Overview

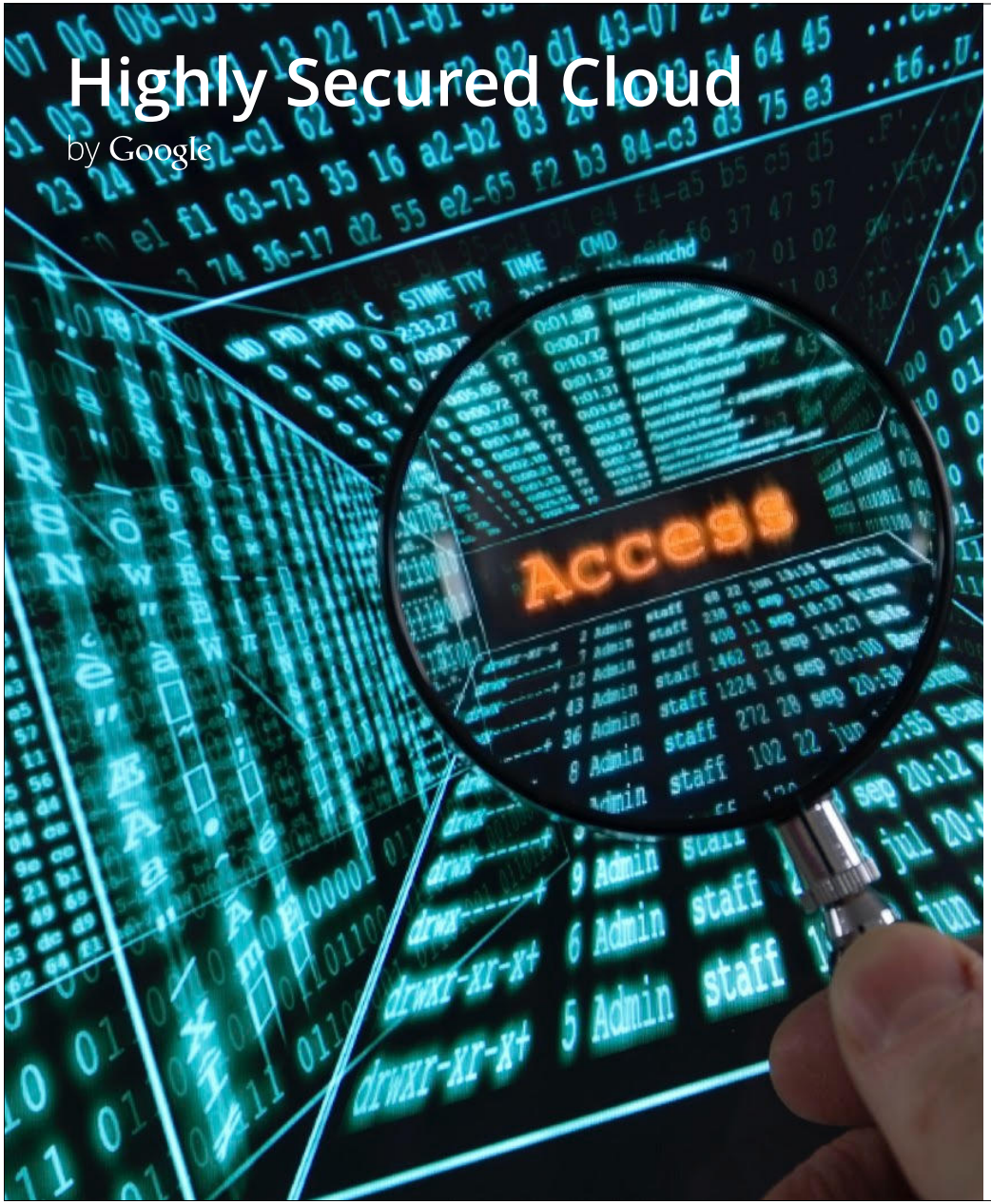
Google Cloud Platform

Google Cloud Platform


Why do we need Cloud?
Google Cloud Platform

- Why
  - too much data that your PC/servers couldn't store
  - too much computation your PC/servers couldn't deal with
  - your PC/servers are hard to scale
- Why not
  - need a website
  - it sounds cool


Why should we use Google Cloud Platform?
Google Cloud Platform



Access Control

public, private networks
block storage

Encryption

all block storages will be encrypted on the cloud, no worries about leaks

Encapsulation

all instances, virtual machines, networks or any resources will be encapsulated to prevent any other ones take over your precious stuffs

Google Cloud Platform

- You will be using Google's Infrastructure
  - **Virtual Machines**
  - **Networks**
  - **Storage**
- And be placed in a safe place
  - **Google's Data Center**
- And Google will do those for you
  - **Scaling**
  - **Migrating**
  - **Maintenance**
  - **Take over anything you don't wanna do**

So What is Google Cloud Platform

- The best way how Google share their
  - Cloud Infrastructure
  - Cloud Knowledge
  - Cloud Engineers
- Your own data center, with minimum cost as possible as it could be

Google Cloud Family

Computing

- Compute Engine
- App Engine

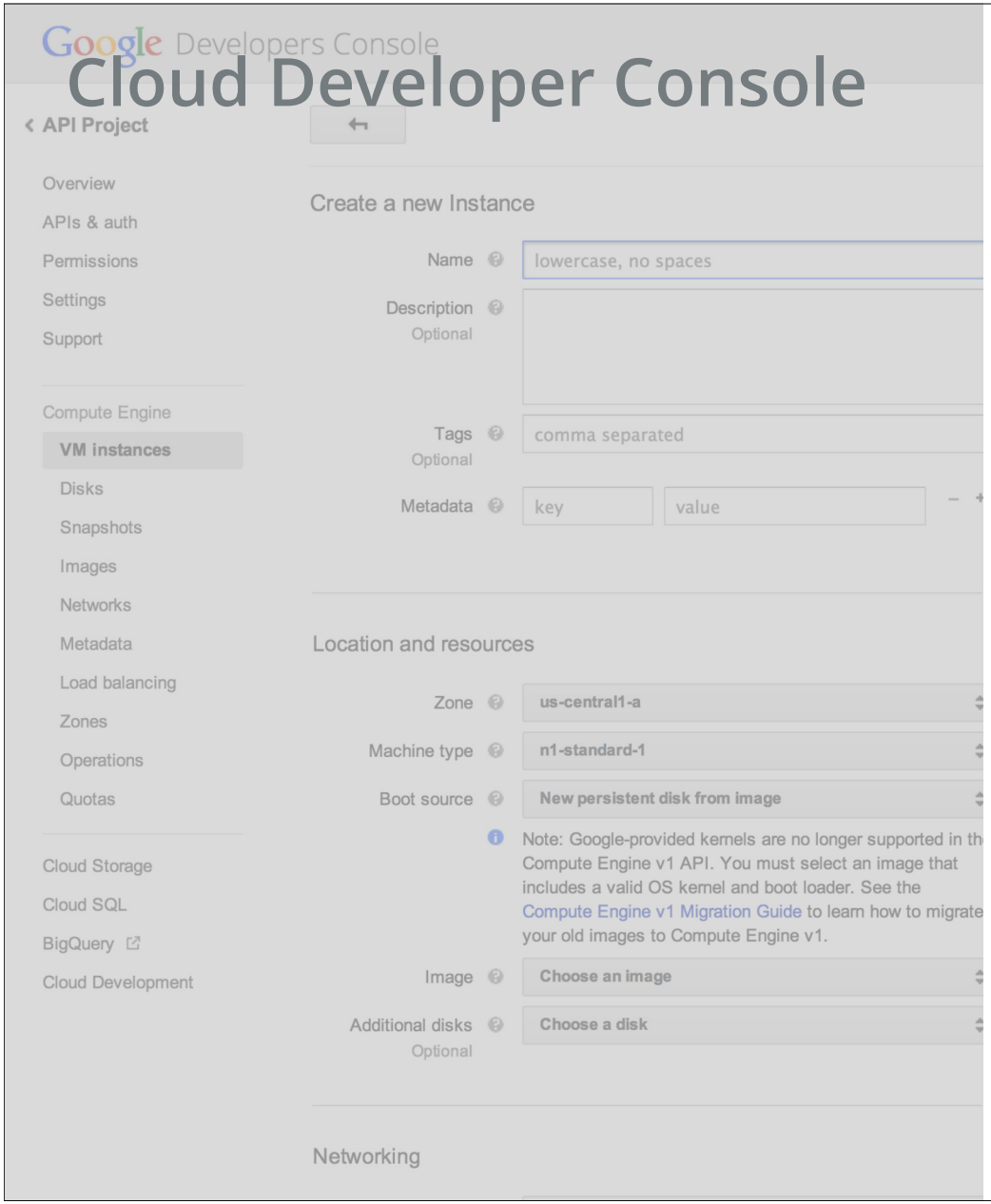
Storage

- Cloud SQL
- Datastore
- Cloud Storage

App Services

- Cloud Endpoints
- Big Query

Cloud Developer Console



- Manage all API services on Google Cloud
  (e.g. Translation API, Prediction API, Maps API...)
- Compose equivalent commands for:
  Command-line tools (Google Cloud SDK)
  RESTful API
- Dashboard for monitoring all resources on Google Cloud Platform

Google Cloud SDK

```
(littleq@littleq-macbook-pro>s000)
(731:%)—o) gcloud components list
The following components are available through the Google Cloud
SDK.  You may choose to install one or more of the pre-configured
packages (which contain everything you need to get started), and/or
any of the individual components below.

                                Packages
| Status        | Name                                    | ID          | Siz
| Not Installed | Cloud SDK for Go Developers             | pkg-go      |
| Not Installed | Cloud SDK for Java Developers           | pkg-java    |
| Installed     | Cloud SDK Core Command Line Tools       | pkg-core    |
| Installed     | Cloud SDK for Python and PHP Developers | pkg-python  |

                            Individual Components
| Status        | Name                                    | ID
| Not Installed | App Engine SDK for Go (Mac OS X, x86_64) | gae-go-darwin-x
| Installed     | App Engine Launcher Application for Mac  | gae-python-laun
| Installed     | App Engine SDK for Java                  | gae-java
| Installed     | App Engine SDK for Python and PHP        | gae-python
| Installed     | Big Query Command Line Tool              | bq
| Installed     | Cloud SDK Core Libraries                 | core
| Installed     | Cloud SQL Admin Command Line Interface   | sql
| Installed     | Cloud Storage Command Line Tool          | gsutil
| Installed     | Compute Engine Command Line Tool         | gcutil

To install new components or update existing ones, run:
 $ gcloud components update [component ids]
```

- Install/uninstall/upgrade all command-line tools related to Google Cloud Platform
- Notification for new release of any Cloud SDK component
- Automatization

Storage

Storage Services in Google Cloud Platform

Google Cloud Platform

Cloud SQL

- It's MySQL, but managed by Google
- Relational Data Storage on Google Cloud
- Use Cases
  - LAMP Applications
  - Google App Engine

Cloud Datastore

- Non-relational database (NoSQL)
- Schema-less data
- Use Cases
  - Highly scalable application

Cloud Storage

- Protected
  Your data is protected at multiple physical locations
- Strong, configurable security
  OAuth or simple access control on your data
- Multiple usages
  - **Serve static objects directly**
  - **Use with other Google Cloud products (Bridge)**

App Services

Power Up Your Applications in Google Cloud Platform

Google Cloud Platform

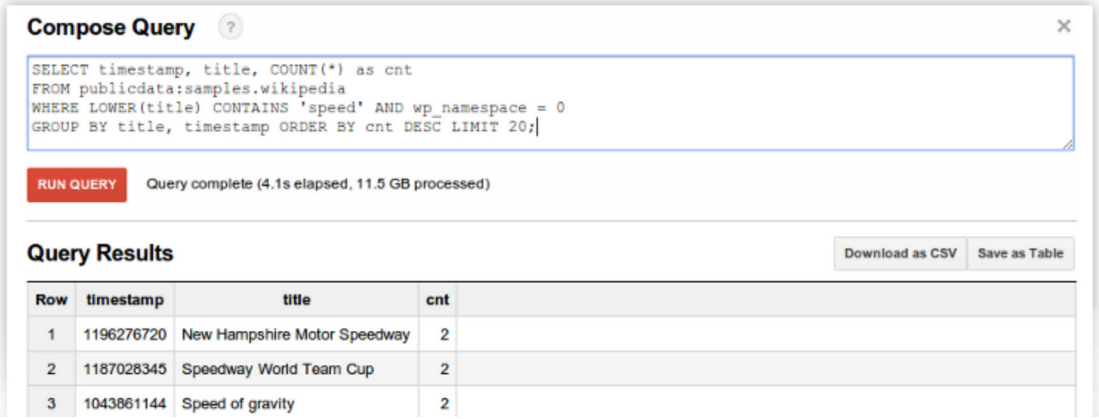
App Services in Google Cloud Platform

- Data Analysis Tool
  - BigQuery
  - Google Prediction API
- Cloud Endpoints
- Google Cloud DNS

Big Query

- Analyze terabytes of data, just a click of a button
- Super-fast, SQL-like queries
- Convenient import/export mechanism

BigQuery Browser Tool



- Previewing of data
- Statistics of tables
- History/Cached Result
- Save query result as another BigQuery table

Popular Languages on Github

BIGQUERY

```
SELECT repository.language, COUNT(repository.language) as num
  FROM [publicdata:samples.github_nested]
  GROUP BY repository.language
  ORDER BY num DESC
  LIMIT 10
```

1.6s elapsed, 12.8 MB processed

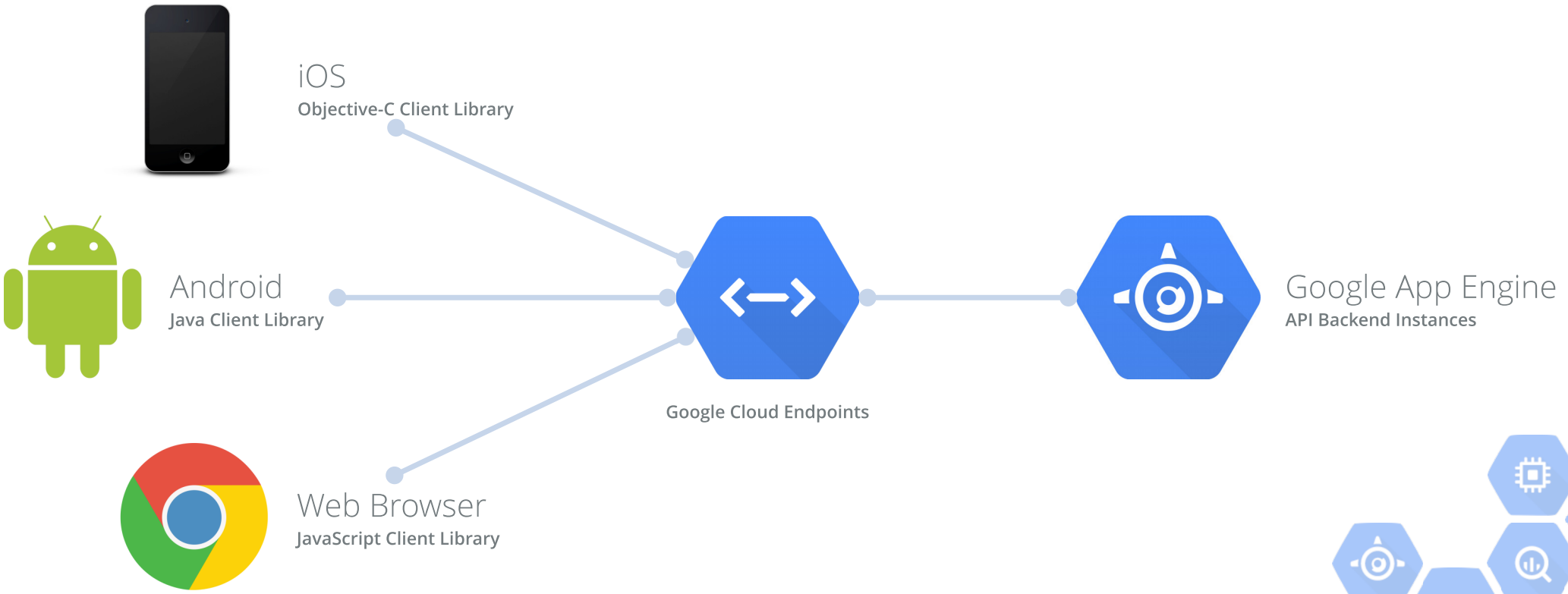
More Ways To Use BigQuery

- Command-line Tool
  a full-featured command-line tool is included in Google Cloud SDK, called `bq`
- RESTful API
  a set of APIs is ready for helping you to control all components and data on your BigQuery
- BigQuery Connector for Excel
  Microsoft Excel? No problem, we have an extension for your excel to query over your excel data
- Third-party Tools
- Make your own

Cloud Endpoints

- generate **APIs** and **client libraries** from an App Engine application
- make it easier to share web backend for mobile applications

Cloud Endpoints Architecture



Use Cases

Website

solid integration, define APIs in Google App Engine application and generate JavaScript client library with Endpoints, no more handmade AJAX

API Server

define APIs with Endpoints API, then it will be a RESTful API service immediately

Mobile Applications

Backend-as-a-Service

define reusable APIs with GAE various services, then generate client libraries for iOS, Android and web browser to share the resources you have

Prediction API

- Machine Learning
  - Categorical
  - Regression
- Pattern-matching
- Simple API Interface

What can you do with Prediction API

- Recommendation System
  Predict what will be liked by your users
- Filtering spams
  Categorizes messages as spam or non-spam
- Semantic Analysis
  Know how your users feel, given your comments

Prediction Model Gallery

- Language Identifier
- Tag Categorizer
- Sentiment Predictor

Try Prediction

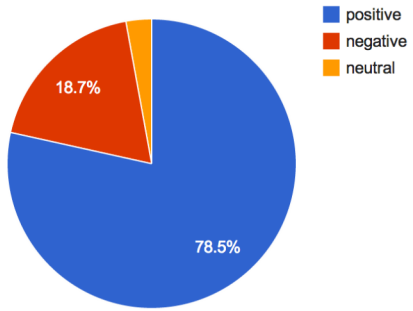
Select a model: Sentiment Predictor — Analyzes the sentiment of a short English-language text snippet.

Phrase: hello world — Enter a text comment for sentiment analysis

Predict

Results: positive

Switch chart type



Google App Engine

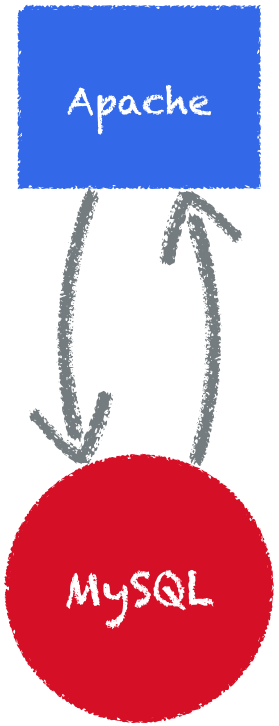
Platform-as-a-Service in Google Cloud Platform

Google Cloud Platform


How did you build a full-functional web service?
a scalable, high-performance, fault-tolerant service
Google Cloud Platform

Traditional Way: LAMP

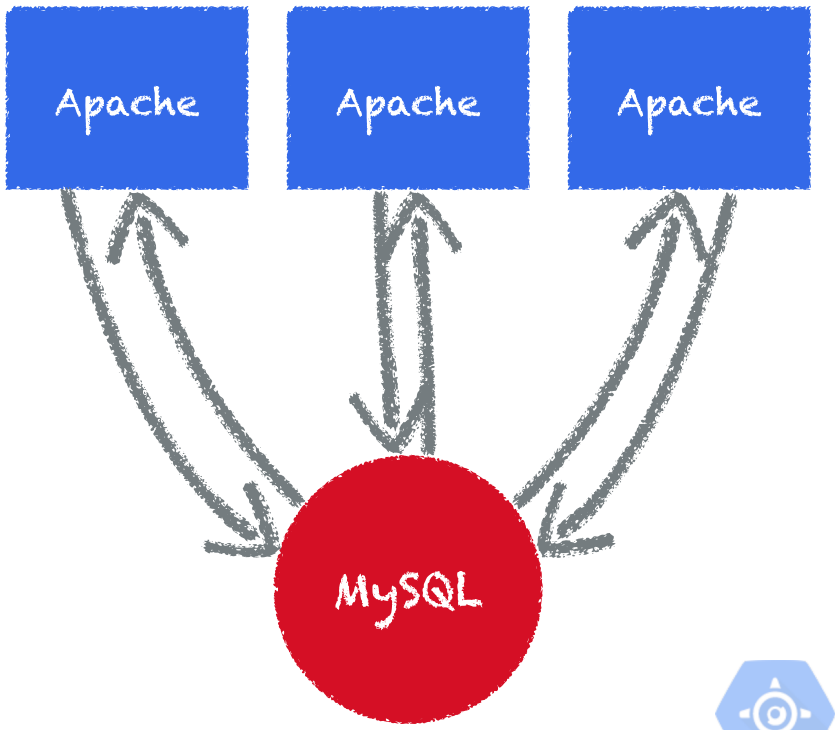
- LAMP
  - Linux
  - Apache
  - MySQL
  - Programming Languages
- Failed: not scalable



Google Cloud Platform

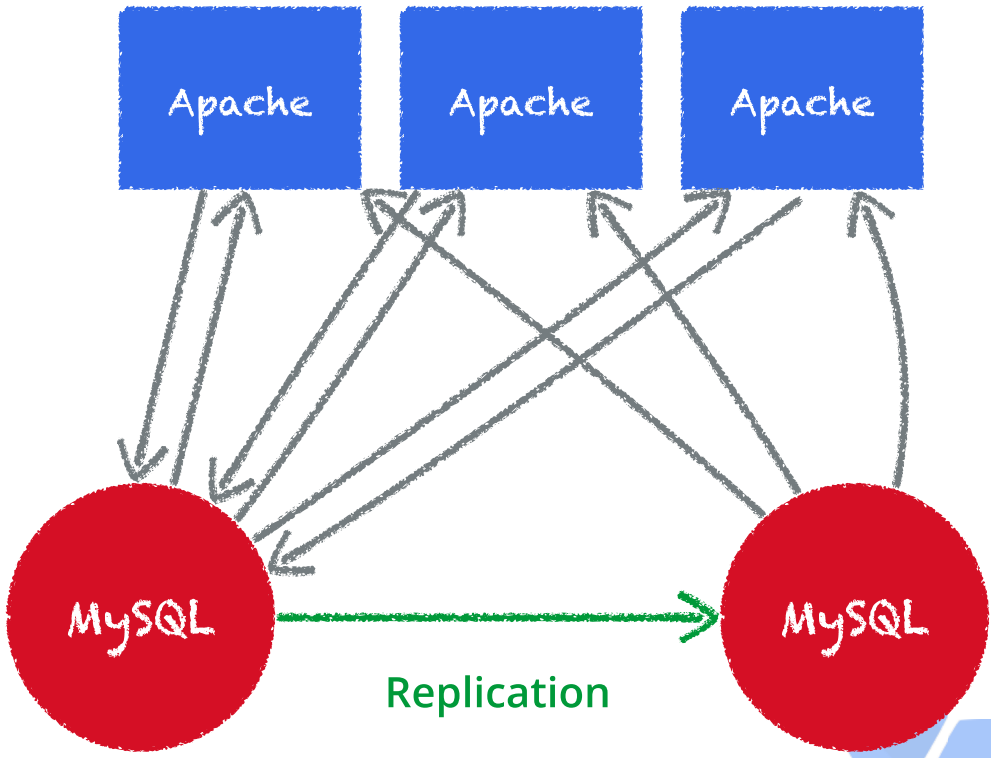
You Need Load Balancing

- Power up Apache2 army!
- Failed: database is alone, too busy



Now Scale Database

- Replication (Master/Slave)
- Failed: Master may die



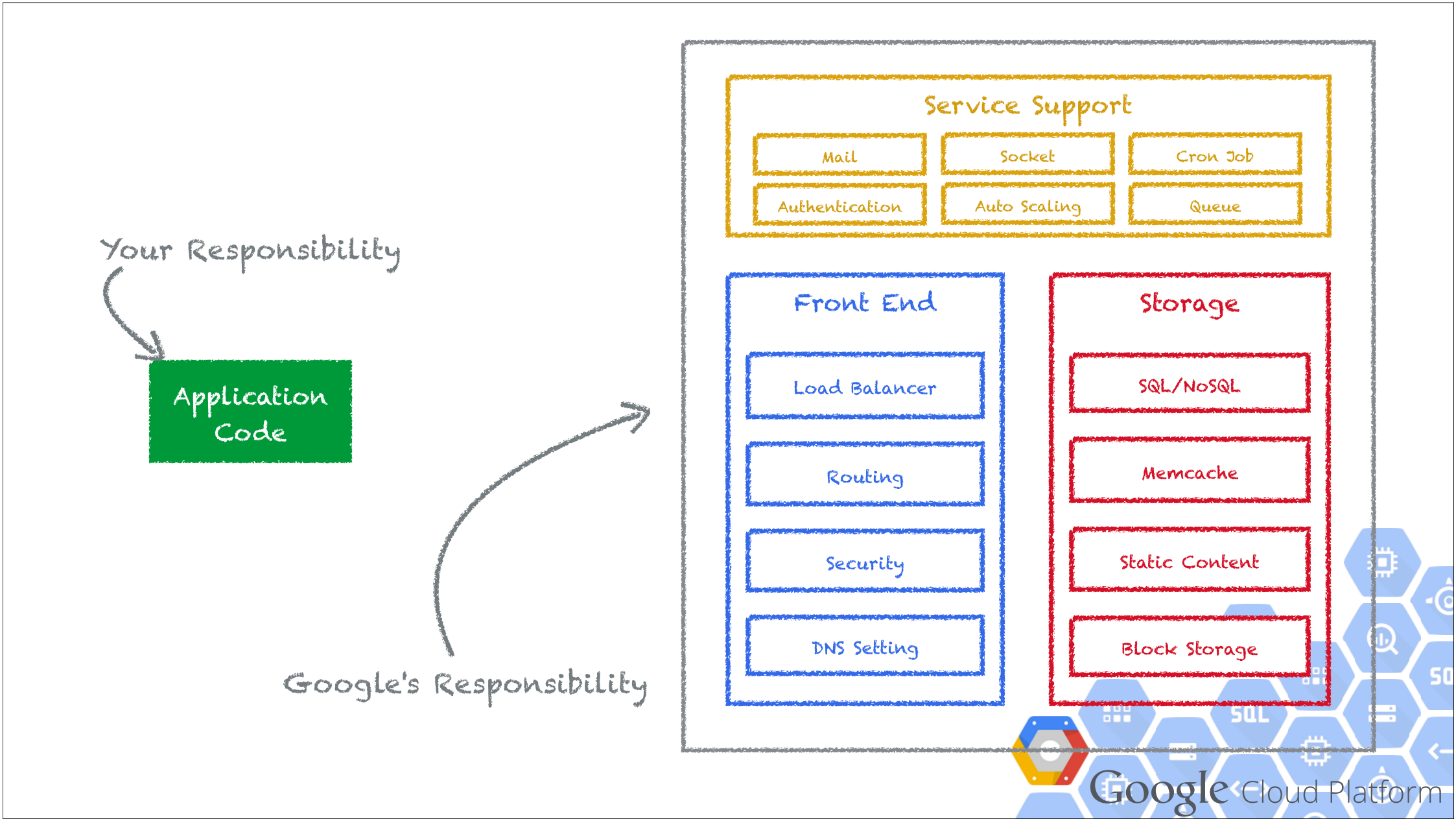
Life is good, don't waste it

Platform-as-a-Service

- You should care
  - **Application code**
  - **Automated Scaling**
- You should not care
  - **Server management (networking, cores, memory, disks...)**
  - **Bootstrapping**
  - **Deployment**

How PaaS Work

- **Application code** gets **executed** (Runtime)
- **Static Content** gets **served** (CDN)
- **Data** gets **stored** (Database)
- **Server** gets **secured** (Sandbox)
- **Service gets scaled (and automatically)**


Your Responsibility
Application Code
Google's Responsibility
Service Support
Mail
Socket
Cron Job
Authentication
Auto Scaling
Queue
Front End
Load Balancer
Routing
Security
DNS Setting
Storage
SQL/NoSQL
Memcache
Static Content
Block Storage
Google Cloud Platform

Google App Engine

- Sandboxed containers with various runtimes
- Easy to build
  All you need to do is preparing your application code
- Easy to run
  Deploy with a single command, and it works
- Easy to scale
  scale on GAE is automated and easy to configure

Languages and Runtimes

> Java

Java Servlets interface
Support for standard interfaces to App Engine scalable services such as JDO, JPA, JavaMail and JCache

> Python

Python 2.7 and full support for any pure Python libraries, tools and frameworks
Built-in Compiled C-extension libraries are good to go

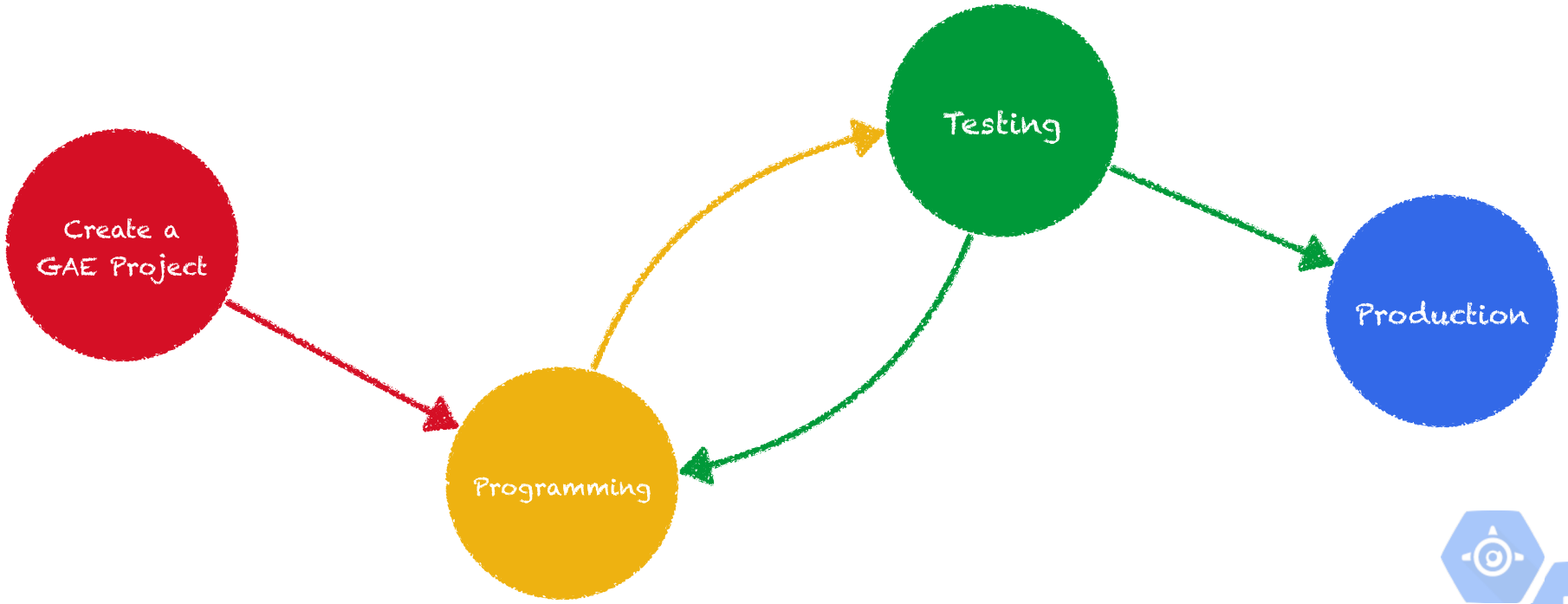
> PHP

Currently in "Preview" stage
But enough for your "Wordpress"

> Go

Currently in "Experimental" stage
automated build service included, no need to rebuild when code changed
and interface similar to the standard Go http package

Workflow of Google App Engine



Data on Google App Engine

- Datastore
  schema-less, scalable object data storage
  rich data modeling API
  SQL-like query language, GQL (Google Query Language)
- Cloud Storage
  strong, flexible, distributed storage service for serving or storing static files
- Search
  Google-like search on structured data, such as full text, numbers, dates and geographic locations
- Memcache
  a distributed, in-memory data cache to greatly improve your applications
- Logs
  programmatic access to logging system
  a full functional control panel in Cloud Console, better than a gzip file
- Migration/Backup Tools

Communication

Channel

Create a persistent connection between your application and Google servers
Send messages to JavaScript clients in real-time

Mail

send email messages on behalf of admin or Google account users
receive mails at various custom email addresses

URL Fetch

Efficiently issue HTTP or HTTPS requests on your web application

Outbound Socket

Socket support without requiring any special App Engine libs or any special App Engine (`import socket` in Python)

XMPP

Enable you application to send and receive chat messages to/from any XMPP-compatible messaging service (e.g. Facebook Chat, previous Google talks...)

Process Management

- Task Queue

  allow your application to asynchronize user requests, and organize them to be executed later

- Scheduled Task (Cron Job)

  configure regular tasks at scheduled times or regular intervals

Computation

- ## Modules
  Create instances for exempting from request deadlines and request more memory and CPI resources for computing

- ## MapReduce
  optimized adaptation of the MapReduce computing model for efficient distributing computation on large data sets

- ## Images API
  Manipulate, combine and enhance images
  Convert images between formats
  Query metadata of images (height/width, colors)

Related Projects & Libraries

Extend Your App Engine to Work on Large-scale Computation

Google Cloud Platform

Pipeline

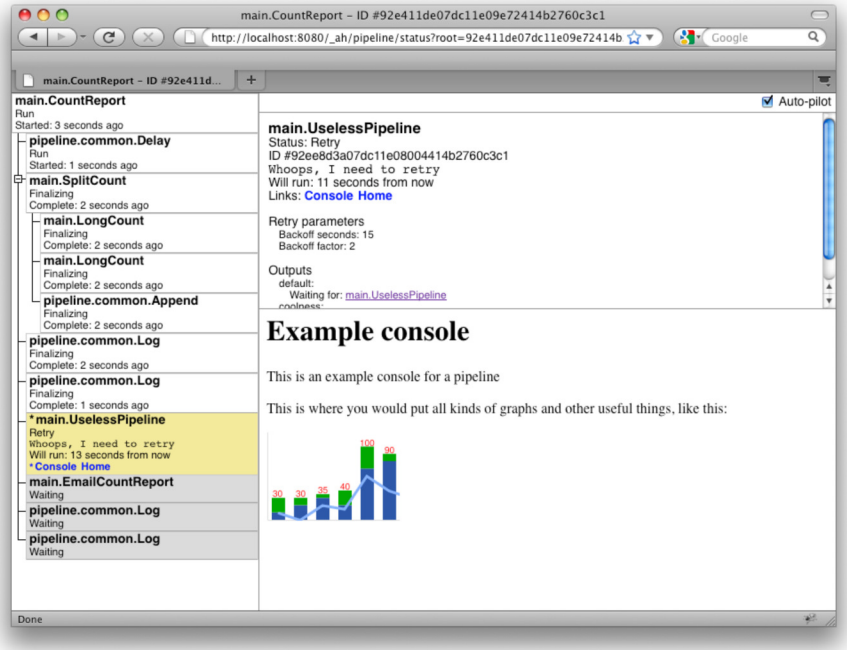
- Connects together complex, time-consuming workflows
- Asynchronize tasks
- Built-in pipelines or implement your own pipelines

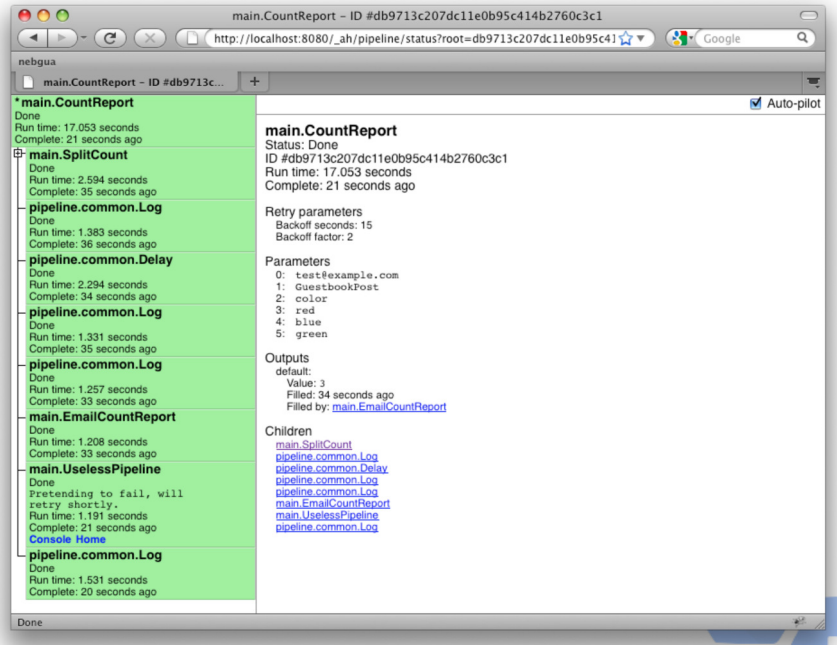
Create a Pipeline

PYTHON

```
from pipeline import common

class CountReport(pipeline.Pipeline):

    def run(self, email_address, entity_kind, property_name, *value_list):
        split_counts = yield SplitCount(entity_kind, property_name, *value_list) # pipeline to gain
count result
        yield common.Log.info('SplitCount result = %s', split_counts)

        with pipeline.After(split_counts):
            with pipeline.InOrder():
                yield common.Delay(seconds=1)
                yield common.Log.info('Done waiting')
                yield EmailCountReport(email_address, split_counts) # another sending mail pipeline
```

Pipeline Console





MapReduce Library

https://developers.google.com/appengine/docs/python/dataprocessing/mapreduce_library

- Programming model for **processing large data sets** in a **parallel** and **distributed** algorithms on a cluster
- differ from map/reduce, one of functional programming conception, but has the same idea, **"divide and conquer"**
- Proposed by Google
- Hadoop-free

MapReduce in Functional Programming

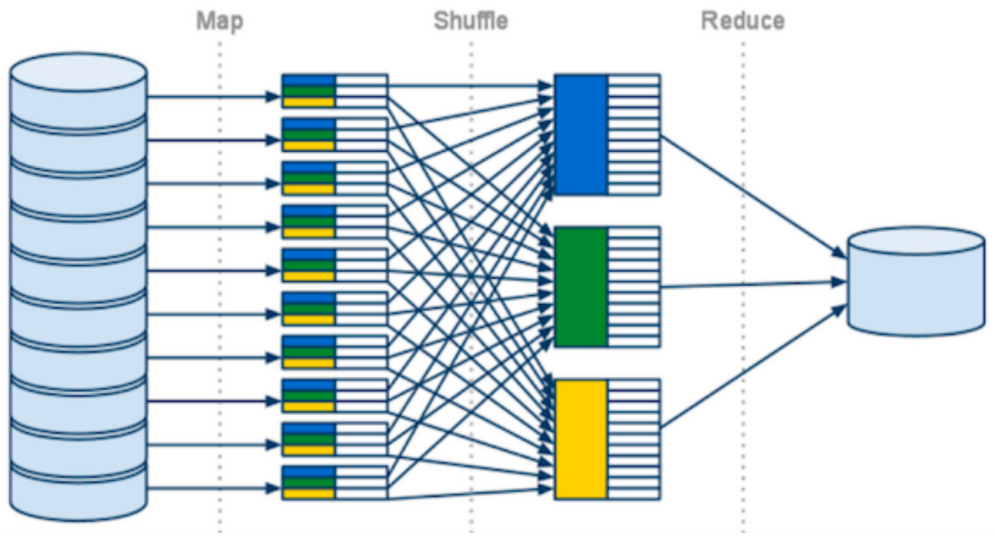
- map()/reduce() in Python
- map(**func(elem)**, list) -> **list**
- reduce(**func(elem1, elem2)**, list) -> **elem**

PYTHON

```
>>> map(lambda x: x*2, [1,2,3,4])
 [2,4,6,8]

>>> reduce(lambda x,y: x+y, [1,2,3,4])
 10
```

MapReduce: Stages

- Map
- Shuffle
- Reduce



Configure a MapReduce Pipeline

PYTHON

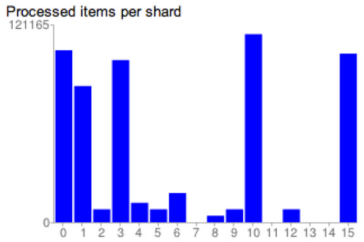
```
class WordCountPipeline(base_handler.PipelineBase):

    def run(self, filekey, blobkey):
        output = yield mapreduce_pipeline.MapreducePipeline(
                "word_count", # name of mapreduce job
                "main.word_count_map", # mapper function
                "main.word_count_reduce", # reducer function
                "mapreduce.input_readers.BlobstoreZipInputReader", # input reader
                "mapreduce.output_writers.FileOutputWriter", # output writer
                mapper_params={ # parameters to supply to the input reader
                    "input_reader": {
                        "blob_key": blobkey,
                        },
                    },
                reducer_params={ # parameters to supply to the output writer
                    "output_writer": {
                        "mime_type": "text/plain",
                        "output_sharding": "input",
                        "filesystem": "blobstore",
                        },
                    },
                shards=16) # number of shards
        yield StoreOutput("WordCount", filekey, output)
```

MapReduce Monitoring

test-map

« Back to Overview | Abort Job

Job #1578697716674A90B9934



Overview

- Running
- Elapsed time: 21 days, 04:56:17
- Start time: 2/20/2014 6:26:57 PM
- input_reader: {"entity_kind":"ad.models.ProductAd","batch_size":50}

Counters

- mapper-calls: 602925 (0.33/sec avg.)
- mapper-walltime-ms: 75273461 (41.08/sec avg.)

Mapper status

Shard	Status	Description	Last work item	Time elapsed
0	success	KeyRangesIterator for Single KeyRange ASC[datastore_types.Key.from_path(u'ProductAd', u'sinyi_house:product:52747V', _app=u's~tagtooadex2') to datastore_types.Key.from_path(u'ProductAd', u'treemall:product:JcRK9Zis1u5s8Vikhp8sI2LwacotjEDJ%2FNKPZohJADvyMpYcYnOZ5lZJYuJ4DRi9=', _app=u's~tagtooadex2'))	Key('ProductAd', 'treemall:product:JcRK9Zis1u5s8Vikhp8sI2LwacotjEDJ%2FMgCp2blgOdmost3HiMBQTSyqQlWmc0Q=')	05:41:36
1	success	KeyRangesIterator for Single KeyRange ASC[datastore_types.Key.from_path(u'ProductAd', u'yahoo:product:4702351', _app=u's~tagtooadex2') to None)	Key('ProductAd', 'zakka:product:ZA144701')	00:53:56
2	running	KeyRangesIterator for Single KeyRange ASC[datastore_types.Key.from_path(u'ProductAd', u'yahoo:product:3249432', _app=u's~tagtooadex2') to datastore_types.Key.from_path(u'ProductAd', u'yahoo:product:4130356', _app=u's~tagtooadex2'))	Key('ProductAd', 'yahoo:product:3323350')	01:27:43
3	success	KeyRangesIterator for Single KeyRange ASC[datastore_types.Key.from_path(u'ProductAd', u'yahoo:product:4130356', _app=u's~tagtooadex2') to datastore_types.Key.from_path(u'ProductAd', u'yahoo:product:4465394', _app=u's~tagtooadex2'))	Key('ProductAd', 'yahoo:product:4465393')	12:35:19
4	running	KeyRangesIterator for Single KeyRange ASC[datastore_types.Key.from_path(u'ProductAd', u'nowshopping:product:27500', _app=u's~tagtooadex2') to datastore_types.Key.from_path(u'ProductAd', u'sinyi_house:product:52747V', _app=u's~tagtooadex2'))	Key('ProductAd', 'nowshopping:product:7147')	01:16:40
5	running	KeyRangesIterator for Single KeyRange ASC[datastore_types.Key.from_path(u'ProductAd', u'treemall:product:JcRK9Zis1u5s8Vikhp8sI8WIF9L1TrmTljK4wALeyIg%3D=', _app=u's~tagtooadex2') to datastore_types.Key.from_path(u'ProductAd', u'treemall:product:JcRK9Zis1u5s8Vikhp8sIwagMhELJShwSO95iYIPVHU%3D=', _app=u's~tagtooadex2'))	Key('ProductAd', 'treemall:product:JcRK9Zis1u5s8Vikhp8sI8WIF9L1TrmTciuHt8aINmk%3D')	00:28:24
6	running	KeyRangesIterator for Single KeyRange ASC[datastore_types.Key.from_path(u'ProductAd', u'herbuy:product:311495797', _app=u's~tagtooadex2') to datastore_types.Key.from_path(u'ProductAd'	Key('ProductAd', 'herbuy:product:99588426')	01:16:40

Google Compute Engine

Infrastructure-as-a-Service in Google Cloud Platform

Google Cloud Platform

Infrastucture-as-a-Service

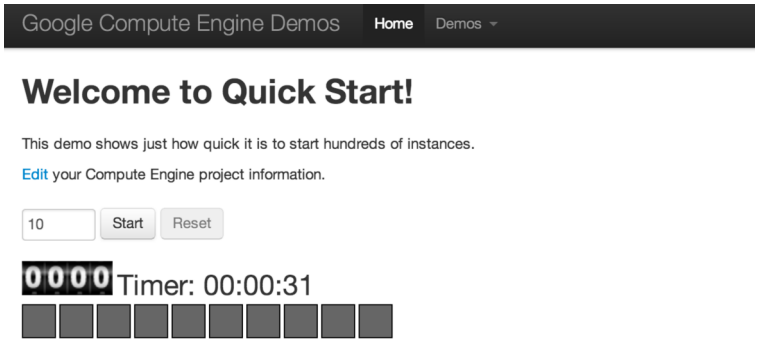
- Google has resources
  - CPU Cores
  - Memory
  - Networking
  - Persistency (Disks, Snapshot, Cloud Storage...)
  - Well-trained engineering monkeys
- You have business and be busy

Google Compute Engine

- High-performance virtual machines
  from micro-VM to large instance
- Powered by Google's global network
  you could build a large cluster with strong and consistent bandwidth, provided by Google
- Load Balancing
  spread incoming traffic across instances
- Fast Bullet Reloading
  quick deployment of large VMs
  command-line interface
  web-based console
- Highly secured
  All data written to disk in Compute Engine will be encrypted by high-class encryption algorithm

Instances on GCE

- KVM-based Virtual machines
- Fast booting time
  routinely takes less than 30 secs
- Various OS support
- Various machine types



http://gce-demos.appspot.com

Operating Systems

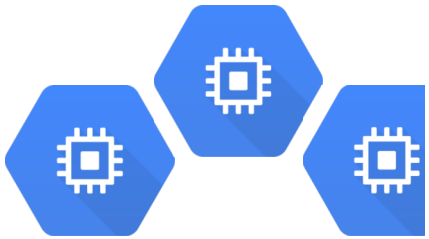
Operating Systems

Premier Only

Google Compute Engine Units (GCEUs)

- a unit of CPU capacity used to describe the compute power of instance types

- 2.75 GCEUs = 1 minimum power of 1 logical core on Sandy Bridge platform



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Google Cloud Platform

Machine Types (Shared-Core)

f1-micro

Shared Core

0.6 GB Memory

g1-small

1 Core

1.7 GB Memory

1.38 GCEUs

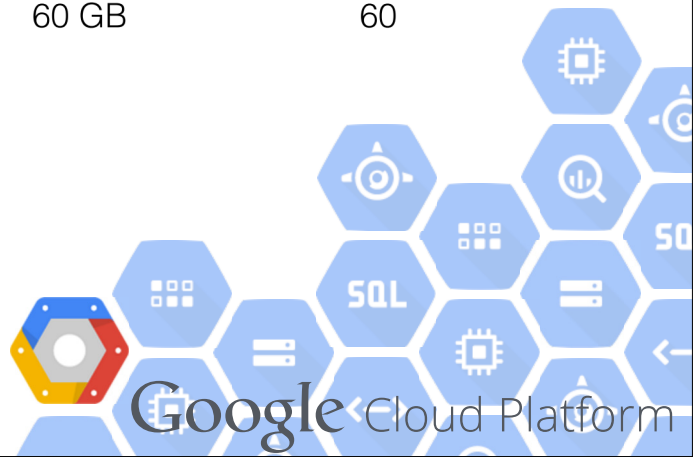
Machine Types (Standard)

n1-standard-n

Starts from 1 Core

Start from 3.75 GB Memory

n	Virtual CPUs	Memory	GCEUs
1	1	3.75 GB	2.75
2	2	7.50 GB	5.50
4	4	15 GB	11
8	8	30 GB	30
16	16	60 GB	60



Machine Types (High Memory)

n1-highmem-n

Starts from 2 Core

Start from 13 GB Memory

n	Virtual CPUs	Memory	GCEUs
2	2	13 GB	5.50
4	4	26 GB	11
8	8	52 GB	22
16	16	104 GB	44

Machine Types (High CPU)

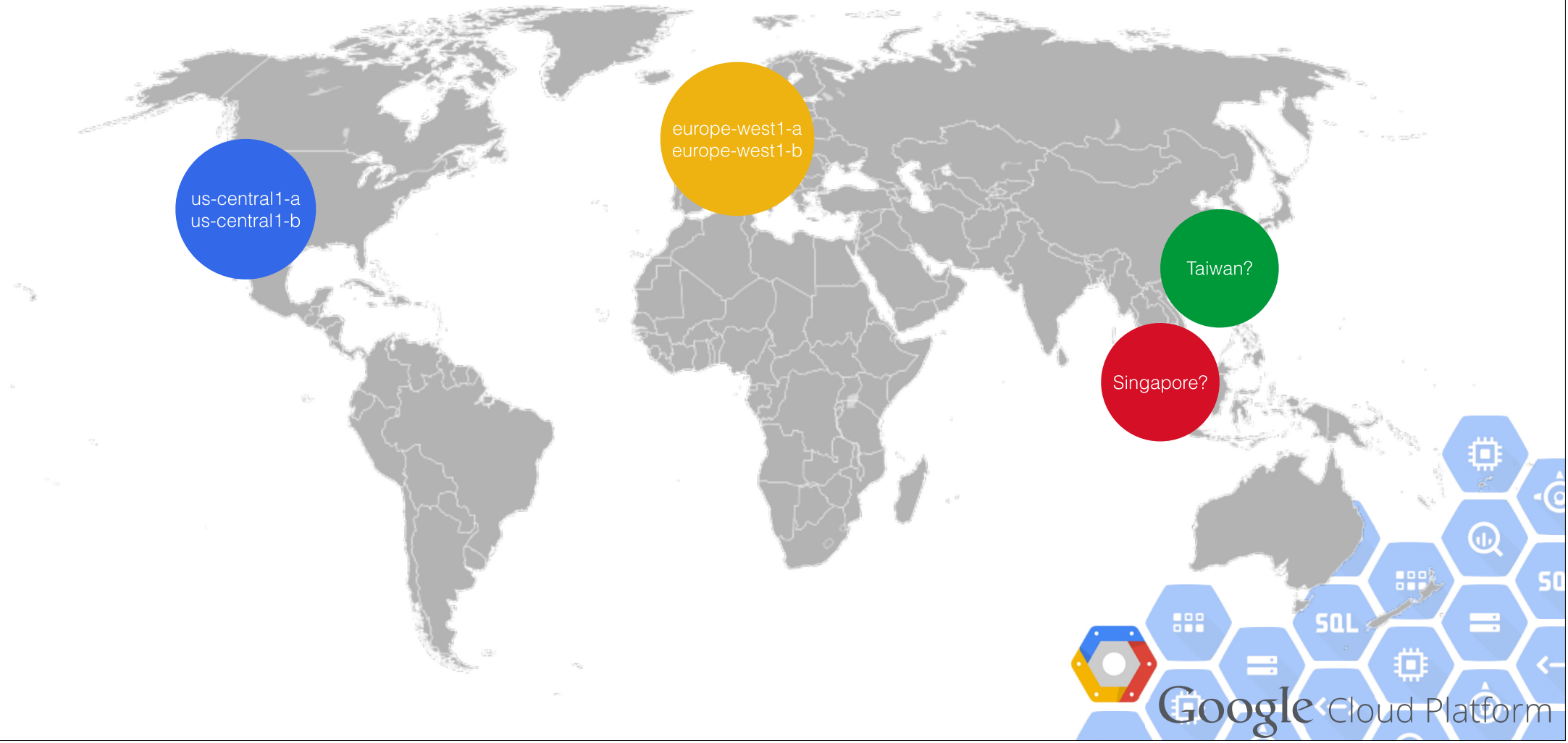
n1-highcpu-n

Starts from 2 Core

Start from 1.8 GB Memory

n	Virtual CPUs	Memory	GCEUs
2	2	1.8 GB	5.50
4	4	3.6 GB	11
8	8	7.2 GB	22
16	16	14.4 GB	44

Regions & Zones



Live Migration

- Transparent Maintenance
- Auto restart instances shutdown by system events
- During transparent maintenance, you could set GCE to handle your instance in two ways:
  - Live migrate
    affect performance in some degree
    but remain your instances online (no downtime)
  - Terminate and reboot

Persistent Disk

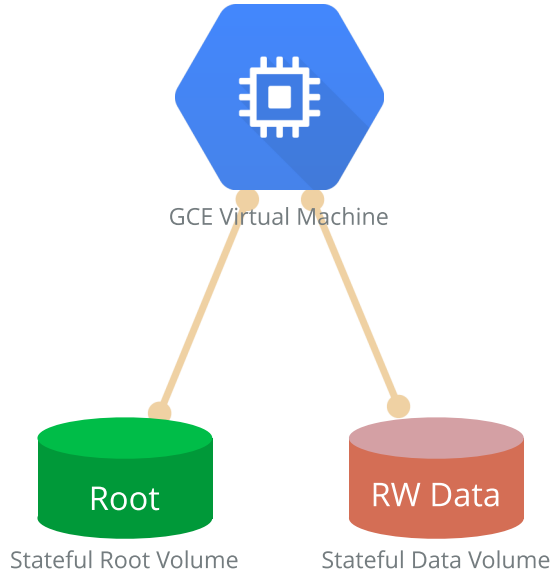
- Virtual SCSI device
- Block Storage
- Persistent until deleted
- Hot-plug to GCE instances (attach/deattach)

Persistent Disk Mode

- Primary Disk: OS boot volume

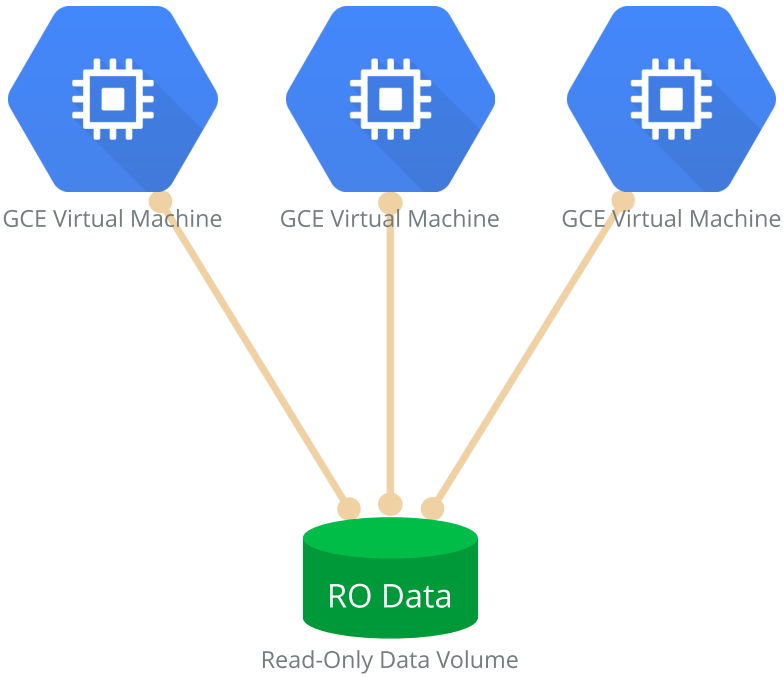
Persistent Disk Mode

- Additional Disk: Read/Write Mode for user managed data volume



Persistent Disk Mode

- Distribution Disk: Instant distribution of static content



Load Balancing

- Target Pools
- Health Checking
- Forwarding Rules
  iptables for target pools

Persistent IP Addresses

- CGE reserved IP for instance, won't change with the reboot of VMs
- You can promote ephemeral IP to persistent IP
- no DNS changing anymore

Integrated Networking

- Networking is first-class object on GCE
  which means you could apply/unapply it anytime easily

- pre-defined networks before the first instance started

Multi-Region Resources

- Those resources are global resources
  - Images (OS Images)
  - Snapshots
  - Network
  - Firewalls
  - Routes
- And they're also first-class object in GCE

Services Host GCE

- Scalr
- Right Scale