

An introduction to Google App Engine

VPE / CTO
Community of Practice
Connecting Opportunities & Experience

Sunnyvale, CA
April 21, 2009

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Agenda

1. What to do about questions?
2. App Engine introduction
3. Why build it?
4. App Engine Tour
5. What's different?

A decorative header at the top of the slide featuring four overlapping spheres: a green one on the left, and blue, red, and yellow ones on the right.

App Engine introduction



Google App Engine



*Leveraging Google's
platform to better serve
your customers*

Recent announcements



Google Campfire One
(April 7, 2009)



Google™

Early look at Java support



150K+ Developers, 50K+ Apps



A decorative header at the top of the slide featuring four overlapping spheres: a green one on the left, and blue, red, and yellow ones on the right.

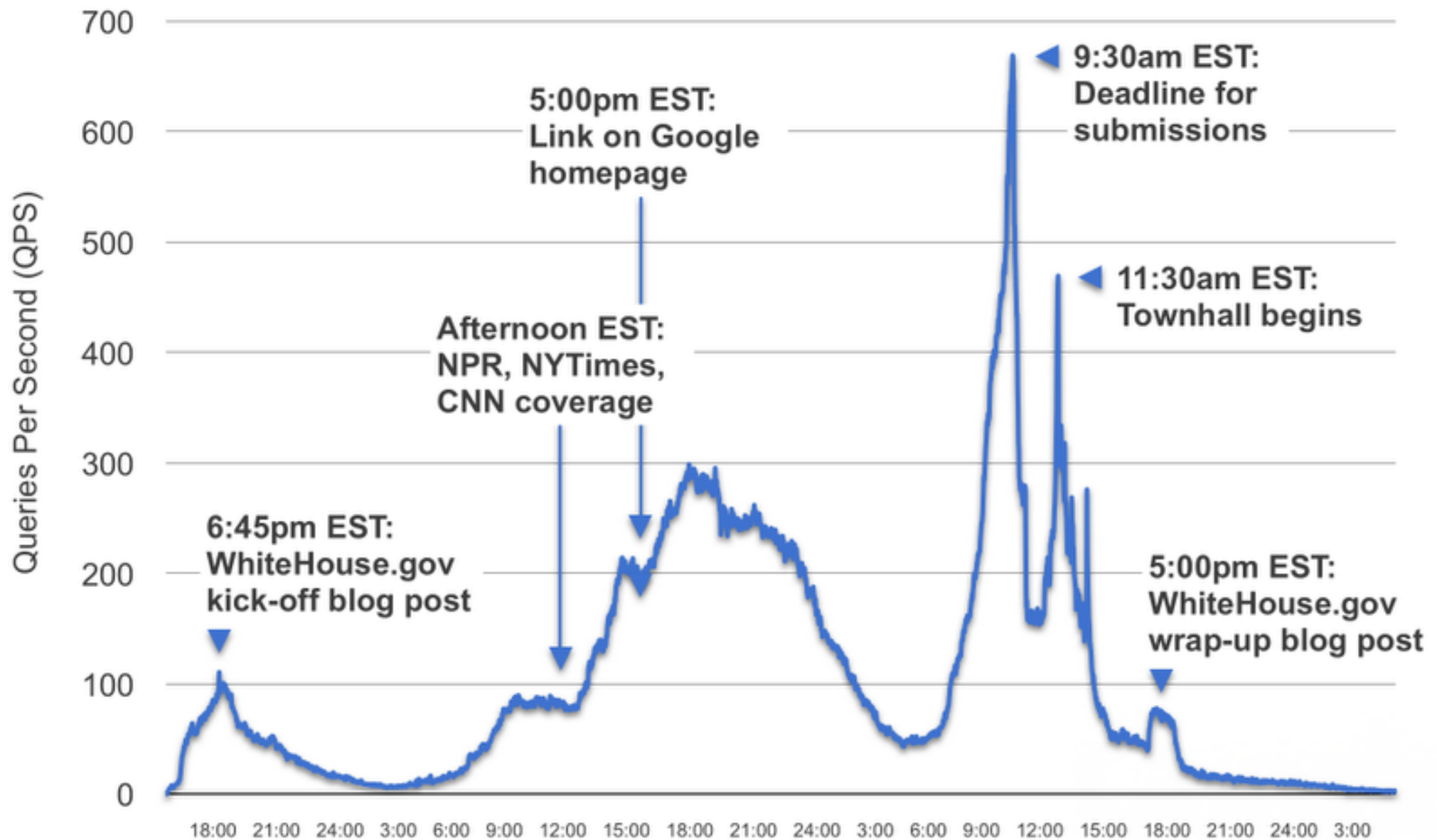
Why build it?



Building web applications is hard

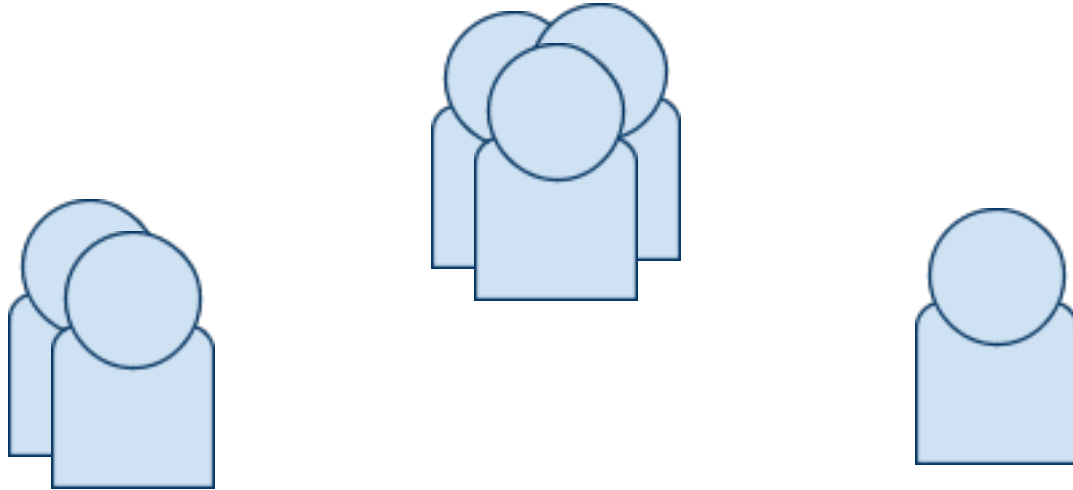


WhiteHouse.gov/openforquestions



Thinking about scalability

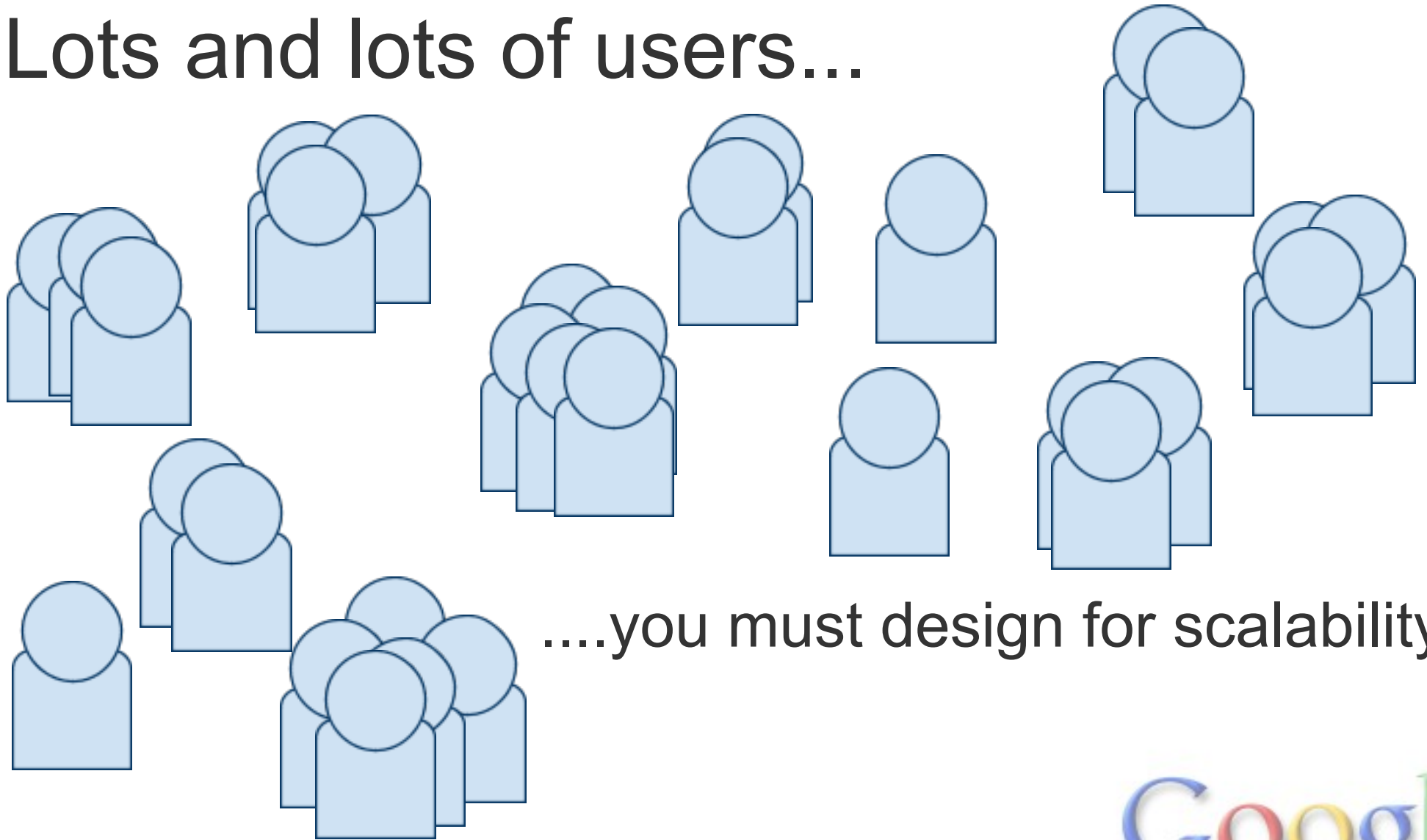
Just a few users....



....the tools, platform and design
don't matter too much

Thinking about scalability

Lots and lots of users...



....you must design for scalability

But the problem is

When?



The real problem is

**When it
happens.**



Serving your customers

Google App Engine



- Scale
- Performance
- Standards
- Cost effective
- Integration
- Services
- Distribution



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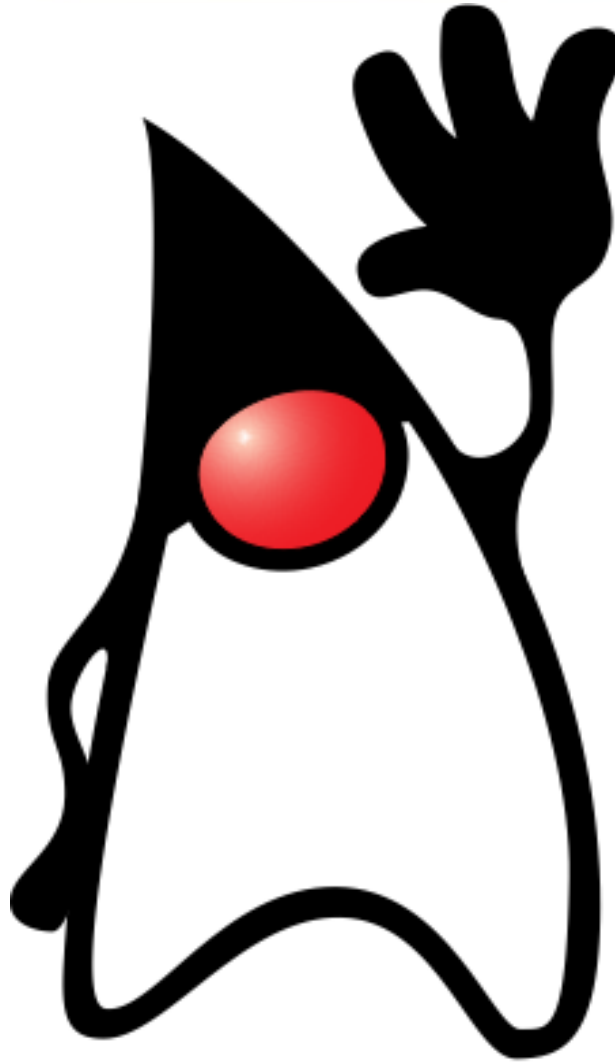
App Engine Tour



Python runtime



Java runtime



Duke, the Java mascot

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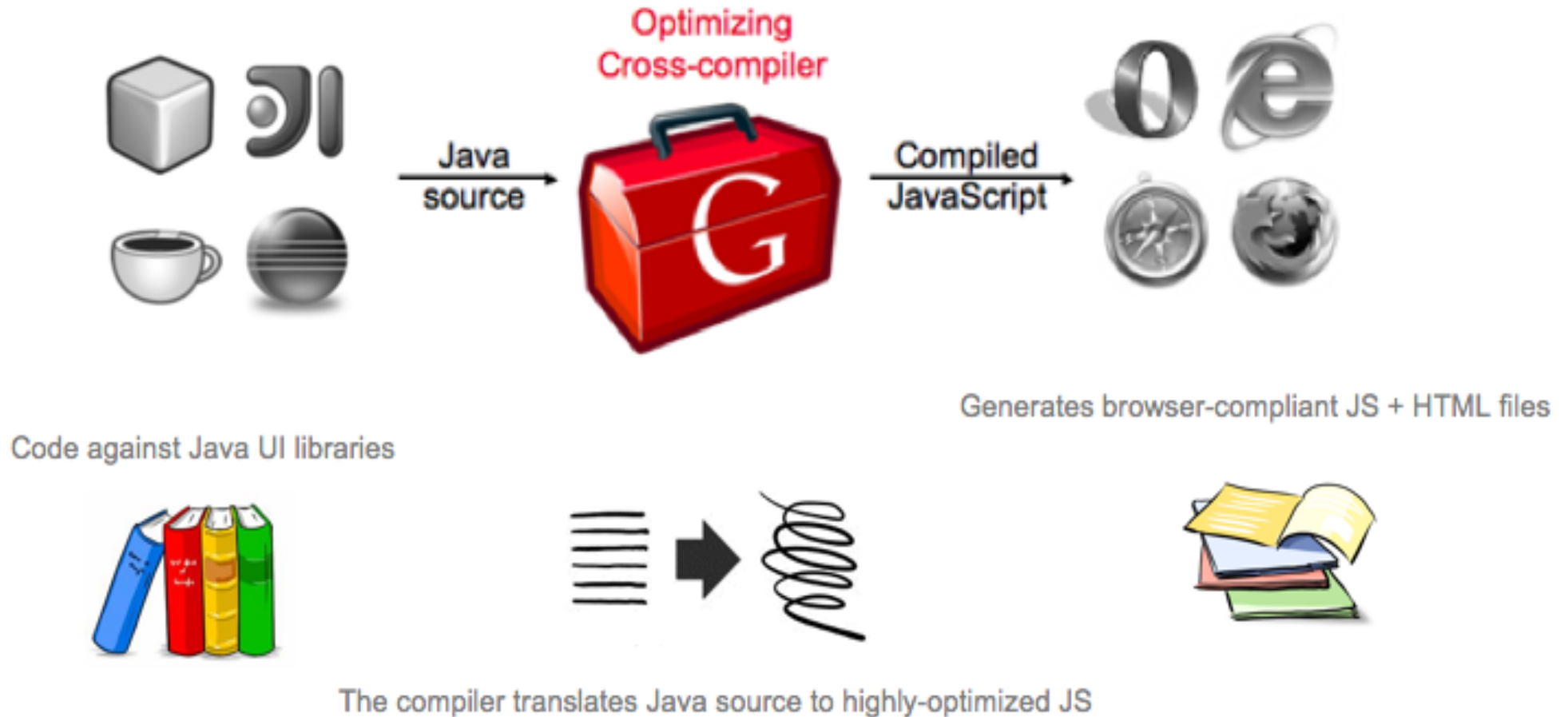
Complete Java development stack



+



Google Web Toolkit (GWT)



GWT Debugging in the browser

The image shows a web browser window and the Eclipse IDE interface for debugging a GWT application.

Browser Window: The browser displays the "Web Application Starter Project" page. It has a navigation bar with "Back", "Forward", "Refresh", and "Stop" buttons. The address bar shows "http://localhost:8080/Sample.html". The page content includes the text "Please enter your name:" followed by a text input field containing "Fred" and a "Send" button. A red arrow points from the "Send" button in the browser to the corresponding line in the IDE.

Eclipse IDE: The IDE is showing the "Sample.java" file in the "Eclipse Platform" environment. The "Variables" view on the right lists the current state of the application:

Name	Value
this	Sample\$1 (id=48)
this\$0	Sample (id=65)
greetingService	GreetingService_Proxy (id=3189)
moduleBaseURI	"http://localhost:8080/sample/" (id=3190)
remoteServiceURL	"http://localhost:8080/sample/greet" (id=3191)
serializationPolicy	"29F4EA1240F157649C12466F01F46F60" (id=3192)
serializer	GreetingService_TypeSerializer (id=3193)
val\$dialogBox	DialogBox (id=67)
val\$sendButton	Button (id=72)

The "Outline" view on the bottom right shows the project structure:

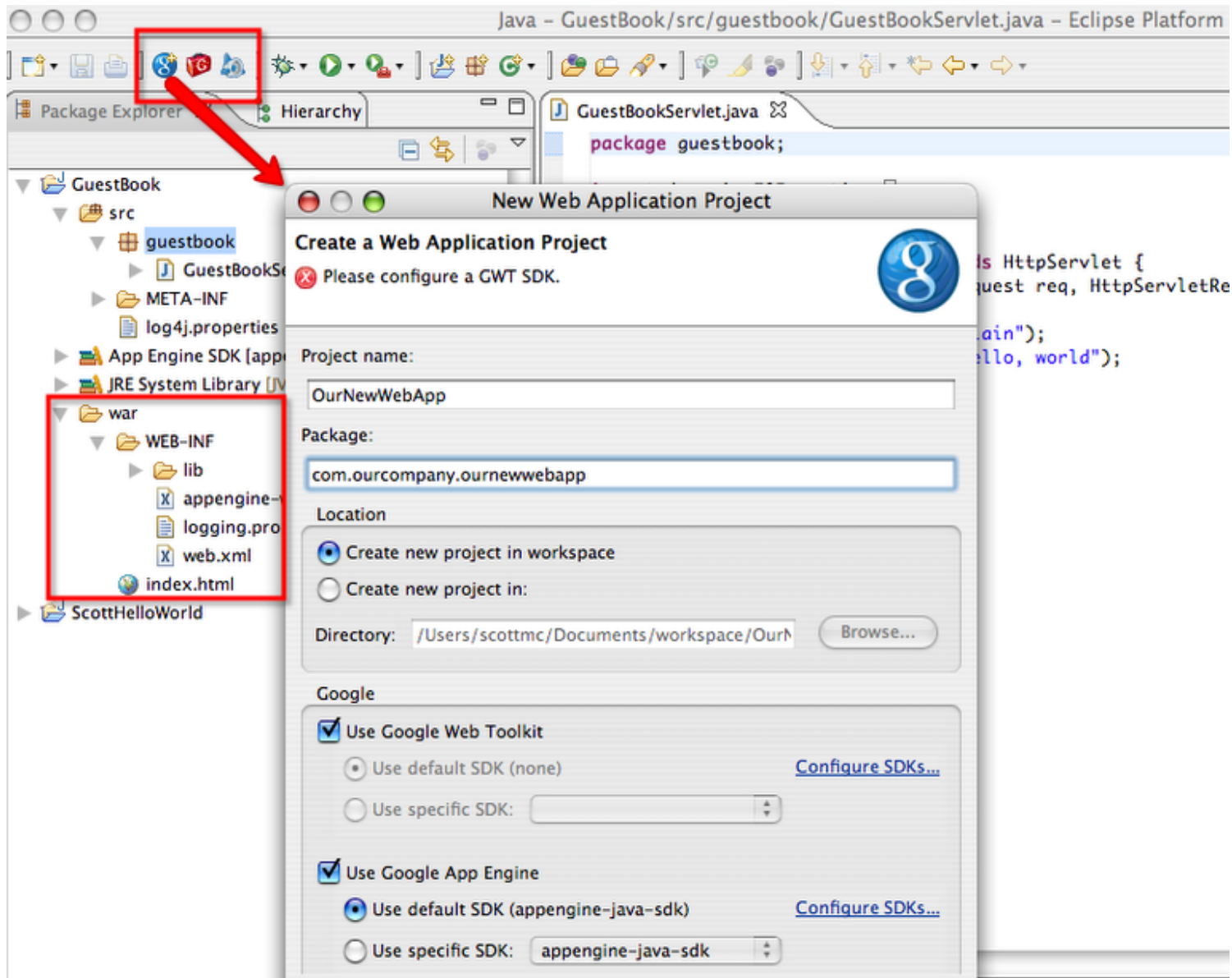
- fredsa.sample.client
 - import declarations
 - Sample
 - SERVER_ERROR : String
 - greetingService : GreetingServiceAsync
 - onModuleLoad()
 - new ClickHandler() {...}
 - onClick(ClickEvent)
 - MyHandler

The "Sample.java" file is open, showing the following code:

```
73 dialogBox.setWidget(dialogVPanel);
74
75 // Add a handler to close the DialogBox
76 closeButton.addClickHandler(new ClickHandler() {
77     public void onClick(ClickEvent event) {
78         dialogBox.hide();
79         sendButton.setEnabled(true);
80         sendButton.setFocus(true);
81     }
82 });
83
84 // Create a handler for the sendButton and nameField
85 class MyHandler implements ClickHandler, KeyUpHandler {
```

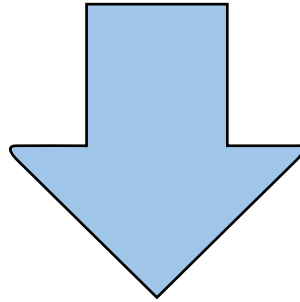
A red arrow points from the "Send" button in the browser to line 77 in the IDE, indicating the current execution point.

Google Plugin for Eclipse



Google Apps integration

<http://appid.appspot.com/>



<http://yourapp.yourdomain.com/>



Google Apps + App Engine

Google **Google Apps for marzianicolai.com - Premier Edition** marzia@marzianicolai.com [Inbox](#)

Search accounts Search Help Center

Dashboard Users and groups Domain settings Advanced tools Support **Service settings**

marzianicolai.com
marzianicolai.com
[Manage account information](#) [domain names](#)
8 users [Create new users](#)
You can create up to 200 user accounts for this domain.
[Request more users](#)

✓ All services are running

Service settings [Add more services](#)

Email - Active
<http://mail.google.com/a/marzianicolai.com>

Calendar - Active
<http://calendar.marzianicolai.com>

Sites - Active
<http://sites.google.com/a/marzianicolai.com>

my-app-id App Engine - Active
<https://my-app-id.appspot.com>
<http://my-app-id.marzianicolai.com.com>

Chat - Active
Users can sign in by [downloading Google Talk](#)

Docs - Active
<http://docs.marzianicolai.com>

Mobile
Get Google Apps on your mobile device

Moderator Google Labs - Active
<http://qq.marzianicolai.com>

Email
Chat
Calendar
Docs
Sites
Mobile
my-app-id (App Engine)
Code Reviews
Moderator
Short Links

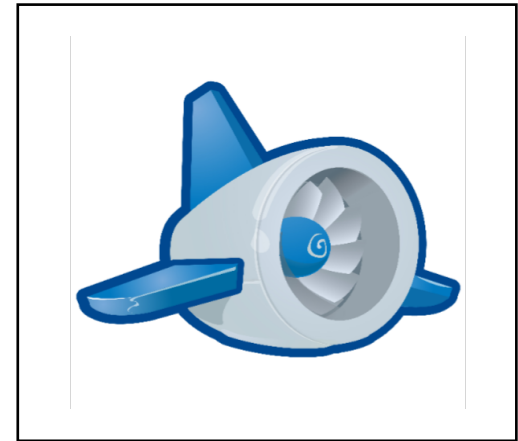


Google Apps + your apps

Our Google Apps



Your custom applications

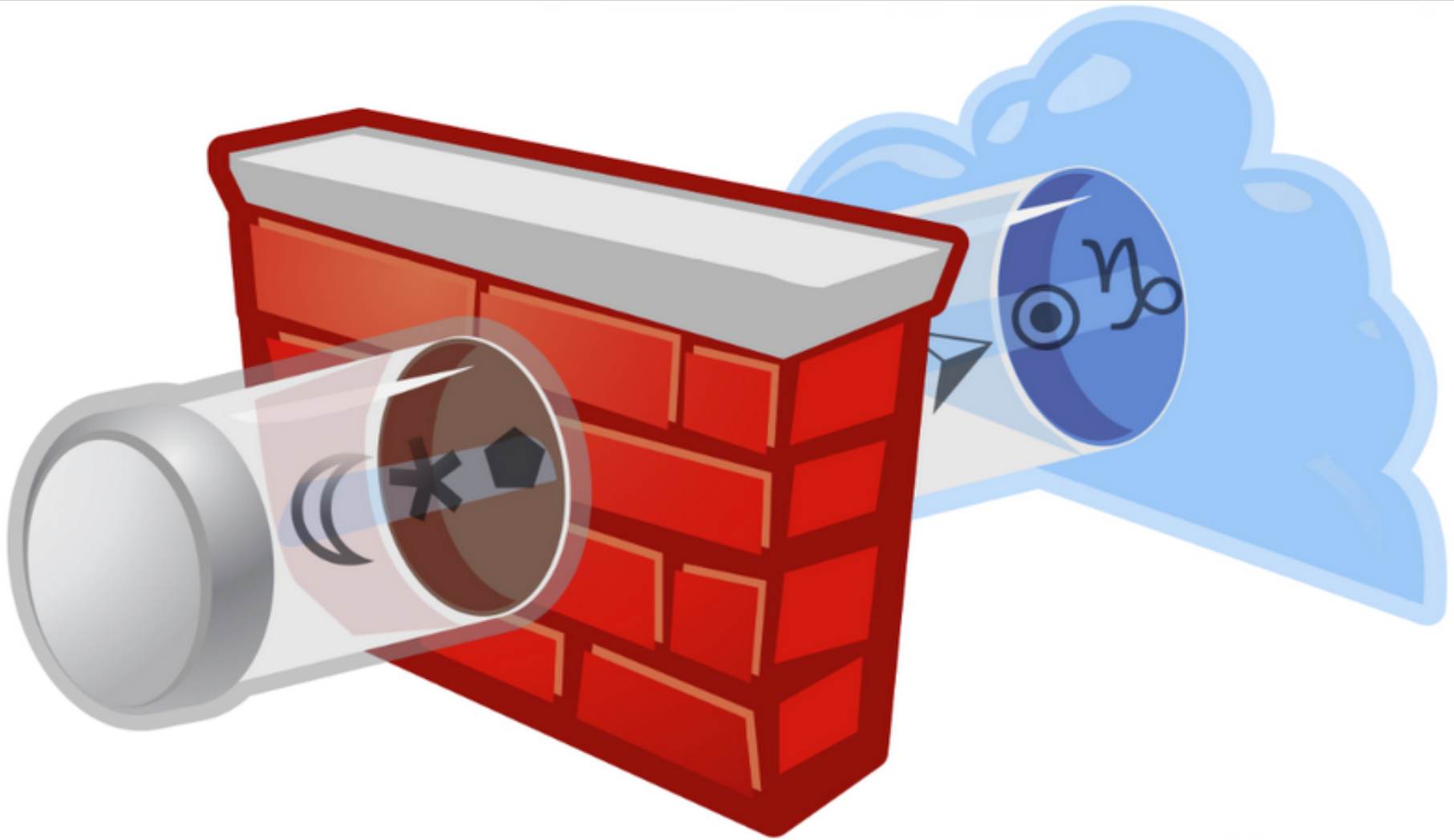


Google's scalable serving architecture

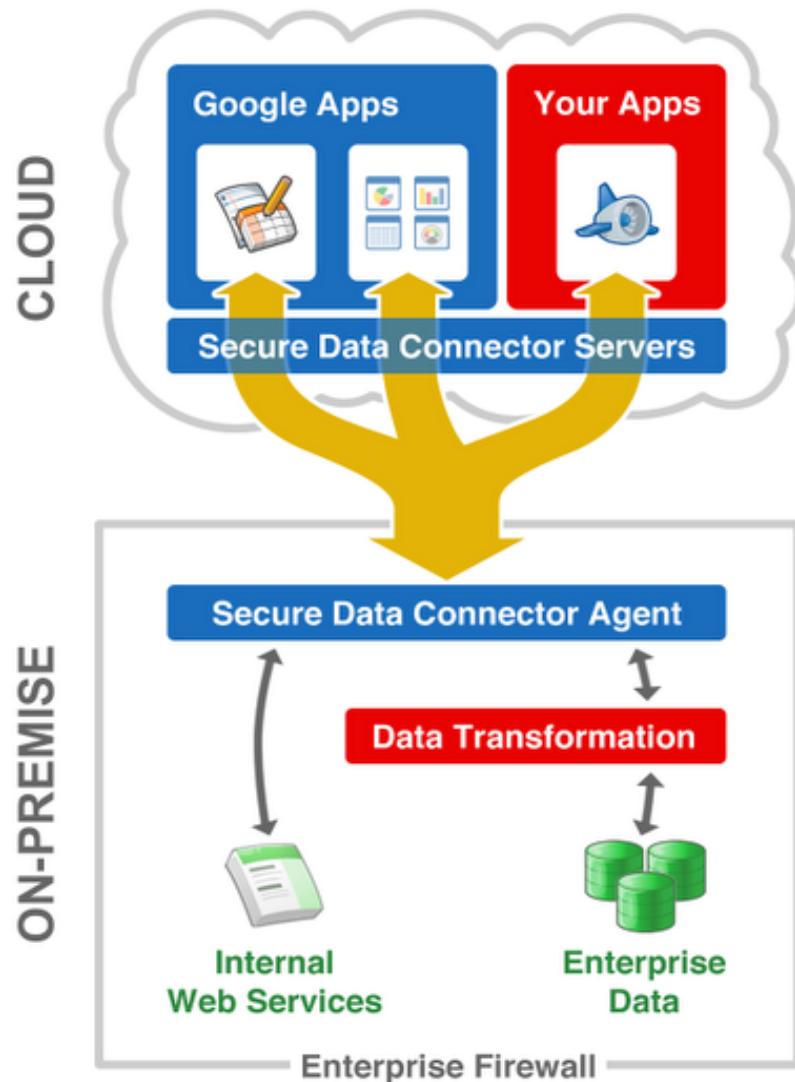
Database import



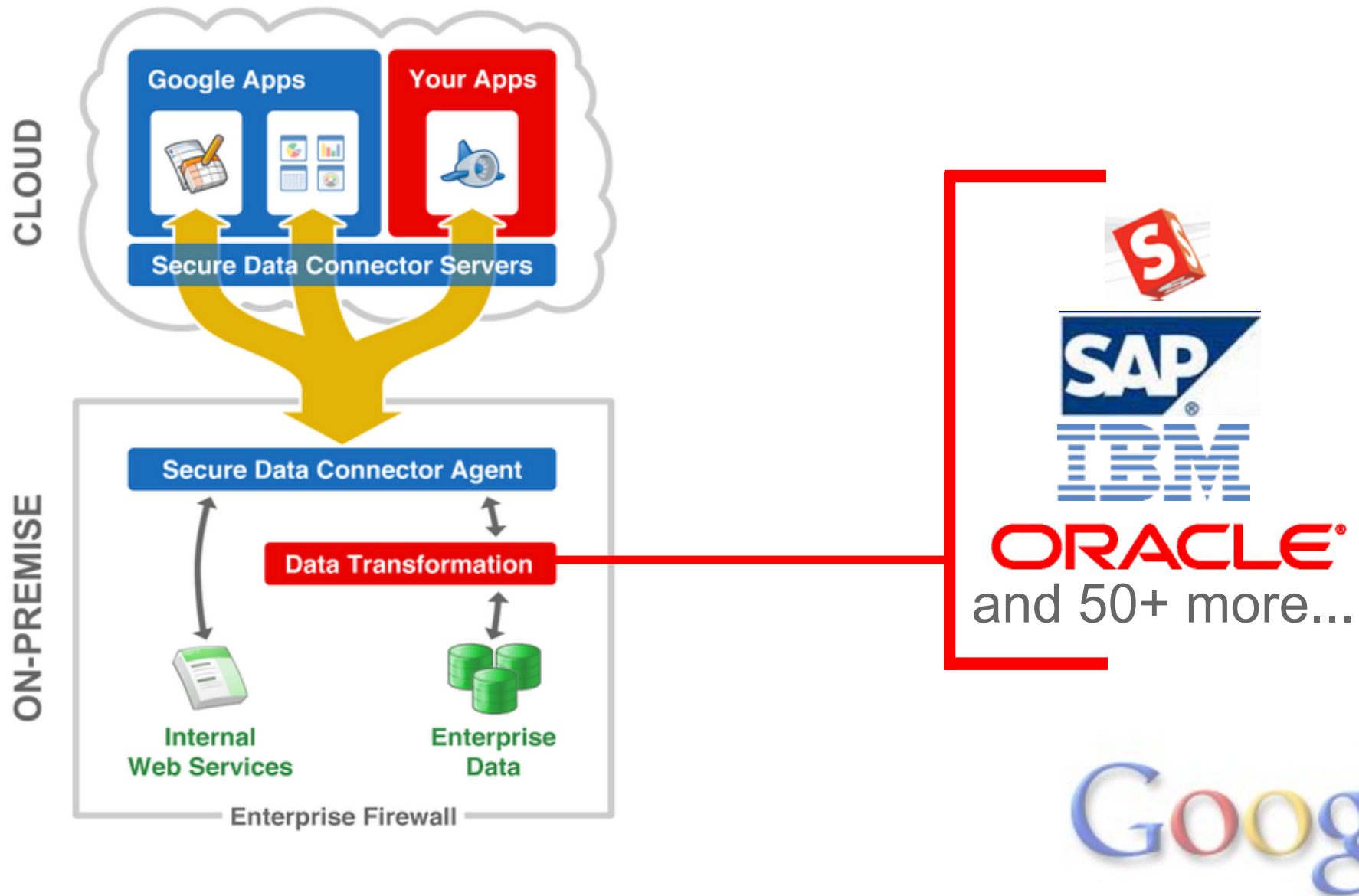
Secure Data Connector (SDC)



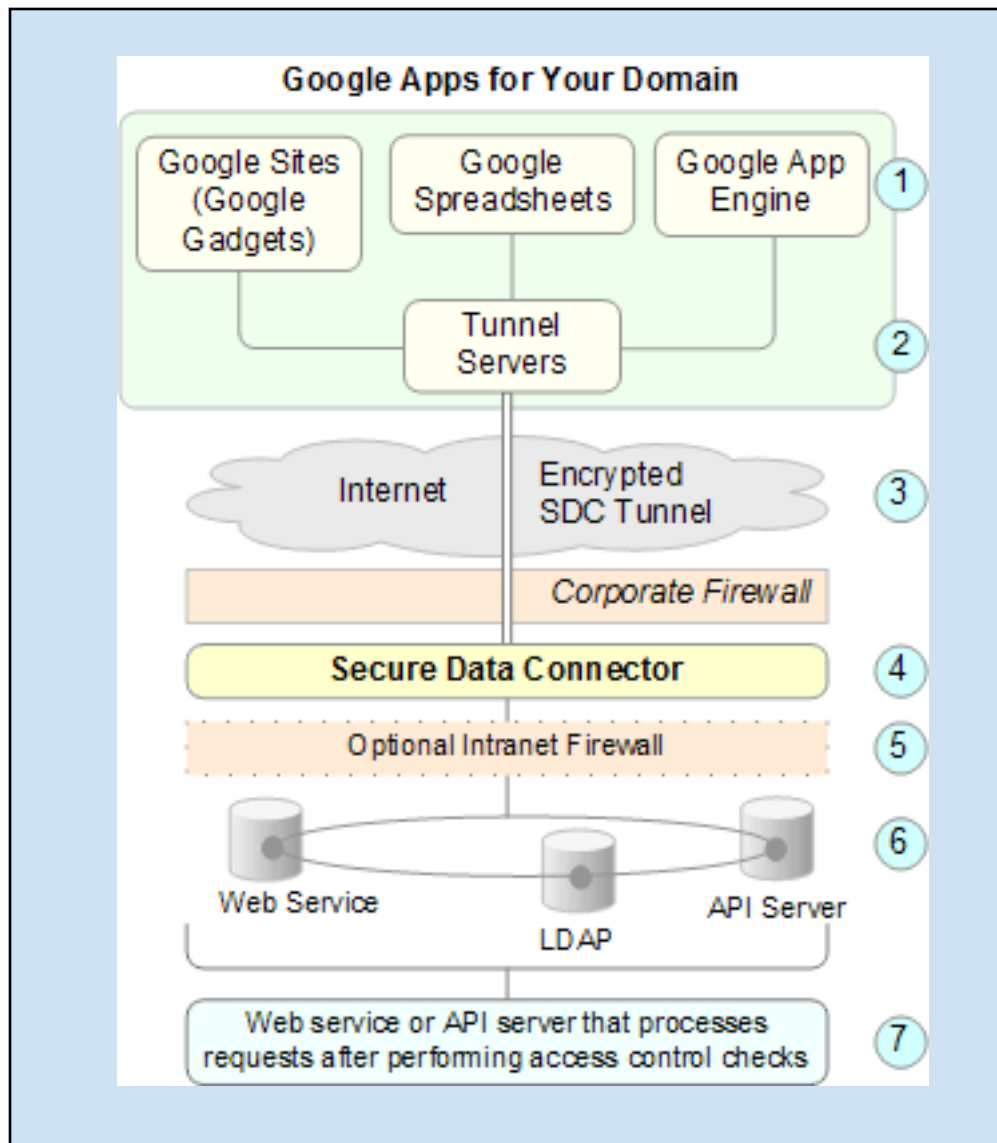
Secure Data Connector



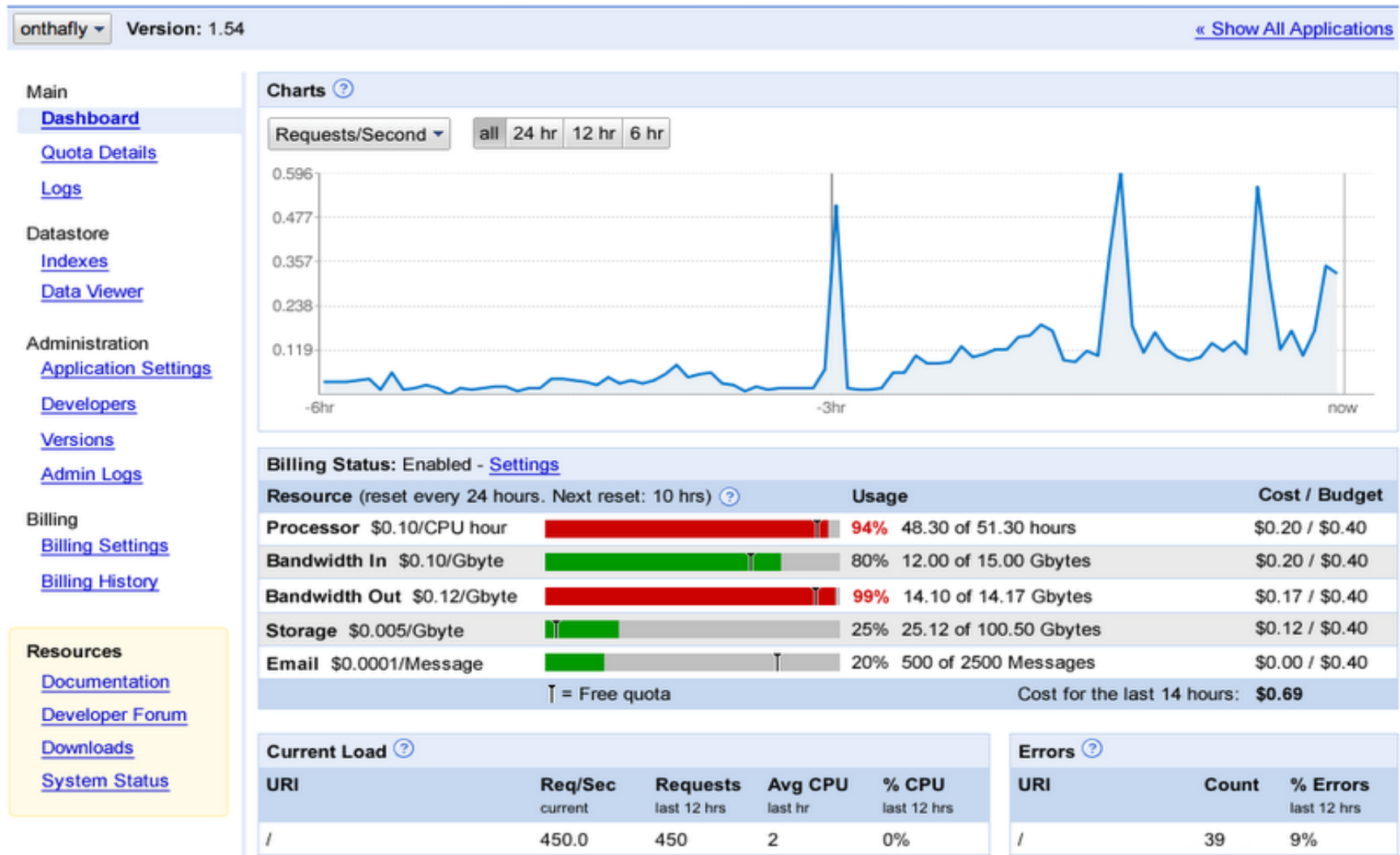
Secure Data Connector



Using Secure Data Connector



Your application's health



App Engine's health history

Google App Engine

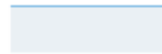
[Help](#) | [Admin Console](#)

System Status

Current Availability

100%

Uptime (last 7 days)



Read latency (today)



Write latency (today)



	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.

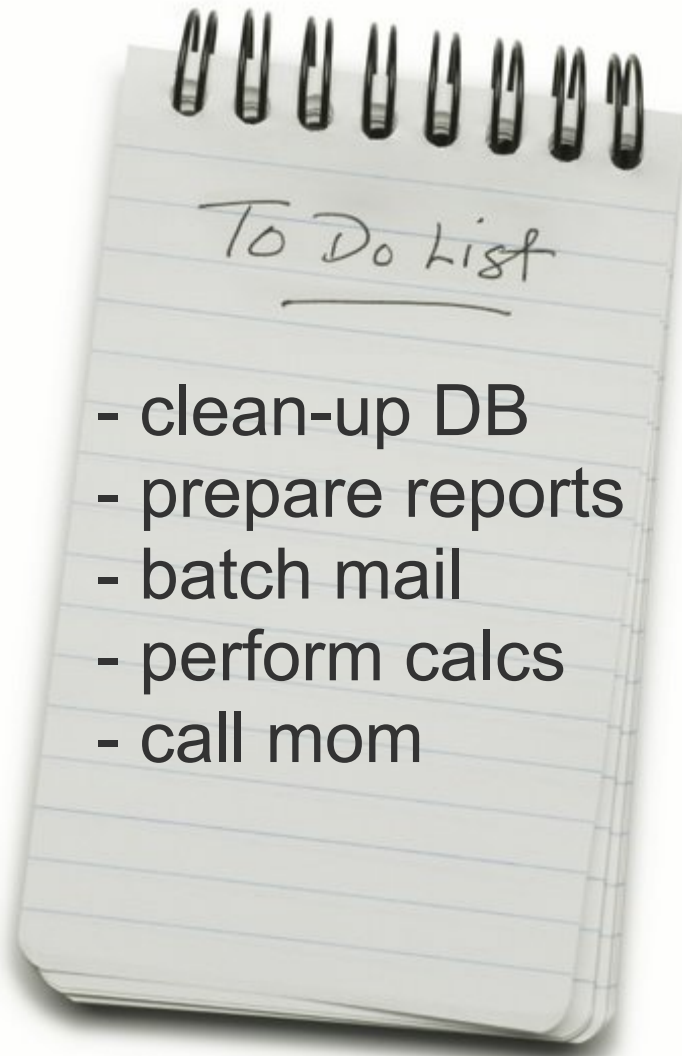
✓ No issues or minor performance issues ⚙ Investigating ⚠ Service disruption ? Unknown



Additional services / APIs

- URL Fetch
- Memcache
- Mail
- Images
- Google Accounts
- Cron support

Cron Support



Cron support

```
<?xml version="1.0" encoding="UTF-8"?>
<cronentries>
  <cron>
    <url>/recache</url>
    <description>Repopulate the cache every 2 minutes</description>
    <schedule>every 2 minutes</schedule>
  </cron>
  <cron>
    <url>/weeklyreport</url>
    <description>Mail out a weekly report</description>
    <schedule>every monday of month 08:30</schedule>
    <timezone>America/New_York</timezone>
  </cron>
</cronentries>
```

("every"|ordinal) (days) "of" (monthspec) (time)

every 5 minutes

every 12 hours

2nd,third mon,wed,thu of march 17:00

every monday of month 09:00

1st monday of sep,oct,nov 17:00

Java standards

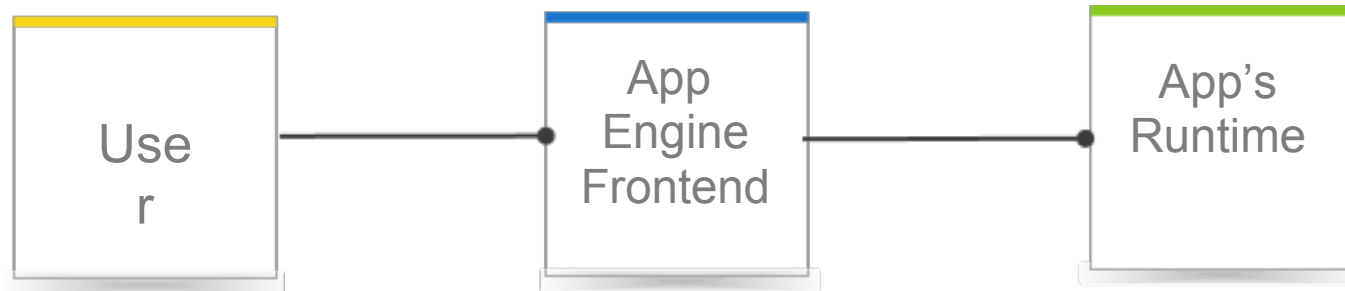
APIs	Servlets	JSRs
Web App Container	Java Servlet	JSR-154
Datastore	JDO & JPA	JSR-220, JSR-243
HTTP	java.net.URL	Java SE
Mail	javax.mail	JSR-919
Memcache	javax.cache	JSR-107

Scalable serving architecture

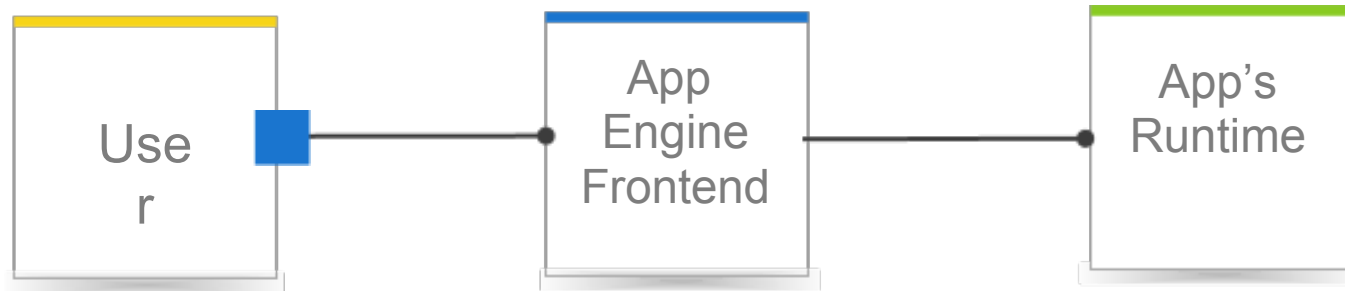


creative commons licensed photograph from cote

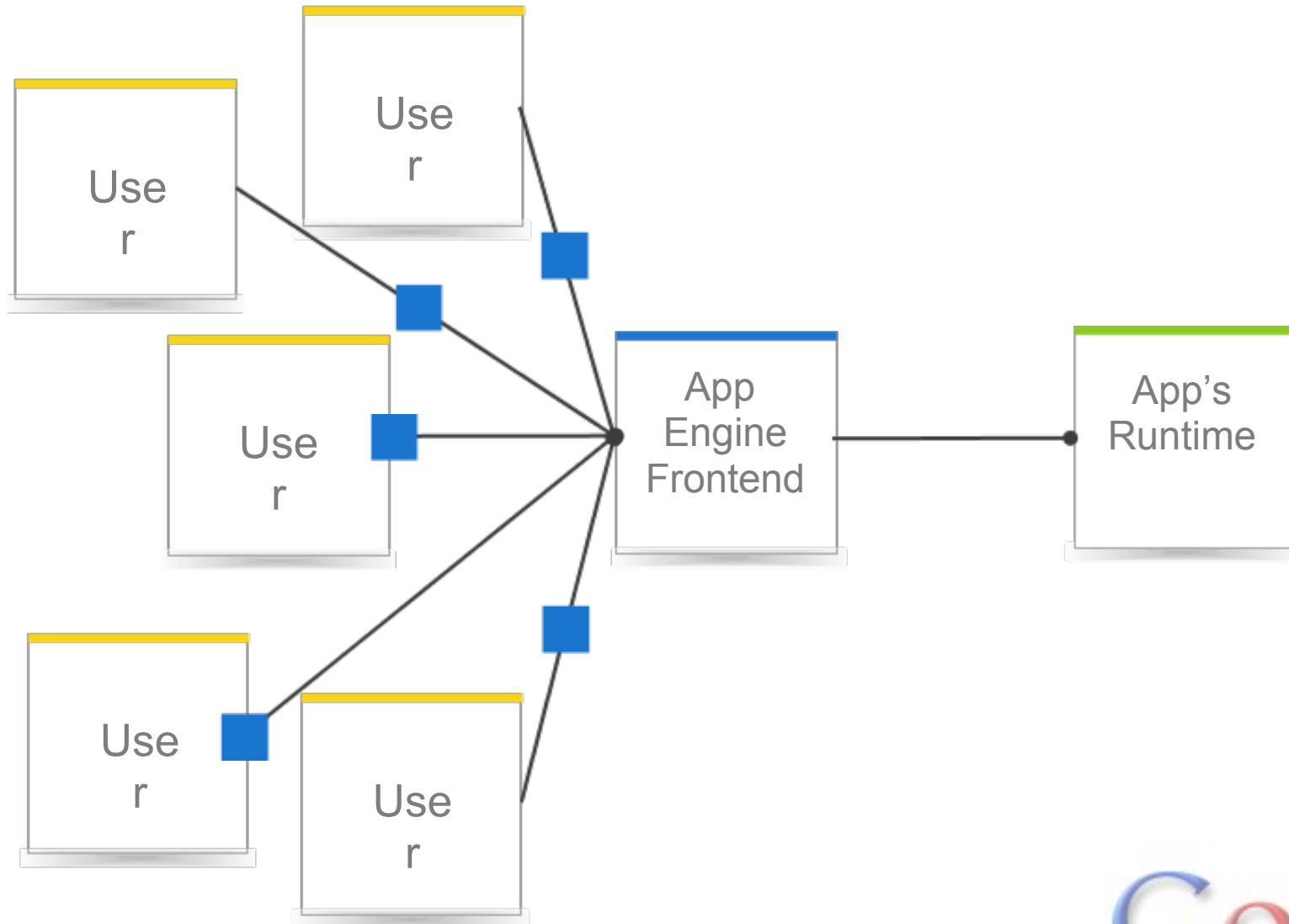
Request path



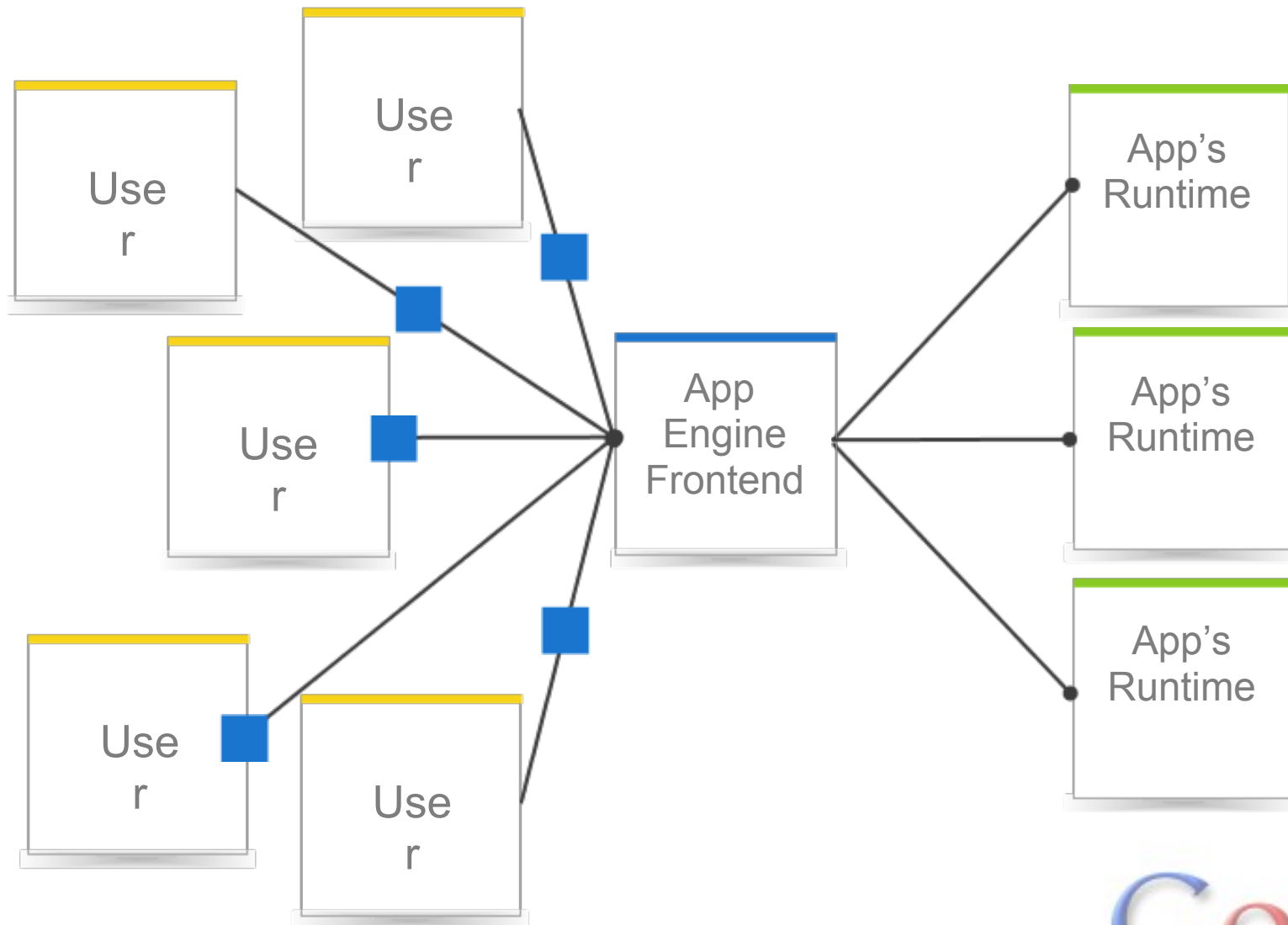
Request path



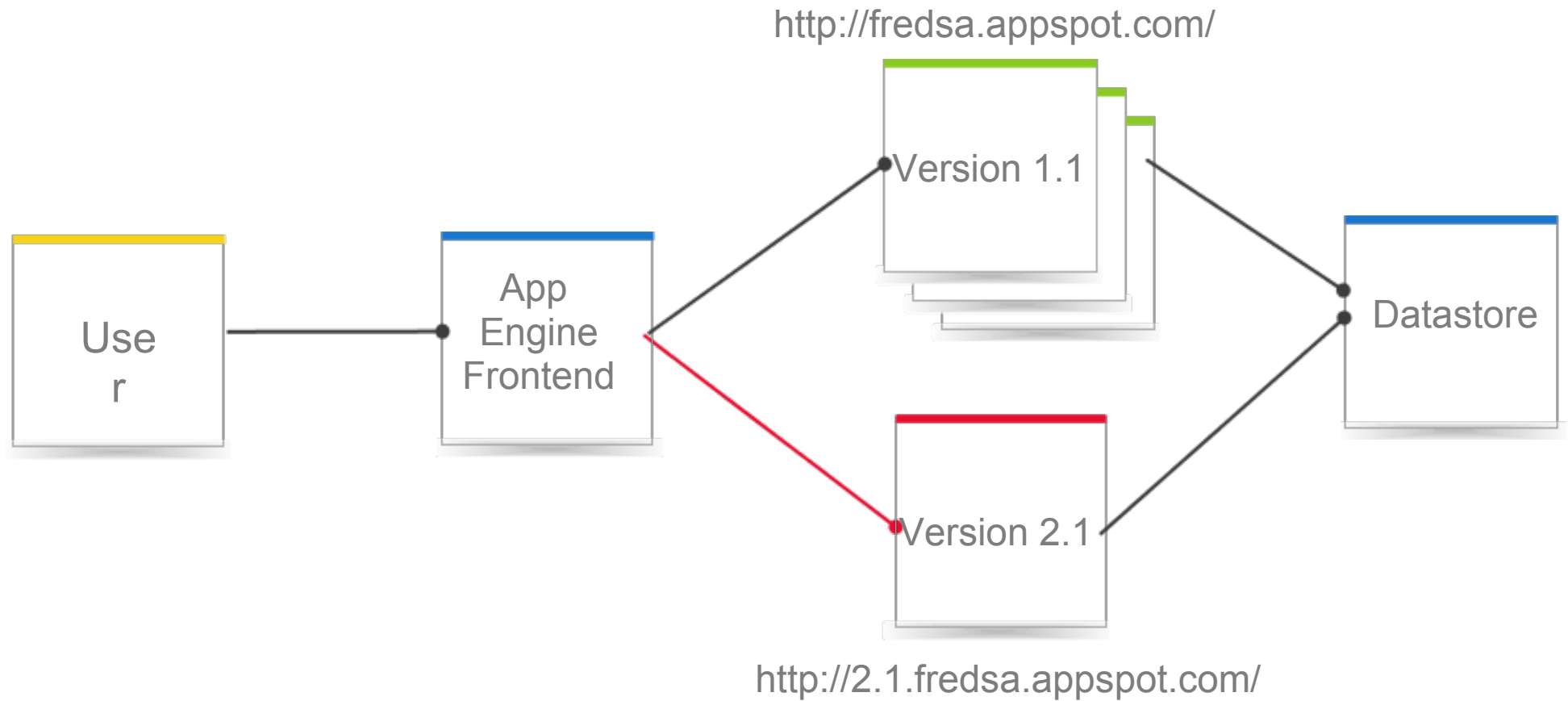
Request path



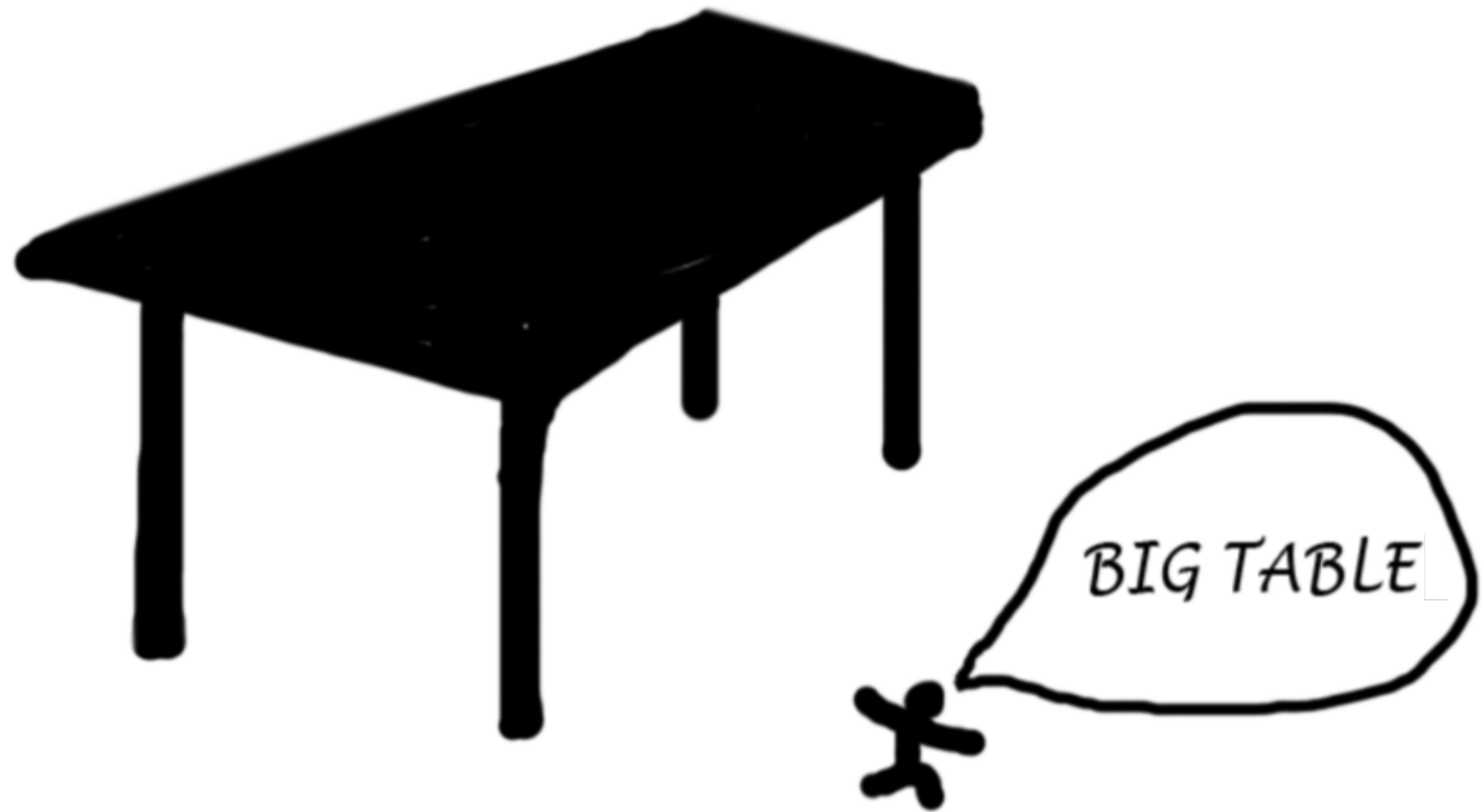
Request path



Multiple versions



Distributed datastore



Bigtable : a sharded, sorted array

Row key Row data

a	...
b	...
c	...

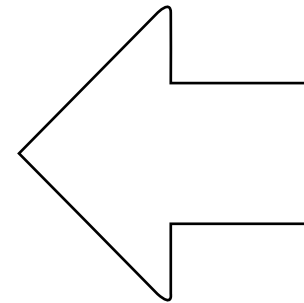
d	...
f	...
j	...

n	...
p	...
z	...

Bigtable : a sharded, sorted array

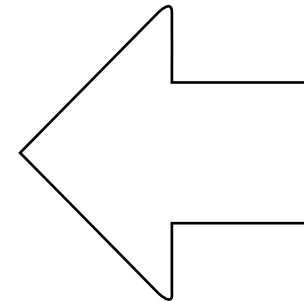
Row key Row data

a	...
b	...
c	...



Shard 1

d	...
f	...
j	...

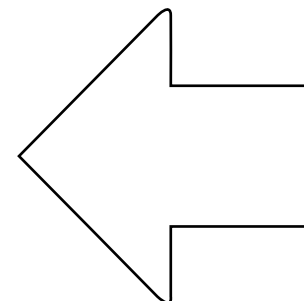


Shard 2

.

.

n	...
p	...
z	...



Shard *n*

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What's different?

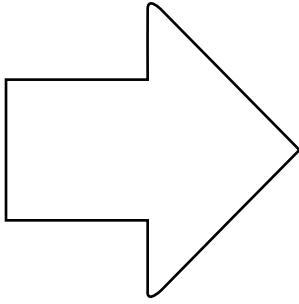


Datastore

- No joins
- Convert queries into *dense* index scans
- Optimistic concurrency
- ACID transactions

ACID

Atomic
Consistent
Isolated
Durable

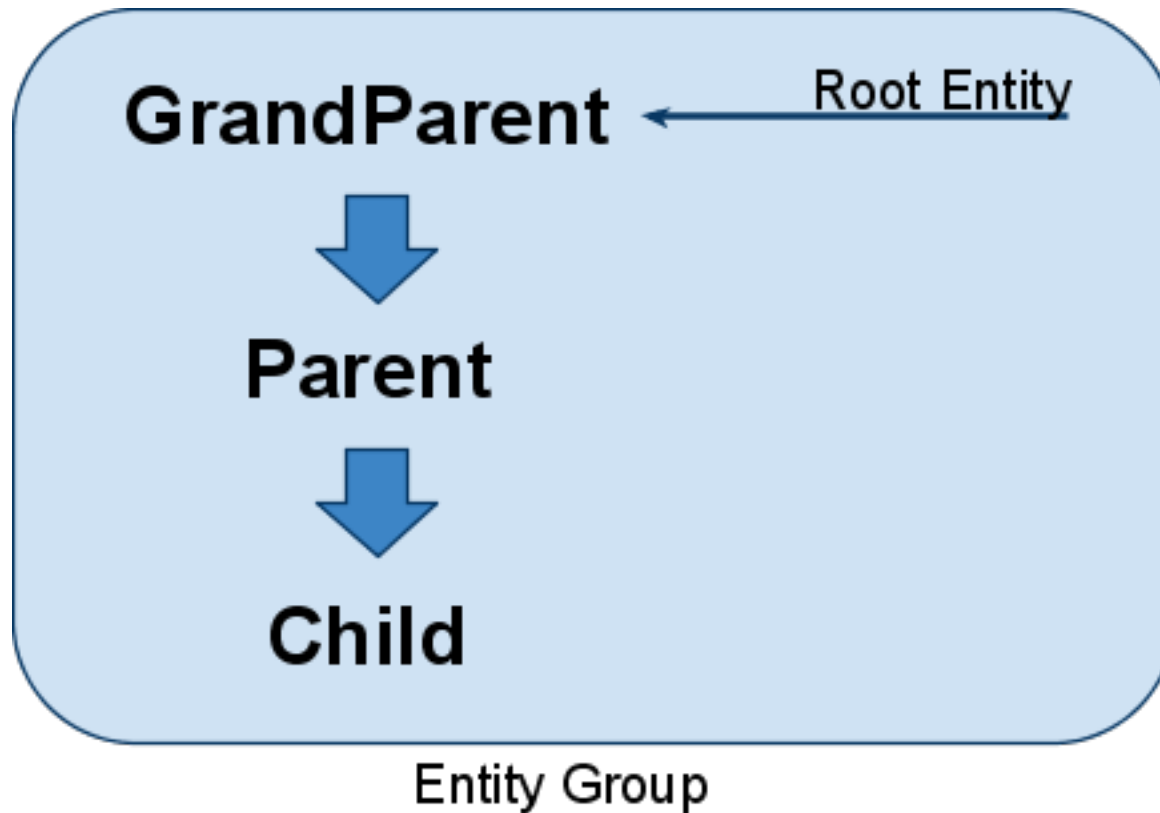


Associative
Commutative
Idempotent
Distributed

Entities & Keys

Entity key	Entity properties
/Child:Timmy	...
/Child:William	...
/Grandparent:Alice	...
/Grandparent:Alice	...
/Grandparent:Ethel	...
/Grandparent:Ethel	...
/Grandparent:Ethel	...
/Grandparent:Ethel	...
/Grandparent:Frank	...
/Parent:Sam	...
/Parent:Jane	...
/Parent:Jane	...
/Parent:Jane	...

Entity groups



Entity keys (with ancestors)

/Grandparent:Alice
/Grandparent:Alice/Parent:Sam
/Grandparent:Ethel
/Grandparent:Ethel/Parent:Jane
/Grandparent:Ethel/Parent:Jane/Child:Timmy
/Grandparent:Ethel/Parent:Jane/Child:William
/Grandparent:Frank

Datastore indexes

- Kind index
- Single property index
- Composite index
- Merge join

Kind index

SELECT * FROM Grandparent

Scan with prefix **Grandparent**

	Kind	Key
	Child	Jimmy
	Child	Timmy
	Grandparent	Ethel
	Grandparent	Fred
	Parent	Jane
	Parent	John
	Parent	Todd

Single property index

WHERE name = 'John'

Scan with prefix **Parent name John**

Kind	Name	Value
Parent	address	1 Palm Dr.
Parent	name	Alice
Parent	name	Bob
Parent	name	Brad
Parent	name	Chelsea
Parent	name	Jane
Parent	name	John
Parent	title	Ninja Pirate

Composite index

```
WHERE lastname = 'Smith'  
  AND firstname >= 'B' AND firstname < 'C'
```

Scan range [Parent Smith B, Parent Smith C):

	Kind	lastname	firstname
	Parent	Anderson	Jane
	Parent	Barrett	Ryan
	Parent	Smith	Bob
	Parent	Smith	Brad
	Parent	Smith	Chelsea
	Parent	Thomas	Alice

Merge join

Intersect results incrementally, using key:

	Kind	Name	Value	Key
	Parent	firstname	John	X
	Parent	firstname	John	Y
	Parent	lastname	Smith	Y
	Parent	lastname	Smith	Z

Datastore in flight

Transactions

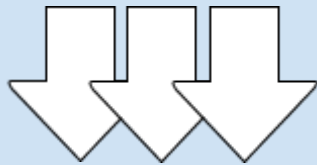
- ACID - Atom, Consistent, Isolated, Durable
- Optimistic concurrency; serialized writes

Entity groups

- Hierarchy of entities
- Related data, transactions

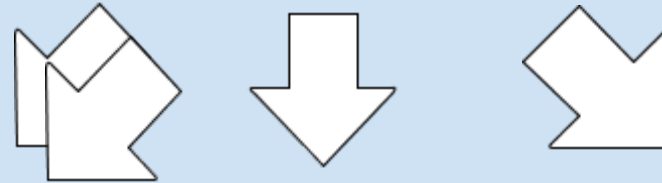
Sharding

Single



Counter

Sharded



Counter

Counter

Counter

Roadmap

- Storing/serving large files
- Database export
- Task queues
- Incoming email
- XMPP API

A decorative header at the top of the slide featuring four spheres. On the left, a green sphere is partially visible. To its right, three other spheres (blue, red, and yellow) are partially visible, overlapping each other and the top edge of the slide.

Wrap up



Always free to get started

Free Quota

~5M pageviews/month

- 6.5 CPU hrs/day
- 1 GB storage
- 2,000 recipients emailed
- 1 GB/day bandwidth



Purchase Additional Resources *



* free monthly quota of ~5 million page views still in full effect

App Engine in three bullets

Deploy your apps to a platform that is



- Easy to use
- Easy to scale
- Easy to manage

Sign Up for Java!



http://appengine.google.com/promo/java_runtime



Google I/O

Google™



<http://code.google.com/io>

- Google's biggest developer event of the year
- May 27-28 in San Francisco
- Google App Engine, GWT and SDC sessions
- Direct interaction with the engineering team

Google™

Thank you

A series of overlapping semi-circles in light green, light blue, light red, and light yellow are positioned along the top edge of the slide.

Read more

<http://code.google.com/appengine>

Early look at Java

http://appengine.google.com/promo/java_runtime

Contact info

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Developer Advocate

fredsa@google.com

Questions

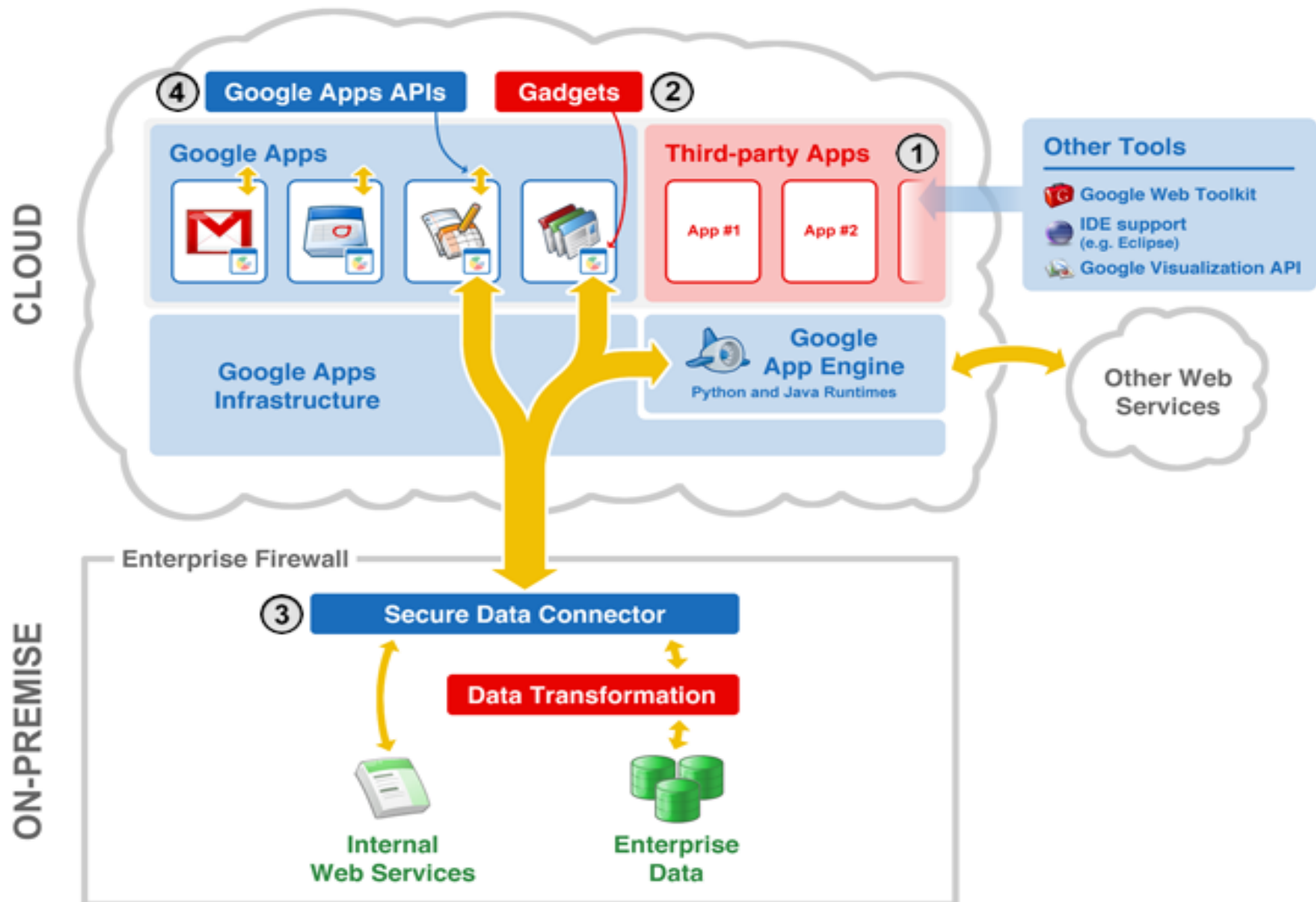
?



A decorative header at the top of the slide featuring four overlapping spheres: a green one on the left, and blue, red, and yellow ones on the right.

Appendix

All together



Database import sample code

```
from google.appengine.ext import db

class Album(db.Model):
    artist = db.StringProperty()
    title = db.StringProperty()
    publication_date = db.DateProperty()
    length_in_minutes = db.IntegerProperty()
```

```
import datetime
from google.appengine.ext import db
import models

class AlbumLoader(Loader):
    def __init__(self):
        Loader.__init__(self, 'Album',
            [('title', str),
             ('artist', str),
             ('publication_date', lambda x: datetime.datetime.strptime(x, '%m/%d/%Y').date()),
             ('length_in_minutes', int)
            ])

```



A year in review

- apr - launch at Campfire One
- may - open sign-ups, Memcache & Images API
- jun - webapp, HTTP header and URL fetch docs
- jul - SDK 1.1.1, logs export
- aug - SDK 1.1.2, DL-able docs, batch write/delete
- sept - SDK 1.1.4, SDK 1.1.5
- oct - HTTPS support, product roadmap
- nov - SDK 1.1.6
- dec - status dashboard, quota details
- jan - SDK 1.1.8
- feb - billing, SDK 1.1.9, new file size limit (10 MB)
- mar - countdown to Campfire One...

