Building Scalable APIs

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What do you mean by Scaling?

Scaling for QPS

Make each request stateless.

Not what this talk is about.

For *one* API

1. Server Implementatation
2. Client Library
3. Documentation
4. Samples

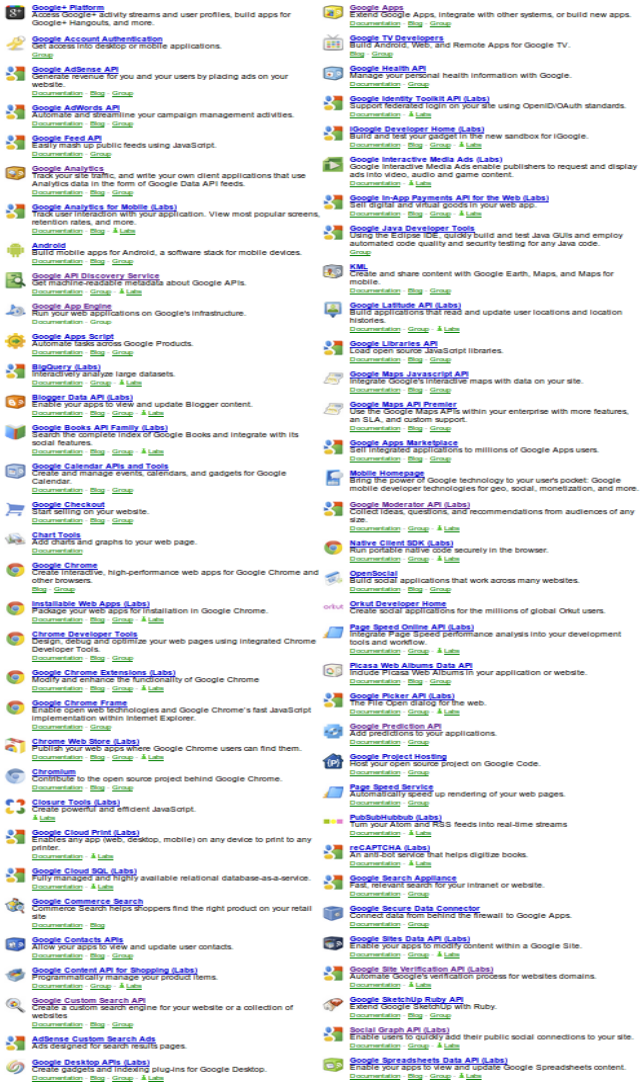
100X

"Right design at X may be very wrong at 10X or 100X"

-Jeff Dean

http://static.googleusercontent.com/external_content/untrusted_dlcp/research.google.com/en/us/people/jeff/WSDM09-keynote.pdf

http://code.google.com/more



Google+ Platform
Access Google+ activity streams and user profiles, build apps for Google+ Hangouts, and more.

Google Account Authentication
Get access into desktop or mobile applications.
Group

Google AdSense API
Generate revenue for you and your users by placing ads on your website.
Documentation · Blog · Group

Google AdWords API
Automate and streamline your campaign management activities.
Documentation · Blog · Group

Google Feed API
Easily mash up public feeds using JavaScript.
Documentation · Group

Google Analytics
Track your site traffic, and write your own client applications that use Analytics data in the form of Google Data API feeds.
Documentation · Blog · Group

Google Analytics for Mobile (Labs)
Track user interaction with your application. View most popular screens, retention rates, and more.
Documentation · Blog · Labs

Android
Build mobile apps for Android, a software stack for mobile devices.
Documentation · Blog · Group

Google API Discovery Service
Get machine-readable metadata about Google APIs.
Documentation · Group · Labs

Google App Engine
Run your web applications on Google's infrastructure.
Documentation · Group

Google Apps Script
Automate tasks across Google Products.
Documentation · Blog · Group

BigQuery (Labs)
Interactively analyze large datasets.
Documentation · Group · Labs

Blogger Data API (Labs)
Enable your apps to view and update Blogger content.
Documentation · Blog · Group · Labs

Google Books API Family (Labs)
Search the complete index of Google Books and integrate with its social features.
Documentation · Blog · Group · Labs

Google Calendar APIs and Tools
Create and manage events, calendars, and gadgets for Google Calendar.
Documentation · Blog · Group

Google Checkout
Start selling on your website.
Documentation · Blog · Group

Chart Tools
Add charts and graphs to your web page.
Documentation

Google Chrome
Create interactive, high-performance web apps for Google Chrome and other browsers.
Blog · Group

Installable Web Apps (Labs)
Package your web apps for installation in Google Chrome.
Documentation · Blog · Group · Labs

Chrome Developer Tools
Design, debug and optimize your web pages using integrated Chrome Developer Tools.
Documentation · Blog · Group

Google Chrome Extensions (Labs)
Modify and enhance the functionality of Google Chrome
Documentation · Blog · Group · Labs

Google Chrome Frame
Enable open web technologies and Google Chrome's fast JavaScript implementation within Internet Explorer.
Documentation · Group

Chrome Web Store (Labs)
Publish your web apps where Google Chrome users can find them.
Documentation · Blog · Group · Labs

Chromium
Contribute to the open source project behind Google Chrome.
Documentation · Blog · Group

Closure Tools (Labs)
Create powerful and efficient JavaScript.
Labs

Google Cloud Print (Labs)
Enables any app (web, desktop, mobile) on any device to print to any printer.
Documentation · Labs

Google Cloud SQL (Labs)
Fully managed and highly available relational database-as-a-service.
Documentation · Labs

Google Commerce Search
Commerce Search helps shoppers find the right product on your retail site
Documentation · Blog

Google Contacts APIs
Allow your apps to view and update user contacts.
Documentation · Blog · Group

Google Content API for Shopping (Labs)
Programmatically manage your product items.
Documentation · Group · Labs

Google Custom Search API
Create a custom search engine for your website or a collection of websites
Documentation · Blog · Group

AdSense Custom Search Ads
Ads designed for search results pages.

Google Desktop APIs (Labs)
Create gadgets and indexing plug-ins for Google Desktop.
Documentation · Blog · Group · Labs

Google Apps
Extend Google Apps, integrate with other systems, or build new apps.
Documentation · Blog · Group

Google TV Developers
Build Android, Web, and Remote Apps for Google TV.
Blog · Group

Google Health API
Manage your personal health information with Google.
Documentation · Group

Google Identity Toolkit API (Labs)
Support federated login on your site using OpenID/OAuth standards.
Documentation · Labs

iGoogle Developer Home (Labs)
Build and test your gadget in the new sandbox for iGoogle.
Documentation · Blog · Group · Labs

Google Interactive Media Ads (Labs)
Google Interactive Media Ads enable publishers to request and display ads into video, audio and game content.
Documentation · Labs

Google In-App Payments API for the Web (Labs)
Sell digital and virtual goods in your web app.
Documentation · Blog · Group · Labs

Google Java Developer Tools
Using the Eclipse IDE, quickly build and test Java GUIs and employ automated code quality and security testing for any Java code.
Group

KML
Create and share content with Google Earth, Maps, and Maps for mobile.
Documentation · Blog · Group

Google Latitude API (Labs)
Build applications that read and update user locations and location histories.
Documentation · Group · Labs

Google Libraries API
Load open source JavaScript libraries.
Documentation · Blog · Group

Google Maps Javascript API
Integrate Google's interactive maps with data on your site.
Documentation · Blog · Group

Google Maps API Premier
Use the Google Maps APIs within your enterprise with more features, an SLA, and custom support.
Documentation · Blog · Group

Google Apps Marketplace
Sell integrated applications to millions of Google Apps users.
Documentation · Blog · Group

Mobile Homepage
Bring the power of Google technology to your user's pocket: Google mobile developer technologies for geo, social, monetization, and more.

Google Moderator API (Labs)
Collect ideas, questions, and recommendations from audiences of any size.
Documentation · Group · Labs

Native Client SDK (Labs)
Run portable native code securely in the browser.
Documentation · Group · Labs

OpenSocial
Build social applications that work across many websites.
Documentation · Blog · Group

Orkut Developer Home
Create social applications for the millions of global Orkut users.

Page Speed Online API (Labs)
Integrate Page Speed performance analysis into your development tools and workflow.
Documentation · Group · Labs

Picasa Web Albums Data API
Include Picasa Web Albums in your application or website.
Documentation · Blog · Group

Google Picker API (Labs)
The File Open dialog for the web.
Documentation · Group · Labs

Google Prediction API
Add predictions to your applications.
Documentation · Group

Google Project Hosting
Host your open source project on Google Code.
Documentation · Group

Page Speed Service
Automatically speed up rendering of your web pages.
Documentation · Group

PubSubHubbub (Labs)
Turn your Atom and RSS feeds into real-time streams
Documentation · Labs

reCAPTCHA (Labs)
An anti-bot service that helps digitize books.
Documentation · Labs

Google Search Appliance
Fast, relevant search for your intranet or website.
Documentation · Group

Google Secure Data Connector
Connect data from behind the firewall to Google Apps.
Documentation · Group

Google Sites Data API (Labs)
Enable your apps to modify content within a Google Site.
Documentation · Group · Labs

Google Site Verification API (Labs)
Automate Google's verification process for websites domains.
Documentation · Labs

Google SketchUp Ruby API
Extend Google SketchUp with Ruby.
Documentation · Blog · Group

Social Graph API (Labs)
Enable users to quickly add their public social connections to your site.
Documentation · Group · Labs

Google Spreadsheets Data API (Labs)
Enable your apps to view and update Google Spreadsheets content.
Documentation · Blog · Group · Labs

For *one hundred* APIs

M x N

M = # APIS (~100)

N = # Languages (~5)

server + client + documentation + samples

The old way

- Java Library
- Atom and AtomPub
- Teams run their own servers
- API definition in code
- Documentation: Hand written
- Clients: Hand written

The old way didn't scale at 100X

- Java Library
- Atom and AtomPub
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The new way

- API Service
- RESTful JSON

API Service

- Machine readable description of the API
- Protocol Buffer Interface
- RESTful JSON default

RESTful JSON

- Data vs Documents
  - internal and external developers
- Embed vs Envelope
- Partial
- Namespaces
- Collections vs Collections+

Discovery

- Public machine readable description
- APIs Explorer
- Client Libraries
- ???

Discovery


```
{
 "kind": "discovery#directoryList",
 "items": [
  {
   "kind": "discovery#directoryItem",
   "id": "adsense:v1",
   "name": "adsense",
   "version": "v1",
   "title": "AdSense Management API",
   "description": "Gives AdSense publishers access to their inventory
       and the ability to generate reports",
   "discoveryLink": "./apis/adsense/v1/rest",
   "icons": {
    "x16": "http://www.google.com/images/icons/product/adsense-16.png",
    "x32": "http://www.google.com/images/icons/product/adsense-32.png"
   },
   "documentationLink": "https://code.google.
com/apis/adsense/management/",
   "labels": [
    "labs"
   ],
   "preferred": true
  },
  ...
```

Discovery


```
{
 "kind": "discovery#restDescription",
 "id": "plus:v1",
 "name": "plus",
 "version": "v1",
 "title": "Google+ API",
 "description": "The Google+ API enables developers to build on top
      of the Google+ platform.",
 "icons": {
  "x16": "http://www.google.com/images/icons/product/gplus-16.png",
  "x32": "http://www.google.com/images/icons/product/gplus-32.png"
 },
 "documentationLink": "http://developers.google.com/+/api/",
 "labels": [
  "labs"
 ],
```

Discovery

```
...
 "basePath": "/plus/v1/",
 "parameters": {
  "fields": {
   "type": "string",
   "description": "Selector specifying which fields to include in a
       partial response.",
   "location": "query"
  },
  ...
 },
```

Discovery

```
...
"auth": {
 "oauth2": {
  "scopes": {
   "https://www.googleapis.com/auth/plus.me": {
    "description": "Know who you are on Google"
   }
  }
 }
},
"schemas": {
},
```

Discovery

```
"resources": {
 "activities": {
  "methods": {
   "get": {
    "id": "plus.activities.get",
    "path": "activities/{activityId}",
    "httpMethod": "GET",
    "description": "Get an activity.",
    "parameters": {
      ...
     }
    },
    "parameterOrder": [
     "activityId"
    ],
    "response": {
     "$ref": "Activity"
    },
    "scopes": [
     "https://www.googleapis.com/auth/plus.me"
    ]
   },
```

Discovery

```
import httplib2
import json
import uritemplate
import urllib
import urlparse

DISCOVERY_URI = "https://www.googleapis.com/discovery/v1/apis/urlshortener/v1/rest"
h = httplib2.Http()
resp, content = h.request(DISCOVERY_URI)
discovery = json.loads(content)

BASE_URI = urlparse.urljoin(DISCOVERY_URI, discovery['basePath'])

class Collection(object): pass

def build(discovery, collection):
  for name, resource in discovery.get('resources', {}).iteritems():
    setattr(collection, name, build(resource, Collection()))
  for name, method in discovery.get('methods', {}).iteritems():
    setattr(collection, name, createNewMethod(name, method))
  return collection

def createNewMethod(name, method):
  def newMethod(**kwargs):
    body = kwargs.pop('body', None)
    url = urlparse.urljoin(BASE_URI, uritemplate.expand(method['path'], kwargs))
    for pname, pconfig in method.get('parameters', {}).iteritems():
      if pconfig['location'] == 'path' and pname in kwargs:
        del kwargs[pname]
    if kwargs:
      url = url + '?' + urllib.urlencode(kwargs)
    return h.request(url, method=method['httpMethod'], body=body,
                     headers={'content-type': 'application/json'})

  return newMethod

service = build(discovery, Collection())
print service.url.insert(body='{"longUrl": "http://www.google.com/"}')[1]
```

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```

Further Reading

How Google Builds APIs - I/O 2010

http://goo.gl/MZ5Up

Google APIs Discovery Service

http://code.google.com/apis/discovery/

Internship and new grad opportunities

Software Engineer

Develop new applications that can make a difference to millions of people. Work on next-generation technologies and software solutions.

Associate Product Manager

Bring Google’s newest products and technologies to market. APMs work with Engineering to develop cutting-edge products that anticipate and exceed market requirements.

Associate Technology Manager

Work with Google's most strategic partnerships around the world to bridge the gap between engineering and sales in developing, distributing, monetizing, and marketing Google's latest products & technologies.

User Experience Designer

Critical thinkers with a good design sense, a strong technical background, and an eye for making things better. Your work can have an impact on the web experience of millions of Google users.

Apply: www.google.com/students/eng

Application Process

Full-Time

Apply! Submit your resume and unofficial transcripts. http://www.google.com/students/eng

Two general fit technical phone interviews.

Second round onsite technical interviews.

Offer

Internship

Apply! Submit your resume and unofficial transcripts. http://www.google.com/students/eng

Two technical phone interviews.

Host and project matching.

Offer.