

Google™





Google App Engine: Now Serving Java

Don Schwarz
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5/26/09



Overview

- Google App Engine
- Java on App Engine
- Demo
- Questions

What is Google App Engine?

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- A cloud-computing platform

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- Run your web apps on Google's infrastructure

What is Google App Engine?

- A cloud-computing platform
- Run your web apps on Google's infrastructure
- We provide the container and services (PaaS)
 - Hardware, connectivity
 - Operating system
 - JVM
 - Servlet container
 - Software services

Key Features

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- Use Google's scalable services via standard APIs
- Charge only for actual usage
 - Always free to get started
- Built-in application management console

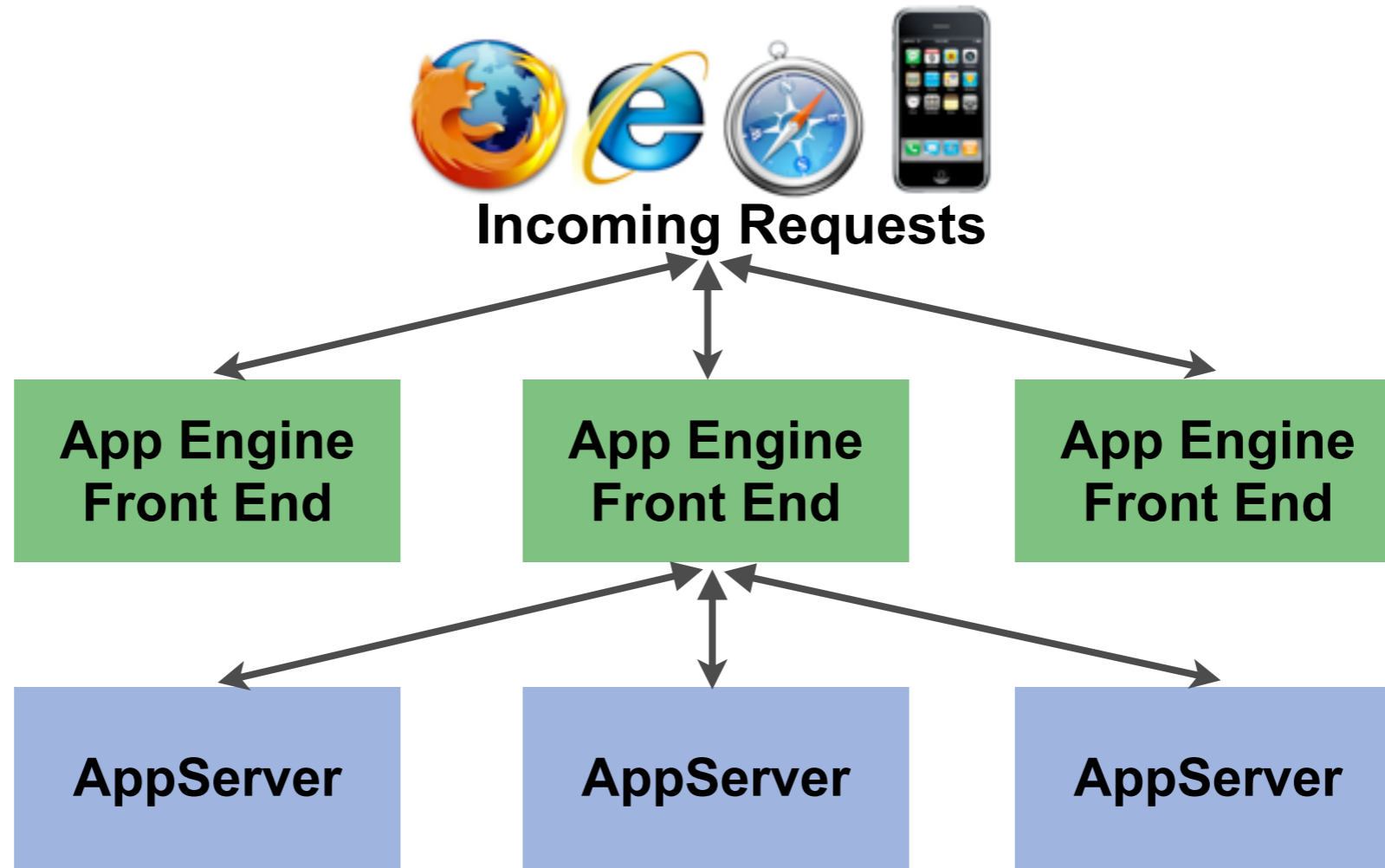
App Engine Architecture



App Engine Architecture



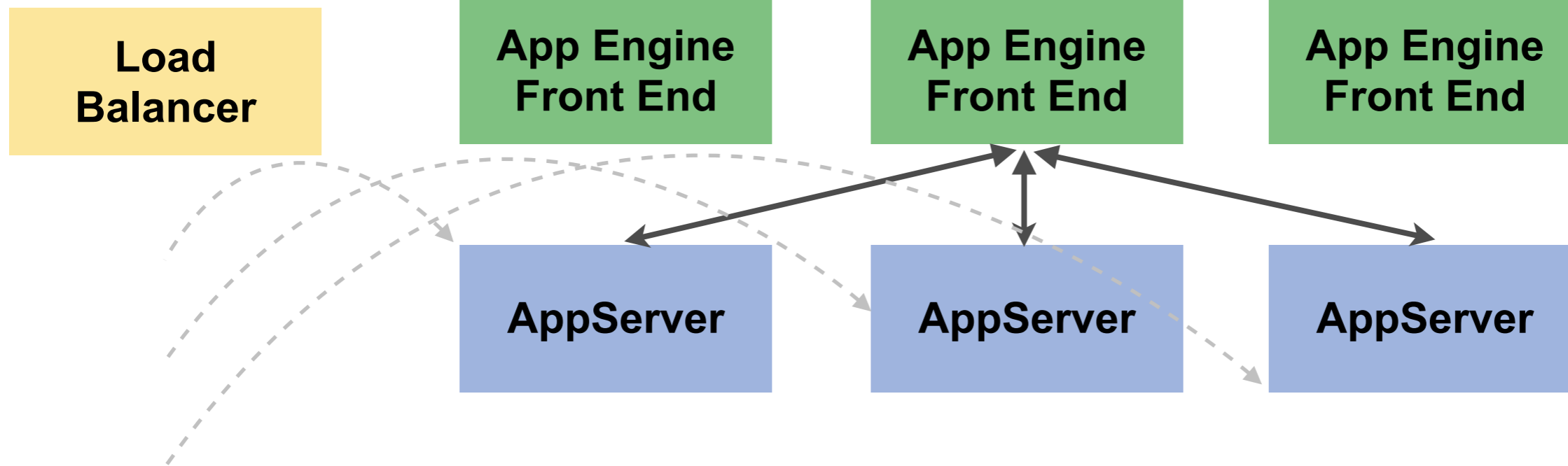
App Engine Architecture



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Incoming Requests



App Engine Architecture



Incoming Requests

Load Balancer

App Engine Front End

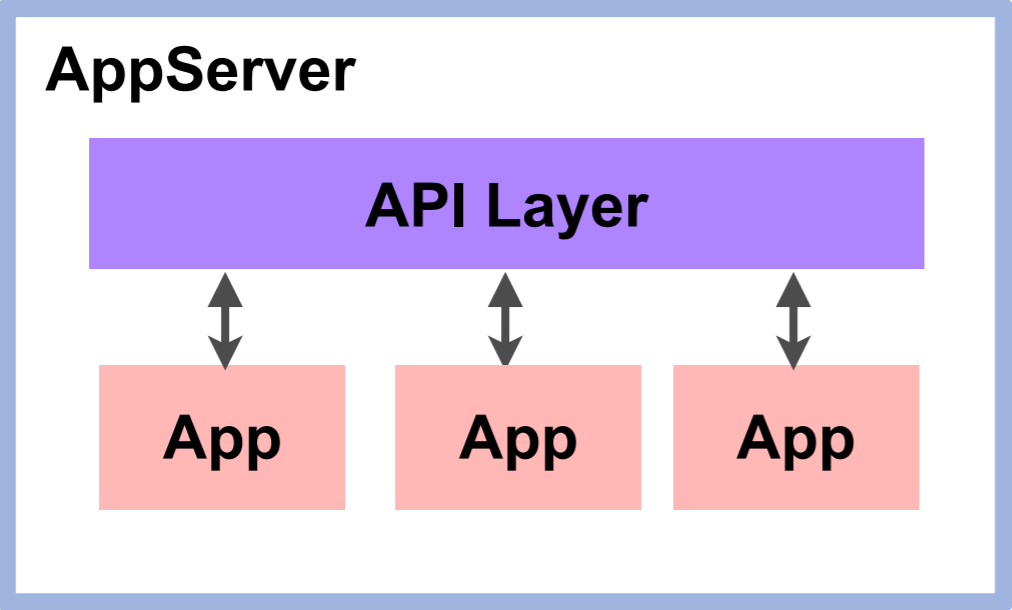
App Engine Front End

App Engine Front End

AppServer

AppServer

AppServer



When To Use Google App Engine

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 - Serve HTTP requests, limited to 30 seconds
 - No long-running background processes
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- Targeting web applications
 - Serve HTTP requests, limited to 30 seconds
 - No long-running background processes
 - No server push
- Sandboxed environment
 - SecurityManager installed
 - No threads
 - Read-only file system

Java Support

- Servlets
- Software services
- Sandboxing
- DevAppServer
- Deployment
- Tooling



Servlet API



Servlet API

- Full Servlet 2.5 Container
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- Full Servlet 2.5 Container
 - HTTP Session support
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- Uses Jetty and Jasper
 - Powered by Google's HTTP stack
 - No Jetty-specific features
 - jetty-web.xml
 - continuations
 - Subject to change

Servlet API - Application Configuration

```
<appengine-web-app>  
  <application>application-id</application>  
  <version>1</version>  
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  <version>1</version>  
  <static-files>  
    <include path="/**/*.png" />  
    <exclude path="/data/**/*.png" />  
  </static-files>  
  <resource-files>  
    <include path="/**/*.xml" />  
    <exclude path="/feeds/**/*.xml" />  
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```



Software Services

Service	Java Standard	Google Infrastructure
Authentication	Servlet API	Google Accounts
Datastore	JPA, JDO	Bigtable
Caching	javax.cache	memcached
E-mail	javax.mail	Gmail gateway
URLFetch	URLConnection	Caching HTTP proxy

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Implementation

Google servers, SDK local stubs

Service Infrastructure - Evolution

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- Several levels of indirection
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 - Provides consistency
- App Engine API jar (`appengine-api.jar`)
 - Contains
 - Proprietary API
 - Mapping to language-neutral API
 - JCache, JavaMail adapters (for now)
 - Major releases
 - Breaking API changes
 - Need to recompile, redeploy with latest jar
 - Patch releases
 - Bug fixes, new functionality
 - Upgrades happen automatically

Service Infrastructure - ApiProxy

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- API calls are made via ApiProxy
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 - Forwards API calls on to a registered Delegate
 - Stores per-request information
 - `ThreadLocal<Environment>`

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- To make API calls outside of App Engine tools
 - Call `ApiProxy.setDelegate(Delegate)`
 - Call `ApiProxy.setEnvironmentForCurrentThread(Environment)`
- Can use `ApiProxyLocalFactory` to simplify unit testing
 - Uses JAR Service Provider to locate API implementations
 - Can replace API implementations just by changing classpath

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- Similar to AOP
 - Add additional logic before, after, or around service call
 - Delegate to previous ApiProxy in chain
- Useful for profiling and debugging
 - Prod services perform differently than local services

ApiProxy Interception - Profiling

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```
class ProfilingDelegate extends Delegate {
    Delegate parent;
    public ProfilingDelegate(Delegate parent) {
        this.parent = parent;
    }
    public byte[] makeSyncCall(Environment env, String pkg,
        String method, byte[] request) {
        long start = System.nanoTime();
        byte[] result = parent.makeSyncCall(env, pkg, method, request);
        log.log(INFO, pkg + "." + method + ": " + System.nanoTime() - start);
        return result;
    }
}

ApiProxy.setDelegate(new ProfilingDelegate(ApiProxy.getDelegate()));
```

Sandboxing



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 - WhiteList classes

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- What do we do?
 - Restrict JVM permissions
 - WhiteList classes
- Why is it necessary?
 - Clustering - JVMs come and go
 - Protect applications from one another
 - Quality of service

Sandboxing Restrictions

Restriction	Alternative
Threads	Async API (coming soon)
Direct network connections	URLConnection
Direct file system writes	Memory, memcache, datastore
Java2D	Images API Software rendering
Native code	Pure Java Libraries

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App Engine delivers a happy medium.

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f.set("Hello World", 2);
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```
Field f = String.class.getDeclaredField("count");  
f.setAccessible(true);  
f.set("Hello World", 2);
```

Good!

```
Field f = MyClass.class.getDeclaredField("foo");  
f.setAccessible(true);  
f.set(myObj, aFoo);
```

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```
ClassLoader myClassLoader = new URLClassLoader() {  
    public PermissionsCollection getPermissions(CodeSource cs) {  
        // return AllPermission;  
    }  
};
```

Flexible Sandboxing - Class Loading

- Create user-controlled ClassLoaders
 - createClassLoader

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ClassLoader myClassLoader = new URLClassLoader() {  
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    }  
};
```

Good!

```
ClassLoader myClassLoader = new URLClassLoader() {  
    public Class findClass(String className) {  
        // define and load some newly generated bytecode  
    }  
};
```

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- Web frameworks
 - Google Web Toolkit, Tapestry, BlazeDS (Flex), etc.
 - Grails (Just Announced!)

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- Dependency Injection Frameworks
 - Guice, Spring, etc.
- Aspect Oriented Programming
 - AspectJ, Spring AOP, etc.
- Web frameworks
 - Google Web Toolkit, Tapestry, BlazeDS (Flex), etc.
 - Grails (Just Announced!)
- Alternate JVM languages
 - Scala, Rhino, JRuby, Jython, Clojure, Groovy, PHP, etc.

DevAppServer

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 - HttpClient-backed URLFetch

DevAppServer

- Emulates the production environment
- Customized Jetty server
- Local implementation of services
 - LRU memcache
 - Disk-backed datastore
 - HttpClient-backed URLFetch
- Some sandbox restrictions difficult to emulate
 - WhiteList not enforced

Deployment

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 - Resource files
 - Other metadata (datastore indexes, cron jobs)

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- Command line and IDE tools
- Deploying uploads
 - Static files
 - Resource files
 - Other metadata (datastore indexes, cron jobs)
- Admin Console
 - dashboards
 - manage multiple versions
 - view logs

Quotas and Billing

Resource	Provided Free	Additional Cost
CPU	6.5 hours/day	\$0.10/hour
Bandwidth In	1GByte/day	\$0.10/GByte
Bandwidth Out	1GByte/day	\$0.12/GByte
Stored Data	1 GB	\$0.005/GB-day
Emails sent	2000/day to users 50000/day to admins	\$0.0001/email

Tooling

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- Google Eclipse Plugin
- IntelliJ Plugin (New!)





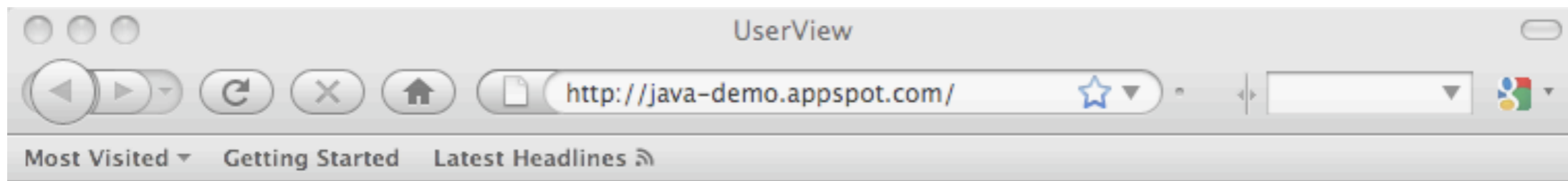
Demo



Demo - Login

The screenshot shows a web browser window titled "UserView" with the address bar containing "http://java-demo.appspot.com/". The page content includes the Google App Engine logo and the heading "Translate This!". Below the heading is a form with a "Name:" label, a text input field containing "Don Schwarz", and a "Sign In" button. A light blue box contains the text "Enter your name before the game can begin." and a "Play Game" button. At the bottom of the browser window, a status bar shows "Done" and a small icon.

Demo - Question



Google App Engine Translate This!

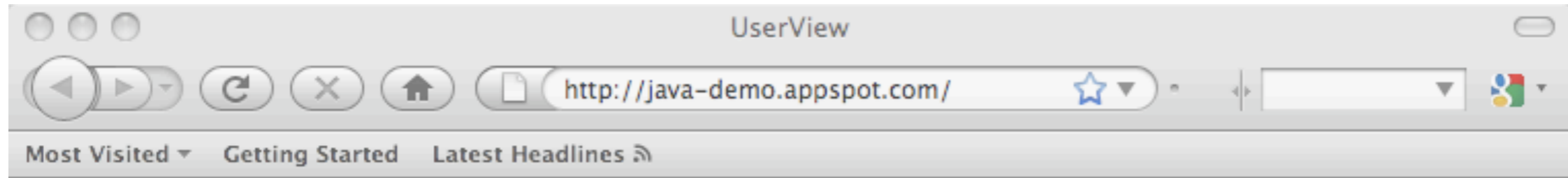
Question: more than one way

- 2つ以上の方法
- uma maneira de o fazer
- 这样我的头
- τρόπο περισσότερο από ένα

Submit Answer

Done

Demo - Question Result



Google App Engine Translate This!

Question: more than one way

2つ以上の方法

✘ uma maneira de o fazer

这样我的头

τρόπο περισσότερο από ένα

Next Question

Done

Demo - Scoreboard

Scoreboard

http://java-demo.appspot.com/admin/

Apple Yahoo! Google Maps YouTube Wikipedia News (798) Popular

Scoreboard

Time Remaining: 0:50

Leaders	Points
Toby Reyelts	232
Don Schwarz	88


[New Game](#) [Finish Game](#)

Found game created at Wed May 27 10:34:00 GMT-700 2009





Demo - Code





<http://java-demo.appspot.com>

Coming Soon

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- Task queues

Coming Soon

- Task queues
- Full text search

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- Task queues
- Full text search
- Incoming e-mail

Coming Soon

- Task queues
- Full text search
- Incoming e-mail
- XMPP

Coming Soon

- Task queues
- Full text search
- Incoming e-mail
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- Large file storage and retrieval

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- Task queues
- Full text search
- Incoming e-mail
- XMPP
- Large file storage and retrieval
- Datastore export tools

Resources

- Don Schwarz, schwardo@google.com
- Toby Reyelts, tobyr@google.com
- Google App Engine
 - <http://code.google.com/appengine>
- Google Group
 - <http://goto.ext.google.com/google-appengine-java>
 - <http://goto.ext.google.com/will-it-play>

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