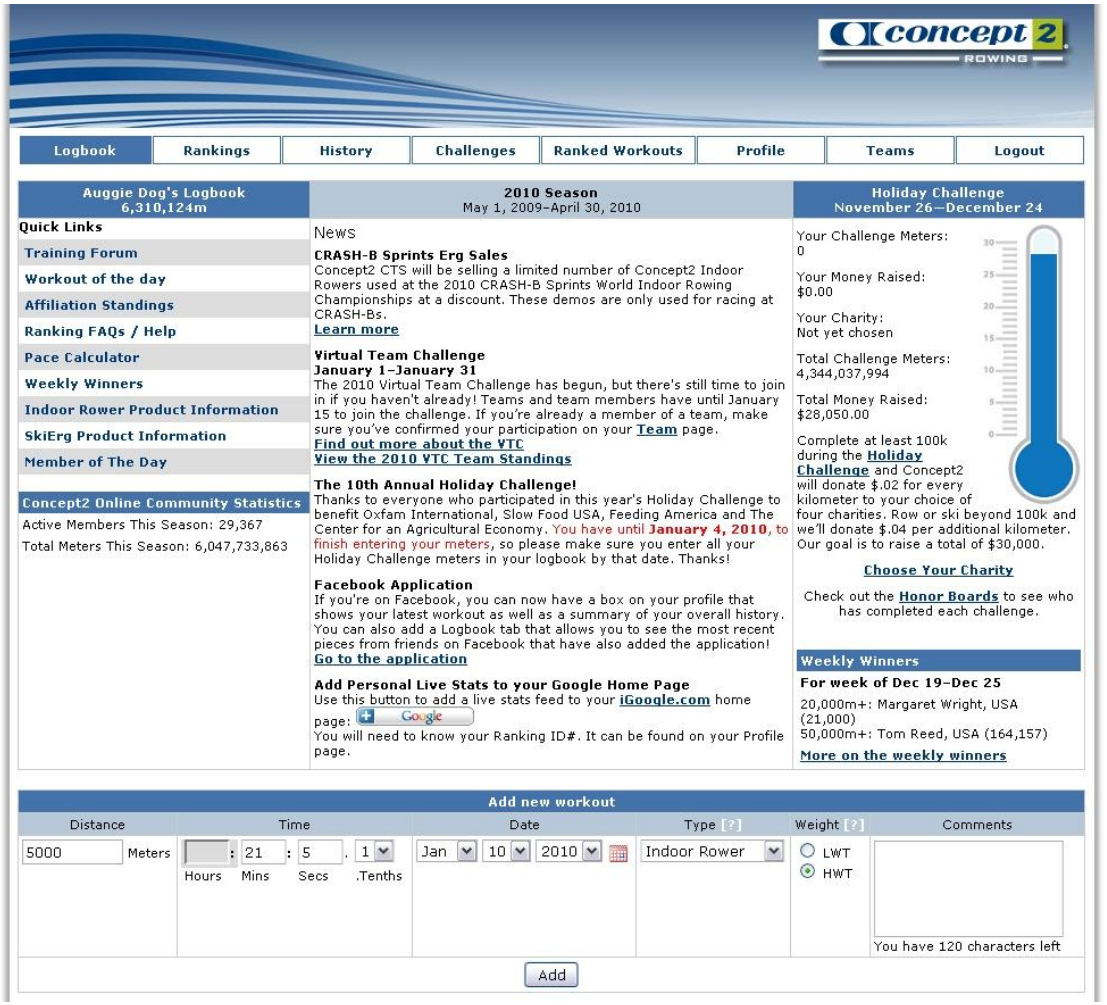
Python Tools: google app-engine

- why?
  - python
  - cost
  - scalability
  - cloud computing – wanted to learn about it
- challenges
  - django -> app-engine patch
  - piston -> manual changes to model, django-piston
  - mechanize -> minor changes urllib, blog
  - no native modules (lxml)

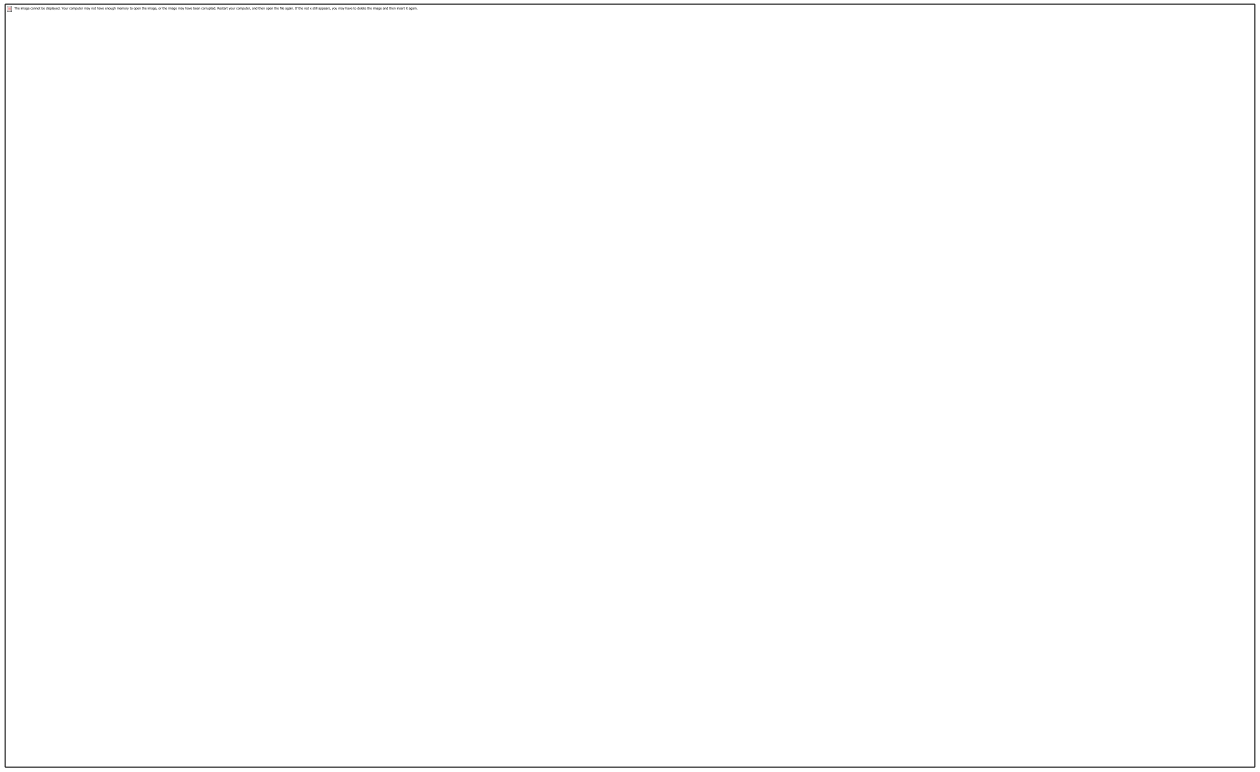
Case-Study: Concept 2 Online Logbook

Use Cases:

- add workouts
- get total distance
- synchronize online log with spreadsheet



(Case Study) Example – Get All Workouts



(authentication / api-key passed in headers or as parameters)

(Case Study) Example – Get All Workouts

JSON:
http://c2logapi.appspot.com/api/1/currentseason/workouts?api_key=xxxxxxxxx


```
[
  {
    "distance": 5000,
    "seconds": 11,
    "age": 41,
    "day": 11,
    "comments": "fly and die - tired, dehydrated",
    "month": 1,
    "hours": 0,
    "weightClass": "H",
    "link": { "href": "http://c2logapi.appspot.com/api/1/currentseason/workout/11360463",  "rel":"self" },
    "typeOfWorkout": "indoor rower",
    "year": 2010,
    "minutes": 21,
    "id": 11360463,
    "tenths": 3
  },
  {
    "distance": 5000,
    "seconds": 5,
    "age": 41,
    "day": 8,
    …
```

(Case Study) Example – Get All Workouts

XML:

http://c2logapi.appspot.com/api/1/currentseason/workouts.xml?api_key=xxxxxxxxx

http://c2logapi.appspot.com/api/1/currentseason/workouts?format=xml&api_key=xxxxxxxxx

Preparation: accounts

- create non-user accounts
  - a development account
  - regression – 1+
    - data loading
- might be obvious – but…. keep testing away from active user accounts

Step 1: Script to store pages locally

- local copies
  - efficiency
  - good user
  - diff

  example2.py

- avoid browser -> save

Step 2: Write a unit test for the parser

- test
  - reads html from local file
  - passes to parser function
    - getTotalDistance(data)
      - parse data return value

example3.py

Step 3: Implement the parsing

- idiom:
  - parser:
    - has html content passed to it
    - getTotalDistance(data)
      - parse data return value
  - domain object:
    - getTotalDistance()
      - uses mechanical browser to get page data
      - then calls parser

example4.py + HomePageLoggedIn.html

Step 4: Add a domain-level test

- calls domain object against regression test account
- tag ‘live’ tests using Nose attributes

```
from nose.plugins.attrib import attr

@attr(‘live')
def testLiveGetDistance():
   .
   .
```

Step 5: Add regression test for the API

- structure tests to run against local or remote server
- validate HTTP result code
- could serve as examples
  - but don’t

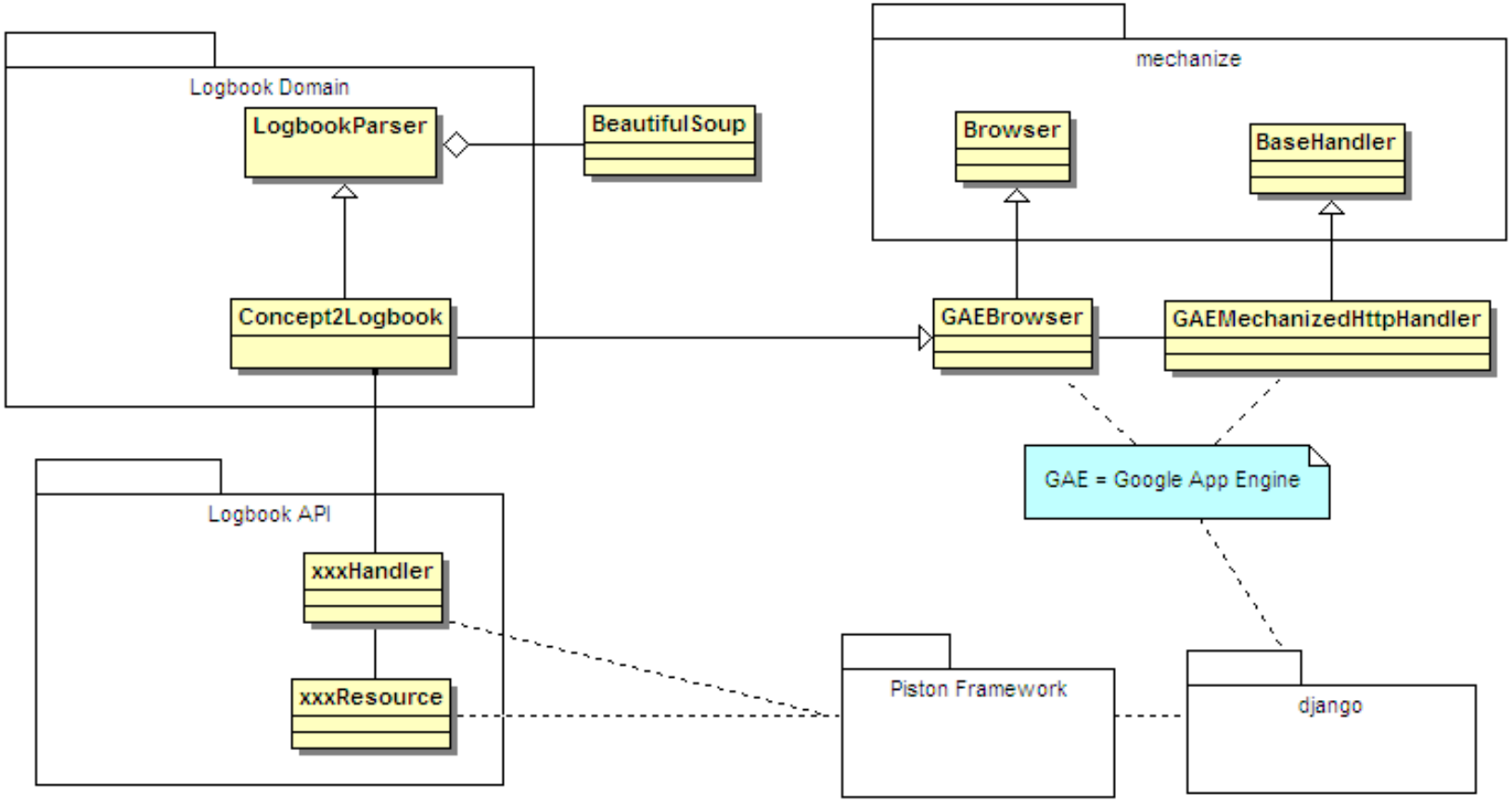
example6.py

Step 6: Expose domain object via your API

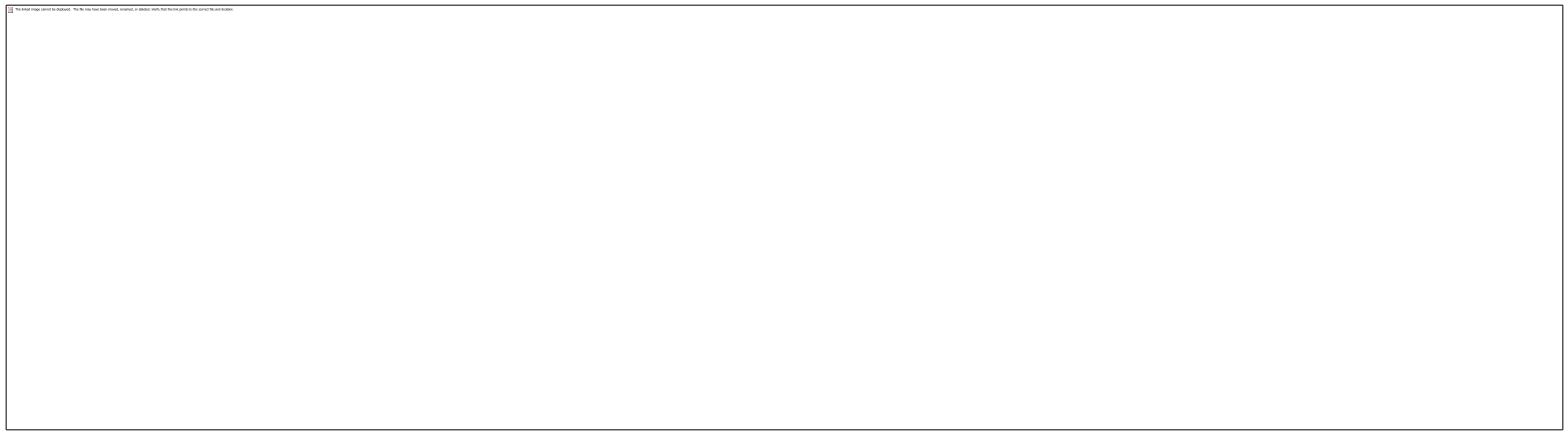
- authentication
  - consider for api and external site
- request throttling
  - piston – id, ipi, group
- ability to disable misbehaved clients
  - api key – exists, not disabled
- api versioning
- statelessness vs. efficiency

example7.py example8.py

(Case Study) Key Classes



Deployment Diagram



Case Study: implementation metrics

- 9 methods implemented
- domain package: 1178 loc (parsing ~26%)
- api package: 571 loc

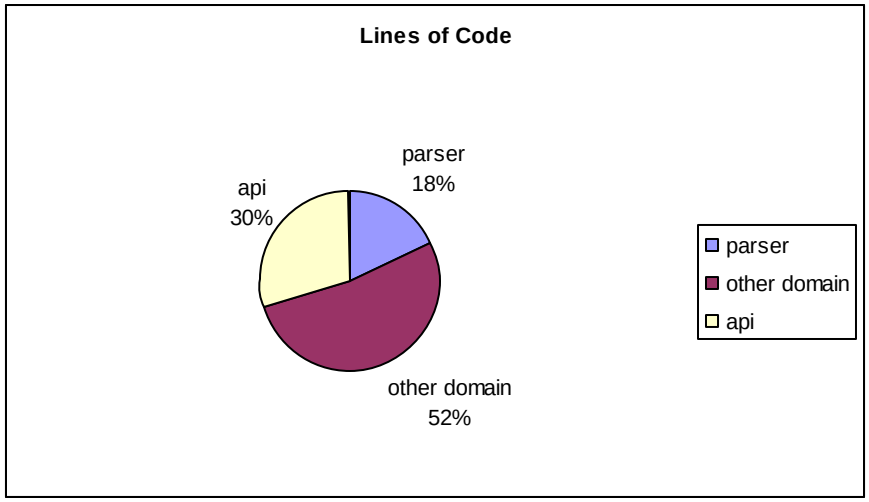
	LOC	% total
code	1749	59%
tests	1225	41%
	2974	

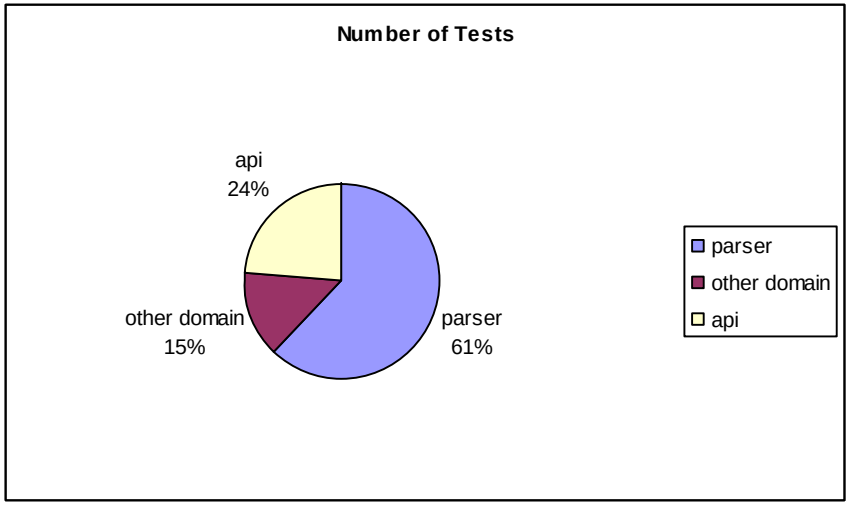
Case Study: implementation metrics

	# tests	% total
parser*	68	62%
other domain	16	15%
api	26	24%
	110	

***parser: 42 unique tests + (18 + 8) generated tests

Case Study: implementation metrics





testing emphasis on the html parsing

(Case Study) Lessons Learned

- REST is good
- use nose ‘attribute’ plugin to segment tests
- domain relationships
  - containment vs. inheritance
- api regression tests as examples of usage
  - better to separate tests from examples
- more logging – detailed usage
- lxml for parsing -> Beautiful Soup
  - native library

Resources

- *Roy Fielding's Dissertation (introduced REST):*
  http://www.ics.uci.edu/~fielding/pubs/dissertation/rest_arch_style.htm
- Allamaraju, *Subbu* and Mike Amundsen. RESTful Web Services Cookbook*.* O'Reilly, 2009 (Rough Cuts)
- *Subbu Allamaraju's Publications :*
  http://www.subbu.org/about/pubs
- *Python web-client programming FAQ:*
  http://wwwsearch.sourceforge.net/bits/GeneralFAQ.html

Resources – python tools

- *mechanize* by John J.Lee
  http://wwwsearch.sourceforge.net/mechanize/

- *Beautiful Soup* by Leonard Richardson
  http://www.crummy.com/software/BeautifulSoup/

- *App-Engine Patch*
  http://code.google.com/p/app-engine-patch/

- *Django Piston by* Jesper Noehr
  http://http://bitbucket.org/jespern/django-piston

- *Nose/Nosy/Nosy Reloaded* by Jason Pellerin / Jeff Winkler / Doug Latornell
  http://somethingaboutorange.com/mrl/projects/nose/0.11.1/
  http://jeffwinkler.net/2006/04/27/keeping-your-nose-green/
  http://douglatornell.ca/software/python/Nosy/