Building NodeJS Apps on Google's Scalable Infrastructure for JuniorDev

https://github.com/lorderikir/juniordev-gcp-techtalk

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Hi, I'm **Eric Jiang** 👋

- I founded and currently am currently the Backend & Infrastructure Engineer at MonPlan (monplan.apps.monash.edu) (*Monash Course Planning Tool*) at eSolutions, Monash University
  - eSolutions is the central IT body of Monash University.
- Part of the *Student Innovation Team*
- I also co-founded and maintaining GeckoDM and MARIE.js
- Also have worked at Localz too!

Student Innovation Program at Monash University

Unfortunately this program is applicable to Current Monash Students only

- If you have an idea don't leave it in the dark, we would ❤️ to see it.
  - Test.Drive
  - Email me: Eric.Jiang@monash.edu or hit me up on the Junior Dev Slack (@lorderikir) and I'll redirect you to right person
- We also hire Students for casual project-based positions too! 🎉

Talk Summary

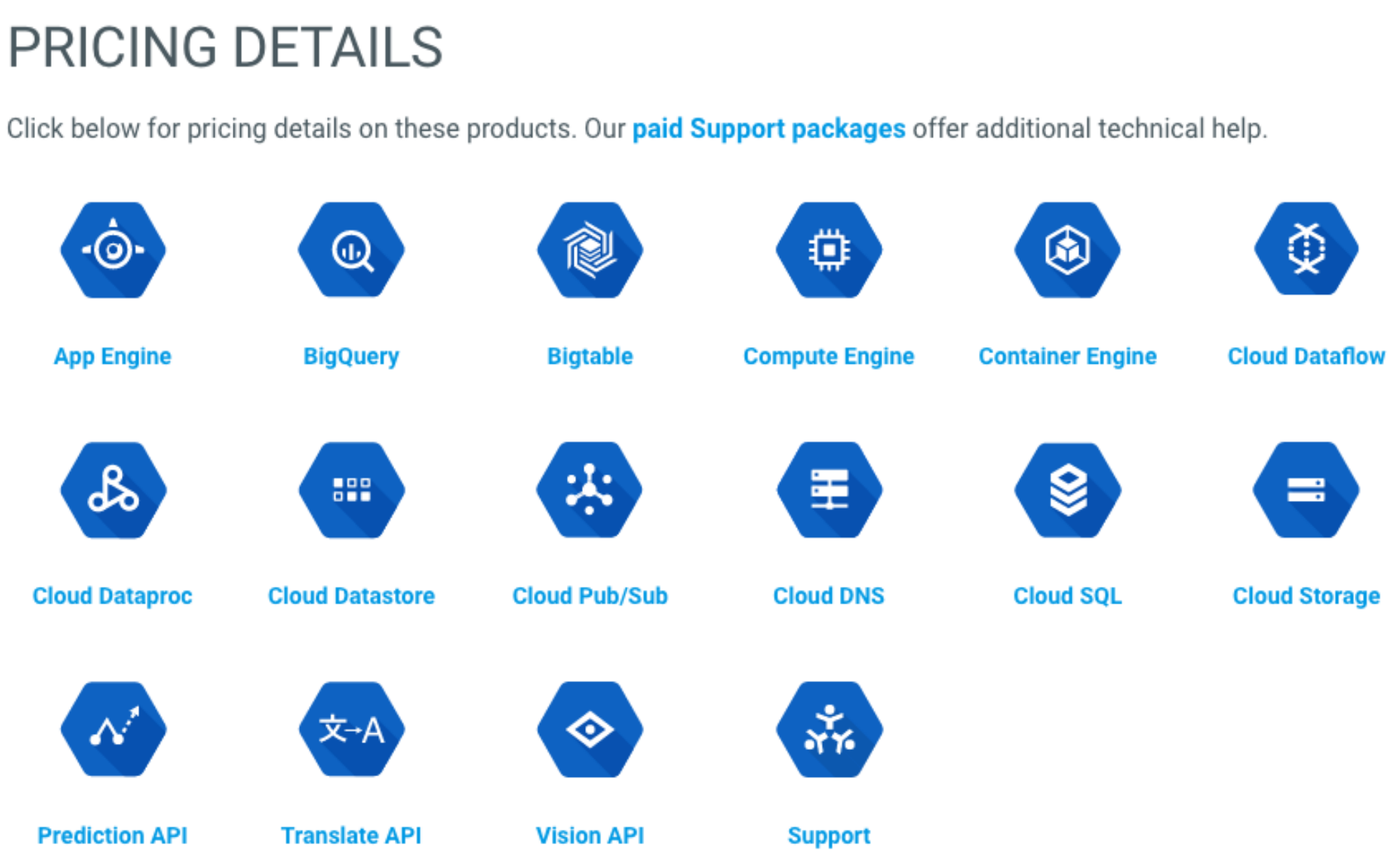
① Introduction to Google Cloud

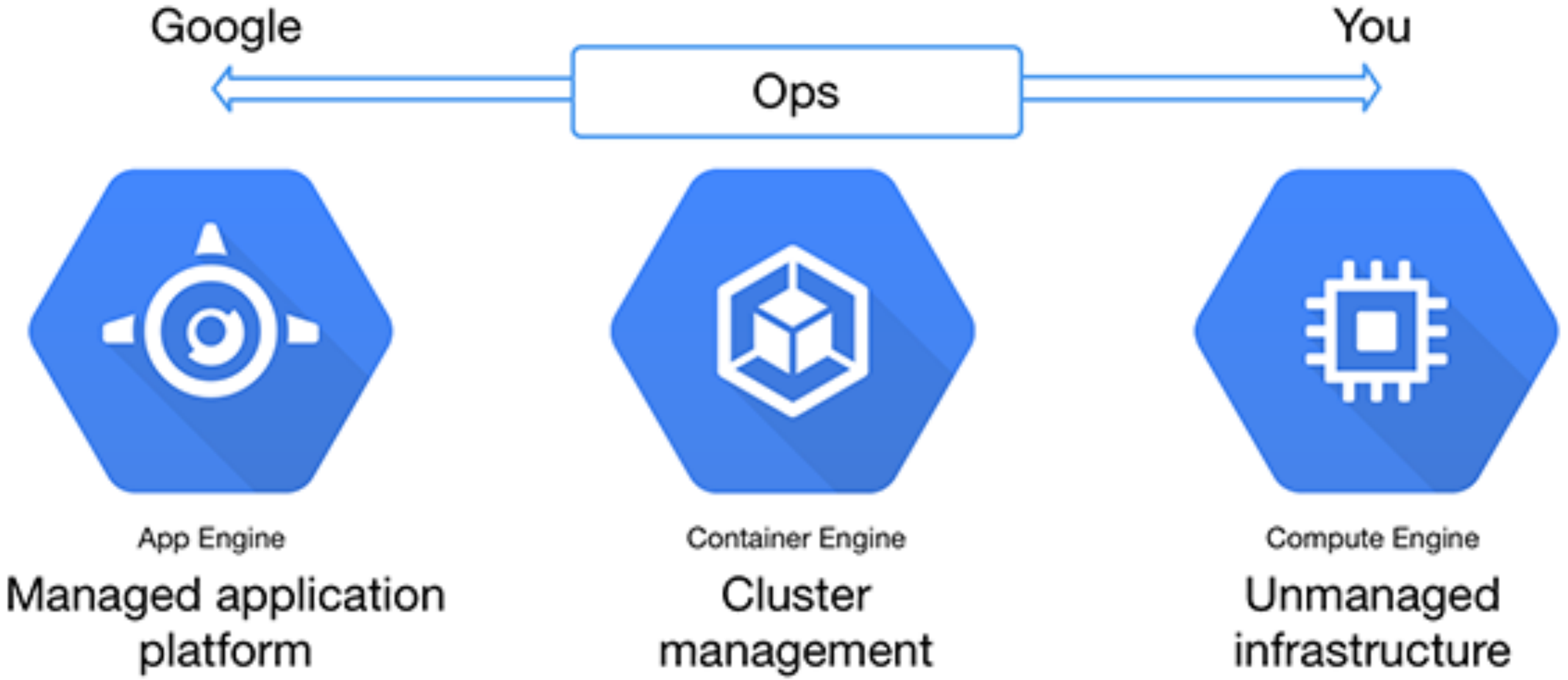
② What is Google App Engine
a. GAE Environments
b. What is Scaling and Why is it Important?

③ Deep-Dive
a. Deploying a simple API to Google App Engine
b. Automating Deployments and Testing

④ Other Cool GCP Products

GCP Products





Google App Engine

Language	Environment
Java 7 (and Kotlin[1])	Standard
Java 8	Standard /Flexible
Node.js 8	Standard (Beta)
Node.js (>4)	Flexible
Python 2.7	Standard
Python 3.5	Flexible

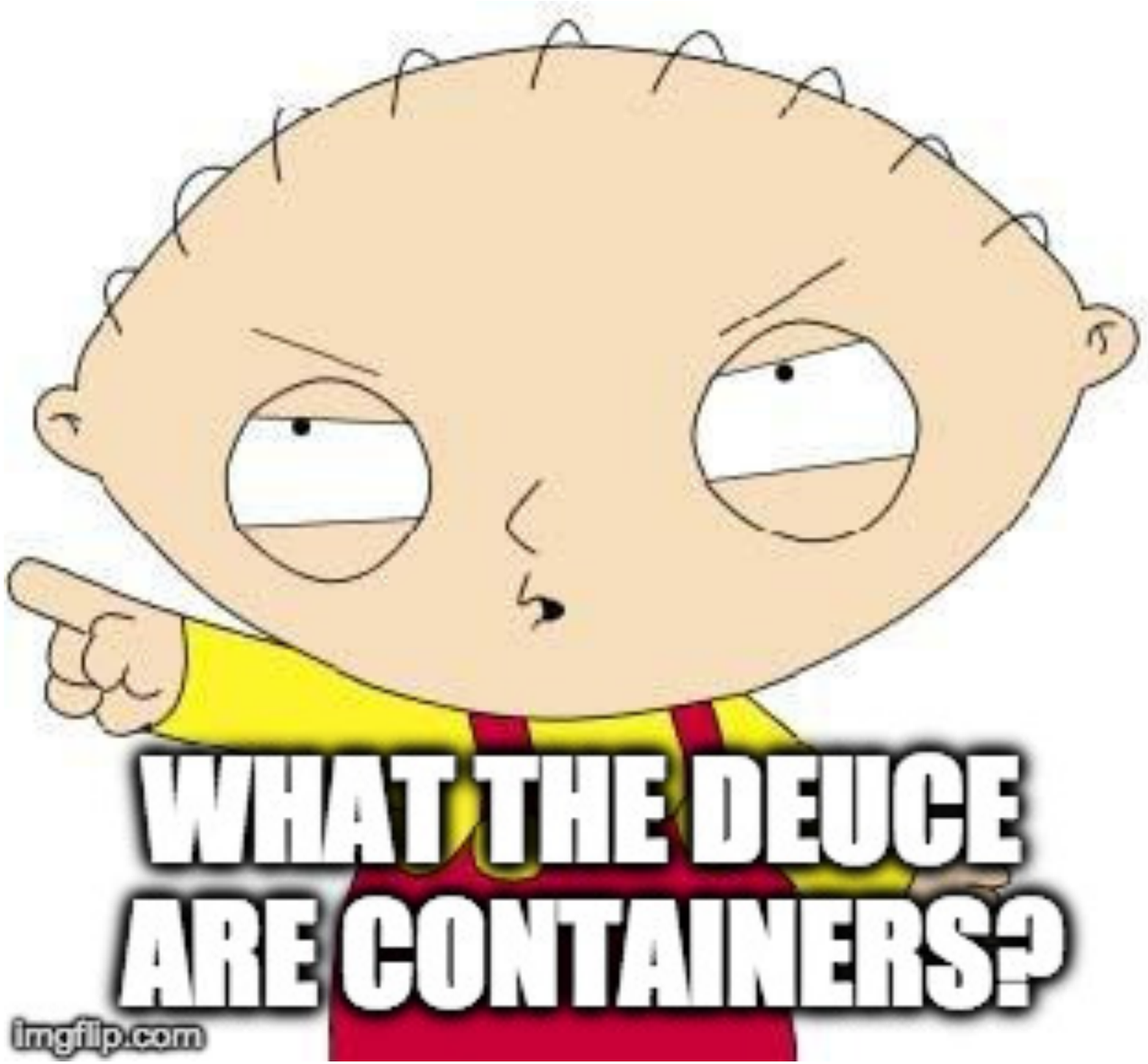
So what is the difference between the Environments?

Standard Environments run in a specialised envrionment. Though building the application is more constrained then other environments, it means that scaling up is faster.

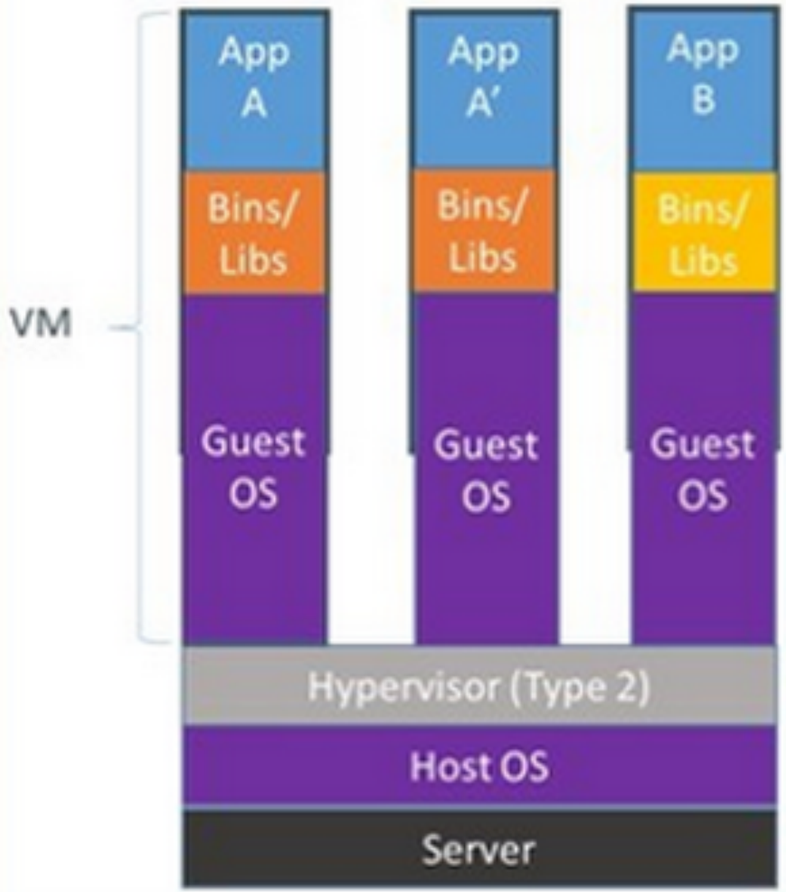
Flexible Environment applications run off a Docker container, it is designed for applications that recieve constant traffic.

When deployed they are Google Compute Engine as Virtual Machines Because they run off Docker, you can write your own Dockerfile Configuration to deploy, and deploy it anywhere, you can even move it to AWS.

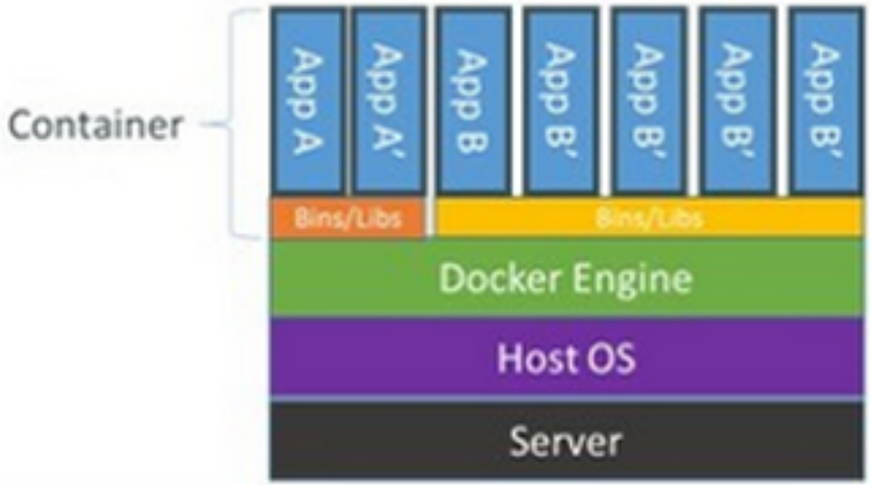
Note: all of these runs as containers...



Containers vs. VMs



Containers are isolated, but share OS and, where appropriate, bins/libraries



The Standard Environment has Instance Classes

> “Each application running in the standard environment has an instance class, which determines its compute resources and pricing.”

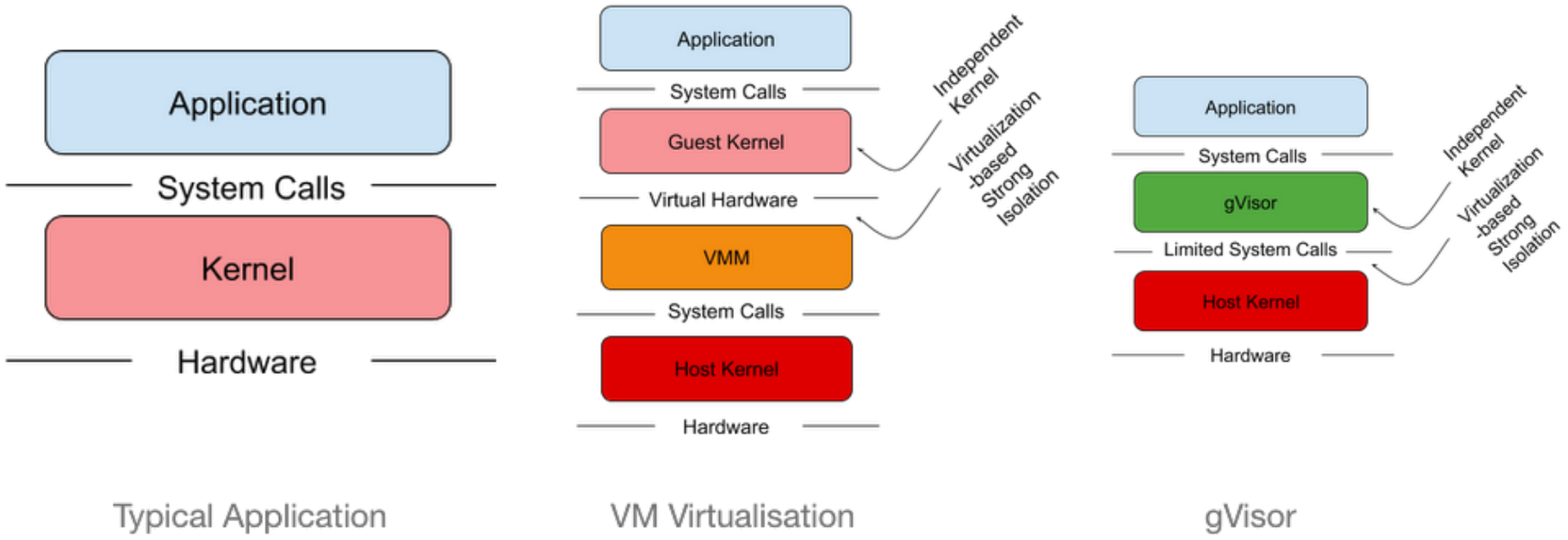
Instance Class	Memory Limit	CPU Limit	$/hr (Sydney)
F1 (default)	128 MB	600 MHz	$0.068
F2	256 MB	1.2 GHz	$0.135
F4	512 MB	2.4 GHz	$0.270
F4_1G	1024 MB	2.4GHz	$0.405

So Back then running NodeJS Application was Impossible on App Engine Standard

This is because Google's infrastructure code is written in low-level language (so many C libraries are not allowed)

Along came gVisor (which also pissed a lot of Docker Devs off)

“gVisor is more lightweight than a VM while maintaining a similar level of isolation. The core of gVisor is a kernel that runs as a normal, unprivileged process that supports most Linux system calls.”

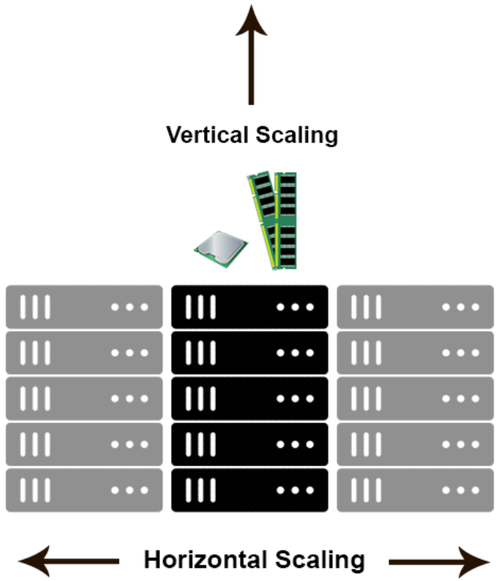


Typical Application | VM Virtualisation | gVisor

Scaling Modern Web Applications

Me when I look at Scaling:

Scaling Vertically vs Scaling Horizontally



Horizontal Scaling: scale by adding more machines into your pool of resources machine.

Vertical Scaling: scale by adding more power (CPU, RAM) to an existing machine.

Benefits of Horizontal Scaling

- Dynamic scaling allows spinning up more instances and nodes faster, i.e. if you suddenly get a influx of traffic
- Vertical Scaling is limited to capacity of resources, simply adding more resources
- Just simplying load testing isn't good enough, examples of this include Niantic (PokemonGo) and Australian Census 2016

Disclaimer: NodeJS on GAE is still in beta. USE AT YOUR OWN RISK

Time for a demo 🤞

Let's Deploy a simple expressJS Application

index.js:

```
const express = require('express');
const app = express();
const APP_PORT = process.env.port || 8080;

const exampleRouter = (req, res) => {
  res.send('hello world!');
}
app.get('/', (req, res) => res.send('Hello from Google App Engine!'));
app.use('/test', exampleRouter);
app.get('/teapot', (req, res) => {
  res.status(418).send("Hello I'm a teapot running on Node Standard GAE");
});

app.listen(APP_PORT, () =>
  console.log(`Example app listening on port ${APP_PORT}!`)
);
```

We need an `app.yaml` to help define the runtime settings on GAE

app.yaml:

```
runtime: nodejs8
```

In some languages we define this in `appengine-web.xml`

```
<?xml version="1.0" encoding="utf-8"?>
<appengine-web-app xmlns="http://appengine.google.com/ns/1.0">
    <runtime>java8</runtime>
    <application>monplan-au-dev</application><!-- unused for Cloud SDK based tooling -->
    <version>1</version><!-- unused for Cloud SDK based tooling -->
    <threadsafe>true</threadsafe>
    <sessions-enabled>true</sessions-enabled>
    <url-stream-handler>urlfetch</url-stream-handler>
    <system-properties>
        <property name="java.util.logging.config.file" value="WEB-INF/classes/logging.properties"/>
        <property name="spring.profiles.active" value="dev"/>
    </system-properties>
    <automatic-scaling>
        <min-instances>1</min-instances>
        <max-instances>100</max-instances>
    </automatic-scaling>
</appengine-web-app>
```

Now we need to run `gcloud app deploy`

Once we successfully deployed

We can access the site via https://juniordev-gcp-demo.appspot.com/

So what happens under the hood?

What happens when the Cloud SDK deploys to GAE

① Builds the Files (For the Java Envrionment this builds it into a WAR package)

② Bundles the Files and Pushes it Up to Google Cloud Storage

③ Reconfigures Google App Engine to deploy
i. Change scaling configuration
ii. reallocate traffic to new version

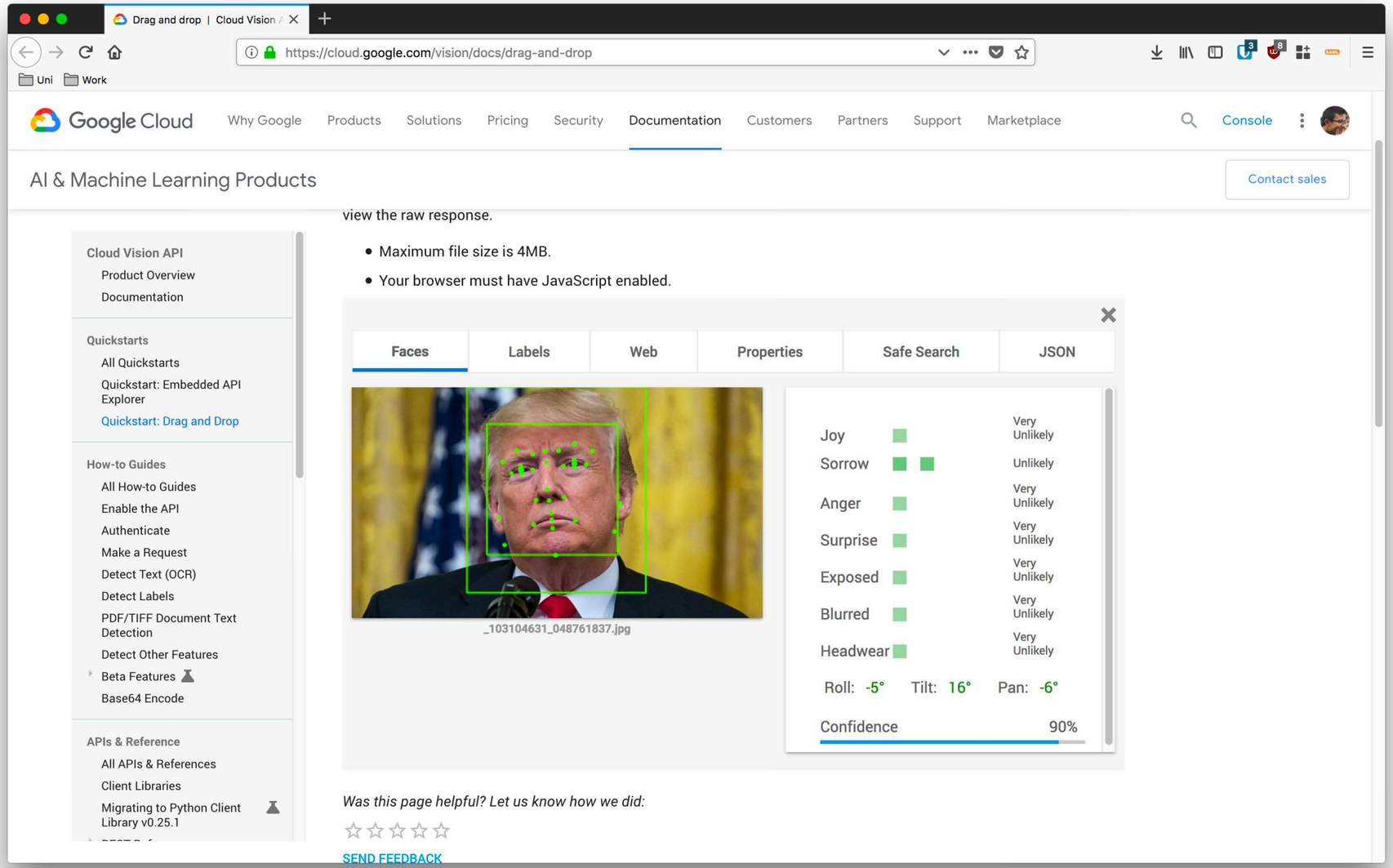
Automating Deployments

- Like alot of environments deploy apps to GAE is really straightforward and easy
- All you need is the Google Cloud SDK and the simple command

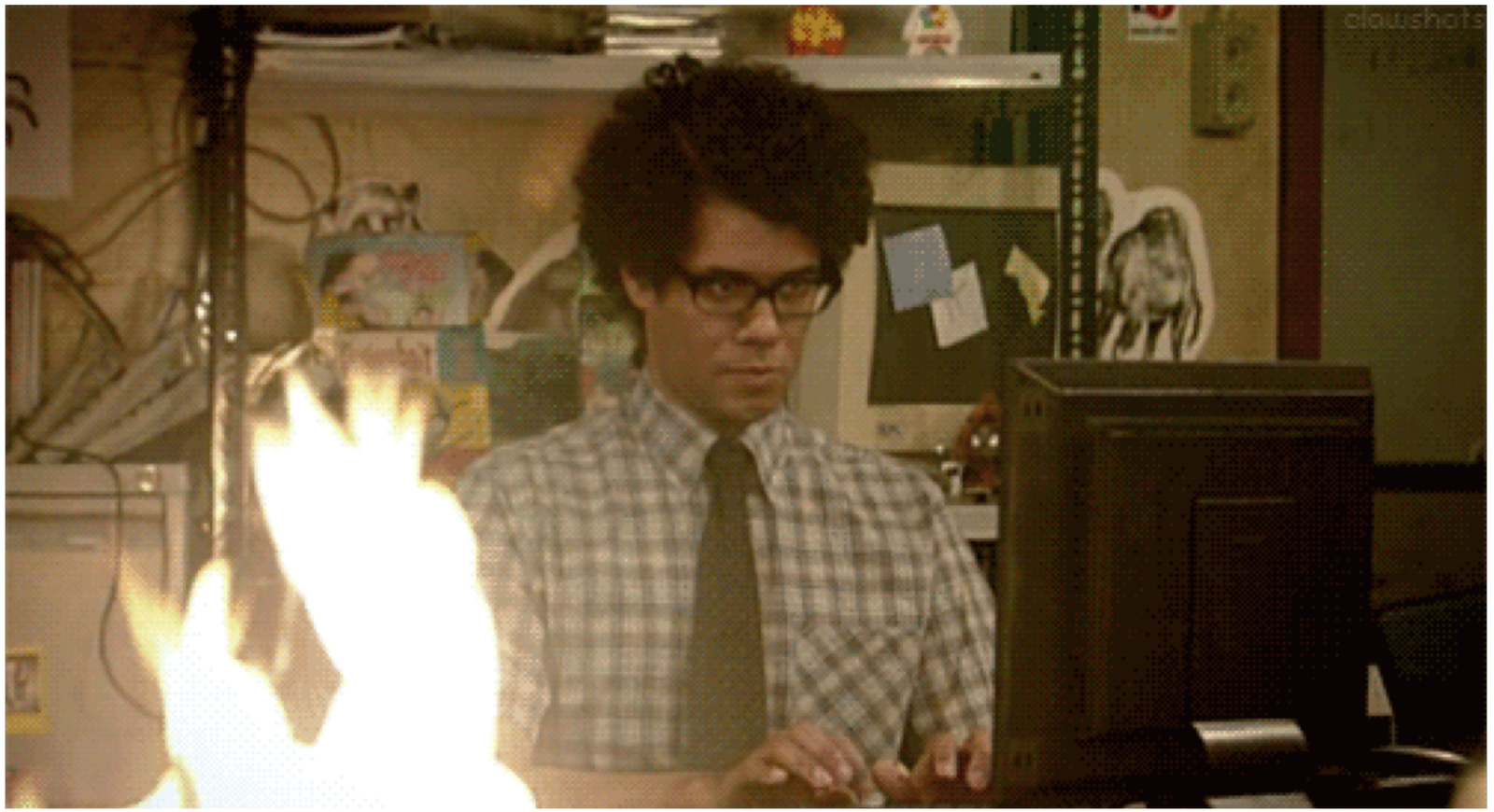
  `gcloud app deploy`
- However, you will need Service Accounts (I like to call them bot accounts) to automated this.
- You can find out more https://s.lorderikir.me/2PxBtRJ

Other Awesome Products on GCP

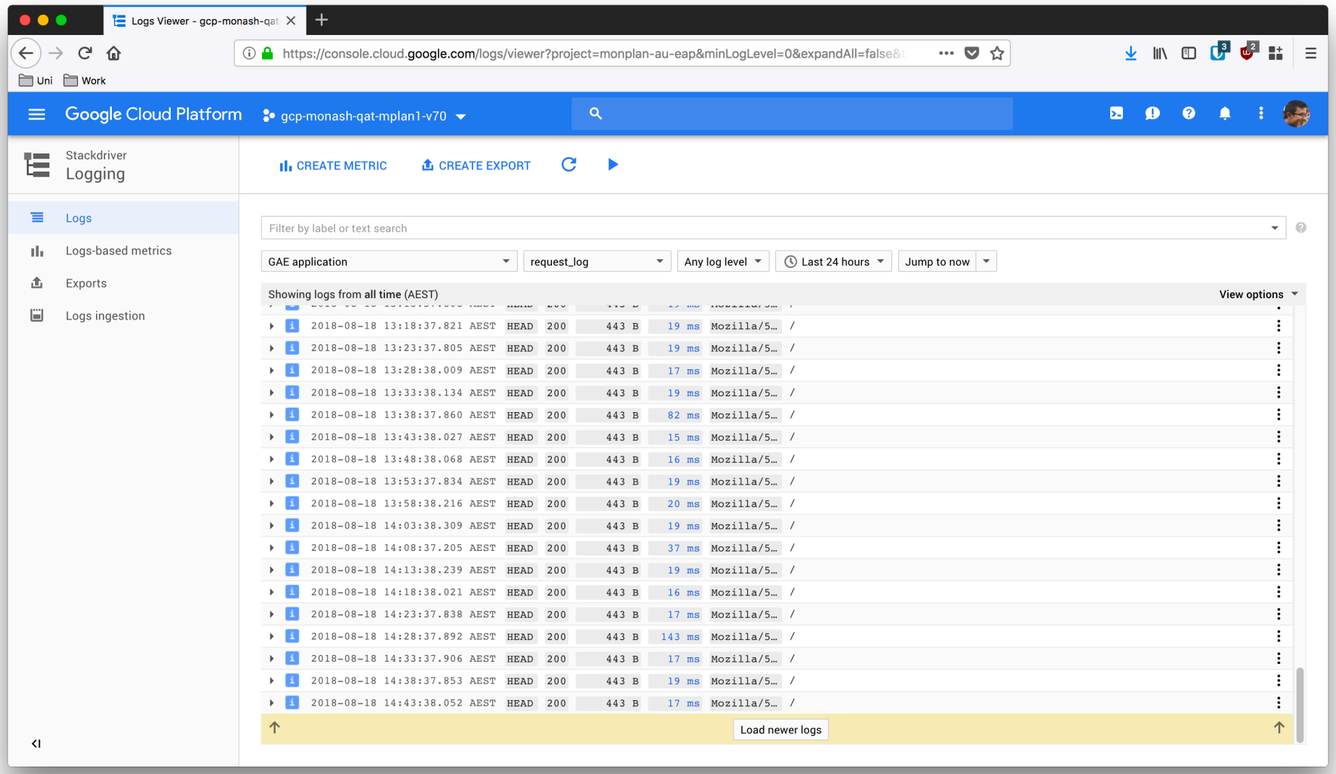
- Cloud ML (Google Cloud Machine Learning) which is built off TensorFlow
- Compute Engine - Google VMs
- BigQuery - Big Data (really awesome for Big Data analysis, companies like REA, Papercut uses this for Big Data analysis) - Our team uses it to provide Faculties and Business Units with reporting functionality.
- Kubernetes Engine - Containorisation! what else do you want?
- Cloud Storage - CDN provider of files (like *Amazon S3*)
- Network Balancer - for Load Balancing of traffic for your applications
- Cloud ML APIs such as Natural Language Processing, Data Loss Prevention, etc.



So what happens if something goes wrong?



In comes, StackDriver Logging



So what is Stackdriver Logging?

“Stackdriver Logging allows you to store, search, analyze, monitor, and alert on log data and events from Google Cloud Platform and Amazon Web Services (AWS)”

Stackdriver Logging is baked into Google App Engine applications

Questions? 🤔 🎤 📣

and the chance to get some free stickers?

Special thanks to:

- Ben Theunissen, REA Group
- Hugo Muller-Downing, Localz

Goodbye 👋 and thanks for listening 🙏

Eric Jiang

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If you want to talk more about what I do or what is the Student Innovation Team hit me up!