Google

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
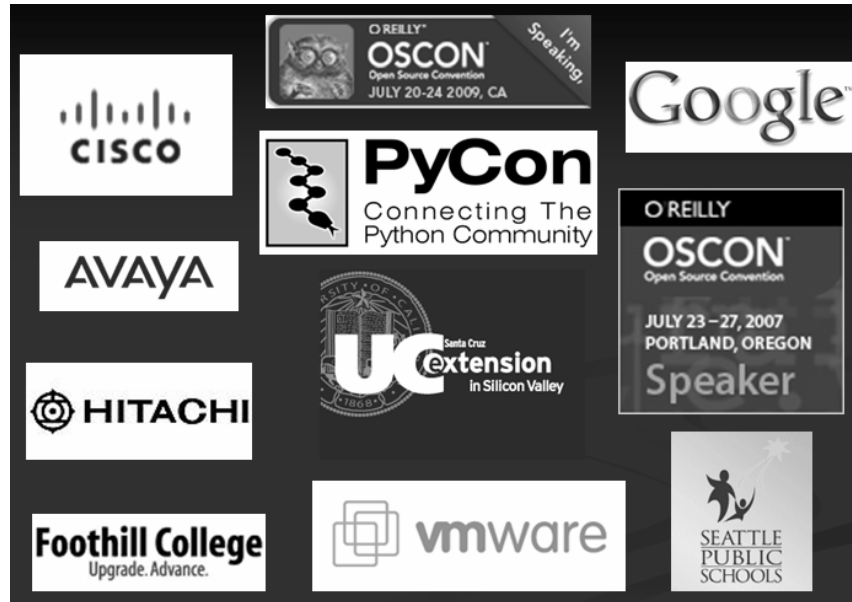
I Write
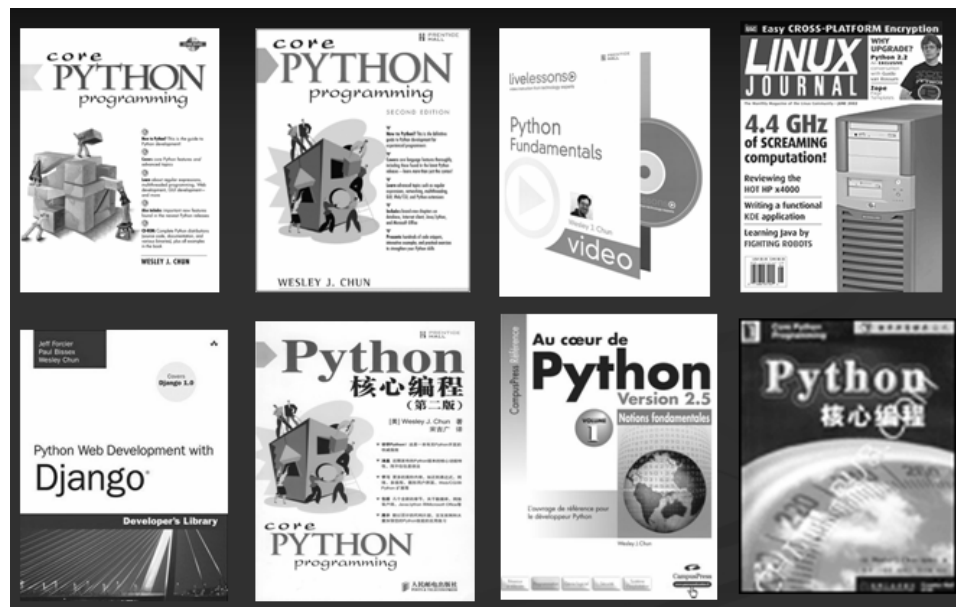
I Code

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

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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
http://www.analysysmason.com/about-us/news/newsletter/Previous-news-articles/Now-the-network-really-is-the-computer

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
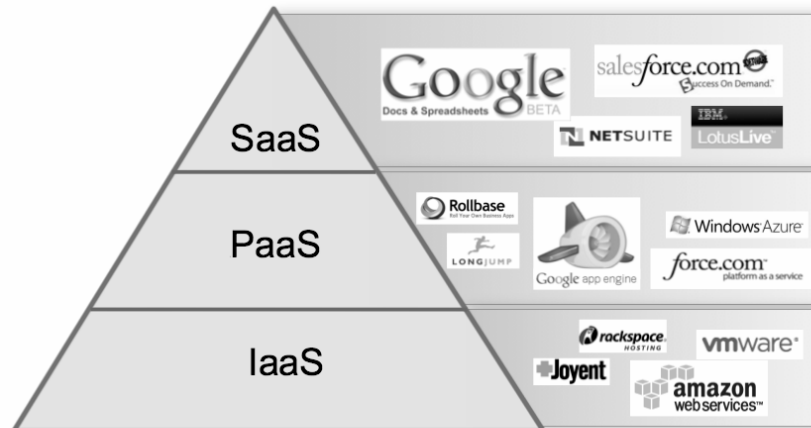
Bottom line: More focus on business!

The shift towards Cloud Computing

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

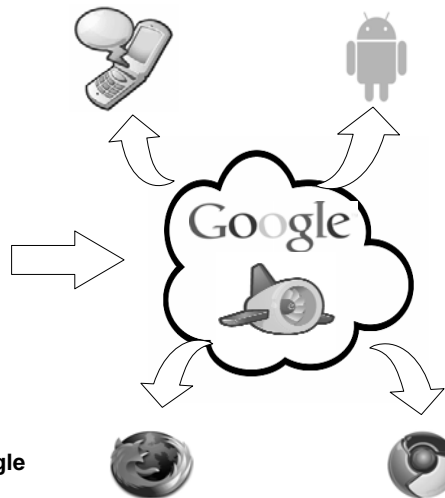Yefim Natis - Gartner Cloud Computing Analyst, AADI Dec 2009

The Cloud Pyramid

Cloud Computing Defined

SaaS

PaaS

IaaS

Source: Gartner AADI Summit Dec 2009

What is App Engine?

main.py   index.yaml   app.yaml

- **App Engine is a platform**

- **You build & test your app**

- **Then upload your app to Google**

- **App Engine runs everything**

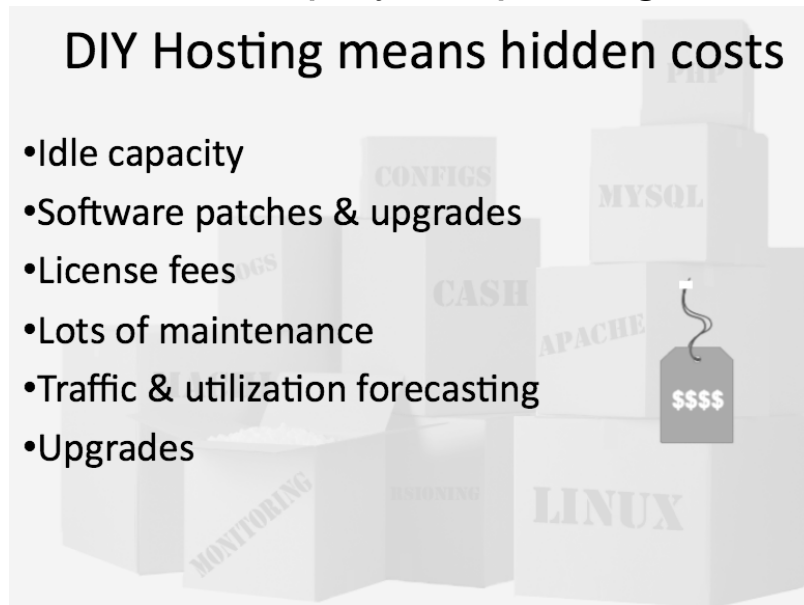- **No need to worry about machines, network, storage, scalability, etc.**

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
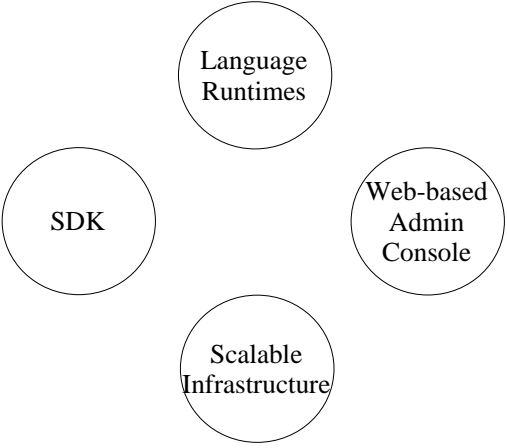
Easy to scale

Easy to maintain

We do the dirty work…
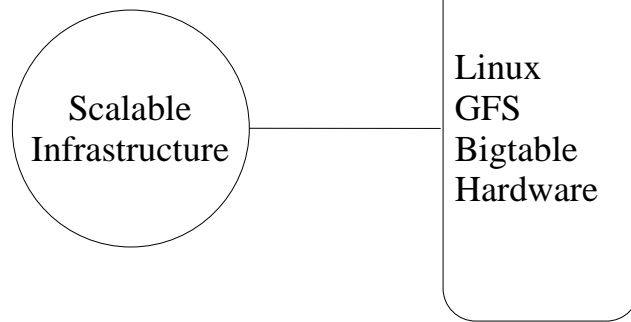
Google App Engine

"We wear pagers so you don't have to"
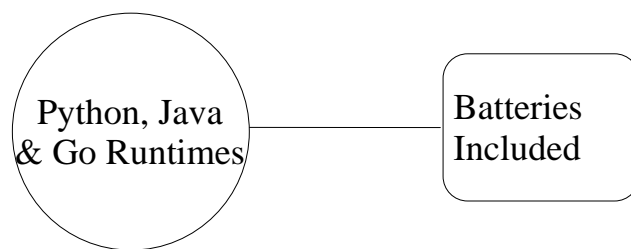
The Components
of Google App Engine

Components

```
        ╭──────────╮
        │ Language │
        │ Runtimes │
        ╰──────────╯

  ╭──────╮      ╭──────────╮
  │      │      │Web-based │
  │ SDK  │      │  Admin   │
  │      │      │ Console  │
  ╰──────╯      ╰──────────╯

        ╭──────────╮
        │ Scalable │
        │Infrastructure│
        ╰──────────╯
```

9

Scalable Infrastructure

Linux
GFS
Bigtable
Hardware

Python, Java & Go Runtimes

Batteries Included
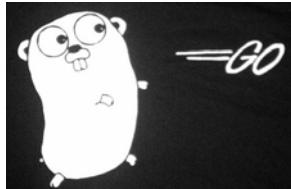
Alternative API/Runtimes also available (more later)

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
_____

python

- **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
_____

Java™

- **Ubiquitous in Enterprise computing**
- **Adheres to Java servlet standard**
- **Rich library of packages/modules**
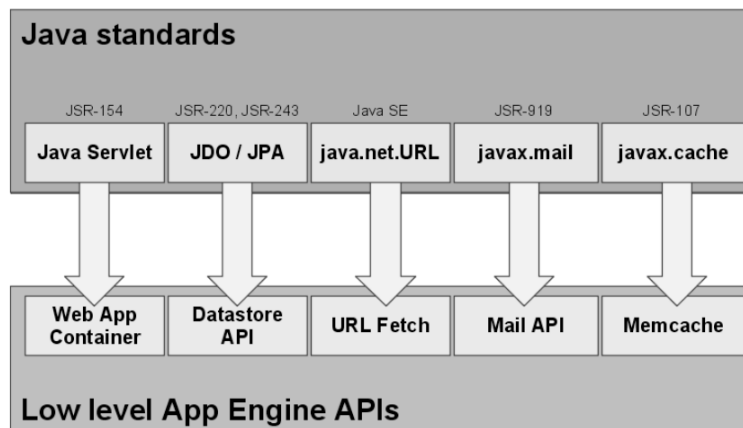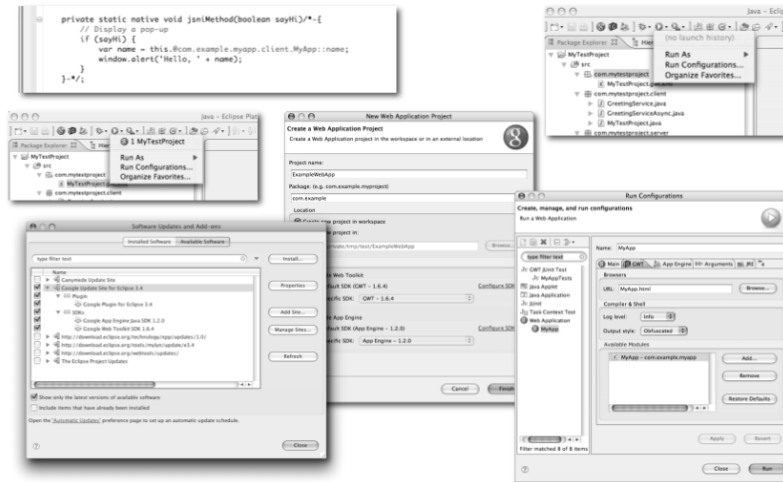- **Eclipse Plug-in support**
- **Alternative language support**
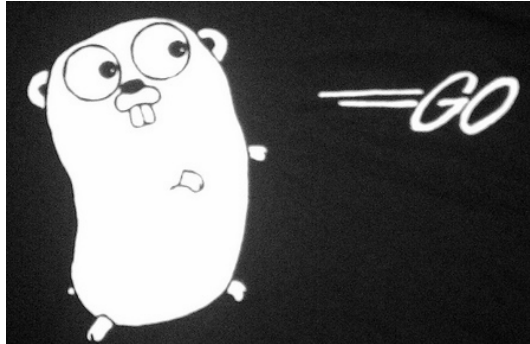
•**Best of both worlds**
•**The complexity & power of a statically-type language**
•**Mixed with the world dynamically-typed langages**
•**Flexible alternative to Python & Java**

Java compliant Servlet Standard

Google Plugin for Eclipse

Extended Language support through JVM

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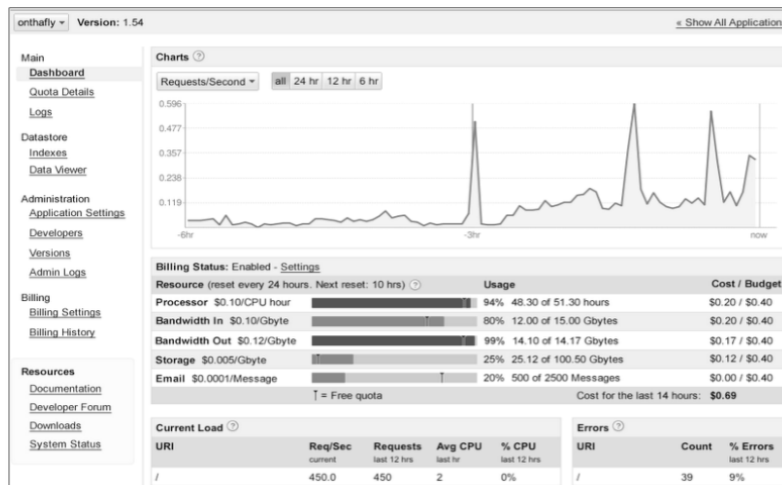- Rhino (JavaScript)
- Jython (Python)

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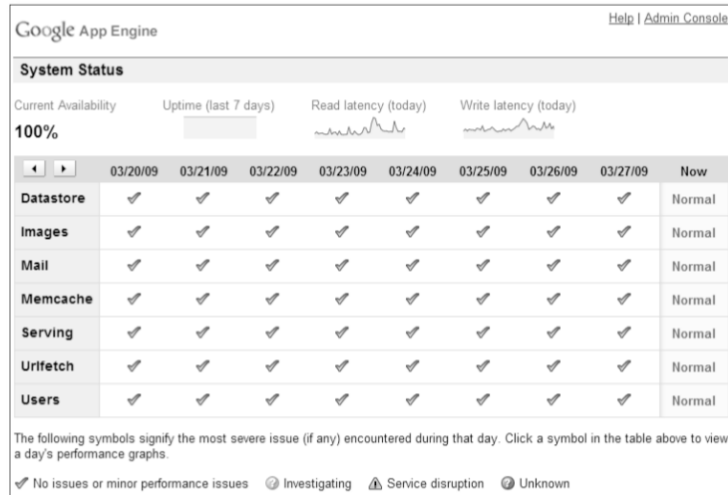Copyright © Sun Microsystems Inc., all rights reserved.
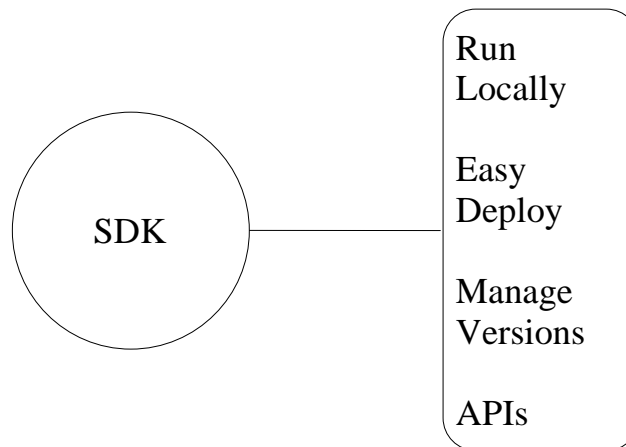
Components
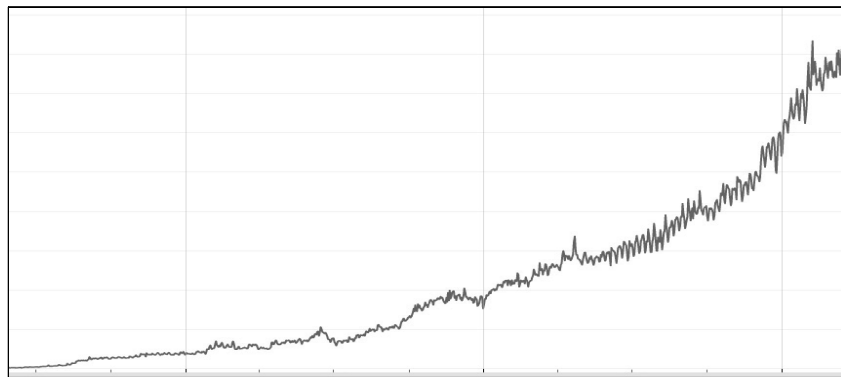

Application Monitoring

App Engine Health History

Google App Engine   Help | Admin Console

System Status

Current Availability	Uptime (last 7 days)	Read latency (today)	Write latency (today)
100%			

	03/20/09	03/21/09	03/22/09	03/23/09	03/24/09	03/25/09	03/26/09	03/27/09	Now
Datastore	✓	✓	✓	✓	✓	✓	✓	✓	Normal
Images	✓	✓	✓	✓	✓	✓	✓	✓	Normal
Mail	✓	✓	✓	✓	✓	✓	✓	✓	Normal
Memcache	✓	✓	✓	✓	✓	✓	✓	✓	Normal
Serving	✓	✓	✓	✓	✓	✓	✓	✓	Normal
Urlfetch	✓	✓	✓	✓	✓	✓	✓	✓	Normal
Users	✓	✓	✓	✓	✓	✓	✓	✓	Normal

The following symbols signify the most severe issue (if any) encountered during that day. Click a symbol in the table above to view a day's performance graphs.

✓ No issues or minor performance issues   ⊘ Investigating   ⚠ Service disruption   ⊘ Unknown

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Components

Run Locally

Easy Deploy

SDK

Manage Versions

APIs

Case Studies
Serving our Users

App Engine growth

2008	2009	2010	2011
App Engine Launch	Batch write/read	**Java**	**Task Queues**	**Blobstore**	**Multitenancy**	**Hi-Replication**

App Engine Launch
Python
Datastore
Memcache
logs export

Batch write/read
Https
Status-
Dashboard

Java
DB Import
cron

Task Queues
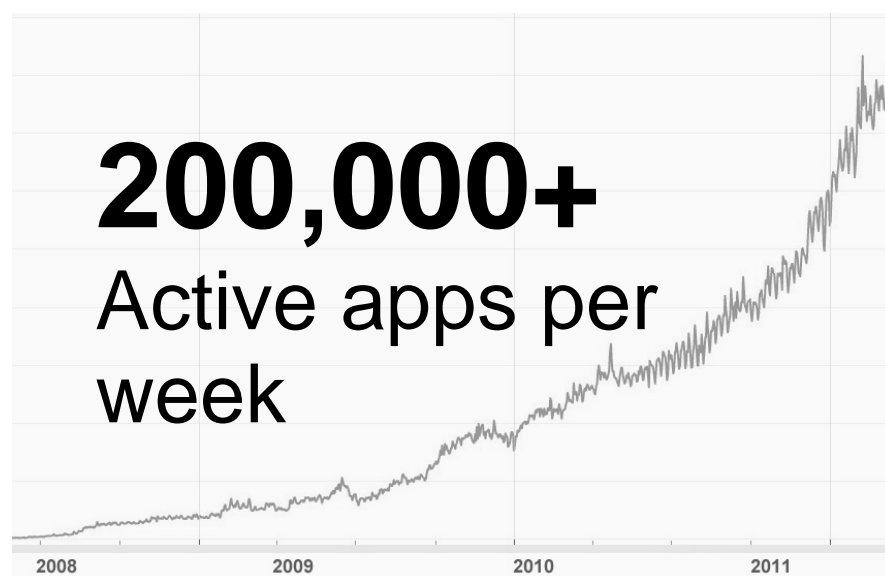**XMPP**
incoming email

Blobstore
Appstats
cursors
Mapper

Multitenancy
Instance Console
Always On
hi-perf imag
10 min tasks

Hi-Replication
Datastore
Channel API
Files API
Remote API
Prosp Search

How many _____ ? By the numbers

100,000+
Active Developers per Month

How many _____ ? By the numbers

200,000+
Active apps per week

1,500,000,000+
Pageviews per day

2008 2009 2010 2011
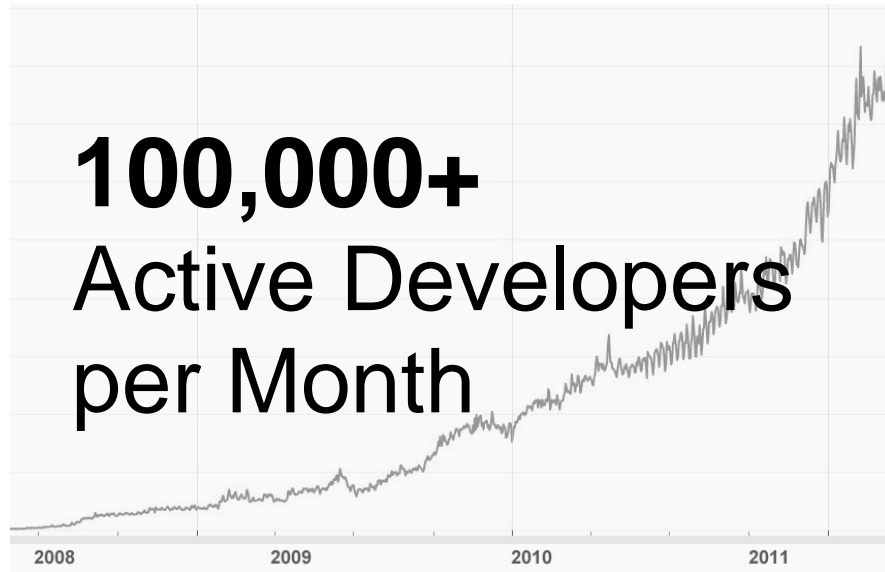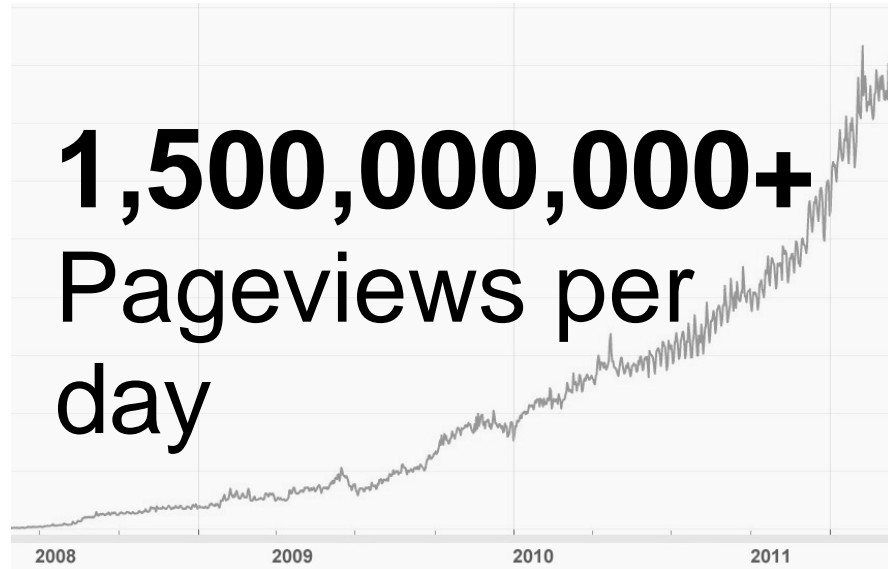
Developers who know that App Engine…

…scales for enterprise-targeted cloud apps

…scales for web and mobile gaming

...scales for event-based websites
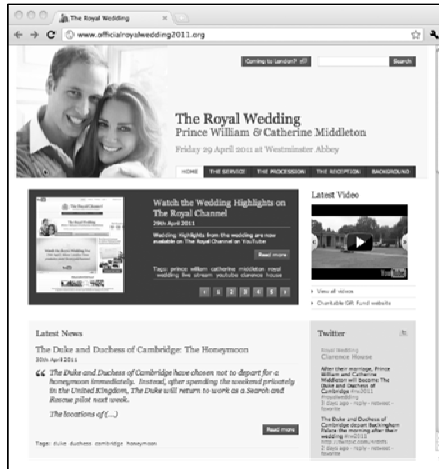
Official Royal Wedding Website hosted on App Engine

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 BuddyPoke
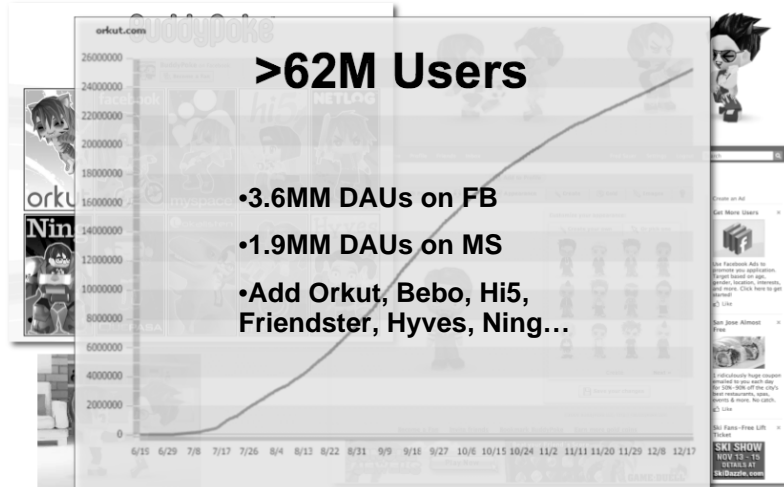
Social networking at scale

BuddyPoke

>62M Users

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

Gigya…

gigya **Socialize**

... scales

gigya Socialize

Flexible Scalability
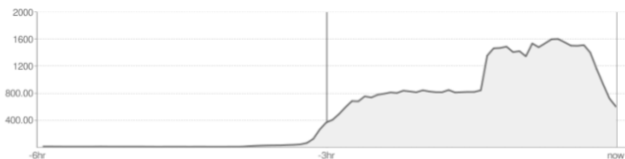
"Although we typically host all our services in-house,
on our own infrastructure, we felt that GAE would be a better fit
for the live chat feature because of its unique traffic pattern, which
is characterized by very low traffic most of the time with very high
bursts during high profile events."

Raviv Pavel, Gigya VP of Research and Development

http://googleappengine.blogspot.com/2010/02/scalability-means-flexibility.html#links

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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
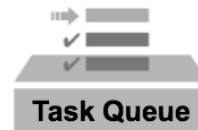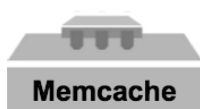
In Review: ~3 years of App Engine... an evolving platform

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

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
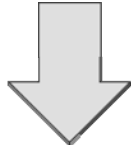
Add your app to your Apps domain

Your app now part of your Apps suite

Getting Started

http://bit.ly/gcodelabs (codelabs)
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)

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

Linux, MacOS, etc. command-line:

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

Windows GUI (also avail for Mac):
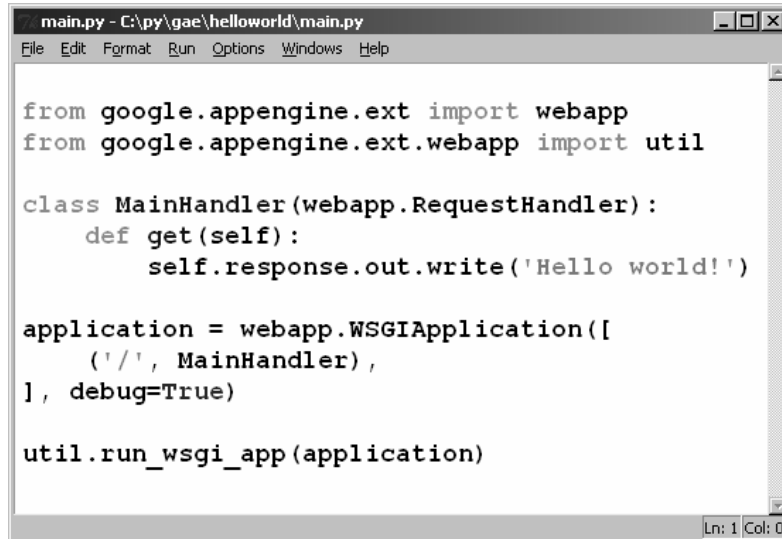
Project Contents
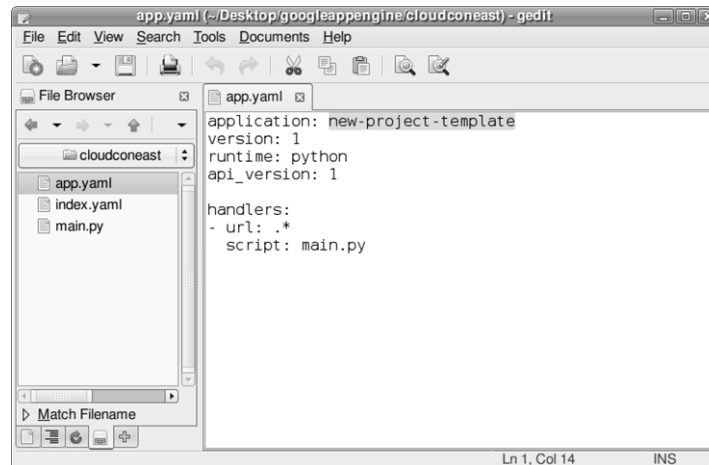
app.yaml – main configuration file

index.yaml – automatically
generated to index your data

main.py – your main application
"controller" code goes here

Hello World

Hello World

```
main.py - C:\py\gae\helloworld\main.py                    _ □ ×
File  Edit  Format  Run  Options  Windows  Help

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)

                                                    Ln: 1  Col: 0
```

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)

Registering

By default, your apps hosted at:
http://*APP-ID*.appspot.com

Create an App Id

Modify 'app.yaml'

```
application: helloworld
version: 1
runtime: python
api_version: 1

handlers:
- url: .*
  script: main.py
```
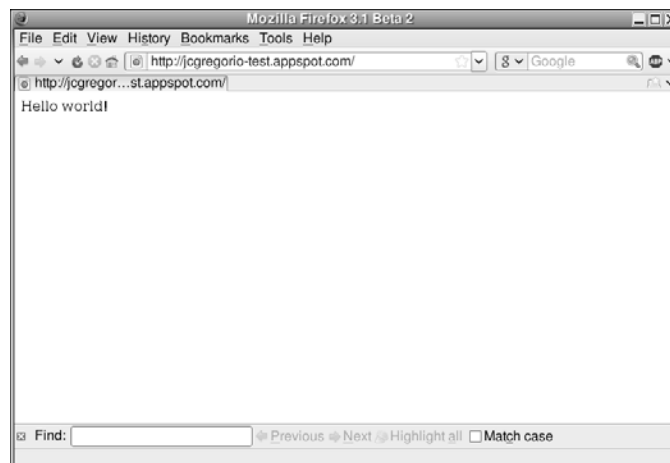
Google

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

Thank You
Questions?

wesc+api@google.com
@wescpy / @app_engine

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™

Google cloud technologies
App Engine, Storage, Prediction, BigQuery
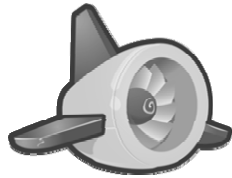
2

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

Panoramio from Google

picnik

double click
Partner Reporting

DL Data Liberation

google.org
Haiti Relief Imagery

You Tube
Partner Reporting

Google BigQuery

Google Prediction API

Some current users

vmware

syncplicity

TECH

APPIRIO

SnapABug

UNITED STATES NAVY

MEDIABEACON

VIVU

Cloud Sherpas

memeo

widgetbox

theguardian

socialwok

OXYLABS

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." → Prediction API → **"french"**

How does it work?

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

"english"	**The** quick brown fox jumped over **the** lazy dog.
"english"	**To** err **is** human, but **to** really foul things up you need a computer.
"spanish"	**No** hay mal **que por** bien **no** venga.
"spanish"	**La** tercera **es la** vencida.

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

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

A virtually endless number of applications...

Customer Sentiment	Transaction Risk	Species Identification	Message Routing	Diagnostics
Churn Prediction	Legal Docket Classification	Suspicious Activity	Work Roster Assignment	Inappropriate Content
Recommend Products	Political Bias	Uplift Marketing	Email Filtering	Career Counselling

... 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