What is…
Google App Engine?

Wesley Chun
Developer Advocate
http://code.google.com/appengine
@wescpy / @app_engine

About the Speaker

• Software engineer by profession
  – Currently at Google (cloud products)

• Course instructor: teaching Python since 1998
  – Private Corporate Training & Public Courses

• Community volunteer
  – User groups: BayPIGgies and SF Python Meetup
  – Other: Tutor mailing list; Python conferences

• Author/co-author (books, articles, blog, etc.)
  – Core Python Programming ([2009],[2007, 2001)
  – Python Fundamentals LiveLessons DVD (2009)
  – Python Web Development with Django (2009)
I Teach

I Write
Cloud Computing
What is it (besides being buzzword-compliant)?
What is Cloud Computing?

"Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."

National Institute of Standards and Technology (NIST) Forum May 2010
http://csrc.nist.gov/groups/SNS/cloud-computing/forum-workshop_may2010.html

Cloud Computing concept... it's been around longer than you think

"In 1984, John Gage and Bill Joy of Sun Microsystems were credited with saying, "The network is the computer," one of the most memorable slogans of the information age. This concept, based on the tenet of making computing resources available to all users irrespective of location, as long as they are connected to the network, forms the basis of the Internet as we know it, and foretold the advent of cloud computing."

Garry Metcalf, Analysys Mason, Sep 2009
The Benefits of Cloud Computing

- Reduced Cost
  - Incremental payment based on usage
- Elastic Storage
  - Data storage can easily grow with business
- High Automation
  - Platform updates/patches updated automatically
- Flexibility
  - Resources can be changed on-demand
- More Mobility
  - Universal Accessibility
- Shift towards Innovation
  - Less maintenance, can focus on product innovation

Bottom line: More focus on business!

The shift towards Cloud Computing

"By 2012, 20% of Global 2000 enterprises will be using public cloud services, up from under 5% in 2009."

Yefim Natis - Gartner Cloud Computing Analyst, AADI Dec 2009
The Cloud Pyramid

Cloud Computing Defined

- SaaS
- PaaS
- IaaS

Source: Gartner AADI Summit Dec 2009

What is App Engine?

- App Engine is a platform
- You build & test your app
- Then upload your app to Google
- App Engine runs everything
- No need to worry about machines, network, storage, scalability, etc.
Challenges building web apps

What keeps you up at night?

DIY Hosting means hidden costs

- Idle capacity
- Software patches & upgrades
- License fees
- Lots of maintenance
- Traffic & utilization forecasting
- Upgrades
Easy to start
Easy to scale
Easy to maintain

We do the dirty work…

Google App Engine

“We wear pagers so you don’t have to”
The Components
of Google App Engine

Components

- Language Runtimes
- Web-based Admin Console
- Scalable Infrastructure
- SDK
Components

Scalable Infrastructure

Linux
GFS
Bigtable

Hardware

Components

Python, Java
& Go Runtimes

Batteries Included

Alternative API/Runtimes also available (more later)
Flexible alternatives

Language runtimes

Duke, the Java mascot
Copyright © Sun Microsystems Inc., all rights reserved.

Getting the job done

What are programming languages?
Various dialects that let humans give instructions to computers

- Some are easier than others
- Some are special-purpose
- Adults: Java, C/C++, Python, Ruby, PHP
- Kids: Scratch, Alice, Python, BASIC
The king of ease-of-use

- Extremely rapid development
- Very low barrier of entry
- Simple yet robust syntax
- Rich library of packages/modules
- App Engine’s first language API

The king of enterprise development

- Ubiquitous in Enterprise computing
- Adheres to Java servlet standard
- Rich library of packages/modules
- Eclipse Plug-in support
- Alternative language support
The new kid on the block

- Best of both worlds
- The complexity & power of a statically-type language
- Mixed with the world dynamically-typed languages
- Flexible alternative to Python & Java

Java compliant Servlet Standard

Ensuring Portability

Java standards

<table>
<thead>
<tr>
<th>JSR-164</th>
<th>JSR-230, JSR-249</th>
<th>Java SE</th>
<th>JSR-919</th>
<th>JSR-107</th>
</tr>
</thead>
<tbody>
<tr>
<td>Java Servlet</td>
<td>JDO / JPA</td>
<td>java.net.URL</td>
<td>javax.mail</td>
<td>javax.cache</td>
</tr>
</tbody>
</table>

Low level App Engine APIs

- Web App Container
- Database API
- URL Fetch
- Mail API
- Memcache
Java Plug-n-Play

Google Plugin for Eclipse

Python & Java not enough?

Extended Language support through JVM

- Java
- Scala
- JRuby (Ruby)
- Groovy
- Quercus (PHP)
- Rhino (JavaScript)
- Jython (Python)
Components

Web-based Admin

Application Monitoring

App Engine Dashboard
App Engine Monitoring

App Engine Health History

- System Status
  - Current Availability
  - Uptime (last 7 days)
  - Read latency (today)
  - Write latency (today)

- Components
  - SDK
  - Run Locally
  - Easy Deploy
  - Manage Versions
  - APIs
Case Studies
Serving our Users

App Engine growth
100,000+
Active Developers
per Month

200,000+
Active apps per
week
How many ______ ? By the numbers

1,500,000,000+
Pageviews per day

Developers who know that App Engine…
...scales for enterprise-targeted cloud apps

...scales for web and mobile gaming
...scales for event-based websites

Official Royal Wedding Website hosted on App Engine

On Wedding day, served:
- Up to 2000 requests per second
- 15 million pageviews
- 5.6 million visitors

http://goo.gl/F1SGc

...scales for social web and mobile apps

Social networking at scale
…and grows with you and your app

Social networking at scale

>62M Users

- 3.6MM DAUs on FB
- 1.9MM DAUs on MS
- Add Orkut, Bebo, Hi5, Friendster, Hyves, Ning...

Gigya...
… scales

Not all apps are web-based!!

- Need backoffice processing? Want to build your own?
- Go cloud with App Engine!
- No UI needed for app to talk to App Engine
- Great place for user info e.g., high scores, contacts, badges, etc.
- Better user interface: move user data off the phone
Features and Futures
Services and APIs now... and coming soon

Rich set of App Engine services/APIs

- Memcache
- Datastore
- URL Fetch
- Mail
- XMPP
- Task Queue
- Images
- Blobstore
- User Service
### In Review: ~3 years of App Engine... an evolving platform

<table>
<thead>
<tr>
<th>Month</th>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apr 2008</td>
<td>Python launch</td>
</tr>
<tr>
<td>May 2008</td>
<td>Memcache API, Images API</td>
</tr>
<tr>
<td>Jul 2008</td>
<td>Logs export</td>
</tr>
<tr>
<td>Aug 2008</td>
<td>Batch write/delete</td>
</tr>
<tr>
<td>Oct 2008</td>
<td>HTTPS support</td>
</tr>
<tr>
<td>Dec 2008</td>
<td>Status dashboard, quota details</td>
</tr>
<tr>
<td>Feb 2009</td>
<td>Billing, Remote API, Larger HTTP request/response size limits (10MB)</td>
</tr>
<tr>
<td>Apr 2009</td>
<td>Java launch, Bulkloader (DB import), Cron jobs, SDC</td>
</tr>
<tr>
<td>May 2009</td>
<td>Key-only queries, Quota API</td>
</tr>
<tr>
<td>Jun 2009</td>
<td>Task queue API, Django 1.0 support</td>
</tr>
<tr>
<td>Sep 2009</td>
<td>XMPP API, Remote API shell, Django 1.1 support</td>
</tr>
<tr>
<td>Oct 2009</td>
<td>incoming email</td>
</tr>
<tr>
<td>Dec 2009</td>
<td>Blobstore API</td>
</tr>
<tr>
<td>Feb 2010</td>
<td>Datstore cursors, Async URLfetch, App stats</td>
</tr>
<tr>
<td>Mar 2010</td>
<td>Denial-of-Service filtering, eventual consistency support</td>
</tr>
<tr>
<td>May 2010</td>
<td>OpenID, OAuth, App Engine for Business, new bulkloader</td>
</tr>
<tr>
<td>Aug 2010</td>
<td>Namespaces, increased quotas, high perf image serving</td>
</tr>
<tr>
<td>Oct 2010</td>
<td>Instances console, datastore admin &amp; bulk entity deletes</td>
</tr>
<tr>
<td>Dec 2010</td>
<td>Channel API, 10-minute tasks &amp; cron jobs, AlwaysOn &amp; Warmup</td>
</tr>
<tr>
<td>Jan 2011</td>
<td>High Replication datastore, entity copy b/w apps, 10-minute URLfetch</td>
</tr>
<tr>
<td>May 2011</td>
<td>Backends, Pull Queues, Leaving Preview soon, Go launch</td>
</tr>
<tr>
<td>Jun 2011</td>
<td>Geolocation headers, Channel presence, WebP images, ProtoPRC, SDK HRD</td>
</tr>
</tbody>
</table>

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### App Engine Roadmap
- App Engine out-of-preview/official support
- SSL access on non.appspot.com domains
- Improved datastore import/export backup/restore
- MapReduce
- Full-text Search over Datastore
- Python 2.7
- Improved monitoring and alerting
- Raise request/response size limits for some APIs
- See code.google.com/appengine/docs/roadmap.html
Google Apps Integration
App Engine apps in your Apps domain

Google Apps + your apps

Our Google Apps

Your custom applications

Google's scalable serving architecture
Google Apps integration

http://appid.appspot.com/

Google Apps

http://yourapp.yourdomain.com/

Add your app to your Apps domain
Your app now part of your Apps suite

Getting Started

http://code.google.com/appengine (download, docs, etc.)
http://code.google.com/p/googleappengine (issues, wiki, etc.)
http://code.google.com/eclipse (Eclipse plug-in)
http://appengine.google.com (login, app management)
http://googleappengine.blogspot.com (blog)
App Engine online resources

http://code.google.com/appengine – downloads, docs, forums, FAQ, etc.

http://appengine.google.com – managing your applications here

http://googleappengine.blogspot.com – our blog

Also check http://stackoverflow.com

Hello World

Linux, MacOS, etc. command-line:

$ dev_appserver.py helloworld # run dev svr
$ appcfg.py update helloworld # deploy live

Windows GUI (also avail for Mac):

![Windows GUI](image.png)
Project Contents

- **app.yaml** – main configuration file
- **index.yaml** – automatically generated to index your data
- **main.py** – your main application "controller" code goes here
Hello World

```
from google.appengine.ext import webapp
from google.appengine.ext.webapp import util

class MainHandler(webapp.RequestHandler):
    def get(self):
        self.response.out.write('Hello world!')

application = webapp.WSGIApplication([
    ('/', MainHandler),
], debug=True)

util.run_wsgi_app(application)
```

Testing Your Install

```
$ cd google_appengine
~/Desktop/google_appengine/helloworld
$ dev_appserver.py helloworld
INFO 2009-03-04 17:51:22,354 __init__.py]
.
.
.
```

(optionally use the launcher for Macs & PCs)
Hello World

Registering

By default, your apps hosted at:
http://APP-ID.appspot.com
Create an App Id

Modify `app.yaml`

```yaml
application: hello world
version: 1
runtime: python
api_version: 1

handlers:
  - url: .*
    script: main.py
```
Upload the default application

$ cd google_appengine
~/Desktop/google_appengine/helloworld
$ appcfg.py update helloworld
Scanning files on local disk.
Initiating update.
Email: ...

Check it out
Recent+Upcoming Events

- Oct 18-20: Python course, San Francisco
  - http://cyberwebconsulting.com

- Jul 25-29 O'Reilly Open Source (OSCON), Portland
  - http://oscon.com

- Jul 11-13 ACM CSTA CS&IT Conference, NYC
  - http://www.csitsymposium.org

- Jun 20-25 EuroPython, Florence
  - http://europython.eu

- May 8-10: Google I/O, San Francisco
  - http://google.com/io
Google cloud technologies
App Engine, Storage, Prediction, BigQuery

Google Storage
Store your data in a fast & reliable cloud!
Google Storage

- Cloud-based binary object store
  - Structured as buckets and objects
  - Many buckets, many objects, large objects

- You control your data
  - Private, shared, or public
  - Get your data back out at any time

- For developers
  - RESTful API
  - Many SDKs + tools
  - Integration with other Google services

Google Storage Benefits

High Performance and Scalability backed by Google infrastructure

Flexible Authentication & Sharing Models

Get Started Fast with Google & 3rd Party Utilities
Google services using Google Storage

Google BigQuery

Google Prediction API

Some current users

vmware
syncplicity

APPIRIO
SnapABug

vivU
Cloud Sherpas

the guardian
socialwok

Google services using Google Storage

Panoramio
picnik
double click

Data Liberation
Haiti Relief Imagery

Partner Reporting
Partner Reporting
Google Prediction API
Use machine learning in the cloud!!

Prediction API 101
Google's sophisticated machine learning algorithms
Available as an on-demand RESTful HTTP web service
Train a model offline/asynchronously
Predict results in real-time

"Tous pour un, un pour tous, c'est notre devise."
How does it work?

The Prediction API finds relevant **features** in the sample data during training.

The Prediction API later searches for those **features** during prediction.

<table>
<thead>
<tr>
<th>&quot;english&quot;</th>
<th>The quick brown fox jumped over the lazy dog.</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;english&quot;</td>
<td>To err is human, but to really foul things up you need a computer.</td>
</tr>
<tr>
<td>&quot;spanish&quot;</td>
<td>No hay mal que por bien no venga.</td>
</tr>
<tr>
<td>&quot;spanish&quot;</td>
<td>La tercera es la vencida.</td>
</tr>
</tbody>
</table>

| ? | To be or not to be, that is the question. |
| ? | La fe mueve montañas. |

A virtually endless number of applications...

<table>
<thead>
<tr>
<th>Customer Sentiment</th>
<th>Transaction Risk</th>
<th>Species Identification</th>
<th>Message Routing</th>
<th>Diagnostics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Churn Prediction</td>
<td>Legal Docket Classification</td>
<td>Suspicious Activity</td>
<td>Work Roster Assignment</td>
<td>Inappropriate Content</td>
</tr>
<tr>
<td>Recommend Products</td>
<td>Political Bias</td>
<td>Uplift Marketing</td>
<td>Email Filtering</td>
<td>Career Counselling</td>
</tr>
</tbody>
</table>

... and many more ...
Three simple steps to use the Prediction API

1. Upload
   - Upload your training data to Google Storage
   - Use the API, gsutil or any compatible utility to upload your data to Google Storage

2. Train
   - Build a model from your data
   - prediction/v1/train/
     - POST : a training request

3. Predict
   - Make new predictions
   - prediction/v1/query/
     - GET : model info
     - POST : a prediction request

Prediction API Capabilities

Data
   - Input Features: numeric or unstructured text
   - Output: up to 100s of discrete categories

Training
   - Many machine learning techniques
     - Automatically selected
     - Performed asynchronously

Access from many platforms:
   - Web app from Google App Engine
   - Apps Script (e.g. from Google Spreadsheet)
     - Desktop app