Developing Java Based Web Applications in Google App Engine

Tahir Akram

19th December 2009

3rd International Conference on Open Source Systems and Technologies
at University of Engineering and Technology, Lahore

Today's Goal!!!

To understand the Java application hosting solution on **cloud** by Google. And to discover its features and to see how it could be useful to develop apps.

What we will learn?

- Understanding of Google App Engine and cloud computing
- What benefits we can grab and what are the limitations
- From where to get GAE SDK and Eclipse plugin
- Creating our first project and running it on production
- The App Engine sandbox
- Incorporating Google accounts for authentication
- Saving, updating and deleting record in App Engine datastore using JPA
- Sending emails from your application
- Billing and free quotas

Intended Audience

- FYP Students
- Developers
- Software Configuration Management Engineers
- Web Hosting Geeks

Lets know our audience?

Areas to Discuss

- Hosting Java web apps traditionally
- Introduction to Google App Engine
- Overview of Runtime Environment
- Scalable Services
- Advantages and Limitations
- Billing and Free Quotas
- Demo

Hosting Java web apps traditionally

Hosting Java web apps traditionally

- Not so popular except enterprise
- High rates as compared to PHP hosting
- Shared Tomcat instance among users
- Restrictions on any time deployments due to shared server
- Dedicated hosts works fine but they are costly

You end up with all this

No Worries!!!
Let Google App Engine come into an action

What is Google App Engine

- It is a platform for hosting web applications in Google-managed data centers. It is **cloud** computing technology which virtualizes applications across multiple servers and data centers.

-Wikipedia

What is cloud computing?

Cloud Computing

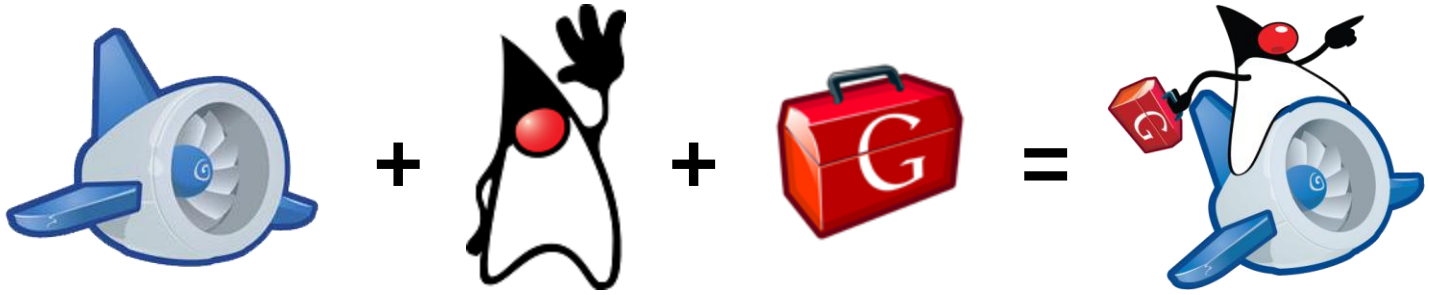
- In which dynamically scalable resources are provided as a service over the Internet
- Users need not have knowledge of expertise in or control over the technology infrastructure in the cloud

-Wikipedia

Introduction to Google App Engine contd…

Introduction to Google App Engine

- Was released on April 08 with Python support. Java included on August 09



Google App Engine + Java Language + Google Web Toolkit = Google App Engine for Java

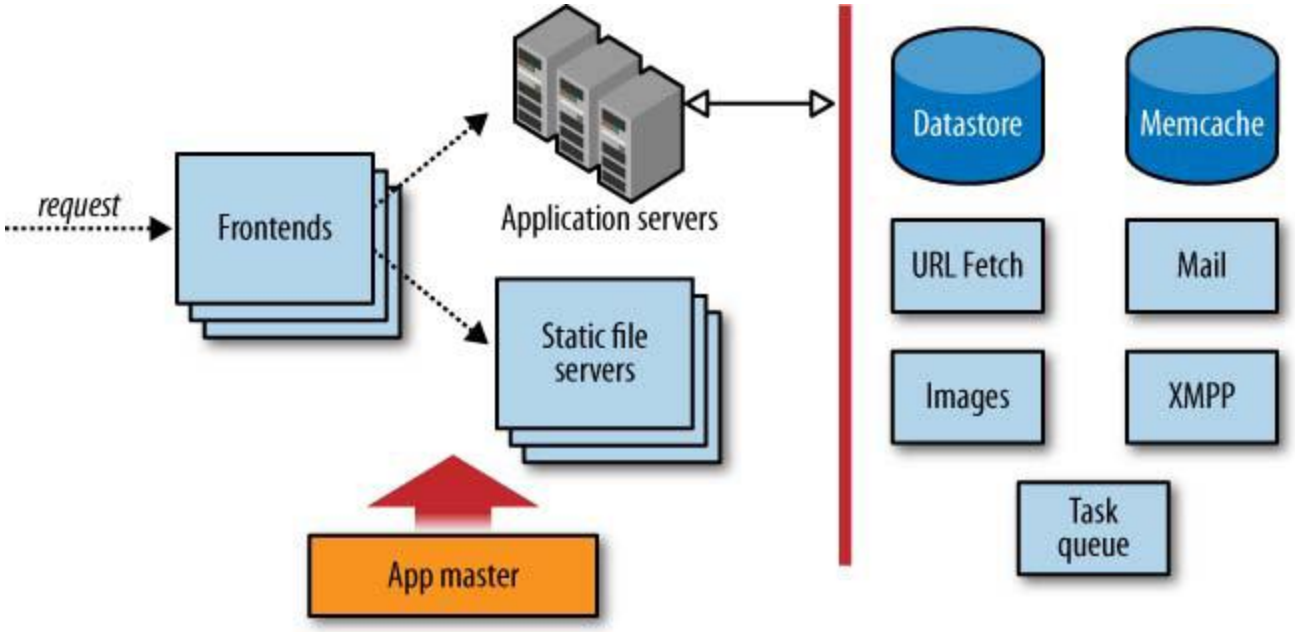
Google App Engine

- Easy to use, scale and manage
- Run your application on Google's infrastructure
- Forgot worries of managing your servers
- Think about developing more features for your web, let Google manage the rest
- No server restart, no network issues

Google Datacenters at Dallas, Oregon

Picture credit: Portland Java User Group 18 Aug 2009

GAE Architecture

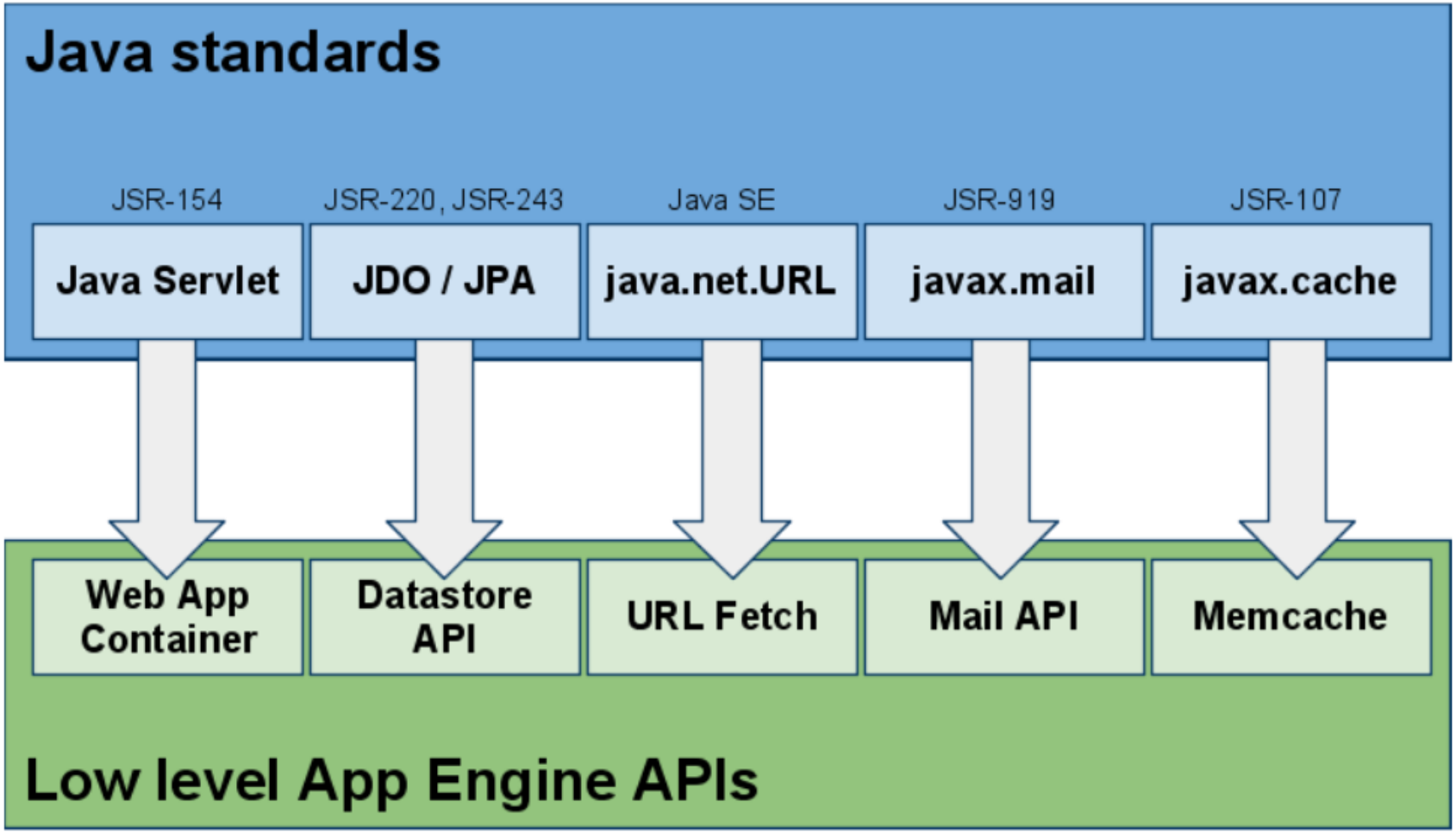


GAE Java Runtime Environment

- Java 6 VM
- Servlet 2.5 Container
- HTTP Session support (need to enable explicitly)
- JDO/JPA for Datastore API
- JSR 107 for Memcache API
- `javax.mail` for Mail API
- `javax.net.URLConnection` for URLFetch API

http://code.google.com/appengine/docs/java/runtime.html

Java Standards on GAE



http://code.google.com/appengine/docs/java/runtime.html

Services by App Engine

- Memcache API – high performance in-memory key-value cache
- Datastore – database storage and operations
- URLFetch – invoking external URLs
- Mail – sending mail from your application
- Task Queues – for invoking background processes
- Images – for image manipulation
- Cron Jobs – scheduled tasks on defined time
- User Accounts – using Google accounts for authentication

http://code.google.com/appengine/docs/java/apis.html

Memcache API

- Better than Datastore
- Storage on memory rather on disk
- Key-value pair mapping
- It implements JCache interface

```
import static java.util.Collections.emptyMap;
import javax.cache.*;

CacheFactory cacheFactory =
   CacheManager.getInstance().getCacheFactory();

Cache cache = cacheFactory.createCache(emptyMap());

cache.put(key, value);
cache.get(key);
```

http://code.google.com/appengine/docs/java/memcache/

Datastore API

- Storing data and manipulation
- Based on Bigtable
- Not a relational database
- GQL (Google Query Language)
- Need to use JDO/JPA

http://code.google.com/appengine/docs/java/datastore/

URLFetch API

- Invoking external URLs from your application over HTTP and HTTPs
- We are already using it in our other Java apps, here it got some more capabilities

```
import java.net.*;
import java.io.*;

URL url = new URL("http://...");
InputStream inputinputStream = new
   InputStreamReader(url.openStream())
BufferedReader reader = new BufferedReader(inputStream);
String line;
while ((line = reader.readLine()) != null) {
 //do something
 }
reader.close();
```

http://code.google.com/appengine/docs/java/urlfetch/

Mail API

- Send emails on the behalf of app administrator to the Google account user
- You can not receive emails

```
import javax.mail.*;

Session session = Session.getDefaultInstance(new
   Properties(), null);
InternetAddress admins = new InternetAddress("admins");
Message msg = new MimeMessage(session);

msg.setFrom(admins);
msg.addRecipient(Message.RecipientType.TO, admins);
msg.setSubject("subject");
msg.setText("text");

Transport.send(msg);
```

http://code.google.com/appengine/docs/java/mail/

Task Queues API

- **Perform background processes by inserting tasks into queues.**
- **Instructions need to be mention in file queue.xml, in the WEB-INF/ dir**

```
import com.google.appengine.api.labs.taskqueue.Queue;
import com.google.appengine.api.labs.taskqueue.QueueFactory;
import com.google.appengine.api.labs.taskqueue.TaskOptions;

// ...
TaskOptions taskOptions =
TaskOptions.Builder.url("/send_invitation_task")
.param("address", "juliet@example.com")
.param("firstname", "Juliet");
Queue queue = QueueFactory.getDefaultQueue();
queue.add(taskOptions);
```

http://code.google.com/appengine/docs/java/config/queue.html

Images API

- Manipulation of images
- Transformation of images
- Changing image formats

http://code.google.com/appengine/docs/java/images/

Cron Jobs

- Up to 20 scheduled tasks per app
- Cron jobs (scheduled tasks) supported in cron.xml in WEB-INF dir
- Schedule instructions contain Englis-like format

```
<?xml version="1.0" encoding="UTF-8"?>
<cronentries>
<cron>
<url>/listbooks</url>
<description>Repopulate the cache every day at
5am</description>
<schedule>every day 05:00</schedule>
</cron>
</cronentries>
```

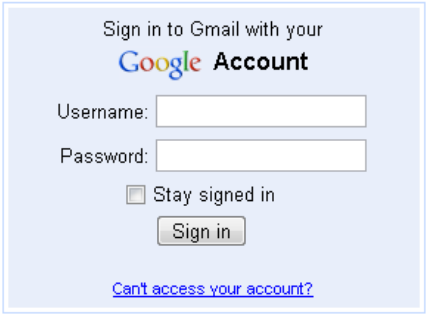
http://code.google.com/appengine/docs/java/config/cron.html

Users API

- Using Google accounts authentication in your application

```
import com.google.appengine.api.users.*;

UserService userService =
   UserServiceFactory.getUserService();
User user = userService.getCurrentUser();
String navBar;
if (user == null) {
navBar = "<p>Welcome! <a href=\"" +
   userService.createLoginURL("/") +"\">Sign in or
   register</a> to customize.</p>";
} else {
   navBar = "<p>Welcome, " + user.getEmail() + "! You can
   <a href=\"" +userService.createLogoutURL("/") +"\">sign
   out</a>.</p>";
}
```

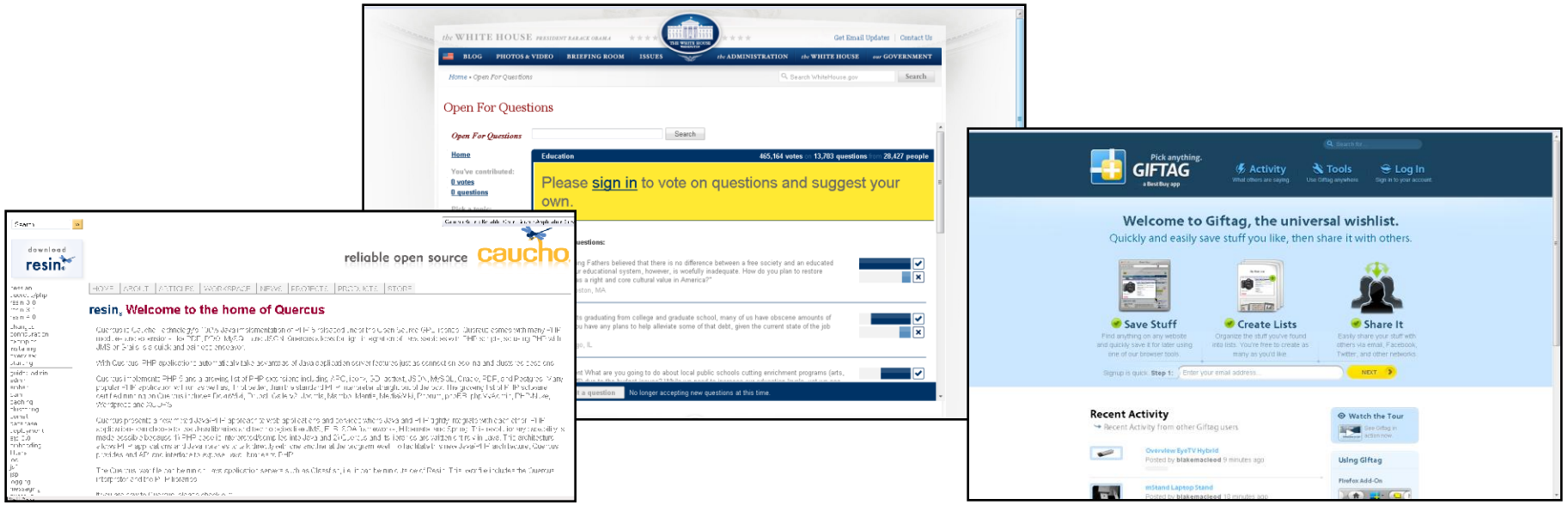


http://code.google.com/appengine/docs/java/users/

Limitations

- No HTTPS for custom domains. Only for your-app-id.appspot.com domains
- No streaming and long term connections
- A web request must respond in 30 senconds otherwise GAE throw DeadlineExceededException
- Application will not work with your naked custom domain. i.e http://yourdomain.com
- Only HTTP and HTTPS. Client can not connect to GAE through FTP
- First request will be slow
- Application can not connect to socket
- You can not create threads
- Only 1000 files per application

Who is using GAE?



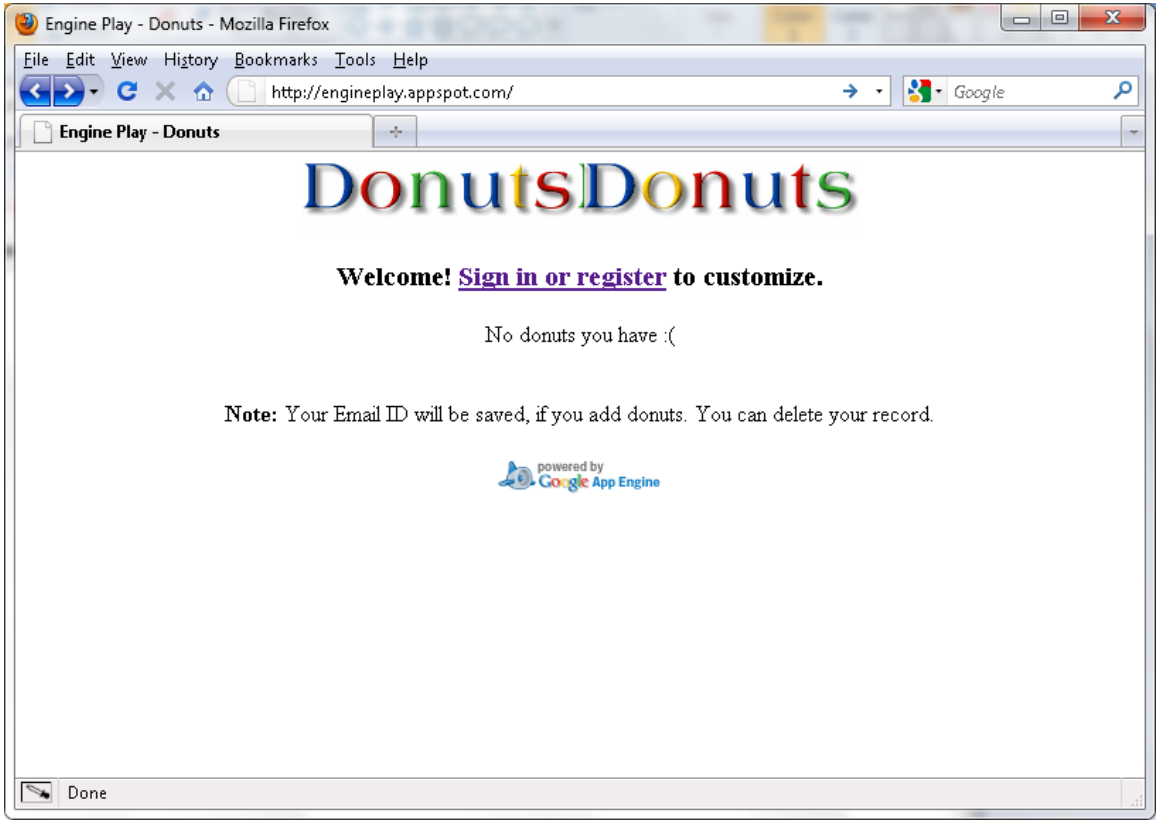
caucho

THE WHITE HOUSE
WASHINGTON

BEST BUY

http://code.google.com/appengine/casestudies.html

Demo



http://engineplay.appspot.com/

Questions, Suggestions and Feedback

Contact Me

Tahir Akram

Email: tahirakramch [AT] gmail [DOT] com
Read my blog: http://pakzilla.com
Follow me on Twitter: http://twitter.com/tahirakram

Resources

Following resources are used to prepare these slides. You must have a look for more insights of Google App Engine

- http://googleappengine.blogspot.com/2009/04/seriously-this-time-new-language-on-app.html
- http://googleappengine.blogspot.com/2009/02/back-to-future-for-data-storage.html
- http://code.google.com/p/googleappengine/issues/list
- http://code.google.com/appengine/kb/adminconsole.html#delete_app
- http://code.google.com/p/googleappengine/issues/detail?id=335
- http://code.google.com/eclipse/docs/download.html
- http://cjedaudio.wordpress.com/2009/06/19/google-appengine-limitations-workarounds/
- http://blog.frankel.ch/tech/dev/java/jee/google-appengine-limitations
- http://groups.google.com/group/google-appengine-java/web/will-it-play-in-app-engine
- http://java.sys-con.com/node/1199833
- http://www.youtube.com/view_play_list?p=DA31F43DE4107B05
- http://gaejexperiments.wordpress.com/2009/10/29/episode-5-upgrading-to-google-app-engine-1-2-6/
- http://code.google.com/appengine/docs/quotas.html
- http://code.google.com/appengine/docs/java/config/appconfig.html
- http://www.techcrunch.com/2009/03/24/white-house-using-google-moderator-for-town-hall-meeting/