



THE UNIVERSITY OF
CHICAGO



MPCS 51033 • AUTUMN 2019 • SESSION 1

BACKENDS FOR MOBILE APPLICATIONS

WELCOME TO BACKENDS
FOR MOBILE APPLICATIONS

COURSE LOGISTICS

COURSE LOGISTICS

- Lectures
 - Tuesday, 5:30-8:30pm
 - JCL 011
- Attendance is highly recommended



COURSE LOGISTICS

- Office Hours
 - Tuesday, TBD
 - By Appointment
- TA Office Hours
 - TBD



COURSE LOGISTICS

- Prerequisites
 - iOS
 - Android
 - Comfortable with UNIX tools



COURSE LOGISTICS

- Instructor
 - Andrew Binkowski
- TA
 - Hannah Bennett



COURSE RESOURCES

COURSE RESOURCES

- Course website
 - <http://uchicago.cloud>
 - Lecture slides
 - Assignments
 - Resources and links
- Class communication
 - Course website for information, articles, homework, etc.



**MPCS
51033**

backends for mobile
applications

[Home](#)
[About This Course](#)
[Sessions Notes](#)
[Course Information](#)
[Forum](#)

anytime has become the
and development. New
to connect applications
considerations such as
balanced to mee the de

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COURSE RESOURCES

- Github forum
 - <https://github.com/uchicago-cloud/mpcs51033-2019-autumn/issues>
- Post questions, interesting links, etc.
 - Anyone can post
 - Anyone can answer

uchicago-cloud / mpcs51033-2019-autumn

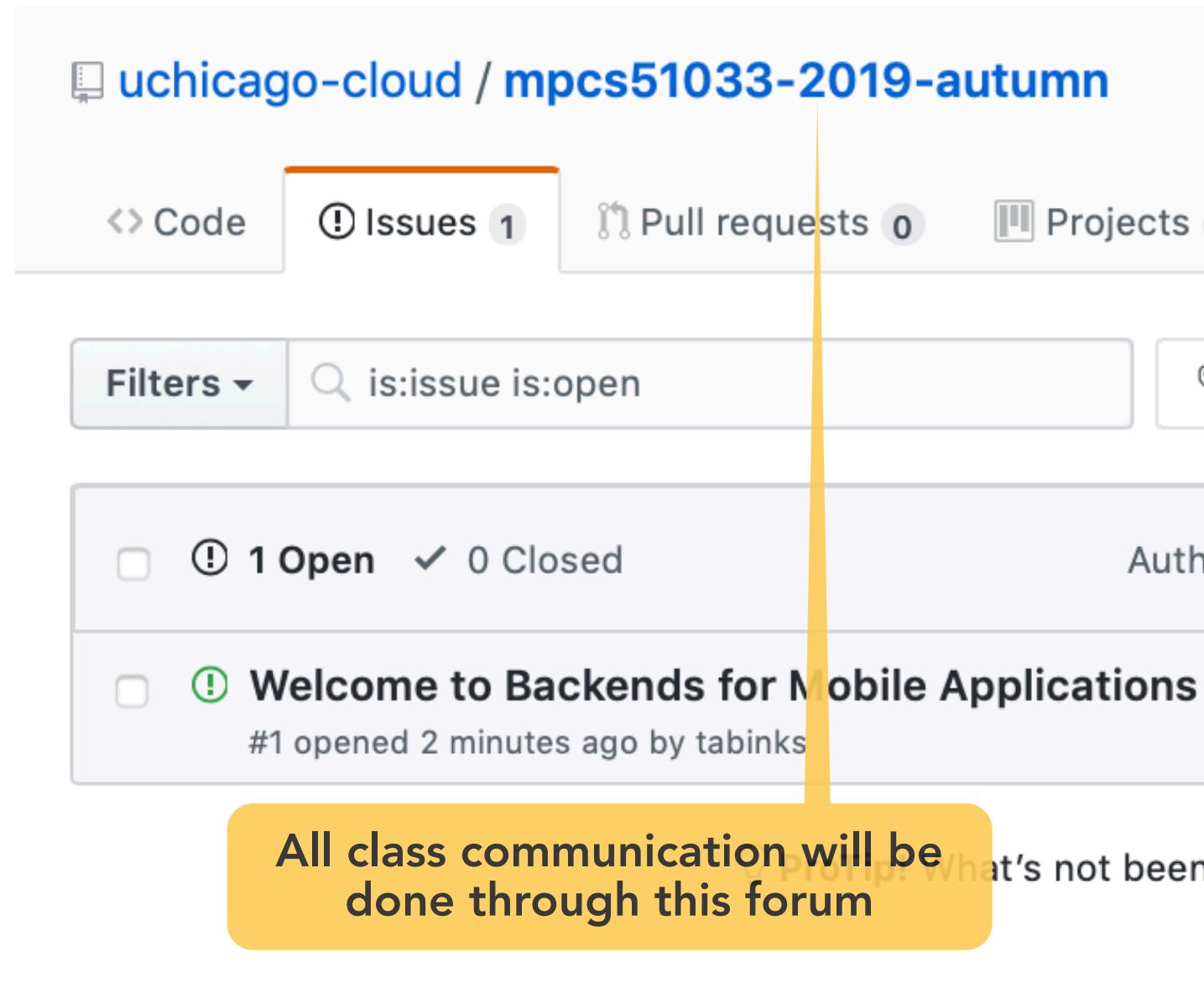
Code Issues 1 Pull requests 0 Projects

Filters ▾ is:issue is:open

1 Open ✓ 0 Closed

Welcome to Backends for Mobile Applications
#1 opened 2 minutes ago by tabinks

All class communication will be done through this forum



COURSE RESOURCES

- No required text books
- Documentation from services
- Slides
- Sample projects or playgrounds
- Online tutorials, videos, etc.

Compute Products

Google App Engine

Product Overview

Python 3 Standard Environment

Documentation

Quickstart

Building an App

Overview

Creating Your Project

[Writing Your Web Service](#)

Deploying Your Web Service

Handling Data

Adding Firebase

Authenticating Users

Personalizing Data

Cleaning Up

How-to Guides

All How-to Guides

Setting Up

Designing Your App

Defining Configuration Files

Testing and Deploying Your App

Debugging Your App

Installing Google Cloud Client Libraries

Storing Data and Files

Securing Your App

Controlling Access

Authenticating Users

Using a Custom Domain

Managing Your App's Traffic

Scheduling Cron Jobs

App Engine > Documentation > Python > Standard Docu

Writing a Basic Web Service

Write and locally test a web service that serves a static file you need for deploying the web service to App Engine.

In this step, you create and locally test a version of a basic web service. Ensure that your basic web service is working before you move on to the next step.

Before you begin

1. If you have not already created a GCP project, click [Create a project](#).
2. If you have not already, set up your local environment:
 - [Download and install Python 2 and 3](#) for development.
 - [Install virtualenv](#) for local testing by running `sudo pip install virtualenv`.

MAC OS / LINUX

WINDOWS

`sudo pip install virtualenv`

- Use your GCP user credentials to authenticate your Datastore:

`gcloud auth application-default login`

Tip: For more extensive testing, it is recommended to use a local development environment. For more information on using a local development environment, see [Authentication Overview](#).

COURSE RESOURCES

- Additional Resources:

- Stack Overflow
- Google Groups (iPhone SDK, etc.)
- Blogs
- You Tube
- ...

WARNING: CHECK THE DATES

Welcome to Q&A for professional and enthusiast programmers — check out the [FAQ!](#)

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Hello World! This is a collaboratively edited question and answer site for professional and enthusiast programmers. It's 100% free, no registration required.

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CAREERS 2.0

Android Developer
GPShopper
Chicago, IL; New York, NY

Internet Web Developer
Monotype Imaging
Elk Grove Village, IL

Front-End Web Developer
Straight North
Oak Brook, IL

Senior Software Engineer - Server Products (C++)
Trading Technologies
Chicago, IL

Software Engineer (Python)
Leapfrog Online
Evanston, IL

Quality Assurance Analyst
FactSet Research Systems
Chicago, IL; Norwalk, CT

Recent Tags

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- mysql × 29
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- python × 24
- css × 22
- asp.net × 21
- .net × 21
- sql-server × 21
- html × 20
- iphone × 20

votes	answers	views	question	asked	by
0	0	1	Open Source Equivalent of TFS?	50s ago	Lawrence Wagerfield 333
0	0	1	android spinner and button problem	57s ago	hardy.exe 15
0	0	2	R combining split and cumsum	1m ago	pssguy 169
0	0	2	How to create resources, when using capybara+selenium?	1m ago	Utility 84
0	0	5	English equivalents to Vim's shortcuts	1m ago	Rook 1,458
0	0	3	Extracting specific data from a string with regex and Powershell	1m ago	user353401 3
0	0	2	Adding a target to an Xcode project	2m ago	imperiousdev 101
0	0	2	Prevent WCF *.datasource files from being checked-in	2m ago	kroonwijk 134
1	0	15	jQuery getJSON data order varies across browsers	3m ago	Joseph 6,957
0	0	5	How to read or write STDF files?	3m ago	mbadawi23 51
0	0	7	Why does a thread, on ubuntu 2.6.38-generic or 3.0.0-lowlatency kernel, block another thread from taking mmap_sem?	3m ago	Dan Pisarski 1
0	0	4	Should reversing an NSMutableArray be avoided when possible?	3m ago	maxedison 1,052
0	0	2	Javamelody and Play Framework	3m ago	peperg 842
1	1	17	PHP - JS and CSS minifier	3m ago	genesis 16.9k

COURSE DESIGN

COURSE DESIGN

- Today an app is not enough
 - Complexity
 - Interconnected
 - User expectations
 - Insights/analytics
- Provide exposure to technologies to complete mobile applications

COURSE DESIGN



COURSE DESIGN

- Current state of the field
 - Technologies come and go
 - Consolidation/duplication of services
 - Fight against DIY mentality
- Industry proving ground doesn't fit with the narrative



**Google App
Engine**



COURSE DESIGN

- Polled former students and colleagues about the topics that are most beneficial to industry

The screenshot shows the 'Jobs at Apple' website interface. At the top, there are links for Mac, iPad, iPhone, Watch, TV, Music, and Support. Below that, it says 'Jobs at Apple' and '591 job(s) found'. On the left, there's a 'Filter by' sidebar with 'Keywords' selected, followed by 'Location', 'Language Skills', 'Business Line', 'Job Function', and 'My Filter Mixes'. To the right of the filter sidebar is a 'Search' section with three radio buttons: 'All jobs' (selected), 'Corporate only', and 'Retail store only'. A search bar contains the text 'ios'. Below the search bar is a note: 'Certain filters have already been applied. To change the results, change the filters. Corporate jobs require English-language skills.' At the bottom, it says 'Showing 1-20 of 591' with 'Previous' and 'Next' buttons. The main table lists 20 job entries, each with 'Job Title', 'Job Function', and 'Location' columns.

Job Title	Job Function	Location
iOS QA Engineer	Software Engineering	Santa Clara Valley
Siri iOS Engineer	Software Engineering	Santa Clara Valley
Siri iOS Engineer	Software Engineering	Santa Clara Valley
Siri iOS Engineer	Software Engineering	Santa Clara Valley
Siri iOS Engineer	Software Engineering	Santa Clara Valley
iOS App Reviewer	Marketing	Santa Clara Valley
iOS Power QA Engineer	Software Engineering	Santa Clara Valley
iOS Home App Engineer	Software Engineering	Santa Clara Valley

COURSE DESIGN

- Challenges for this course...which ones to explore?
 - Most likely to be around next year
 - Easiest
 - Most powerful
 - Cost effective
 - Use in industry

COURSE DESIGN

- This class is meant to be a discussion and exploration
 - Please ask questions



COURSE DESIGN

- Expectations
 - You are highly motivated 😊
 - You will do a lot of self-learning to address questions that effect your work 😓
 - You will not wait until the last minute to work on assignments and projects 🤔
 - You will show up and participate in class 😇
 - You will have fun 😃

COURSE WORK

SYLLABUS

- Class Sessions
 - Lectures
 - Discussion
 - Demos
 - Labs

SYLLABUS

- Labs
 - "White board" ideas for upcoming assignment
 - Address pain points on current assignment
 - Review code
 - Share solutions with peers
- On "as needed basis" as course progresses

SYLLABUS

- Technologies
 - Google Cloud Platform
 - Firebase
 - Serverless Solutions
 - Realm
 - Swift on the Server
 - iCloud
 - IBM BlueMix

Build reactive, offline-first mobile experiences - Start a free trial!

 realm

Products ▾ Pricing Docs Support ▾ Blog Academy  [Free Trial](#)

Your apps deserve a better mobile stack

Realm makes it easy to build modern reactive apps, realtime collaborative features, and offline-first experiences.

Choose Your Free Download:

 Linux  macOS

Looking for the [Realm Mobile Database](#)?

TRUSTED BY       


CUSTOMER HIGHLIGHT



SYLLABUS

- Topics
 - API Design
 - Cost benefit analysis
 - Production vs. development
 - ...

Build reactive, offline-first mobile experiences - Start a free trial!

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Your apps deserve a better mobile stack

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Looking for the [Realm Mobile Database](#)?

TRUSTED BY       



CUSTOMER HIGHLIGHT



COURSE DESIGN

- Assignments
 - Explore/create different backends and strategies
 - Majority of the coursework
 - 1 or 2 weeks; depending on assignment
- Case Study
 - A topic you are interested related to mobile backends
- Final Project

COURSE DESIGN

- Week 1 - Google Cloud Platform
- Week 2 - Google App Engine
- Week 3 - Firebase
- Week 4 - Firebase
- Week 5 - CloudKit
- Week 6 - CloudKit
- Week 7 - Swift on Server
- Week 8 - All the others...
- Week 9 - Case Studies (Last class meeting)
- Finals Week - Final Projects Due

**Subject to
Change**

COURSE DESIGN

- Assignments (6 * 10 points) 60%
- Case Study (10 points) 10%
- Final Project (30 points) 30%

COURSE WORK

- Honor Code
 - All the assignments should be your own work
 - Department policies are strictly enforced
- Citing Resources
 - Cite any resources you use on homework
 - Includes online resources (StackOverflow, BioStars, blogs, GitHub, etc.)
- No late work (except for extraordinary circumstances)

ASSIGNMENTS

ASSIGNMENTS

- Assignments will all work toward backend solutions in a given technology
 - Tutorial based; add/improve features to existing code
 - New task designed and developed by you

The screenshot shows the Google Cloud Platform Documentation website. At the top, there's a navigation bar with links for Why Google, Products, Solutions, Launcher, Pricing, and Customer Support. Below the navigation, a breadcrumb trail shows the path: App Engine > Documentation > Python. The main content area is titled "Tutorials". On the left, there's a sidebar with sections like "NDB Client Library Reference", "Concepts", and "Tutorials". The "Tutorials" section is expanded, showing sub-sections such as "Authenticating users with Firebase" and "Guestbook tutorial". The "Guestbook tutorial" section is currently active, indicated by a blue vertical bar on the left.

Google Cloud Platform

Why Google Products Solutions Launcher Pricing Customer Support

App Engine > Documentation > Python

Tutorials

Contents

- Firebase Authentication tutorial
- Guestbook tutorial
- Hello World tutorial

Firebase Authentication

Authenticating users with Firebase

Verify and store user credentials with ...

Guestbook tutorial

NDB Client Library Reference

Built-in Third-Party Libraries

Glossary

Command-Line Reference

Concepts

All Concepts

An Overview of App Engine

The Python Runtime Environment

Microservices on App Engine

How Requests are Handled

How Requests are Routed

Outbound Requests

How Instances are Managed

Access Control

Application Security

Cloud Storage Features

NDB Client Library Features

Tutorials

All Tutorials

ASSIGNMENTS

- There will be varying degrees of integration required with an actual mobile application
- In these cases, the mobile application can be a minimal function product (MFP?) 😐
- The backend should be the main artifact of the assignment

The screenshot shows a navigation bar for the Google Cloud Platform with links to Why Google, Products, Solutions, Launcher, Pricing, and Customer Support. Below this, a breadcrumb trail indicates the current location: App Engine > Documentation > Python. The main content area is titled "Tutorials" and contains a sidebar with "Contents" and several tutorial links: Firebase Authentication tutorial, Guestbook tutorial, and Hello World tutorial. The main content area displays two sections: "Firebase Authentication" (with a sub-section for "Authenticating users with Firebase" and "Verify and store user credentials with ...") and "Guestbook tutorial".

Google Cloud Platform

Why Google Products Solutions Launcher Pricing Customer Support

App Engine > Documentation > Python

Tutorials

Contents

- Firebase Authentication tutorial
- Guestbook tutorial
- Hello World tutorial

Firebase Authentication

Authenticating users with Firebase

Verify and store user credentials with ...

Guestbook tutorial

NDB Client Library Reference

Built-in Third-Party Libraries

Glossary

Command-Line Reference

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Application Security

Cloud Storage Features

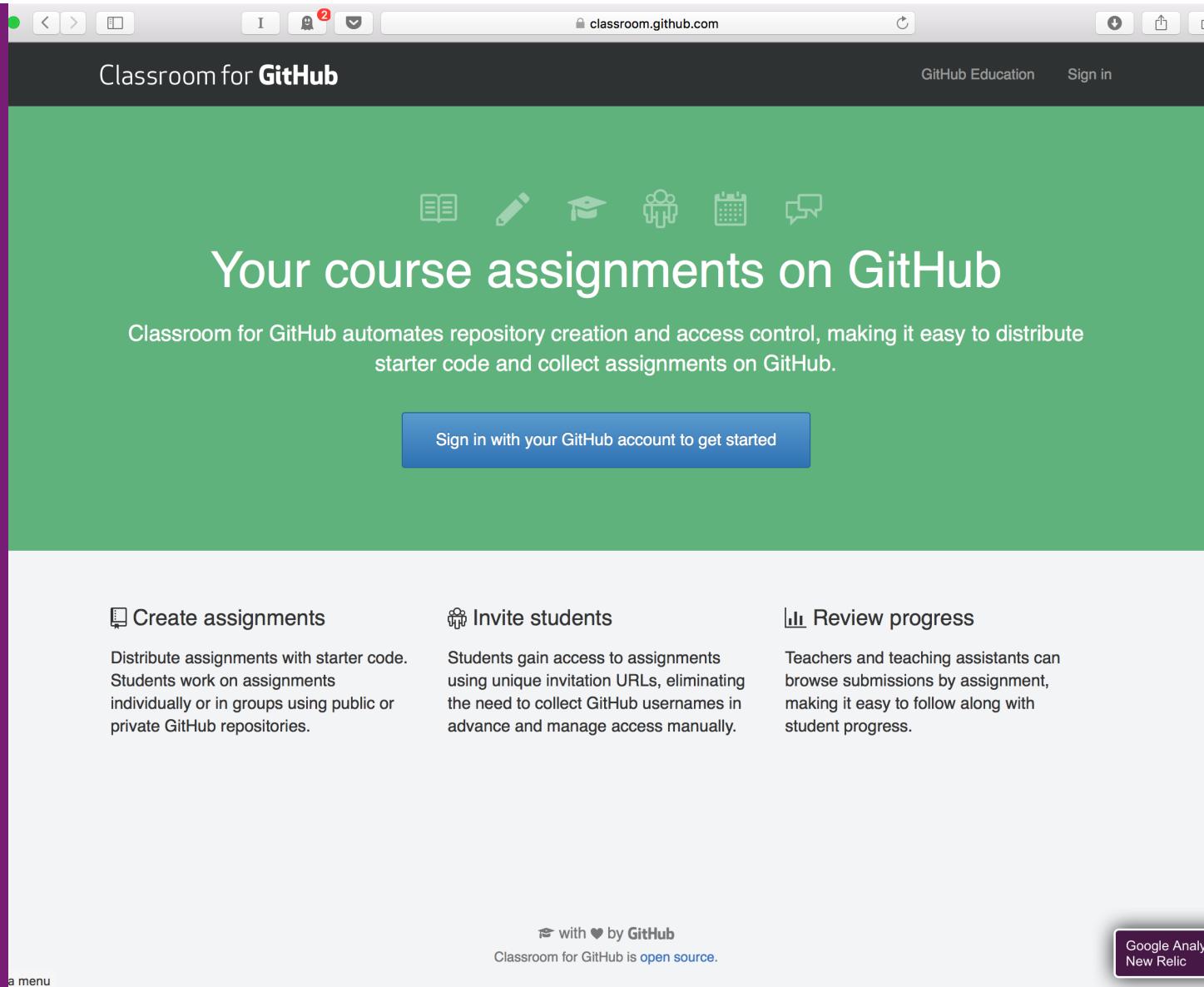
NDB Client Library Features

Tutorials

All Tutorials

ASSIGNMENTS

- Github Classroom
- Private repositories for homework and projects
- Link to create a repo
- Grades will be posted in a "Grading" branch



The screenshot shows the homepage of Classroom for GitHub. At the top, there's a navigation bar with icons for search, refresh, and user profile, followed by the URL 'classroom.github.com'. On the right of the bar are links for 'GitHub Education' and 'Sign in'. Below the bar, the title 'Classroom for GitHub' is displayed next to a small icon. To the right, there are several icons representing different features: a book, a pencil, a graduation cap, two people, a calendar, and a speech bubble. The main heading 'Your course assignments on GitHub' is prominently displayed in large white text against a green background. Below it, a subtext explains: 'Classroom for GitHub automates repository creation and access control, making it easy to distribute starter code and collect assignments on GitHub.' A blue button with the text 'Sign in with your GitHub account to get started' is centered below this. At the bottom of the page, there are three sections with icons and descriptions: 'Create assignments' (distributing assignments with starter code), 'Invite students' (using unique invitation URLs), and 'Review progress' (allowing teachers to browse submissions). The footer contains the GitHub logo and the text 'Classroom for GitHub is open source.', along with links for 'Google Analytics' and 'New Relic'.

Classroom for GitHub

GitHub Education Sign in

Your course assignments on GitHub

Classroom for GitHub automates repository creation and access control, making it easy to distribute starter code and collect assignments on GitHub.

Sign in with your GitHub account to get started

Create assignments

Distribute assignments with starter code. Students work on assignments individually or in groups using public or private GitHub repositories.

Invite students

Students gain access to assignments using unique invitation URLs, eliminating the need to collect GitHub usernames in advance and manage access manually.

Review progress

Teachers and teaching assistants can browse submissions by assignment, making it easy to follow along with student progress.

a menu

with ❤ by GitHub

Classroom for GitHub is open source.

Google Analytics New Relic

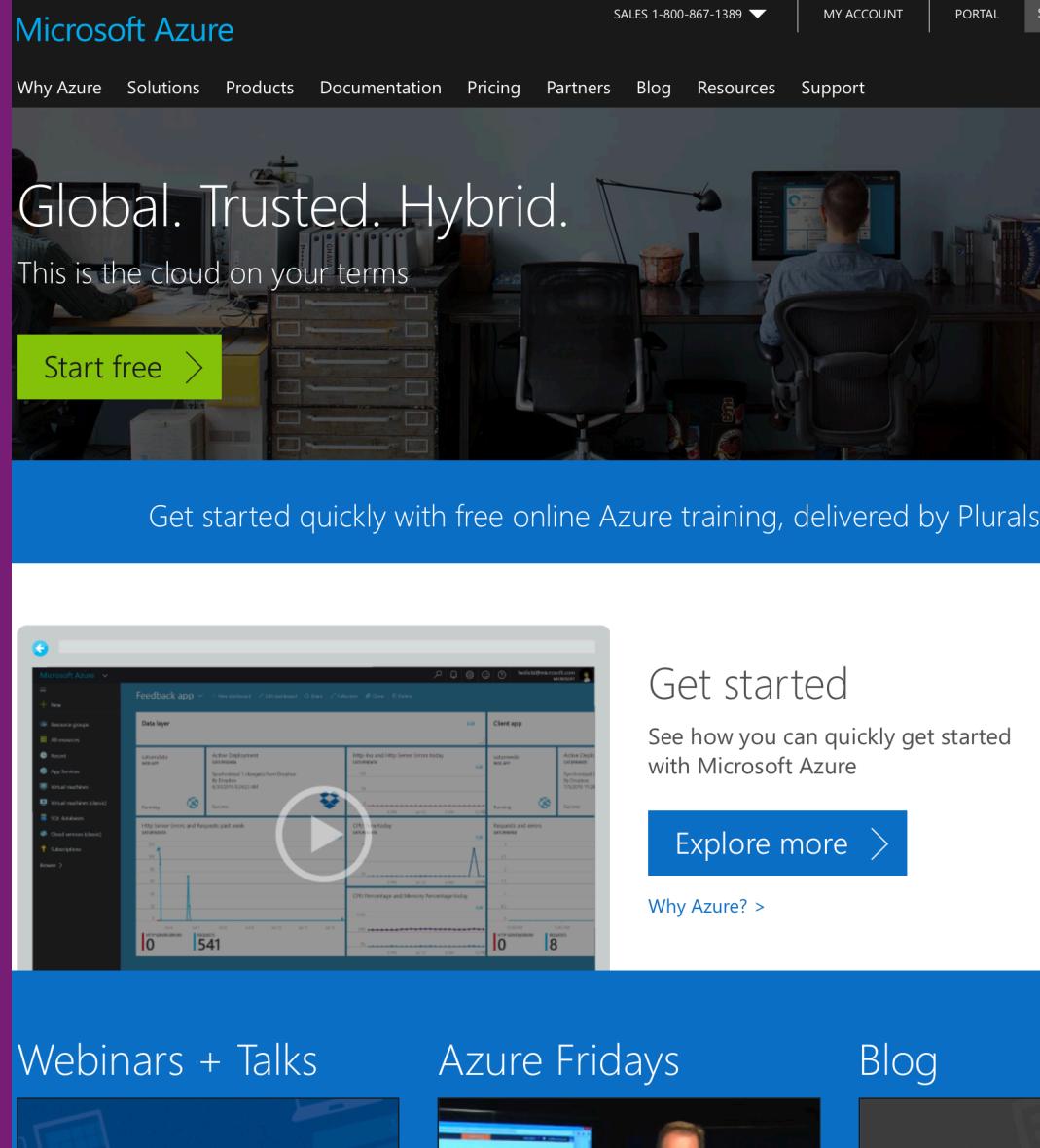
ASSIGNMENTS

- Homework grading
 - Specific requirements to be met
 - Functioning solution on a server
 - Style Points
 - Application design, Coding factoring/style, Readability, Best practices
- Some assignments are over the course of two weeks
 - I will recommend what to cover each week

CASE STUDIES

CASE STUDIES

- Teach us all something we did not discuss
 - Related to your final project?
- Present to class (or alternative)



The screenshot shows the Microsoft Azure homepage. At the top, there's a dark header with the "Microsoft Azure" logo, a "SALES 1-800-867-1389" phone number, "MY ACCOUNT", and a "PORTAL" link. Below the header is a navigation bar with links for "Why Azure", "Solutions", "Products", "Documentation", "Pricing", "Partners", "Blog", "Resources", and "Support". The main content area features a large banner with the text "Global. Trusted. Hybrid." and "This is the cloud on your terms". A green button labeled "Start free >" is prominently displayed. Below the banner, a video player shows a person working at a desk with multiple monitors, with the text "Get started quickly with free online Azure training, delivered by Pluralsight". To the left, a sidebar shows a list of services: "New", "Resource groups", "Compute", "Storage", "Virtual machines (classic)", "SQL databases", "Cloud services (classic)", and "Azure DevOps". On the right, there's a section titled "Feedback app" showing deployment metrics like "Last deployment: Syncronized 1 - Average from Pipeline" and "Success rate: 98.42% (484/494)". Below this are charts for "Http Server Errors and Requests past week" and "CPU Percentage and Memory Percentage today". At the bottom, there are links for "Webinars + Talks", "Azure Fridays", and "Blog".

CONTROL STUDIES

POTENTIAL TOPICS

- Up-and-computing technology
- Strategy/technique to deal with problem
- Microsoft Azure
- Compare costs of different services
- Industry survey
- Case study on company (SnapChat, Spotify, Evernote)

Using Microservices to Encode and Publish Videos at The New York Times

By FLAVIO RIBEIRO , FRANCISCO SOUZA , MAXWELL DA SILVA and THOMPSON MARZAGÃO NOVEMBER 1, 2016 10:30 AM [Comment](#)

 Email

 Share

 Tweet

 Save

 More

Video publishing at The Times is growing

For the past 10 years, the video publishing lifecycle at The New York Times has relied on vendors and in-house hardware solutions. With our growing investment in video journalism over the past couple of years, we've found ourselves producing more video content every month, along with supporting new initiatives such as 360-degree video and Virtual Reality. This growth has created the need to migrate to a video publishing platform that could adapt to, and keep up with, the fast pace that our newsroom demands and the continued evolution of our production process. Along with this, we needed a system that could continuously scale in both capacity and features while not compromising on either quality or reliability.

A solution

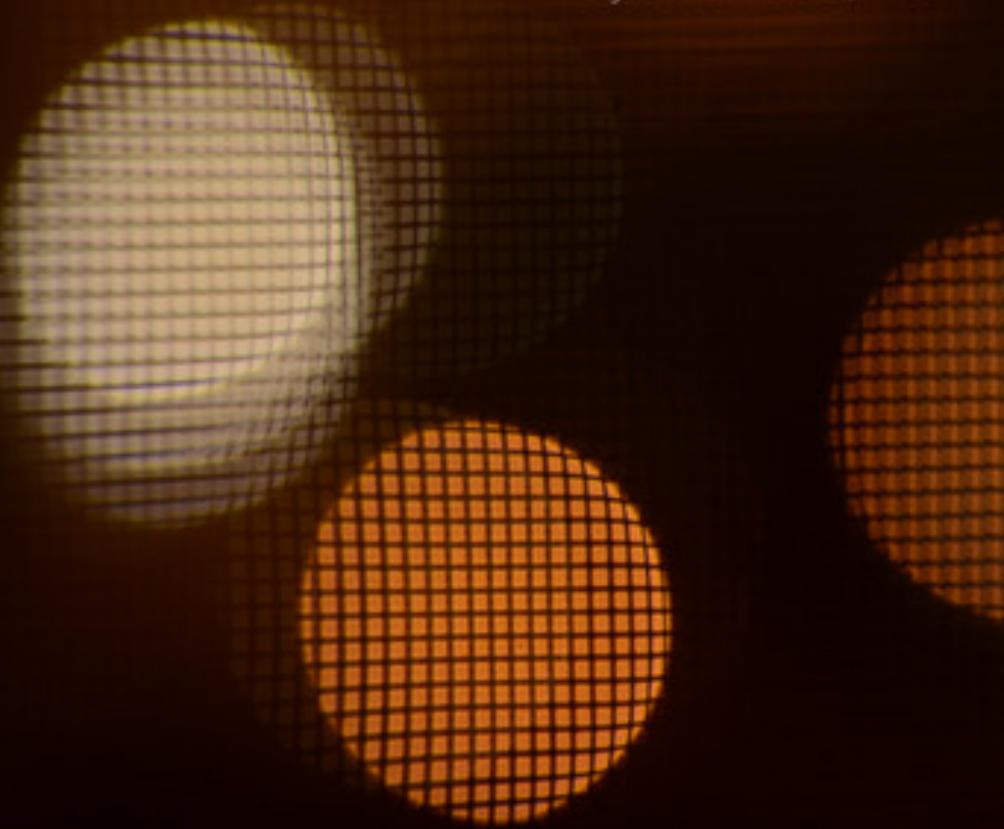
At the beginning of this year, we created a group inside our video engineering team to implement a new solution for the ingesting, encoding, publishing and the syndication of our growing library of video content. The main goal of the team was to implement a job processing pipeline that was vendor agnostic and cloud-based, along with being highly efficient, elastic, and, of course, reliable. Another goal was to make the system as easy to use as possible, removing any hurdles that might get in the way of our video producers publishing their work and distributing it to our platforms and third-party partners. To do that, we decided to leverage the

FINAL PROJECTS

FINAL PROJECTS

- Opportunity to use what you've learned in a project you care about
 - Adapt old iOS project
 - New project
 - ...

Sound On Sound
by Diomedé, Inc.

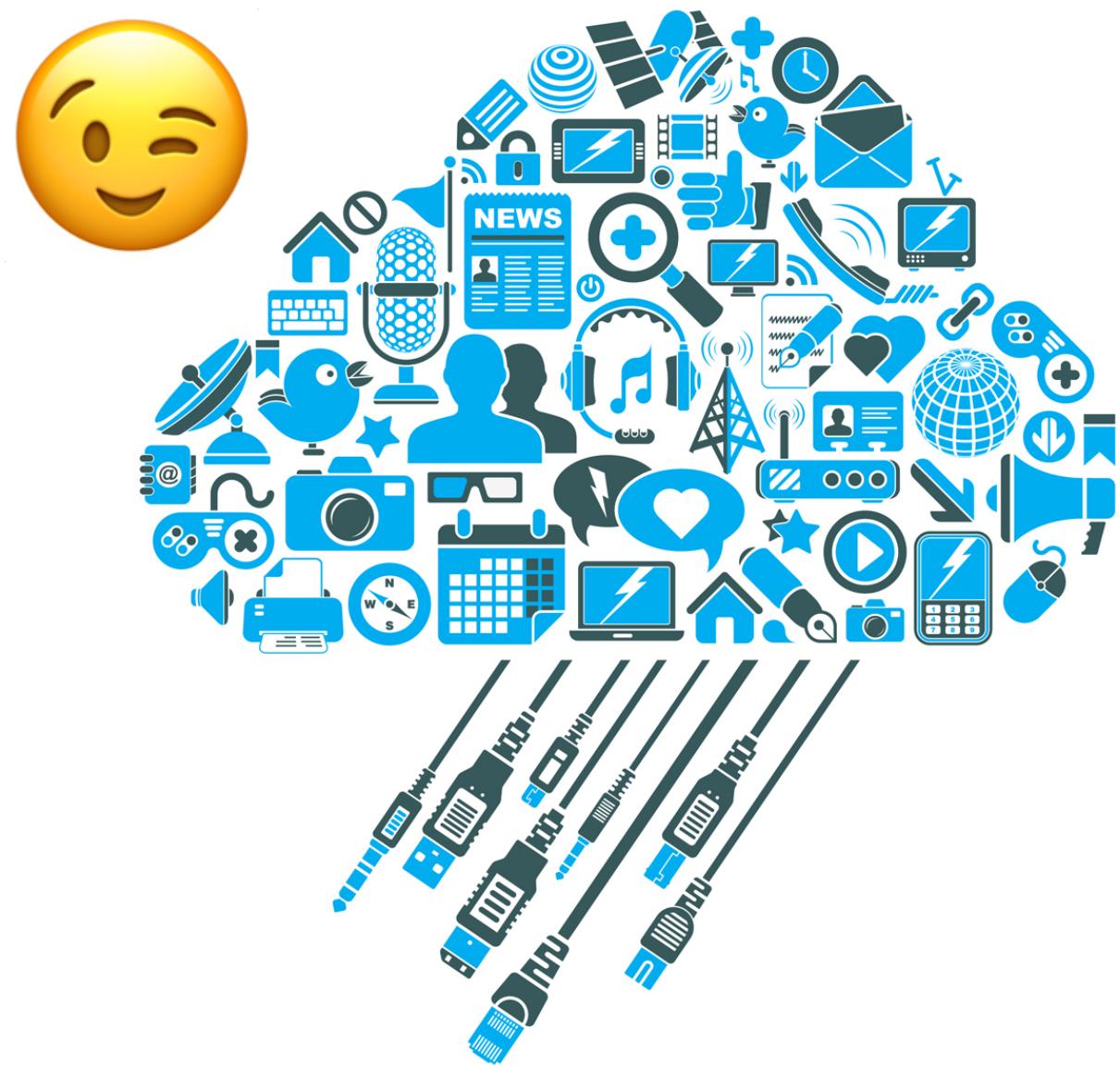


be creative, again.

BACKENDS FOR MOBILE APPLICATION

BACKENDS FOR MOBILE APPLICATION

- Backends is a specific utilization of cloud computing



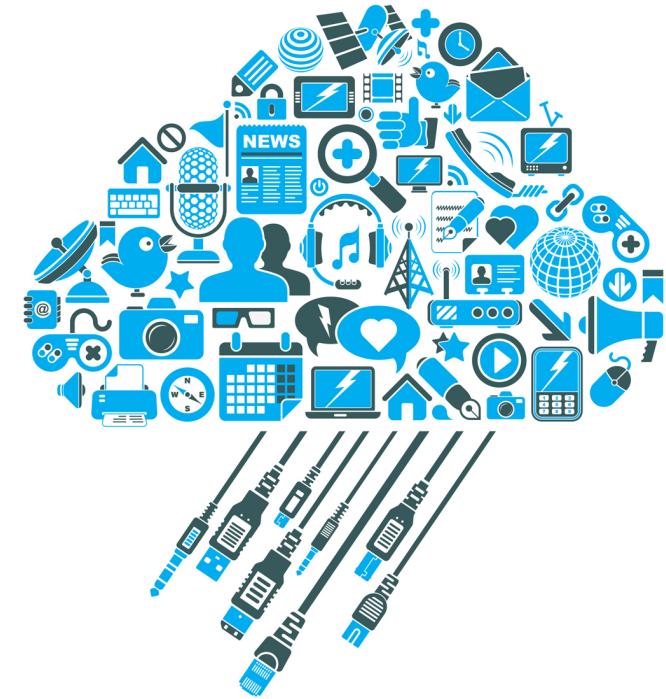
BACKENDS FOR MOBILE APPLICATION

- Can you keep a secret?



BACKENDS FOR MOBILE APPLICATION

- Cloud Computing
 - General term used to describe a class of network based computing over the Internet
 - Collection/group of integrated and networked hardware, software and Internet infrastructure (ie. platform)
 - Off-the-shelf components with OSS combined with in-house applications and/or system software



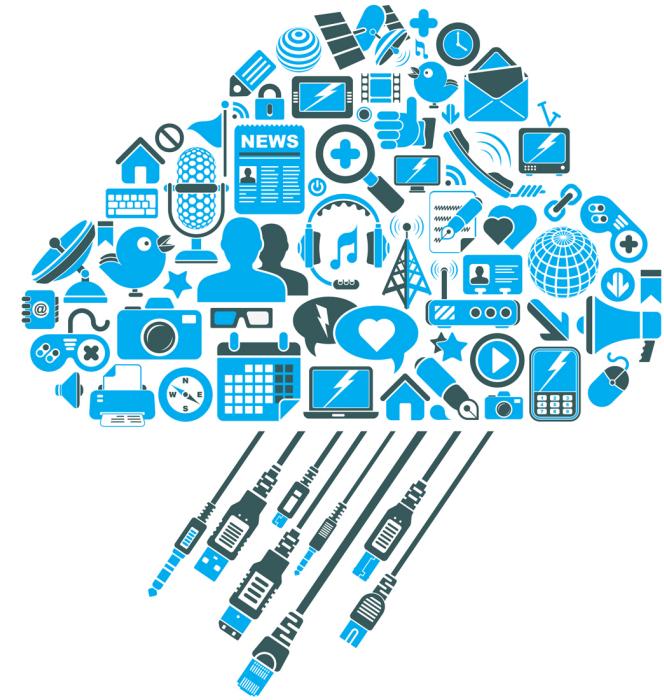
BACKENDS FOR MOBILE APPLICATION

- Cloud computing platforms
 - Provides on demand services
 - Elastic pricing (pay for what you use)
 - Scale up and down in capacity and functionalities
 - Available to general public, enterprises, corporations and businesses markets
 - Cloud are transparent to users and applications



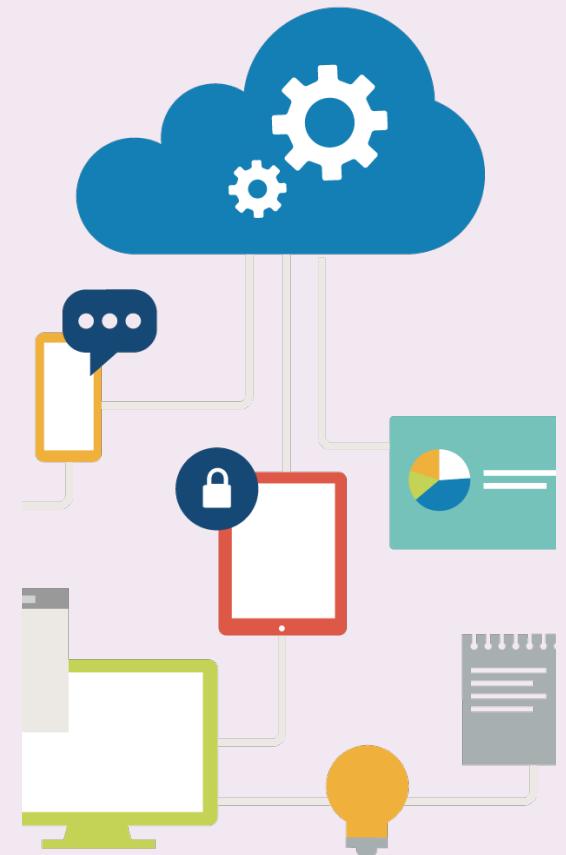
BACKENDS FOR MOBILE APPLICATION

- Characteristics of cloud computing
 - Use the Internet for communication and transport
 - Provides hardware, software and networking services to clients
 - Hide the complexity and details of the underlying infrastructure from users and applications through APIs



BACKENDS FOR MOBILE APPLICATION

- Characteristics of cloud data, applications services and infrastructure
 - Remotely hosted - services or data are hosted on remote infrastructure
 - Ubiquitous - services or data are available from anywhere
 - Commodified - a utility



BACKENDS FOR MOBILE APPLICATION

Common Characteristics:

Massive Scale

Homogeneity

Virtualization

Low Cost Software

Resilient Computing

Geographic Distribution

Service Orientation

Advanced Security

Reproduce the features of robust architecture that would require cross discipline expertise

Essential Characteristics:

On Demand Self-Service

Broad Network Access

Resource Pooling

Rapid Elasticity

Measured Service

Make it more cost effective

BACKENDS FOR MOBILE APPLICATION

- Cloud service models
 - Software as a service (SaaS) - Adobe Creative Cloud, Office 365
 - Storage as a service - Apple iCloud, Box, Amazon
 - Platform as a service (PaaS) - Amazon S3, Google App Engine
 - Infrastructure as a service (IaaS) - AWS, Rackspace, Google Compute Engine

BACKENDS FOR MOBILE APPLICATION

- Cloud computing providers

Application Service (SaaS)	MS Live/ExchangeLabs, IBM, Google Apps; Salesforce.com Quicken Online, <u>Zoho</u> , Cisco
Application Platform	Google App Engine, Mosso, Force.com, Engine Yard, Facebook, <u>Heroku</u> , AWS
Server Platform	3Tera, EC2, SliceHost, GoGrid, RightScale, Linode
Storage Platform	Amazon S3, Dell, Apple, ...

Naming and acronyms are not consistent across industry

BACKENDS FOR MOBILE APPLICATION

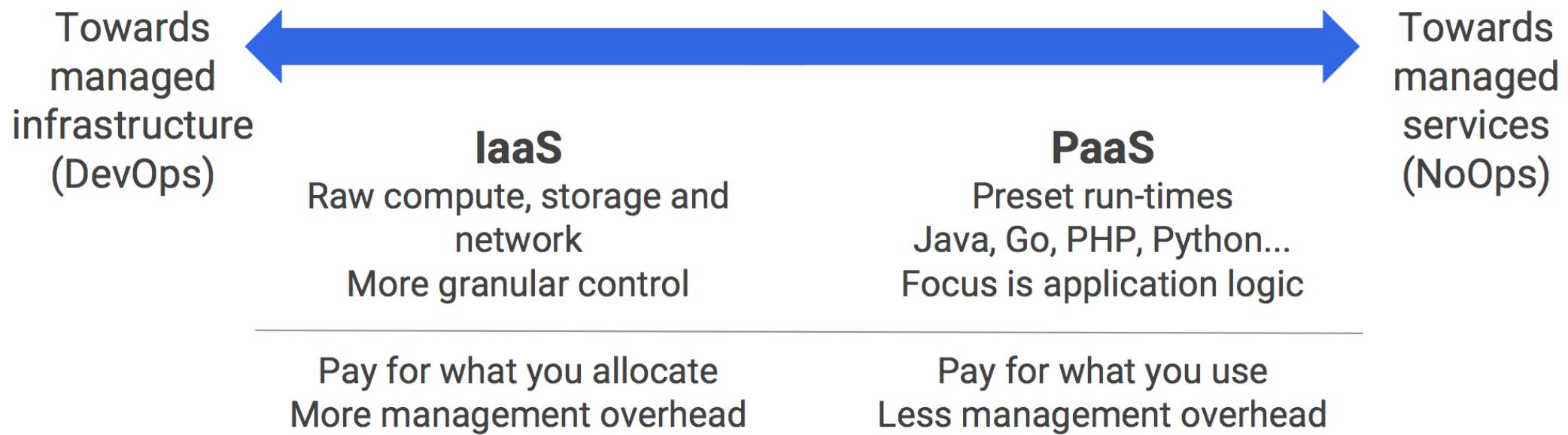
- Cloud computing service layers

Services	Description
Services	Services - Complete business services such as PayPal, OpenID, OAuth, Google Maps, Alexa
Application	Application - Cloud based software that eliminates the need for local installation such as Google Apps, Microsoft Online
Development	Development - Software development platforms used to build custom cloud based applications (PAAS & SAAS) such as SalesForce
Platform	Platform - Cloud based platforms, typically provided using virtualization, such as Amazon ECC, Sun Grid
Storage	Storage - Data storage or cloud based NAS such as CTERA, iDisk, CloudNAS
Hosting	Hosting - Physical data centers such as those run by IBM, HP, NaviSite, etc.

Application Focused

Infrastructure Focused

BACKENDS FOR MOBILE APPLICATION

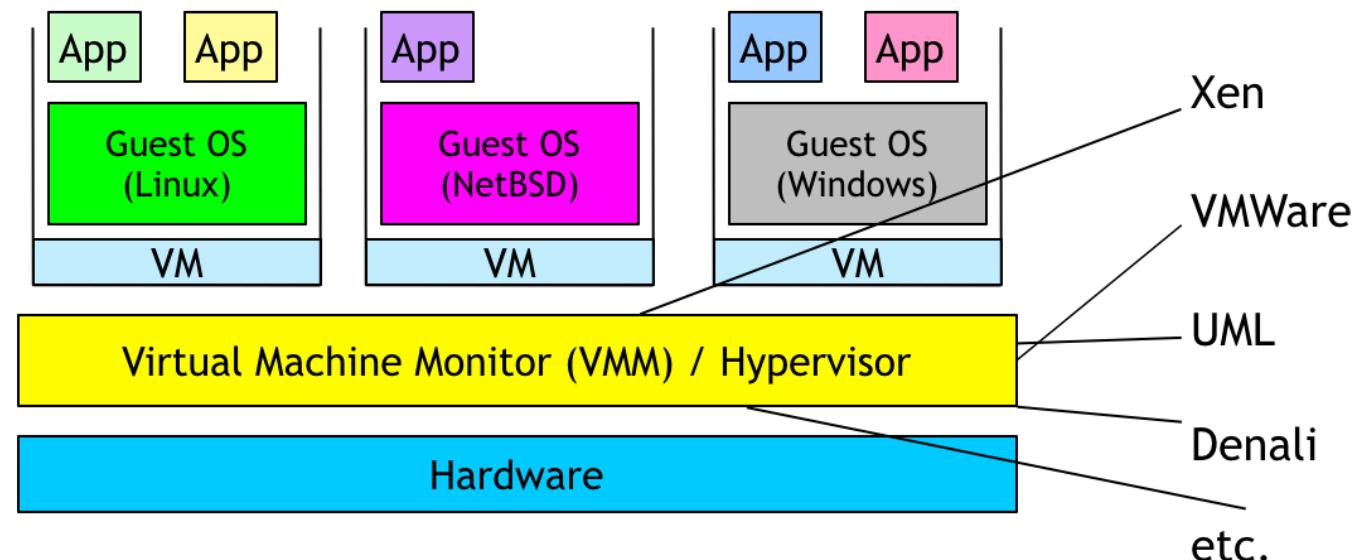


BACKENDS FOR MOBILE APPLICATION

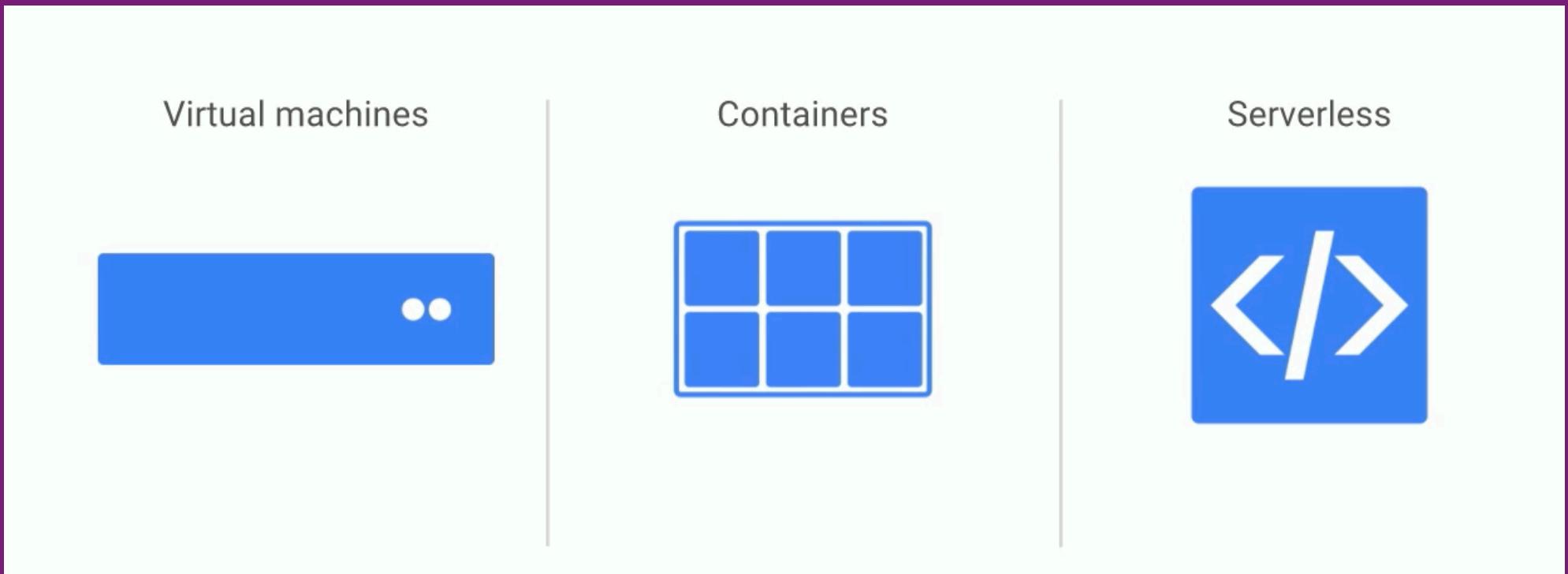
- Common benefits
 - “no-need-to-know” the underlying details of infrastructure
 - Applications interface with the infrastructure via the APIs (simpler)
 - “flexibility and elasticity” allows these systems to scale up and down at will utilizing the resources (eg. CPU, storage, server capacity, load balancing, and databases)
 - “pay as much as used and needed” type of utility computing
 - “always on!, anywhere and any place” type of network-based computing

BACKENDS FOR MOBILE APPLICATION

- VM (virtual machine) technology allows multiple virtual machines to run on a single physical machine
- Abstraction of a physical machine



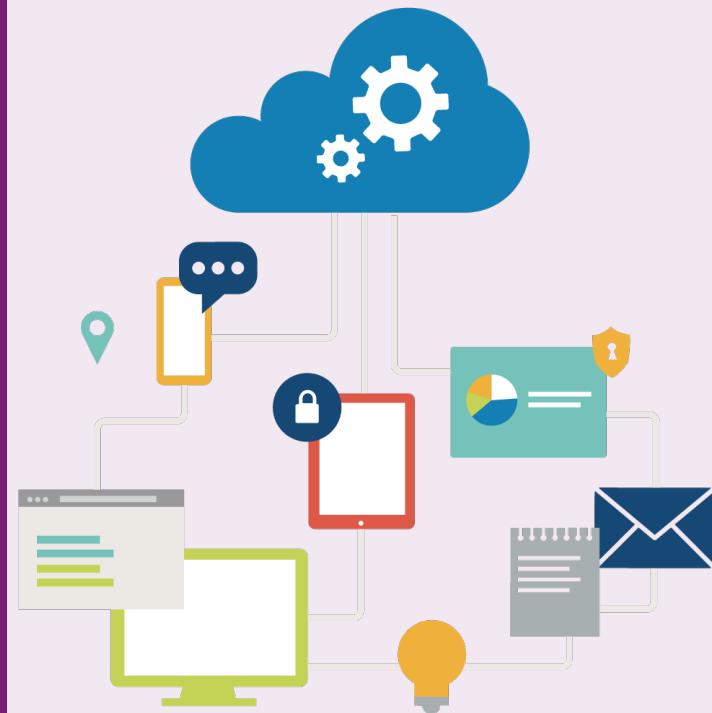
BACKENDS FOR MOBILE APPLICATION



- Virtualization of computers, application, functions

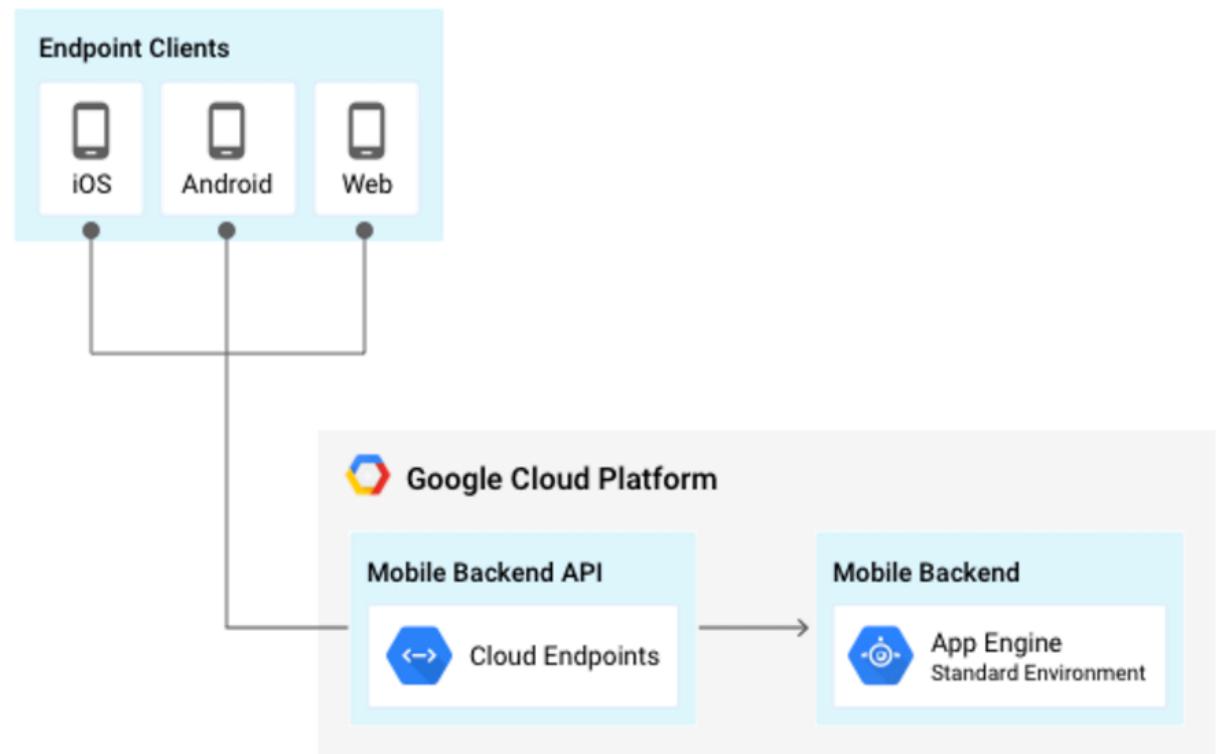
BACKENDS FOR MOBILE APPLICATION

- Advantages
 - Performance, cost, access, collaboration, reliability, bought expertise, security
- Disadvantages
 - Need a network, loss of control, ease of use, monopolization of industry, security

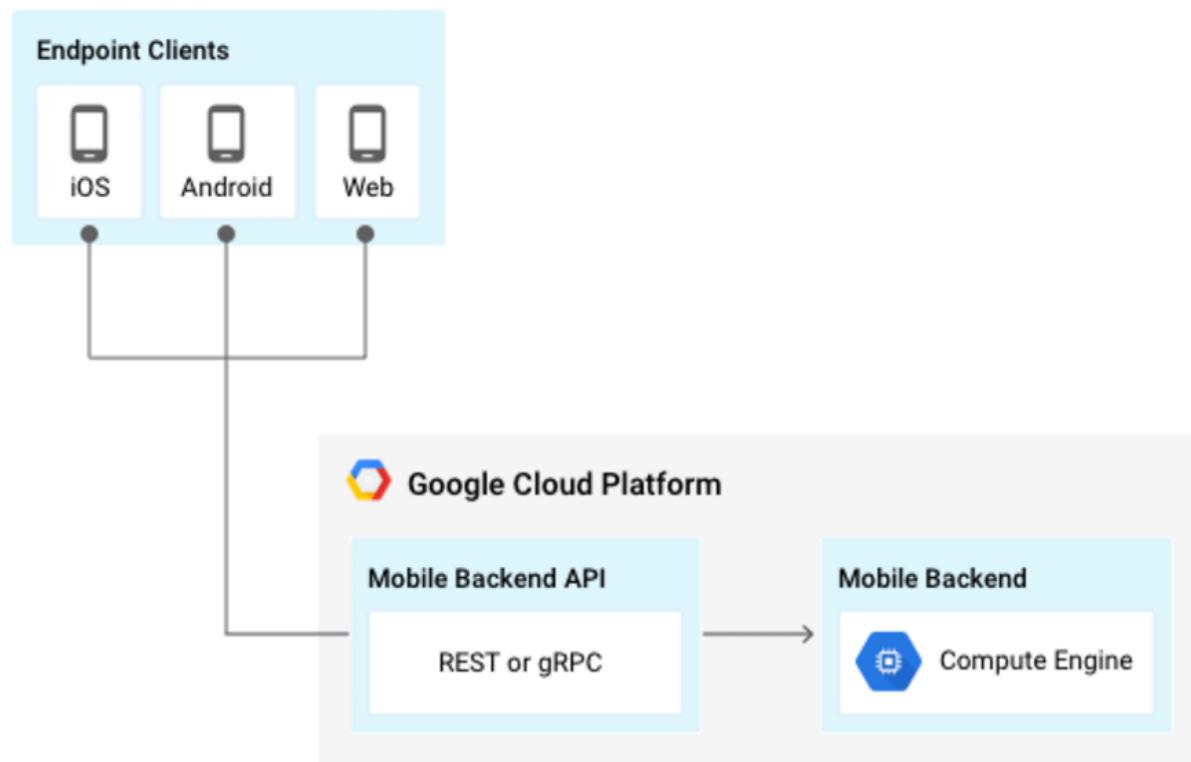


BACKENDS FOR MOBILE APPLICATION

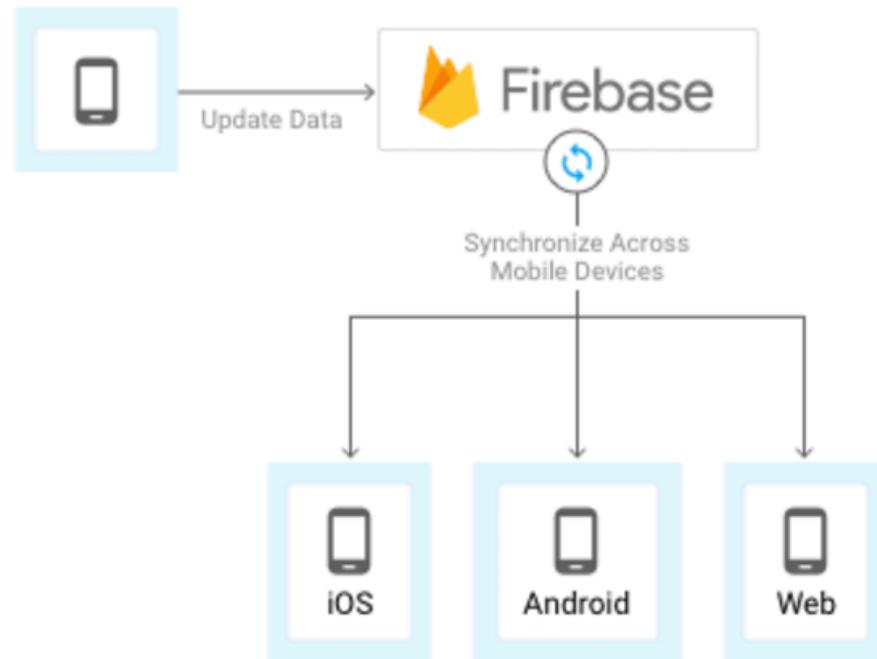
- Design patterns for backends for mobile applications



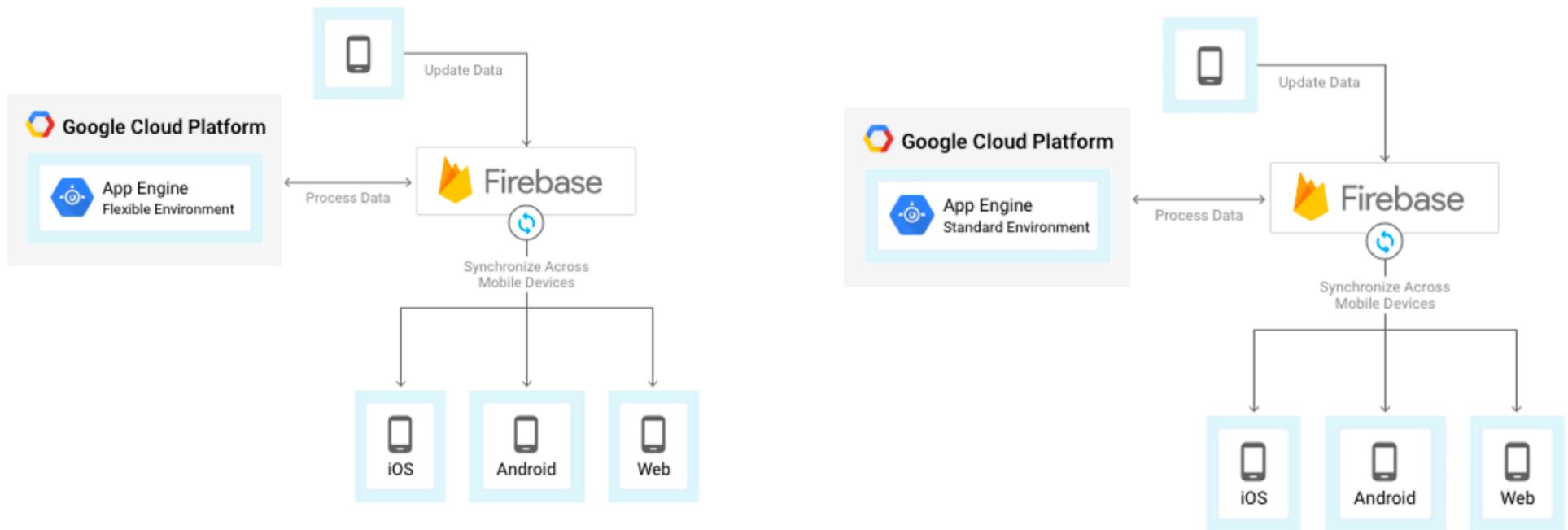
BACKENDS FOR MOBILE APPLICATION



BACKENDS FOR MOBILE APPLICATION



BACKENDS FOR MOBILE APPLICATION



BREAK TIME



GOOGLE CLOUD PLATFORM

FOR MOBILE APPLICATION DEVELOPERS

GOOGLE CLOUD PLATFORM

- Platform to build, test and deploy applications and services using Google's infrastructure
 - Highly-scalable
 - Secure
 - Reliable



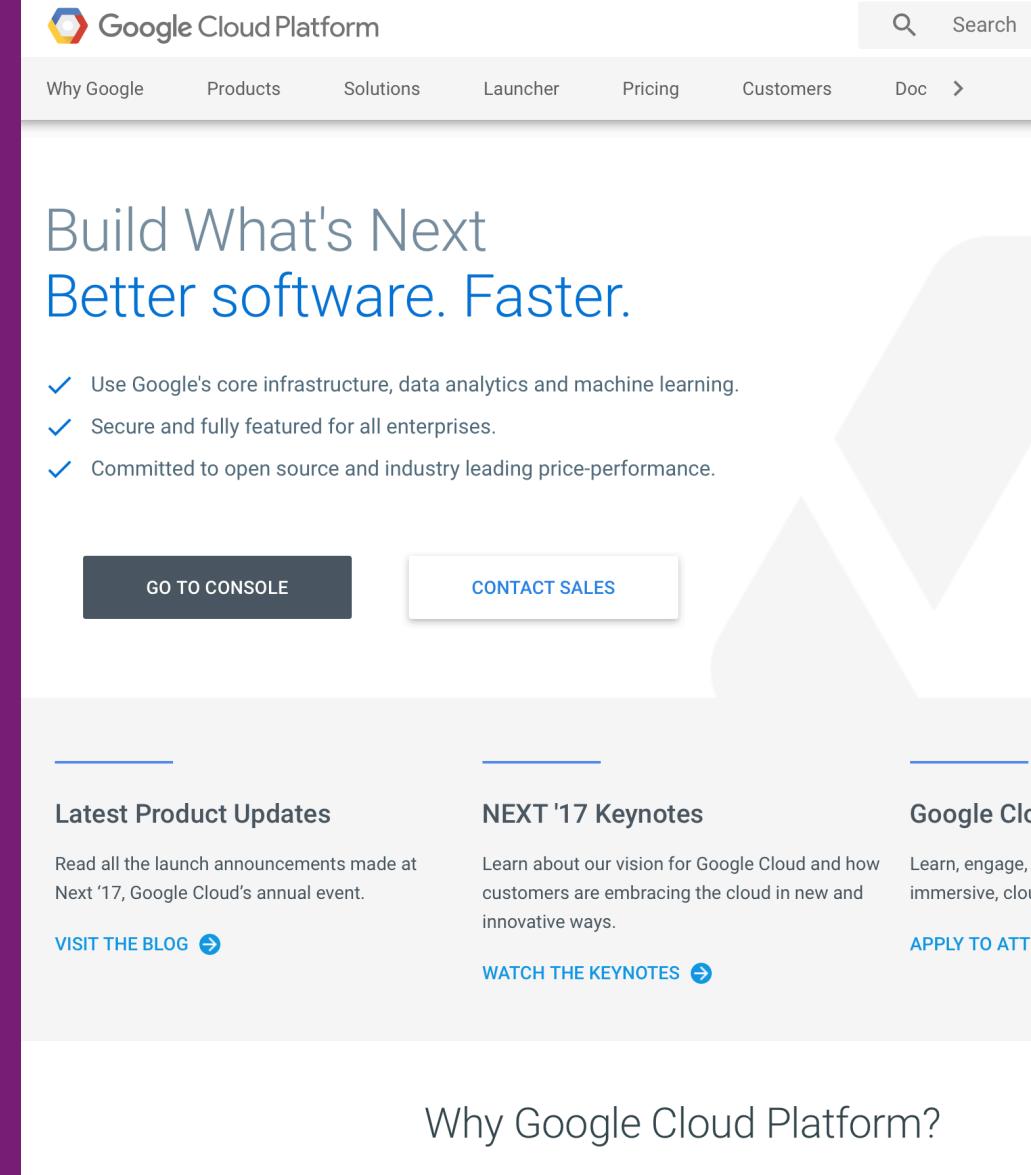
GOOGLE CLOUD PLATFORM

- GCP uses Google's infrastructure and data centers
 - Global meshed backbone network
 - 33 countries



GOOGLE CLOUD PLATFORM

- Google Cloud Platform provides offerings of every type to run code in the cloud
 - Control
 - Ease of use
 - Cost
 - Products (50+)



The screenshot shows the Google Cloud Platform homepage. At the top, there's a navigation bar with links for "Why Google", "Products", "Solutions", "Launcher", "Pricing", "Customers", and "Doc". A search bar is also at the top right. The main headline reads "Build What's Next" and "Better software. Faster." Below this, there's a list of three benefits: "Use Google's core infrastructure, data analytics and machine learning.", "Secure and fully featured for all enterprises.", and "Committed to open source and industry leading price-performance.". Two buttons are present: "GO TO CONSOLE" in a dark box and "CONTACT SALES" in a light box. Below these, there are sections for "Latest Product Updates" (with a link to "VISIT THE BLOG"), "NEXT '17 Keynotes" (with a link to "WATCH THE KEYNOTES"), and "Google Cloud" (with a link to "APPLY TO ATTEND"). At the bottom, a large call-to-action button says "Why Google Cloud Platform?".

Google Cloud Platform

Why Google Products Solutions Launcher Pricing Customers Doc >

Search

Build What's Next
Better software. Faster.

- ✓ Use Google's core infrastructure, data analytics and machine learning.
- ✓ Secure and fully featured for all enterprises.
- ✓ Committed to open source and industry leading price-performance.

GO TO CONSOLE

CONTACT SALES

Latest Product Updates

Read all the launch announcements made at Next '17, Google Cloud's annual event.

VISIT THE BLOG →

NEXT '17 Keynotes

Learn about our vision for Google Cloud and how customers are embracing the cloud in new and innovative ways.

WATCH THE KEYNOTES →

Google Cloud

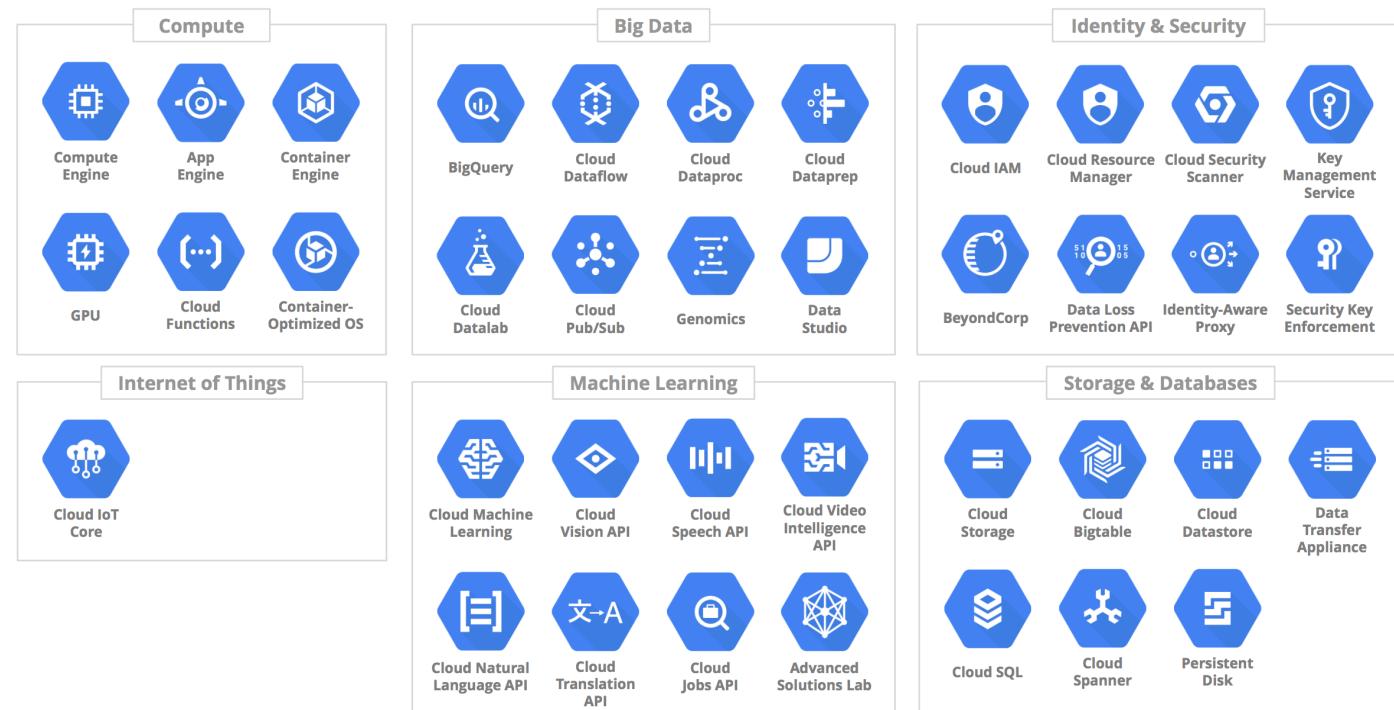
Learn, engage, and n immersive, cloud eve

APPLY TO ATTEND

Why Google Cloud Platform?

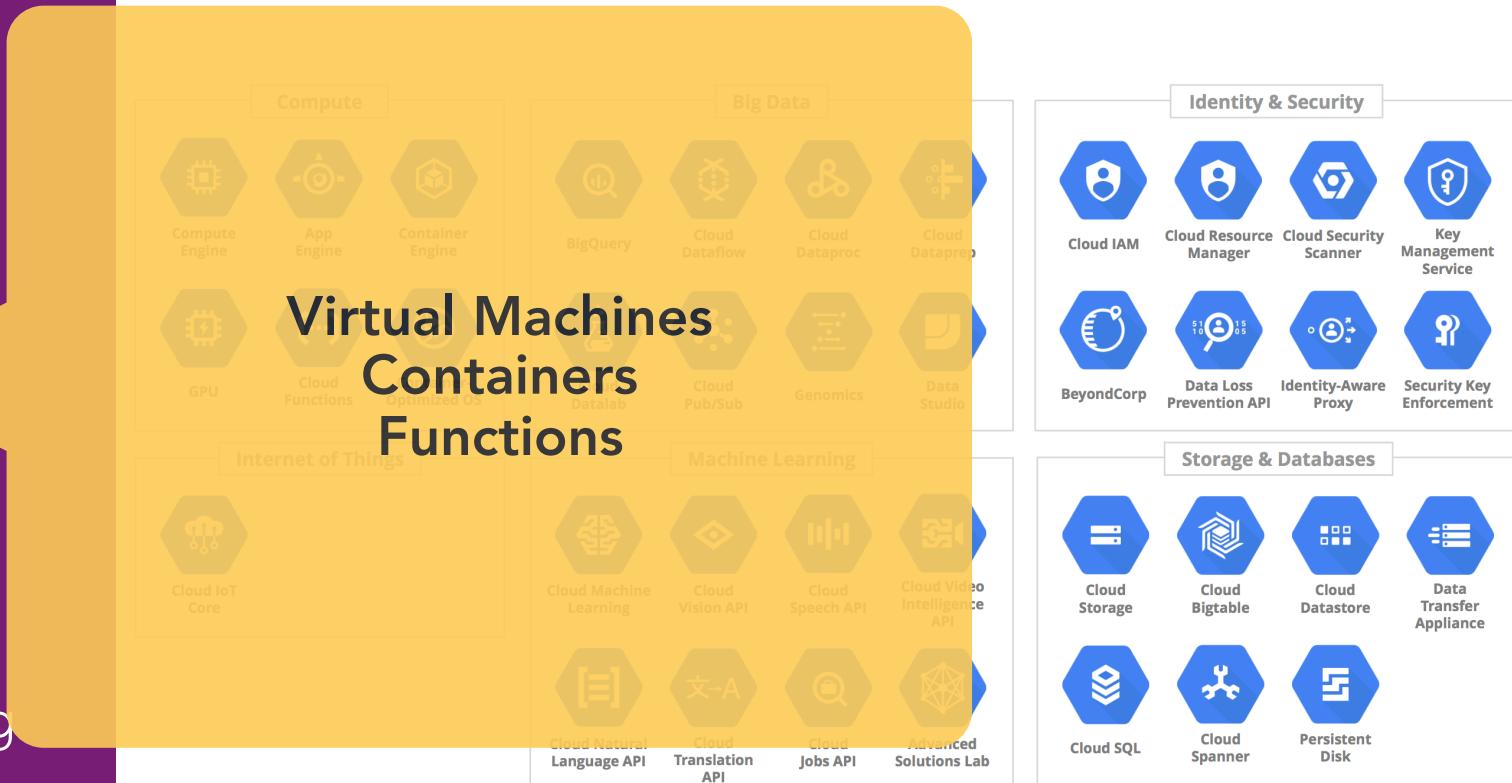
GOOGLE CLOUD PLATFORM

- Compute
- Storage
- Big Data
- Machine Learning



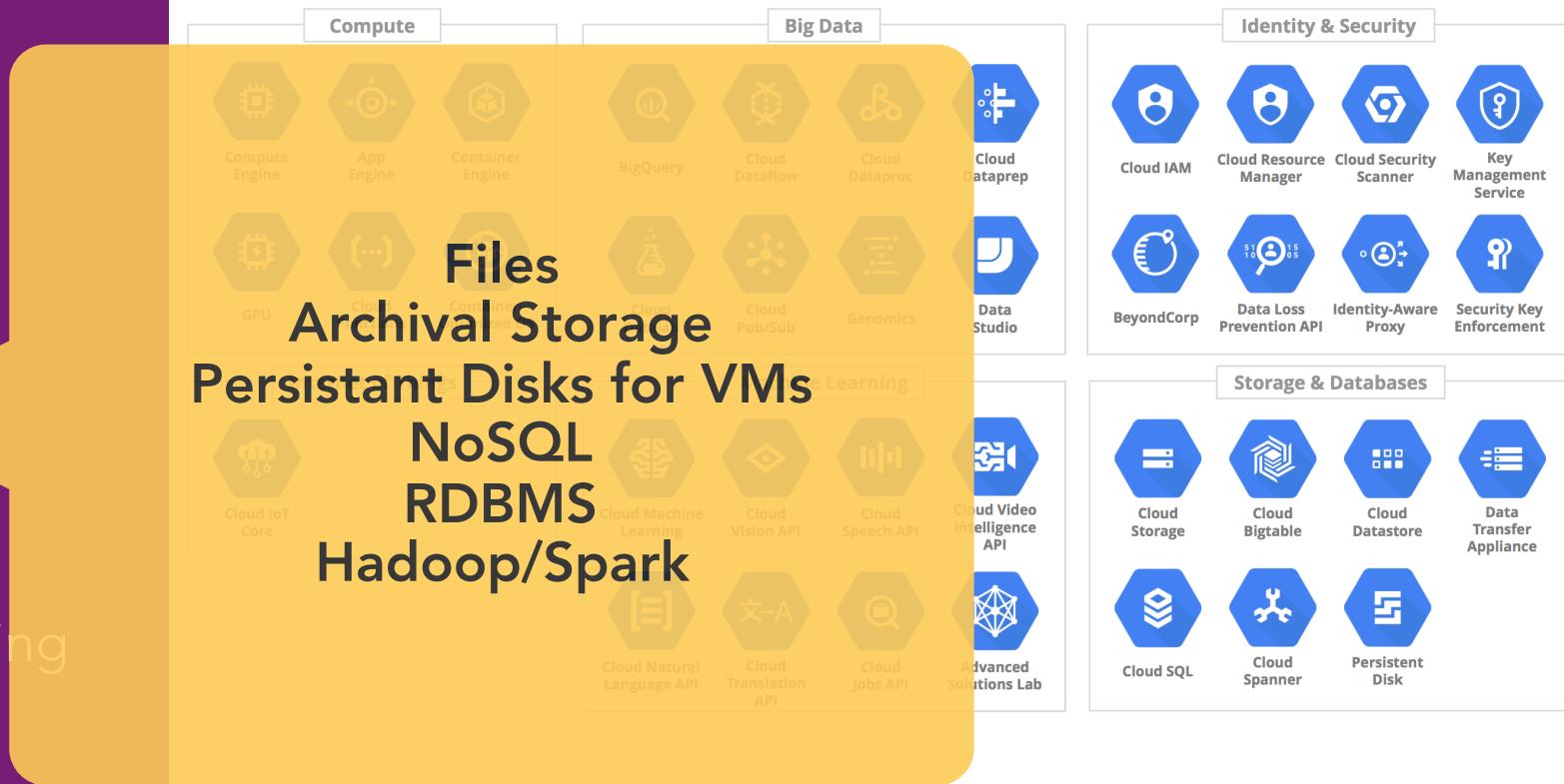
GOOGLE CLOUD PLATFORM

- Compute
- Storage
- Big Data
- Machine Learning



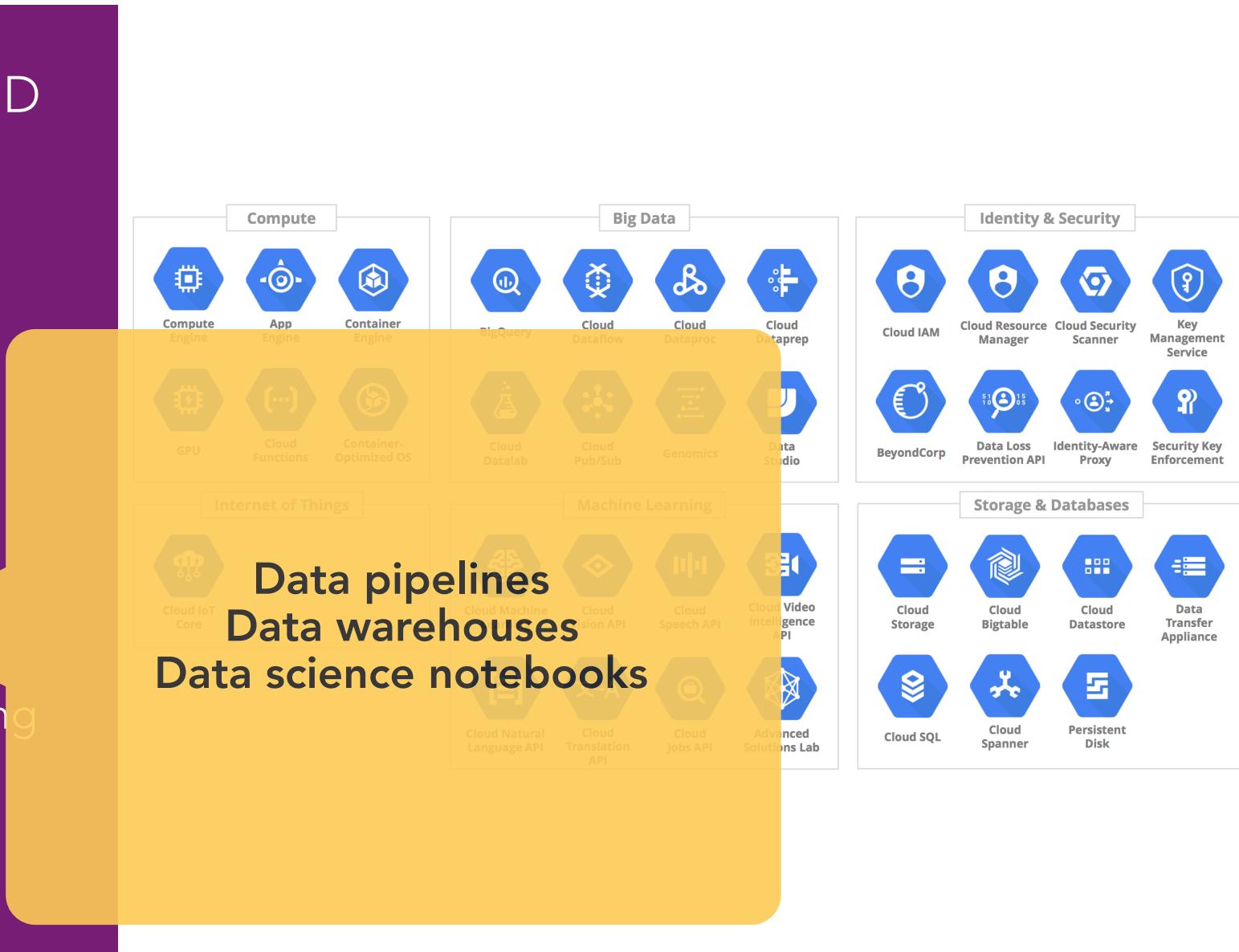
GOOGLE CLOUD PLATFORM

- Compute
 - Storage
 - Big Data
 - Machine Learning



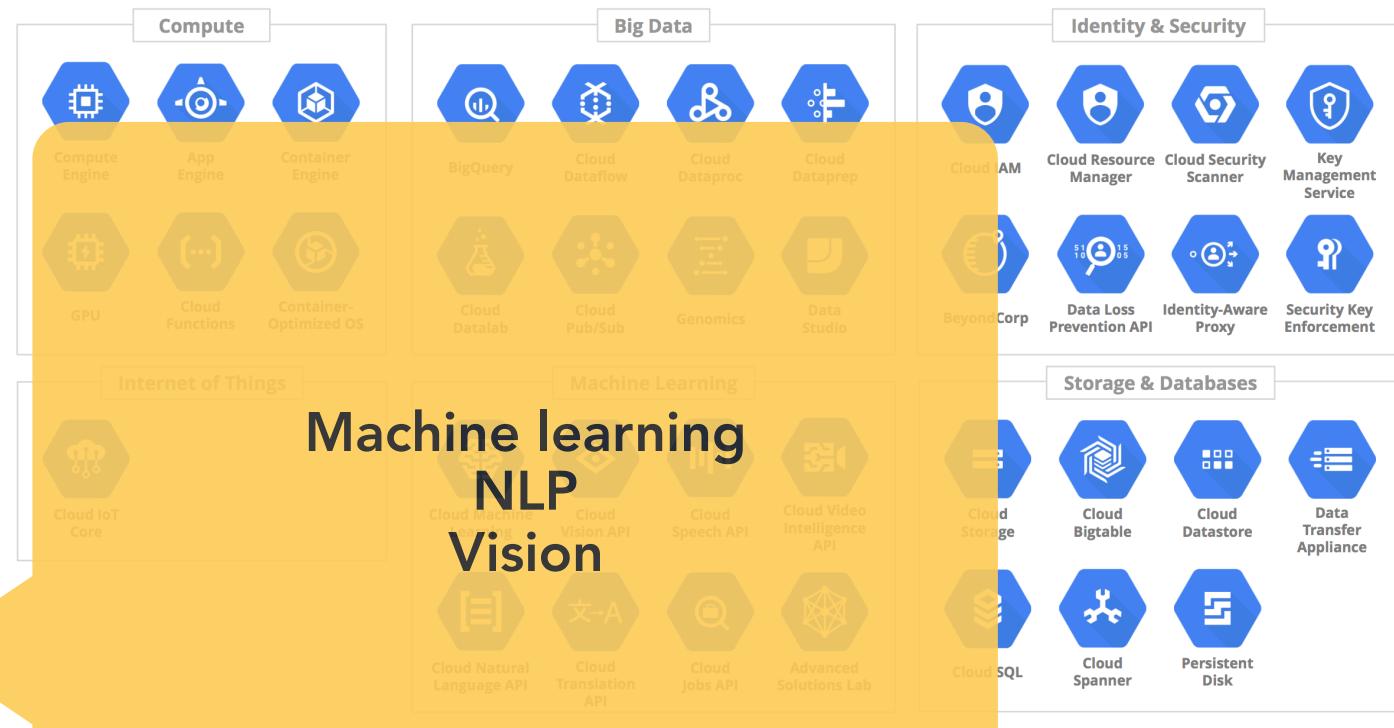
GOOGLE CLOUD PLATFORM

- Compute
- Storage
- Big Data
- Machine Learning



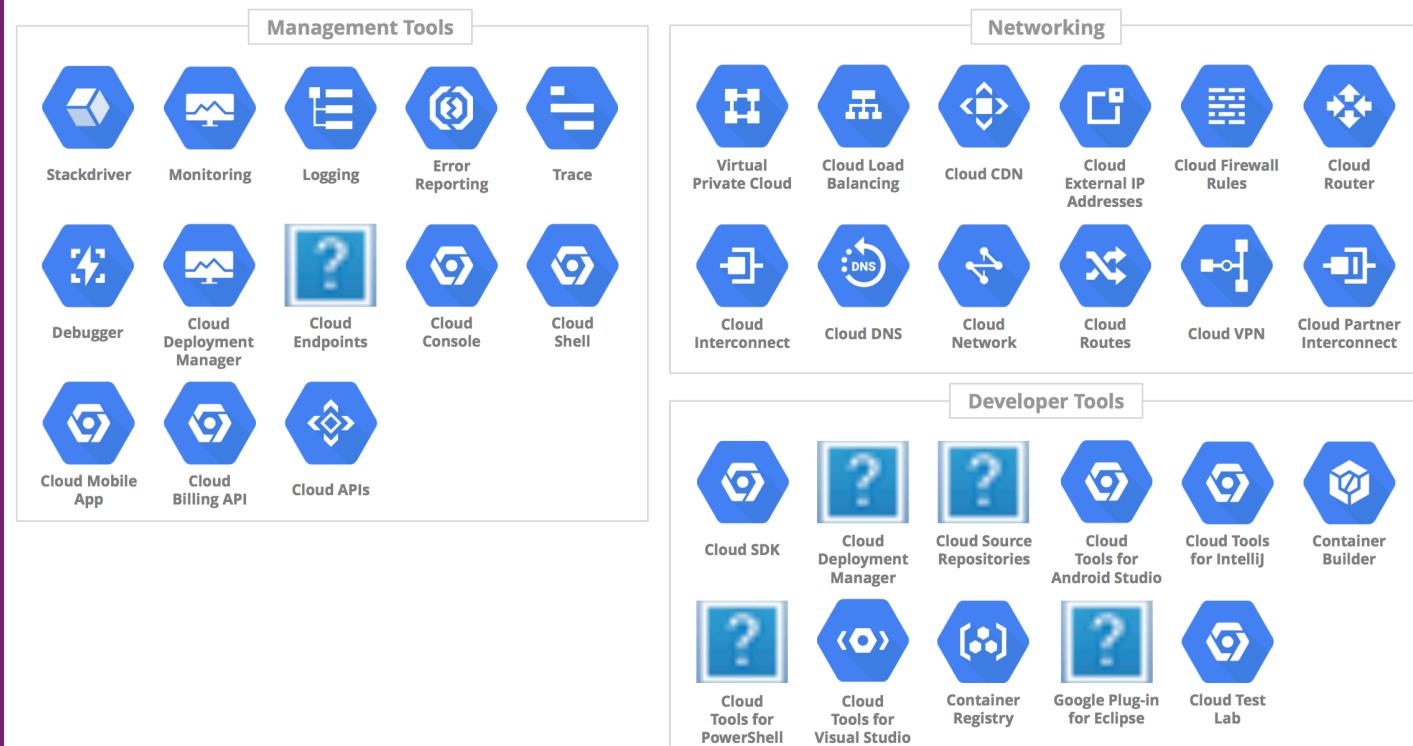
GOOGLE CLOUD PLATFORM

- Compute
- Storage
- Big Data
- Machine Learning



GOOGLE CLOUD PLATFORM

- Developer Tools
- Networking
- Management Tools
- Identity and Security



GOOGLE CLOUD PLATFORM

- Developer Tools
- Networking
- Management Tools
- Identity and Security



GOOGLE CLOUD PLATFORM

Why Google Cloud Platform?



Future-Proof Infrastructure

Secure, global, high-performance, cost-effective and constantly improving. We've built our cloud for the long haul.



Seriously Powerful Data & Analytics

Tap into big data to find answers faster and build better products.



Serverless, Just Code

Grow from prototype to production to planet-scale, without having to think about capacity, reliability or performance.

BENEFITS OF GCP 

BENEFITS OF GCP

- Time
 - Faster to market
 - Borrowed expertise
 - Fast infrastructure (for development and growth)



BENEFITS OF GCP

- Money
 - Pay for what you use; scales to 0
 - No capital investments; rent vs. buy
 - Man hours



BENEFITS OF GCP

- Co\$t benefits (compared to other clouds)
 - Sub-hour billing
 - Sustained user discounts
 - Custom machine



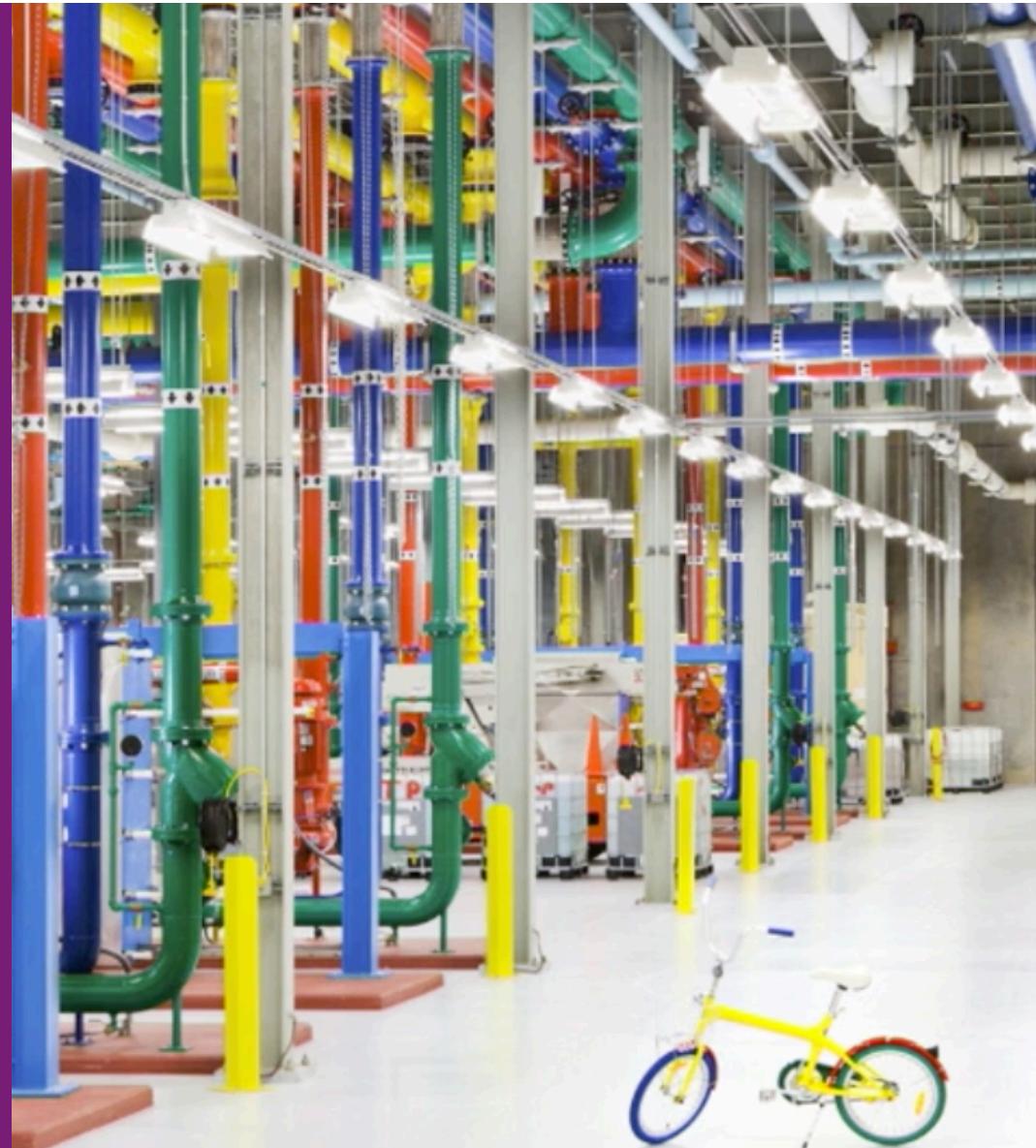
BENEFITS OF GCP

- Scaling
 - Default is to autoscale
 - Set limits



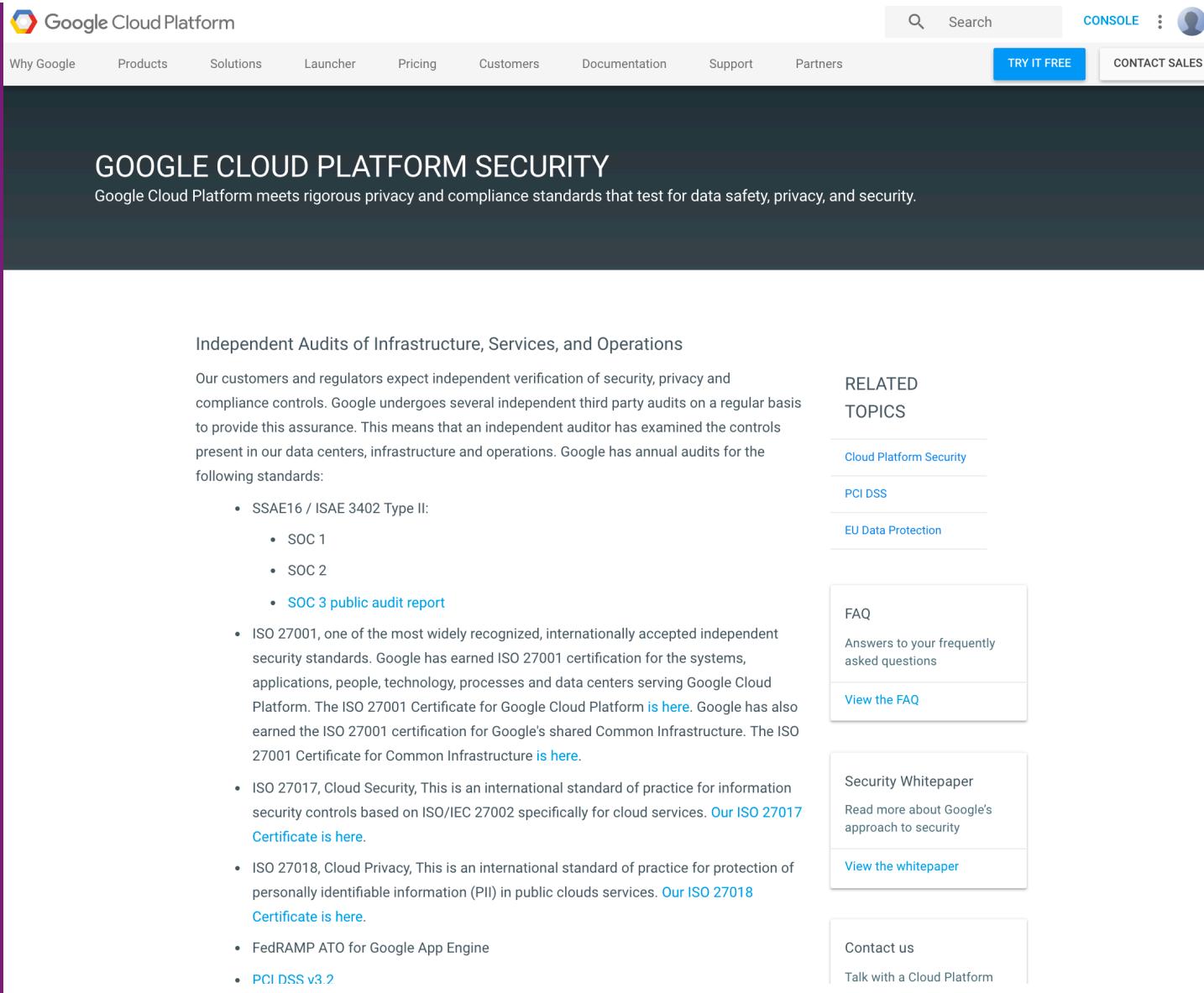
BENEFITS OF GCP

- Upgrades
 - Frequent improvements to infrastructure
 - Services added/upgraded



BENEFITS OF GCP

- Compliance
 - Certifications for compliance across different industries



The screenshot shows the Google Cloud Platform Security page. At the top, there's a navigation bar with links for Why Google, Products, Solutions, Launcher, Pricing, Customers, Documentation, Support, and Partners. On the right, there are buttons for Search, TRY IT FREE, CONTACT SALES, CONSOLE, and a user profile icon. The main title is "GOOGLE CLOUD PLATFORM SECURITY" with a subtitle stating "Google Cloud Platform meets rigorous privacy and compliance standards that test for data safety, privacy, and security." Below this, there's a section titled "Independent Audits of Infrastructure, Services, and Operations" which discusses Google's annual audits for various standards like SSAE16, ISO 27001, ISO 27017, ISO 27018, FedRAMP, and PCI DSS. To the right, there's a sidebar titled "RELATED TOPICS" with links to "Cloud Platform Security", "PCI DSS", and "EU Data Protection". At the bottom, there are three boxes: "FAQ" (with a link to "View the FAQ"), "Security Whitepaper" (with a link to "View the whitepaper"), and "Contact us" (with a link to "Talk with a Cloud Platform").

Independent Audits of Infrastructure, Services, and Operations

Our customers and regulators expect independent verification of security, privacy and compliance controls. Google undergoes several independent third party audits on a regular basis to provide this assurance. This means that an independent auditor has examined the controls present in our data centers, infrastructure and operations. Google has annual audits for the following standards:

- SSAE16 / ISAE 3402 Type II:
 - SOC 1
 - SOC 2
 - [SOC 3 public audit report](#)
- ISO 27001, one of the most widely recognized, internationally accepted independent security standards. Google has earned ISO 27001 certification for the systems, applications, people, technology, processes and data centers serving Google Cloud Platform. The ISO 27001 Certificate for Google Cloud Platform [is here](#). Google has also earned the ISO 27001 certification for Google's shared Common Infrastructure. The ISO 27001 Certificate for Common Infrastructure [is here](#).
- ISO 27017, Cloud Security, This is an international standard of practice for information security controls based on ISO/IEC 27002 specifically for cloud services. [Our ISO 27017 Certificate is here](#).
- ISO 27018, Cloud Privacy, This is an international standard of practice for protection of personally identifiable information (PII) in public clouds services. [Our ISO 27018 Certificate is here](#).
- FedRAMP ATO for Google App Engine
- [PCI DSS v3.2](#)

RELATED TOPICS

[Cloud Platform Security](#)

[PCI DSS](#)

[EU Data Protection](#)

FAQ
Answers to your frequently asked questions
[View the FAQ](#)

Security Whitepaper
Read more about Google's approach to security
[View the whitepaper](#)

Contact us
Talk with a Cloud Platform

BENEFITS OF GCP

- The bad
 - Options are daunting; "Am I doing this the right (best) way"
 - Documentation
 - Potential for di\$aster



TOOLS AND LIBRARIES

TOOLS AND LIBRARIES

- Google tools
- Consoles/GUIs
- Command line
- Third-party tools

Choosing Developer Tools on GCP

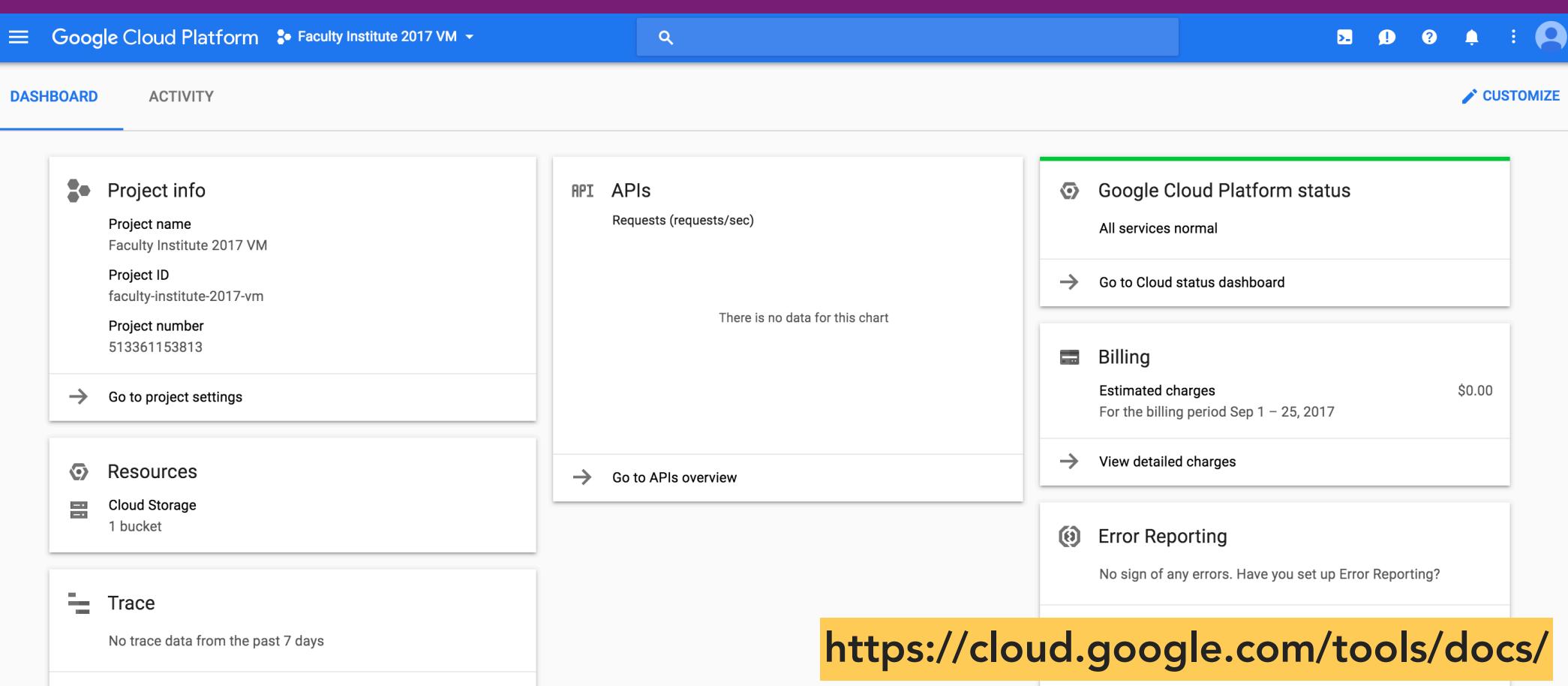
Google Cloud Platform provides a collection of tools and libraries that help you develop quicker. This page helps you identify the tools that best fit your situation, whether you're looking to manage your resources from the command line, need better ways to debug source code in production, need a solution for running API backends or just want intuitive integration into your favorite IDE.



TOOL	DESCRIPTION	BENEFITS
Cloud SDK	Command-line interface for Google Cloud Platform products and services	Manage all of your Google Cloud Platform projects from the command line including compute, networking, storage and development products.
Cloud Shell	Manage your infrastructure and applications from the command-line in any browser	Your own Linux VM accessible from your browser allows you to manage your GCP resources with all of the necessary tools pre-installed and up-to-date.
Cloud Source Repositories	Private Git repositories hosted on Google Cloud Platform	Enable collaborative development with hosted Git repositories and improve developer productivity with automatic integration with Stackdriver Debugger and other Google Cloud Platform diagnostic tools.
Cloud Tools for Android Studio	Build backend services on Google Cloud Platform for your Android apps	Google Cloud Platform plugin for Android Studio lets you unify the development experience by letting you code, build, test and validate your backends in the same environment you use to develop your mobile apps.
Cloud Tools for IntelliJ	Deploy and debug production cloud applications right inside of IntelliJ	Google Cloud Platform plugin for IntelliJ lets you easily deploy and debug your Java applications directly from your IDE.
Cloud Tools for Eclipse	Deploy and debug App Engine Standard applications right inside of Eclipse	Google Cloud Platform plugin for Eclipse lets you easily deploy and debug your Java App Engine Standard applications directly from your IDE.
Cloud Tools for PowerShell	Full Google Cloud Platform control from Windows PowerShell	Cloud Tools for PowerShell lets you script, automate, and manage your Google Cloud Platform projects.
Cloud Tools for Visual Studio	Deploy Visual Studio applications to Google Cloud Platform	Google Cloud Platform plugin for Visual Studio lets you easily deploy your .NET applications directly and manage your projects from Visual Studio.
Cloud Deployment Manager	Create and manage cloud resources with simple templates	Google Cloud Deployment Manager allows you to specify all the resources needed for your application in a declarative format using yaml.
Maven App Engine Plugin	Build and deploy your App Engine apps using Maven	The Google Maven Plugin and archetypes lets you easily build and deploy your App Engine applications using Maven.
Gradle App Engine Plugin	Build and deploy your App Engine apps using Gradle	

<https://cloud.google.com/tools/docs/>

TOOLS AND LIBRARIES



The screenshot shows the Google Cloud Platform dashboard for the project "Faculty Institute 2017 VM". The dashboard is divided into several sections:

- Project info:** Project name: Faculty Institute 2017 VM; Project ID: faculty-institute-2017-vm; Project number: 513361153813. A link to "Go to project settings" is provided.
- Resources:** Cloud Storage: 1 bucket.
- Trace:** No trace data from the past 7 days.
- APIs:** Requests (requests/sec) chart (No data). A link to "Go to APIs overview" is provided.
- Status:** Google Cloud Platform status: All services normal. A link to "Go to Cloud status dashboard" is provided.
- Billing:** Estimated charges: \$0.00. For the billing period Sep 1 – 25, 2017. A link to "View detailed charges" is provided.
- Error Reporting:** No sign of any errors. Have you set up Error Reporting?

A large yellow banner at the bottom displays the URL: <https://cloud.google.com/tools/docs/>

TOOLS AND LIBRARIES

The screenshot shows the Google Cloud Platform dashboard with a blue header bar. The header includes the "Google Cloud Platform" logo, a dropdown menu for "Faculty Institute 2017 VM", a search bar, and several status icons.

The left sidebar contains navigation links for various services:

- Cloud Launcher
- Billing
- APIs & services
- Support
- IAM & admin
- COMPUTE
 - App Engine
 - Compute Engine
 - Container Engine
 - Cloud Functions
- STORAGE
 - Bigtable

The main content area displays the following sections:

- APIs**: A chart titled "Requests (requests/sec)" showing no data. It includes a link to "Go to APIs overview".
- Google Cloud Platform status**: Shows "All services normal" and a link to "Go to Cloud status dashboard".
- Billing**: Displays estimated charges of \$0.00 for the period Sep 1 – 25, 2017, with a link to "View detailed charges".
- Error Reporting**: States "No sign of any errors. Have you set up Error Reporting?" and a link to "Learn how to set up Error Reporting".

TOOLS AND LIBRARIES

The screenshot shows the Google Cloud Platform interface. The top navigation bar includes the project name "Faculty Institute 2017 VM" and a search bar. On the left, a sidebar lists "IAM & admin", "IAM", "Identity", "Quotas", and "Manage resources". The main content area displays the "Settings" page for the "Faculty Institute 2017 VM" project. It shows the "Project name" as "Faculty Institute 2017 VM" with a "Save" button, "Project ID" as "faculty-institute-2017-vm", and "Project number" as "513361153813". Below this, a terminal window titled "faculty-institute-2017-vm" shows the command "ls" being run, listing files like "compute-engine-template.jinja", "firewall-template.jinja", etc.

Google Cloud Platform Faculty Institute 2017 VM

IAM & admin

Settings

SHUT DOWN MIGRATE

Project name Faculty Institute 2017 VM Save

Project ID faculty-institute-2017-vm

Project number 513361153813

faculty-institute-2017-vm

```
tabinks@faculty-institute-2017-vm:~/global$ ls
compute-engine-template.jinja  firewall-template.jinja  networking-lab.yaml  network-template.jinja  subnetwork-template.jinja  vm-template.jinja
tabinks@faculty-institute-2017-vm:~/global$ ls
compute-engine-template.jinja  firewall-template.jinja  networking-lab.yaml  network-template.jinja  subnetwork-template.jinja  vm-template.jinja
tabinks@faculty-institute-2017-vm:~/global$
```

TOOLS AND LIBRARIES

```
INFO    2017-09-23 20:14:21,891 recording.py:676] Saved; key: __appstats__:061800, part: 50 bytes, full: 1206 bytes, overhead: 0.000 + 0.005
; link: http://localhost:8080/_ah/stats/details?time=1506197661886
INFO    2017-09-23 20:14:21,900 module.py:832] default: "GET /apple-touch-icon-precomposed.png HTTP/1.1" 404 154
INFO    2017-09-23 20:14:21,924 recording.py:676] Saved; key: __appstats__:061900, part: 38 bytes, full: 1202 bytes, overhead: 0.000 + 0.009
; link: http://localhost:8080/_ah/stats/details?time=1506197661914
INFO    2017-09-23 20:14:21,932 module.py:832] default: "GET /apple-touch-icon.png HTTP/1.1" 404 154
INFO    2017-09-23 20:14:21,937 module.py:832] default: "GET /favicon.ico HTTP/1.1" 404 -
INFO    2017-09-23 20:14:21,963 recording.py:676] Saved; key: __appstats__:061900, part: 12 bytes, full: 1330 bytes, overhead: 0.000 + 0.006
; link: http://localhost:8080/_ah/stats/details?time=1506197661956
INFO    2017-09-23 20:14:21,975 module.py:832] default: "GET / HTTP/1.1" 200 21531
INFO    2017-09-23 20:14:22,002 recording.py:676] Saved; key: __appstats__:061900, part: 50 bytes, full: 1212 bytes, overhead: 0.000 + 0.005
; link: http://localhost:8080/_ah/stats/details?time=1506197661997
INFO    2017-09-23 20:14:22,011 module.py:832] default: "GET /apple-touch-icon-precomposed.png HTTP/1.1" 404 154
INFO    2017-09-23 20:14:22,030 recording.py:676] Saved; key: __appstats__:062000, part: 38 bytes, full: 1198 bytes, overhead: 0.000 + 0.005
; link: http://localhost:8080/_ah/stats/details?time=1506197662025
INFO    2017-09-23 20:14:22,042 module.py:832] default: "GET /apple-touch-icon.png HTTP/1.1" 404 154
INFO    2017-09-23 20:14:22,047 module.py:832] default: "GET /favicon.ico HTTP/1.1" 404 -
INFO    2017-09-23 20:14:22,069 recording.py:676] Saved; key: __appstats__:062000, part: 50 bytes, full: 1234 bytes, overhead: 0.000 + 0.008
; link: http://localhost:8080/_ah/stats/details?time=1506197662059
INFO    2017-09-23 20:14:22,083 module.py:832] default: "GET /apple-touch-icon-precomposed.png HTTP/1.1" 404 154
INFO    2017-09-23 20:14:22,102 recording.py:676] Saved; key: __appstats__:062000, part: 38 bytes, full: 1221 bytes, overhead: 0.000 + 0.005
; link: http://localhost:8080/_ah/stats/details?time=1506197662096
INFO    2017-09-23 20:14:22,112 module.py:832] default: "GET /apple-touch-icon.png HTTP/1.1" 404 154
INFO    2017-09-23 20:14:22,117 module.py:832] default: "GET /favicon.ico HTTP/1.1" 404 -
^CINFO    2017-09-25 04:12:42,163 shutdown.py:45] Shutting down.
INFO    2017-09-25 04:12:42,212 api_server.py:945] Applying all pending transactions and saving the datastore
INFO    2017-09-25 04:12:42,229 api_server.py:948] Saving search indexes
tabinkowski@Ts-MacBook-Pro ~/Documents/Development/GitHub/everydaycomputing/everydaycomputing.org (dev-microservice)
501 %

[Restored Sep 25, 2017, 5:42:39 PM]
Last login: Mon Sep 25 17:42:38 on ttys001
```

TOOLS AND LIBRARIES

Google Cloud Platform Faculty Institute 2017 VM ▾

Library

Google APIs

Search all 100+ APIs

Popular APIs

 Google Cloud APIs Compute Engine API BigQuery API Cloud Storage Service Cloud Datastore API Cloud Deployment Manager API Cloud DNS API More	 Google Cloud Machine Learning Vision API Natural Language API Speech API Translation API Machine Learning Engine API	 Google Maps APIs Google Maps Android API Google Maps SDK for iOS Google Maps JavaScript API Google Places API for Android Google Places API for iOS Google Maps Roads API More
 G Suite APIs Drive API Calendar API Gmail API Sheets API Google Apps Marketplace SDK Admin SDK More	 Mobile APIs Google Cloud Messaging Google Play Game Services Google Play Developer API Google Places API for Android	 Social APIs Google+ API Blogger API Google+ Pages API Google+ Domains API
 YouTube APIs YouTube Data API	 Advertising APIs AdSense Management API	 Other popular APIs Analytics API

TOOLS AND LIBRARIES

GOOGLE STACKDRIVER

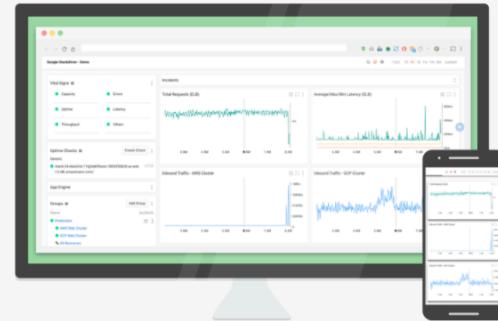
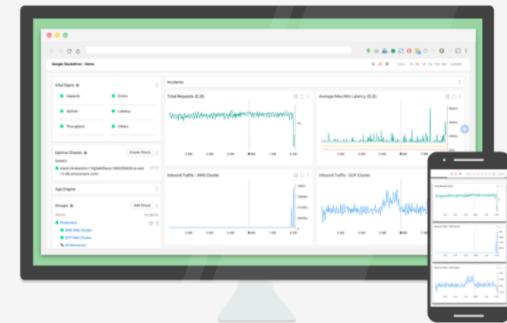
Monitoring, logging, and diagnostics for applications on Cloud Platform and AWS

 TRY IT FREE

[VIEW GOOGLE STACKDRIVER DOCS](#)

Monitoring, logging & diagnostics

Google Stackdriver provides powerful monitoring, logging, and diagnostics. It equips you with insight into the health, performance, and availability of cloud-powered applications, enabling you to find and fix issues faster. It is natively integrated with Google Cloud Platform, Amazon Web Services, and popular open source packages. Stackdriver provides a wide variety of metrics, dashboards, alerting, log management, reporting, and tracing capabilities.



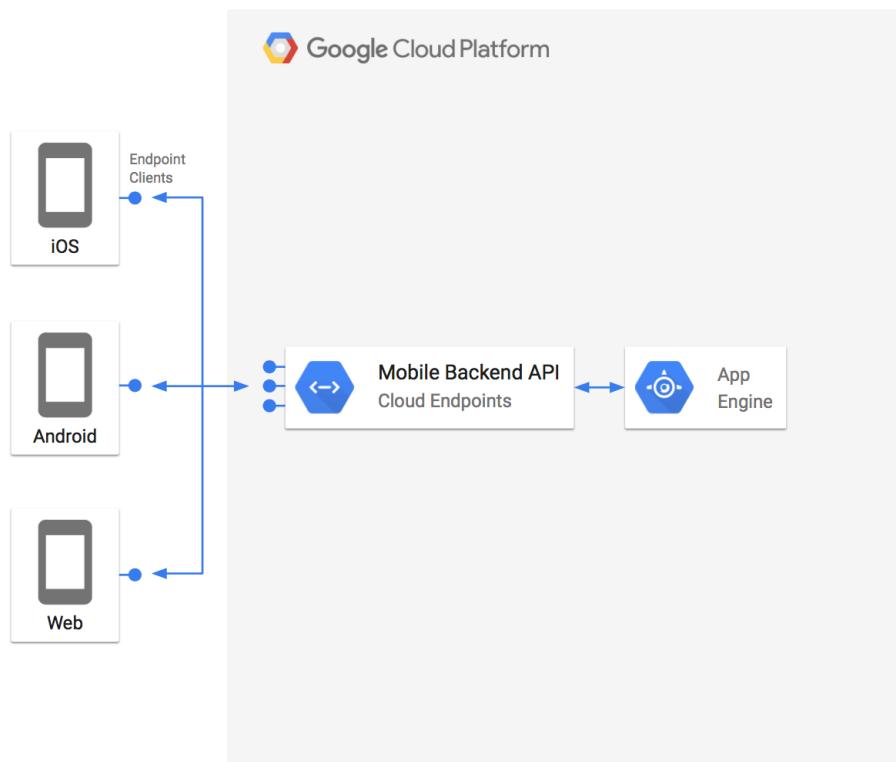
Monitor Cloud Platform and AWS

Stackdriver is built from the ground up for cloud-powered applications. Whether you're running on

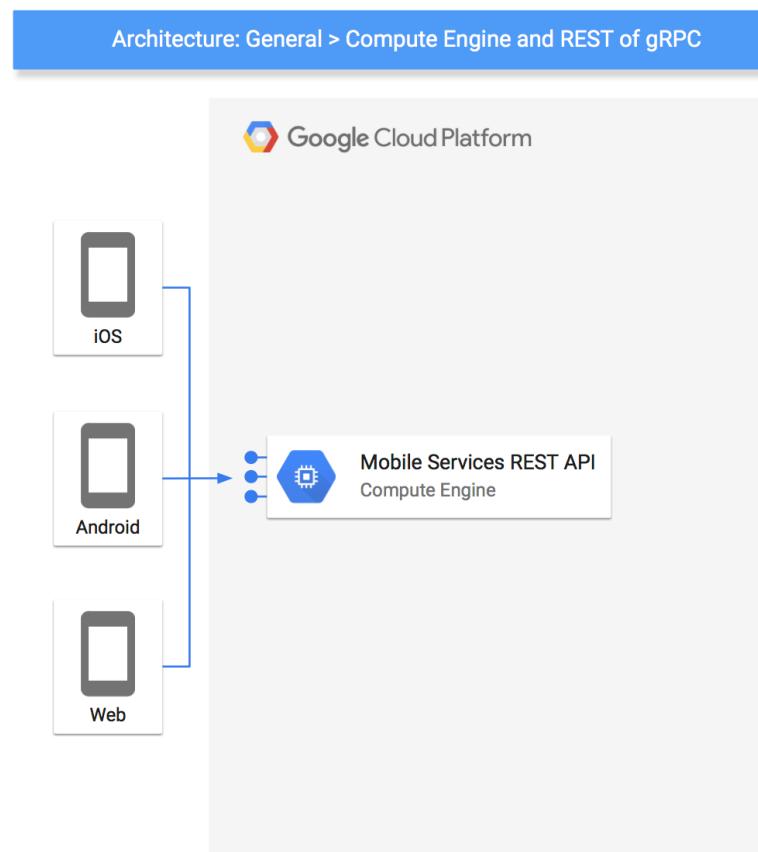
GCP ARCHITECTURE EXAMPLES

GCP ARCHITECTURES

Architecture: General > App Engine and Cloud Endpoints

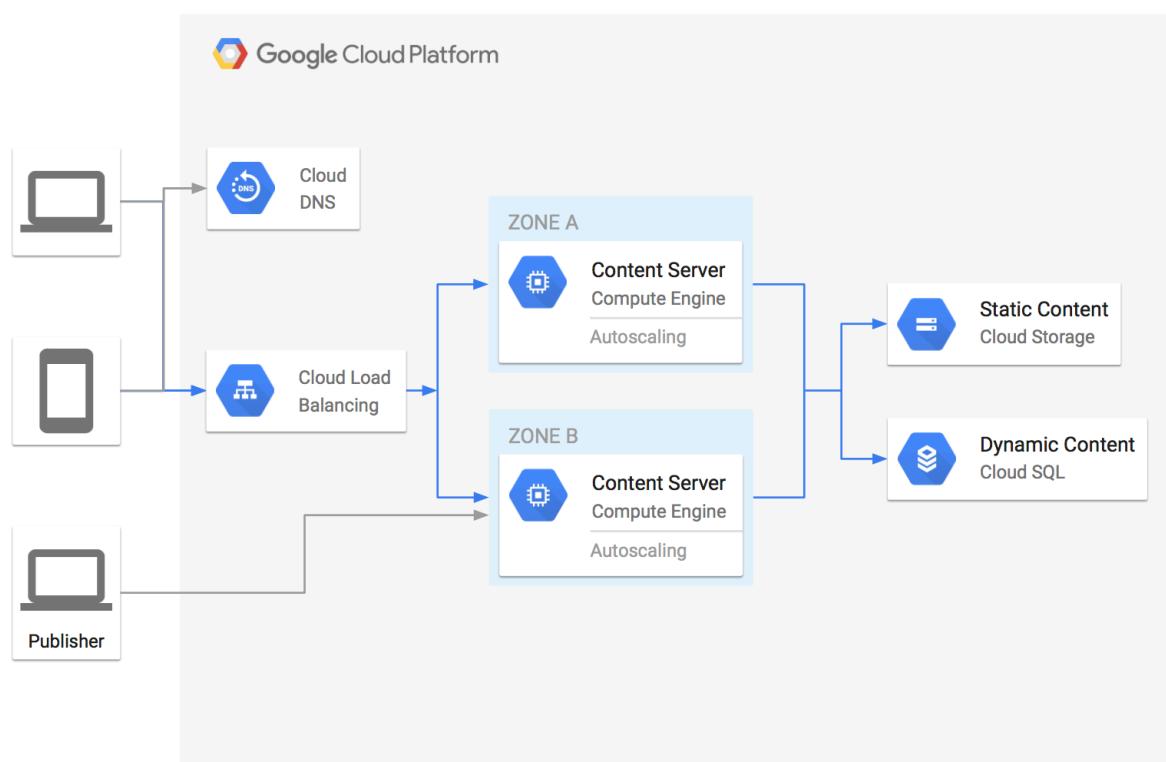


GCP ARCHITECTURES



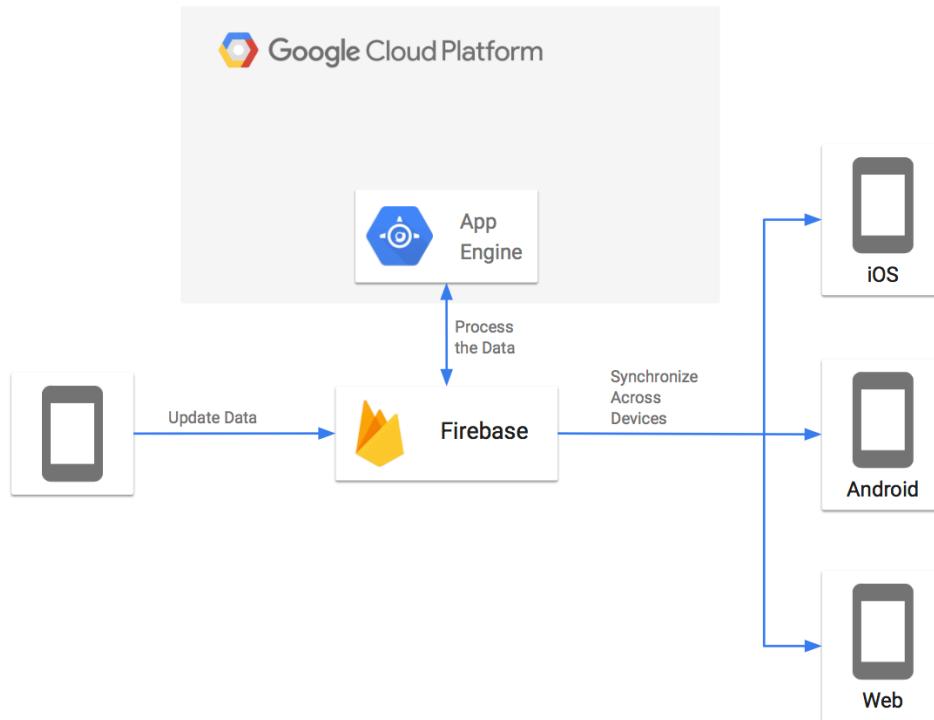
GCP ARCHITECTURES

Architecture: General > Content Management



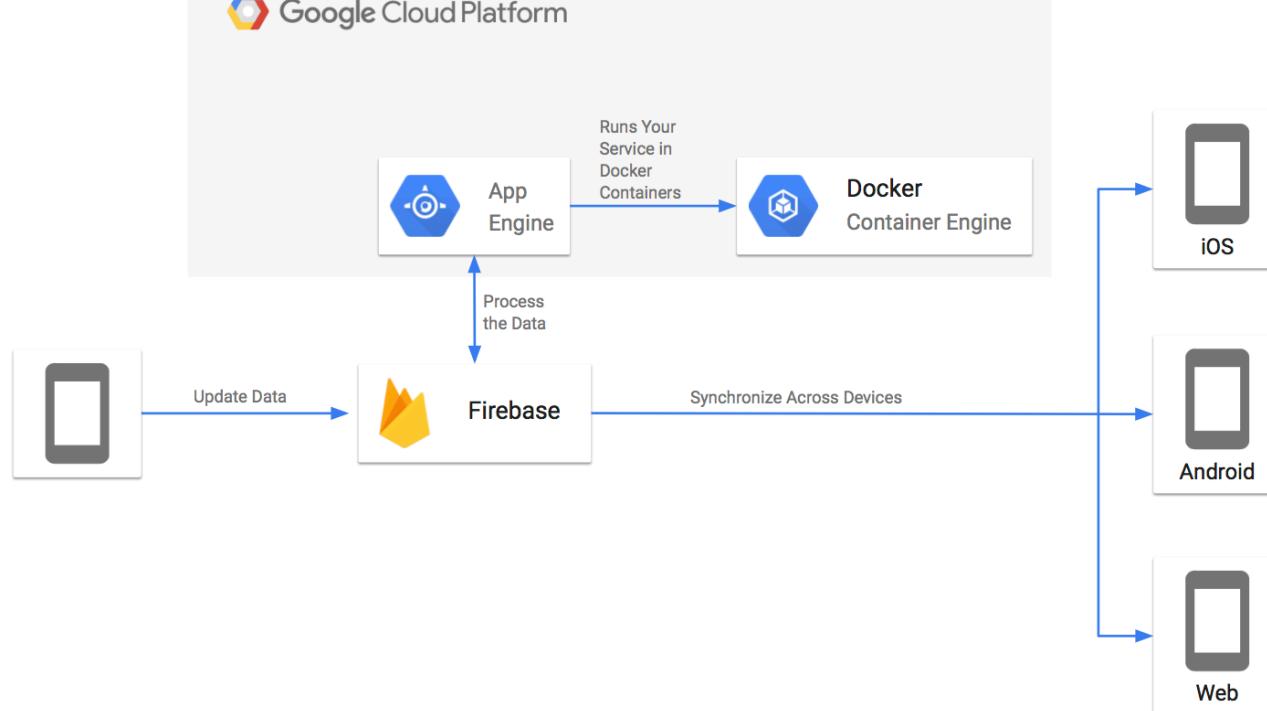
GCP ARCHITECTURES

Architecture: General > Firebase and Google App Engine



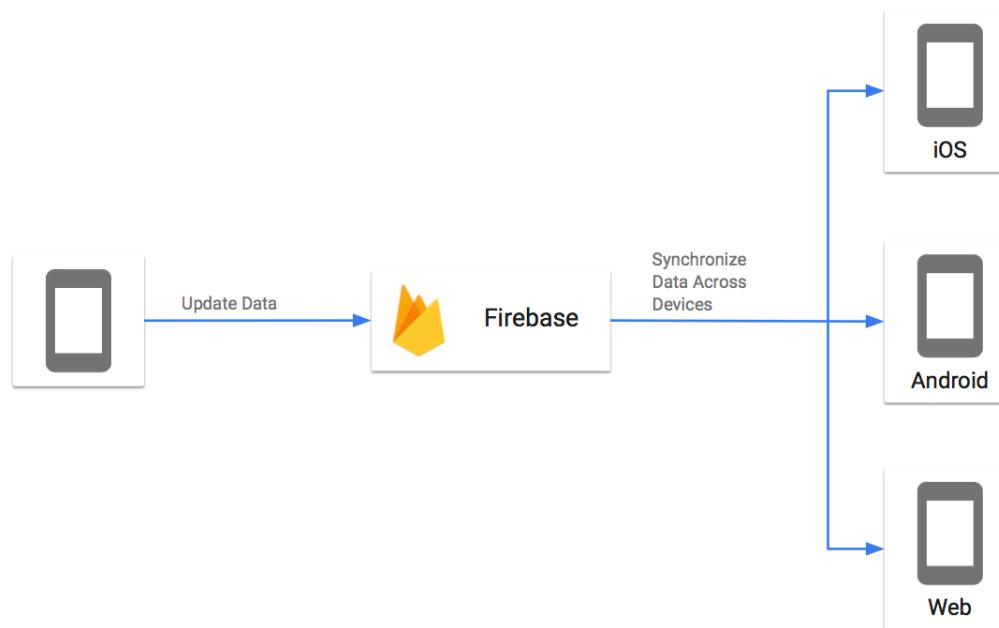
GCP ARCHITECTURES

Architecture: General > Firebase and Managed VMs



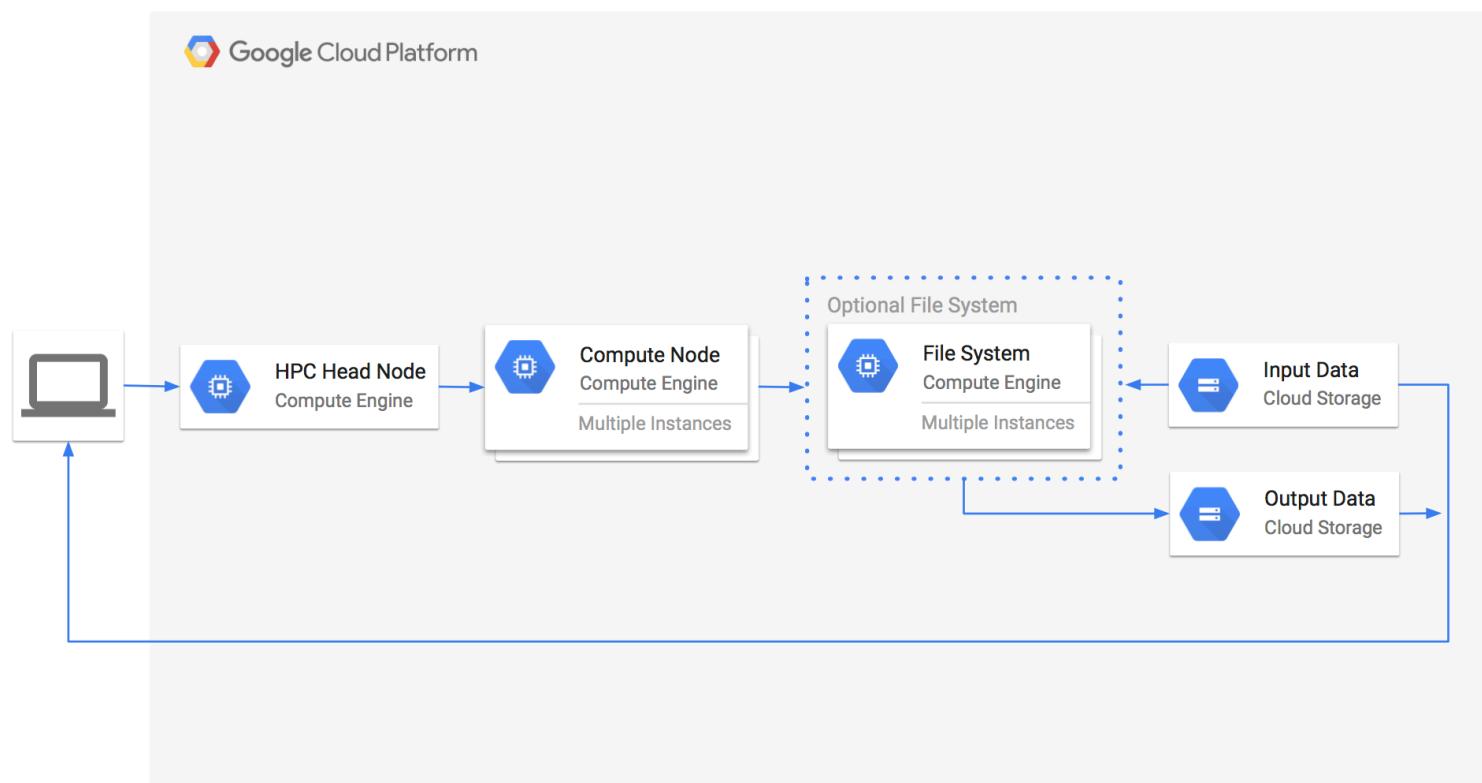
GCP ARCHITECTURES

Architecture: General > Firebase



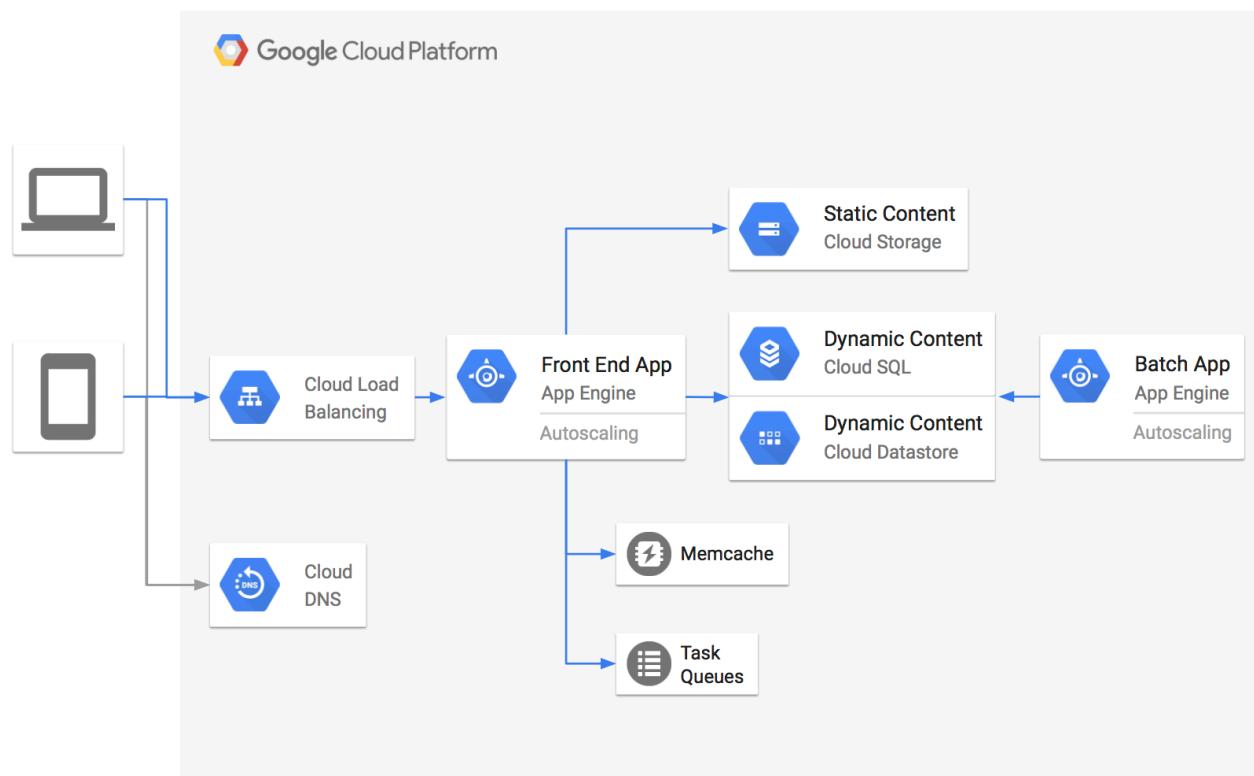
GCP ARCHITECTURES

Architecture: General > High Performance Computing



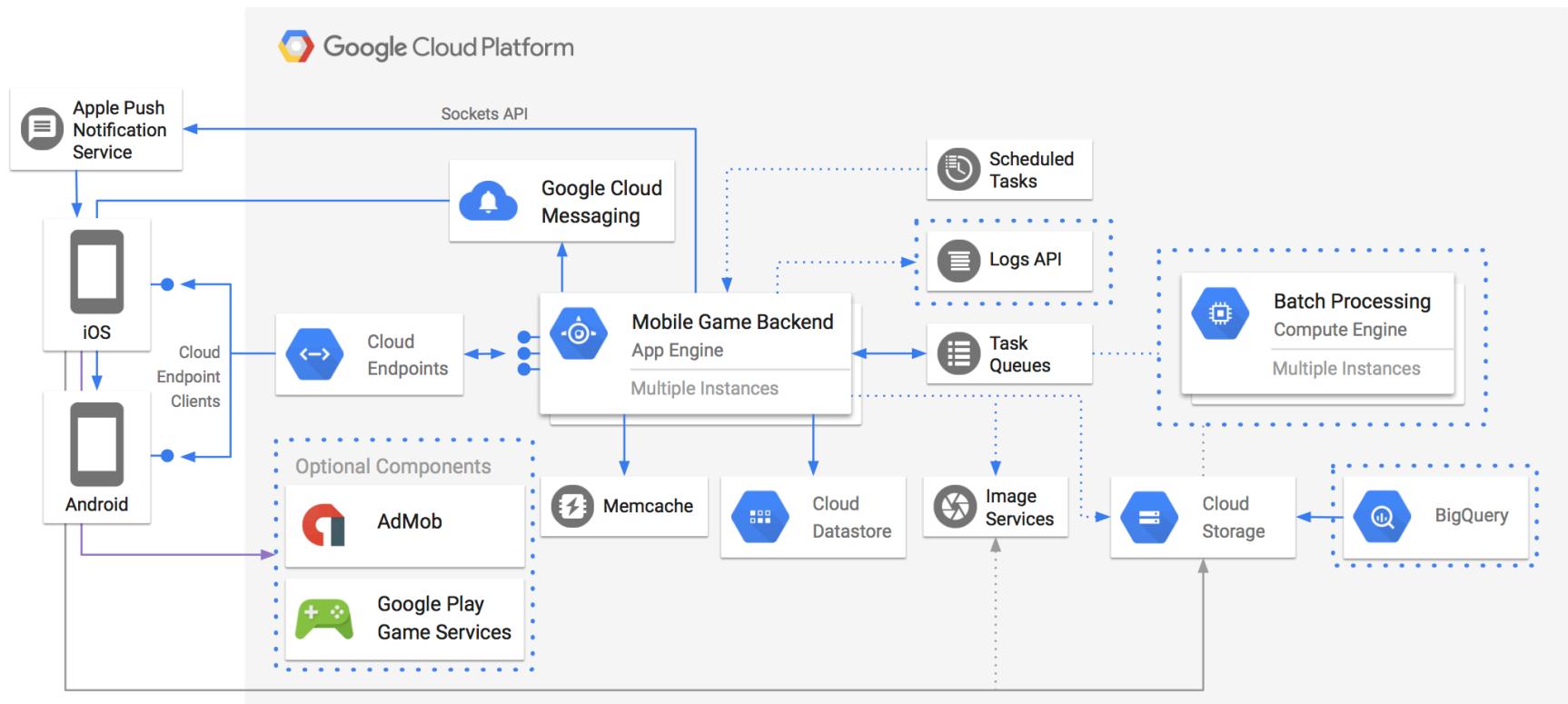
GCP ARCHITECTURES

Architecture: General > Web Application on Google App Engine



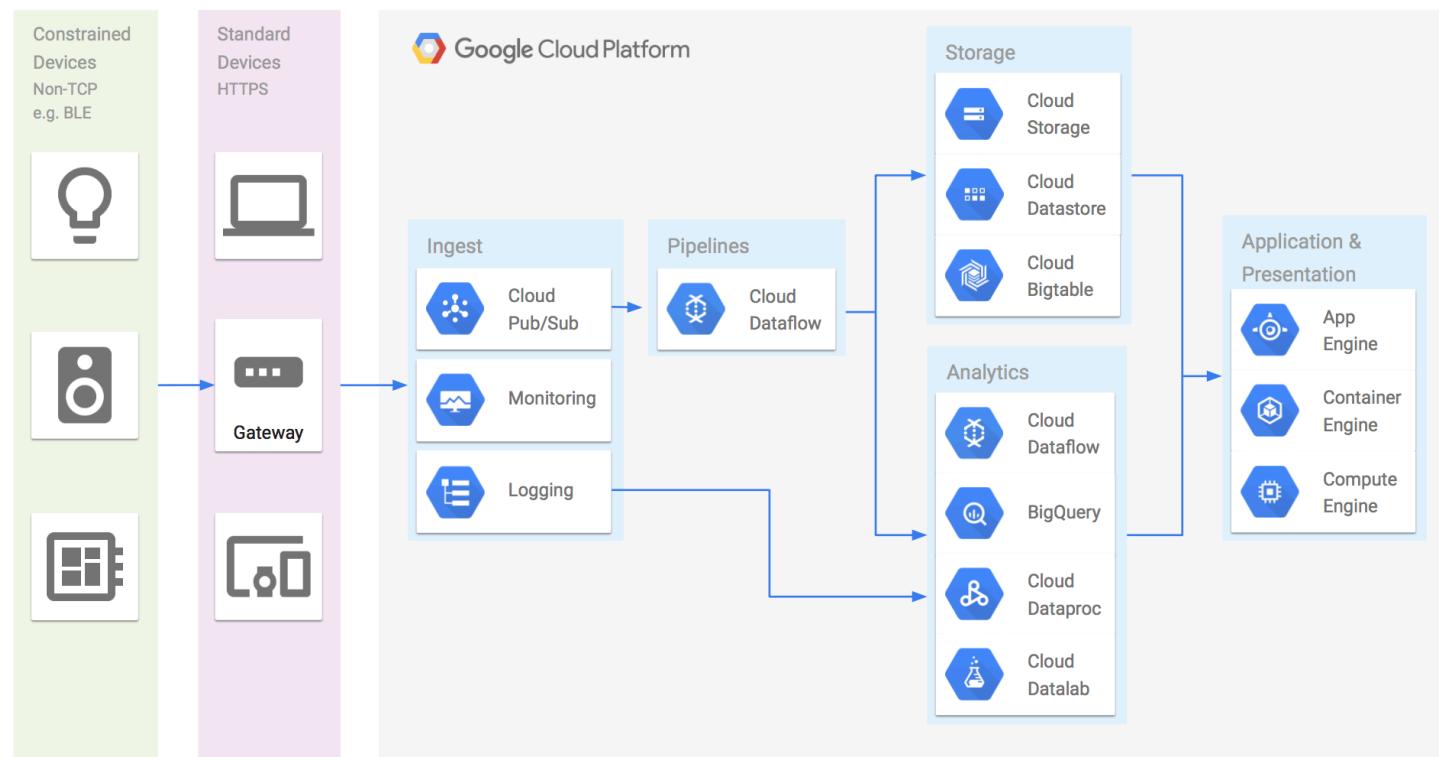
GCP ARCHITECTURES

Architecture: Gaming > Mobile Game Backend



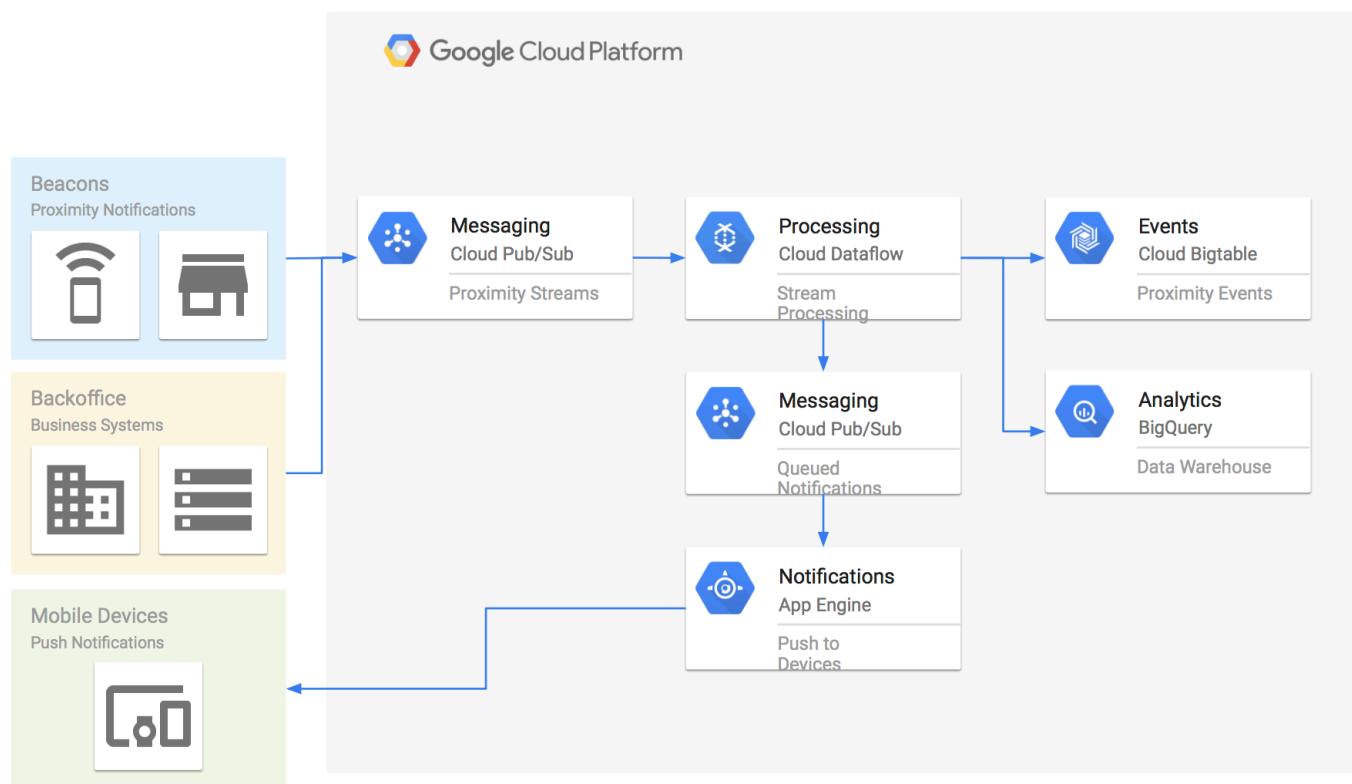
GCP ARCHITECTURES

Architecture: Internet of Things > Sensor stream ingest and processing

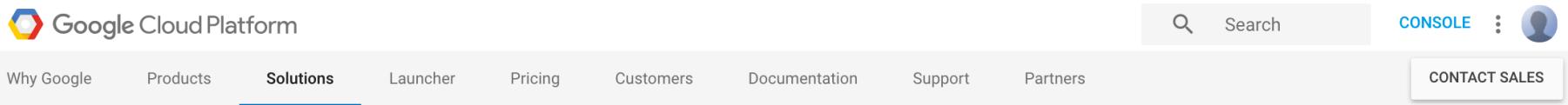


GCP ARCHITECTURES

Architecture: Retail > Beacons and Targeted Marketing



GCP ARCHITECTURES



The image shows the top navigation bar of the Google Cloud Platform website. It features the Google Cloud logo and the text "Google Cloud Platform". On the right side, there is a search bar with a magnifying glass icon and the word "Search". Next to it are links for "CONSOLE", three vertical dots, and a user profile icon. Below the main navigation, there is a secondary navigation bar with links: "Why Google", "Products", "Solutions" (which is underlined), "Launcher", "Pricing", "Customers", "Documentation", "Support", and "Partners". To the right of this secondary bar is a "CONTACT SALES" button.

MOBILE SOLUTIONS

Create compelling mobile apps using the best of Google

 DEVELOPMENT GUIDES

CONTACT SALES

The Mobile Cloud Era

Mobile devices backed by scalable machine intelligence in the cloud is the defining computing paradigm of our time. Modern tools require special consideration for the challenges developers face on mobile: **serverless** capabilities, a cloud-first data model capable of persisting data even when the device is offline, **low-latency access** to media anywhere in the world, and real-time data synchronization across all mobile platforms. Cloud Platform gives developers **comprehensive solutions** with a focus on ease of use and speed – all without having to manage infrastructure.



https://cloud.google.com/solutions/mobile/#development_guides

SETTING UP GOOGLE CLOUD PLATFORM

SETTING UP GCP

 Google Cloud Platform Search CONSOLE ⋮ 

Why Google Products Solutions Launcher Pricing Customers Documentation Support Partners

Build What's Next Better software. Faster.

- ✓ Use Google's core infrastructure, data analytics and machine learning.
- ✓ Secure and fully featured for all enterprises.
- ✓ Committed to open source and industry leading price-performance.

[GO TO CONSOLE](#) [CONTACT SALES](#)



 **Pricing**
Industry-leading

 **Get Started Fast**
10-min tutorials to help you

 **Security**
GCP is purpose-built for

 **Migrate**
Free VM Migration and

SETTING UP GCP

- Use a gmail account
- \$300 free trials available from signup (60 day expiration)
- May need a paid account for some services

Account type ?

Business ▼

Name and address ?

Business name

Madisyn Rooth

Address line 1

Address line 2

City

State ▼

ZIP code

Primary contact

Madisyn Rooth

Phone number

madisynroope@gmail.com

How you pay

Automatic payments

Your service can start immediately, and you pay after you accrue costs. You're charged automatically either when your balance reaches a predetermined amount, or 30 days after your last automatic payment, whichever



Access to all Cloud Platform Pro

Get everything you need to build and run your websites and services.



\$300 credit for free

Sign up and get \$300 to spend on Google Cloud Platform over the next 60 days.



No autocharge after free trial ends

We ask you for your credit card to make sure you're not a robot. You won't be charged during or after the free trial ends.



SETTING UP GCP

- Use a gmail account
- \$300 free trials available from signup (60 day expiration)
- May need a paid account for some services

Account type ?
Business ▼

Name and address ?

Business name
Madsyn Roope

Address line 1
Address line 2
City
State
ZIP code

Primary contact ?

Madsyn Roope

Phone number
madsynroope@gmail.com

How you pay
Automatic payments

Your service can start immediately, and you pay after you accrue costs. You're charged automatically either when your balance reaches a predetermined amount, or 30 days after your last automatic payment, whichever

Do not use



Access to all Cloud Platform Pro

Get everything you need to build and run your websites and services.



\$300 credit for free

Sign up and get \$300 to spend on Google Cloud Platform over the next 60 days.



No autocharge after free trial ends

We ask you for your credit card to make sure you're not a robot. You won't be charged during or after the free trial ends.



SETTING UP GCP

- University credits of \$50 that will last the length of the class
- May still need to enter a credit card for some services
- We will use very little of it

Dear Students,

Here is the URL you will need to access in order to request a Google Cloud Platform coupon. You will be asked to provide your school email address and name. An email will be sent to you to confirm these details before a coupon is sent to you.

[Student Coupon Retrieval Link](#)

- You will be asked for a name and email address, which needs to match the domain. A confirmation email will be sent to you with a coupon code.
- You can request a coupon from the URL and redeem it until: **10/27/2019**
- Coupon valid through: **6/27/2020**
- You can only request ONE code per unique email address.

Please contact me if you have any questions or issues.

SETTING UP GCP

- Sign up for edu grants

≡ Google Cloud Platform Select a project ▾ 🔍

Education grants

Please enter the coupon code provided to you via the Google Cloud Platform Education Grants program to receive credit for Google Cloud Platform. Get what you need to build and run your apps, websites and services.

Coupon code

HLGN-TUQ3-CM6T-QRM5|

Credit amount	Expiration date	Course
\$100.00	Sep 25, 2018	51033-Backends for Mobile Applications- Sep 2017

Please email me updates regarding feature announcements, performance suggestions, feedback surveys and special offers.

Yes No

Google Cloud Platform education grants credits terms and conditions

By clicking "Accept and continue" below, you, on behalf of yourself and the organization you represent ("You") agree to these terms and conditions:

The credit is valid for Google Cloud Platform products and is subject to Your acceptance of the applicable Google Cloud Platform License Agreement and any other applicable terms of service. The credit is non-transferable and may not be sold or bartered. Unused credit expires on the date indicated on the media conveying the promotion code. The credit may be issued in increments as You use the credit over the period of time during which the credit is valid. Offer void where prohibited by law.

SETTING UP GCP

Billing

Overview Manage billing accounts ▾ RENAME BILLING ACCOUNT

Billing account ID: 01E52D-D69FD5-E9E18E

Credits

	\$100.00 Credits remaining Out of \$100.00		365 Days remaining Ends Sep 26, 2018
--	--	--	--

Projects linked to this billing account
There are no projects linked to this billing account.

SETTING UP GCP

- Be very careful about billing
- Shut down services after you are done when testing
- Set up budgets
- Check console



SETTING UP GCP



Google Cloud Platform Free Tier

Learn and build on GCP for free.

[VIEW MY CONSOLE](#)

<https://cloud.google.com/free/>

PROJECTS

PROJECTS

- "Project" is the organizational structure on GCP
- Projects is a container for services
 - Don't have to be in same location
 - Don't have to be same type of service
- Project identifier

PROJECTS

- "Project" is the organizational structure on GCP
- Projects is a container for services
 - Don't have to be same type of service

≡ Google Cloud Platform

New Project

ⓘ You have 3 projects remaining in your quota. [Learn more.](#)

Project name ?
My Project 2659

Your project ID will be vaulted-copilot-181100 ? [Edit](#)

Billing account ?
Choose account

Organization ?
uchicago.edu

ⓘ You have logged in under a managed account. Your [domain administrator](#) may be able to access, change or suspend any projects created using this account. If you do not want your domain administrator to access your projects, please log out and create a project under an unmanaged Google Account. For more information, please review Google's [Privacy Policy](#).

Create Cancel

PROJECTS

- Projects have regions
 - Cost
 - Performance
 - Availability
- Rule: The closer the better

≡ Google Cloud Platform

New Project

i You have 3 projects remaining in your quota. [Learn more.](#)

Project name ?

My Project 2659

Your project ID will be vaulted-copilot-181100 ? [Edit](#)

Billing account ?

Choose account

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uchicago.edu

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[Create](#)

[Cancel](#)

PROJECTS

≡ Google Cloud Platform



New Project

i You have 3 projects remaining in your quota. [Learn more.](#)

Project name ?

MyFirstProject

Your project ID will be myfirstproject-181100 ? [Edit](#)

Billing account ?

MCPS51033-2017-Autumn-Staff

Organization ?

uchicago.edu

i You have logged in under a managed account. Your [domain administrator](#) may be able to access, change or suspend any projects created using this account. If you do not want your domain administrator

PROJECTS

Cloud Platform  EverydayComputingOrg ▾

ACTIVITY

fo

e

computingOrg

computingorg

per

8

Notifications

 Create Project: MyFirstProject 5s

 SEE ALL ACTIVITY

All services normal

 Go to Cloud status dashboard

 Billing

- App Engine

Summary (count/sec) ▾

0.2
0.15
0.1
0.05

PROJECTS

Success!

≡ Google Cloud Platform MyFirstProject ▾



DASHBOARD ACTIVITY

CUSTOMIZE

Project info

Project name
MyFirstProject

Project ID
myfirstproject-181100

Project number
627857732929

→ Go to project settings

Resources

Compute Engine

Compute Engine

CPU (%) ▾

There is no data for this chart

→ Go to the Compute Engine dashboard

Google Cloud Platform status

All services normal

→ Go to Cloud status dashboard

Billing

Estimated charges \$0.00
For the billing period Sep 1 – 25, 2017

→ View detailed charges

PROJECTS

≡ Google Cloud Platform MyFirstProject ▾ 🔍 ✉️ ! ? 🔔 ⋮ 

DASHBOARD ACTIVITY CUSTOMIZE

 Project info ⋮

Project name
MyFirstProject

Project ID
myfirstproject-181100

Project number
627857732929

[Go to project settings](#) 

 Resources Compute Engine

 Compute Engine CPU (%) ▾

There is no data for this chart

[Go to the Compute Engine dashboard](#)

 Google Cloud Platform status

All services normal

[Go to Cloud status dashboard](#)

 Billing

Estimated charges \$0.00
For the billing period Sep 1 – 25, 2017

[View detailed charges](#)

PROJECTS

≡ Google Cloud Platform ⚙ MyFirstProject ▾

SEARCH

SHUT DOWN MOVE

IAM & admin	Settings	SHUT DOWN MOVE
IAM	Project name <small>?</small>	MyFirstProject Save
Quotas	Project ID	myfirstproject-181100
Service accounts	Project number	627857732929
Labels	Organization <small>?</small>	uchicago.edu
GCP Privacy & Security		
Settings		
Encryption keys		
Identity-Aware Proxy		
Roles		

3 different ways of identifying a project

BILLING

BILLING

- Billing is per project
- Different billing administrators for each project

Home - MyFirstProject

Secure | https://console.cloud.google.com/home/dashboard?project=myfirstproject-181100&organizationId=409994573993

Google Cloud Platform MyFirstProject CUSTOMIZE

Cloud Launcher

Billing

APIs & services

Support

IAM & admin

COMPUTE

App Engine

Compute Engine

Container Engine

Cloud Functions

STORAGE

Bigtable

Datastore

Storage

SQL

Spanner

NETWORKING

VPC network

API APIs

Requests (requests/sec)

There is no data for this chart

→ Go to APIs overview

Google Cloud Platform status

All services normal

→ Go to Cloud status dashboard

Billing

Estimated charges \$0.00
For the billing period Sep 1 – 25, 2017

→ View detailed charges

Error Reporting

No sign of any errors. Have you set up Error Reporting?

→ Learn how to set up Error Reporting

News

Committed use discounts for Google Compute Engine now generally available
3 days ago

Announcing Stackdriver Debugger for Node.js
3 days ago

Introducing faster GPUs for Google Compute Engine
4 days ago

→ Read all news

Documentation

BILLING

The screenshot shows the Google Cloud Platform Billing & alerts interface. The left sidebar has three options: 'Overview', 'Budgets & alerts' (which is selected and highlighted in blue), and 'Billing export'. The main content area is titled 'Billing Budgets & alerts' and contains a brief description: 'Avoid surprises on your bill by creating budgets to monitor all your Google Cloud charges in one place. After you've set a budget, you can create budget alerts to email billing admins when charges exceed a certain amount.' Below this description is a prominent blue 'Create budget' button.

- Create budgets

BILLING

- Credits can be applied to budgets

The screenshot shows the Google Cloud Platform Billing interface. The left sidebar has a 'Billing' section with 'Overview', 'Budgets & alerts' (which is selected and highlighted in blue), and 'Billing export'. The main content area is titled 'Create budget' and contains the following fields:

- Budget name:** Daily Spend
- Project or billing account:** MCPS51033-2017-Autumn-Staff
- Budget amount:** Specified amount (\$ 5)
- Include credit as a budget expense:**
- Set budget alerts:** Send email alerts to billing admins after spend exceeds a percent of the budget or a specified amount. Alerts are based on estimated expenses, so actual expenses may be greater.
- | Percent of budget | Amount |
|-------------------|---------|
| 50 % | \$ 2.50 |
| 90 % | \$ 4.50 |
| 100 % | \$ 5.00 |

+ Add item
- Buttons:** Save (blue) and Cancel

BILLING

uchicago.edu ▾  

Budgets & alerts MCPS51033-2017-Autumn-Staff ▾  CREATE BUDGET  DELETE

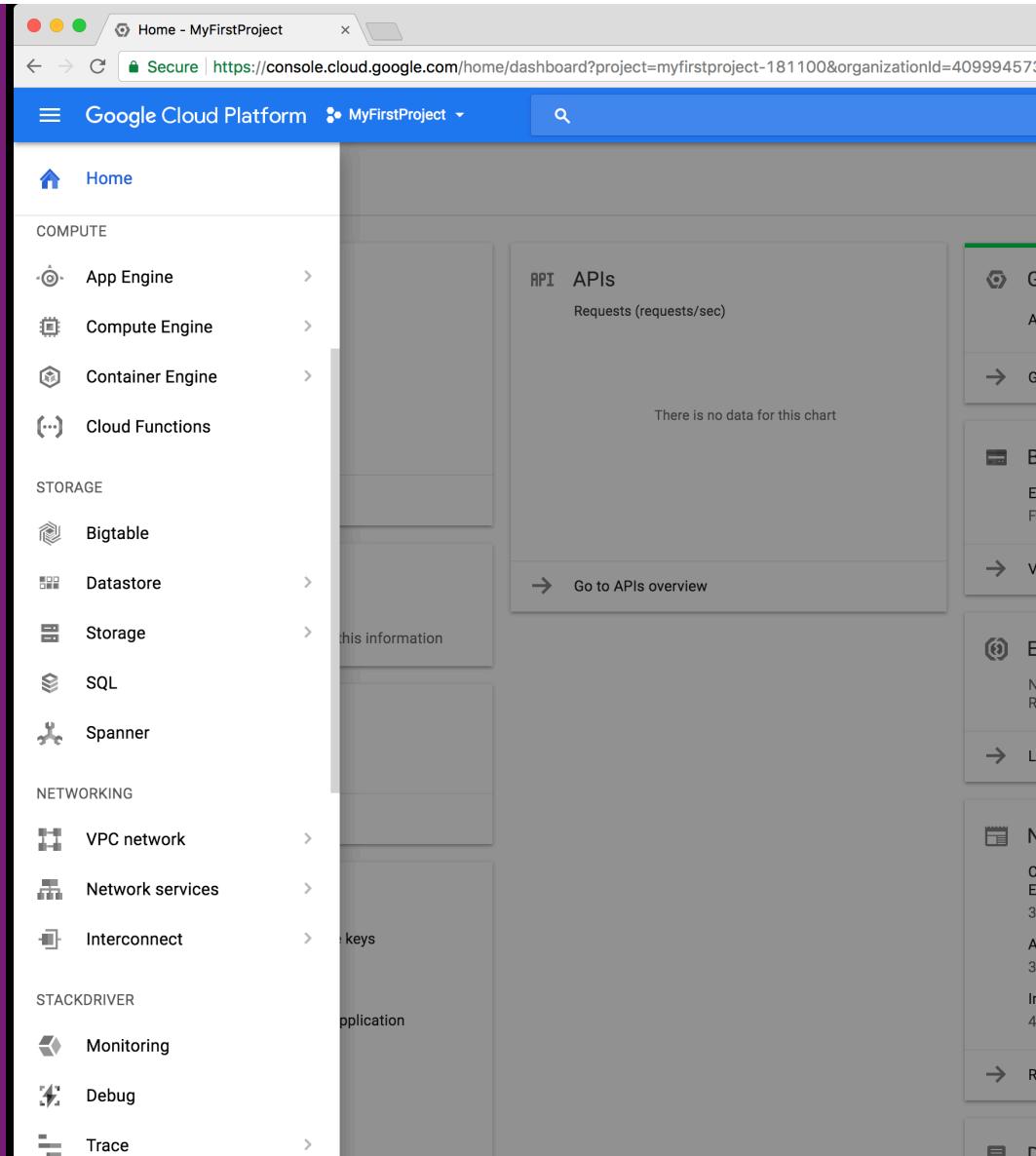
Budgets track expenses within a Google Cloud Platform project or billing account. Your budget can be a specified amount or based on previous spend. You can set alerts to notify billing admins when a budget goes over a specified amount.

<input type="checkbox"/> Budget name ^	Budget type	Applies to	Trigger alerts at	Spend and budget amount
<input type="checkbox"/> Daily Spend	Specified amount	This billing account	50%, 90%, and 100%	 \$0.00 / \$5.00 No credits used

APIS

BILLING

- Not every service or API is available by default
- Quickly see what services are available in menu



BILLING

- APIs that are enabled

The screenshot shows the Google Cloud Platform API Dashboard for the project "MyFirstProject". The left sidebar has "API APIs & services" selected, with "Dashboard" highlighted. Below the dashboard are "Library" and "Credentials". The main area starts with a section titled "Enabled APIs and services" stating "Some APIs and services are enabled automatically". It includes a "Traffic" card showing "Requests/sec" and a message "There is no traffic for this time period.", a "Errors" card showing "Percent of requests" and a message "There are no errors for this time period.", and a "Median latency" card showing "Milliseconds" and a message "There is no latency data.". At the bottom is a table listing various Google APIs with their status and options:

API	Requests	Errors	Error ratio	Latency, median	Latency, 98%	Action
BigQuery API	—	—	—	—	—	Disable
Google Cloud APIs	—	—	—	—	—	Disable
Google Cloud Datastore API	—	—	—	—	—	Disable
Google Cloud SQL	—	—	—	—	—	Disable
Google Cloud Storage	—	—	—	—	—	Disable
Google Cloud Storage JSON API	—	—	—	—	—	Disable
Google Compute Engine API	—	—	—	—	—	Disable
Google Service Management API	—	—	—	—	—	Disable
Stackdriver Debugger API	—	—	—	—	—	Disable
Stackdriver Logging API	—	—	—	—	—	Disable
Stackdriver Monitoring API	—	—	—	—	—	Disable
Stackdriver Trace API	—	—	—	—	—	Disable

BILLING

API	Requests	Errors	
BigQuery API	—	—	
Google Cloud APIs	—	—	
Google Cloud Datastore API	—	—	
Google Cloud SQL	—	—	
Google Cloud Storage	—	—	
Google Cloud Storage JSON API	—	—	—
Google Compute Engine API	—	—	—
Google Service Management API	—	—	—
Stackdriver Debugger API	—	—	—
Stackdriver Logging API	—	—	—

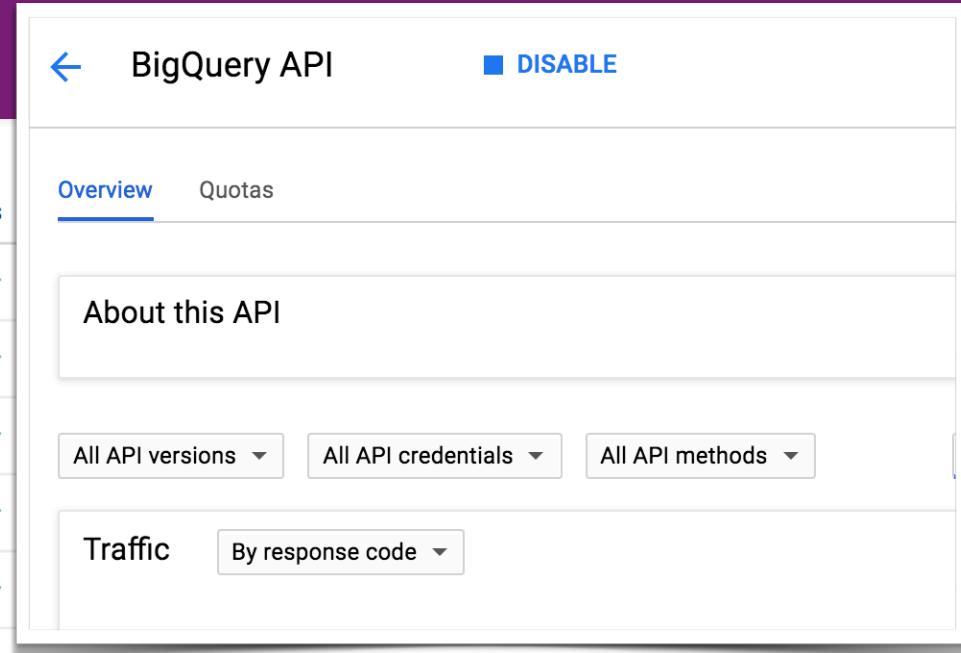
← BigQuery API ■ DISABLE

Overview Quotas

About this API

All API versions ▾ All API credentials ▾ All API methods ▾

Traffic By response code ▾



BILLING

API APIs & services

Dashboard

Library

Credentials

Library

[Google APIs](#) [Private APIs](#)

Search all 100+ APIs

Popular APIs

 Google Cloud APIs Compute Engine API BigQuery API Cloud Storage Service Cloud Datastore API Cloud Deployment Manager API Cloud DNS API More	 Google Cloud Machine Learning Vision API Natural Language API Speech API Translation API Machine Learning Engine API	 Google Maps APIs Google Maps Android API Google Maps SDK for iOS Google Maps JavaScript API Google Places API for Android Google Places API for iOS Google Maps Roads API More
 G Suite APIs Drive API Calendar API Gmail API Sheets API Google Apps Marketplace SDK Admin SDK	 Mobile APIs Google Cloud Messaging  Google Play Game Services Google Play Developer API Google Places API for Android	 Social APIs Google+ API Blogger API Google+ Pages API Google+ Domains API

Google Cloud Vision API

[Documentation](#) [Try this API in APIs Explorer](#)

About this API

Integrates Google's vision features, including image labeling, face, logo, and landmark detection, optical character recognition (OCR), and detection of explicit content, into your applications.

Using credentials with this API

Accessing user data with OAuth 2.0

You can access user data with this API. On the Credentials page, create an OAuth 2.0 client ID. A client ID requests user consent so that your app can access user data. Include that client ID when making your API call to Google. [Learn more](#)

Server-to-server interaction

You can use this API to perform server-to-server interaction, for example between a web application and a Google service. You'll need a service account, which enables app-level authentication. You'll also need a service account key, which is used to authorize your API call to Google. [Learn more](#)

Dashboard

Library

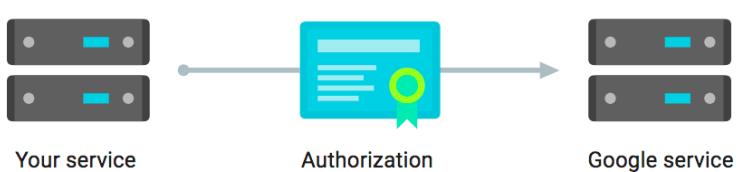
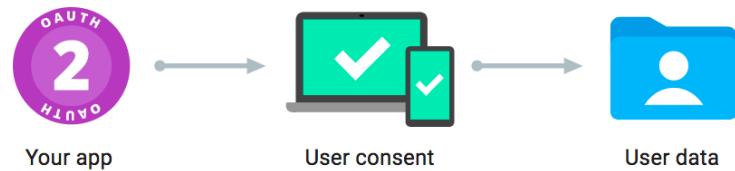
Credentials

[◀ Google Cloud Vision API](#) [▶ ENABLE](#)[Documentation](#)[Try this API in APIs Explorer](#) **About this API**

Integrates Google Vision features, including image labeling, face, logo, and landmark detection, optical character recognition (OCR), and detection of explicit content, into applications.

Using credentials with this API**Accessing user data with OAuth 2.0**

You can access user data with this API. On the Credentials page, create an OAuth 2.0 client ID. A client ID requests user consent so that your app can access user data. Include that client ID when making your API call to Google. [Learn more](#)

**G Suite APIs**

- [Drive API](#)
- [Calendar API](#)
- [Gmail API](#)
- [Sheets API](#)
- [Google Apps Marketplace SDK](#)
- [Admin SDK](#)
- [...](#)

**Mobile APIs**

- [Google Cloud Messaging](#)
- [Google Play Game Services](#)
- [Google Play Developer API](#)
- [Google Places API for Android](#)

**Social APIs**

- [Google+ API](#)
- [Blogger API](#)
- [Google+ Pages API](#)
- [Google+ Domains API](#)

BILLING

The screenshot shows the Google APIs Explorer interface. At the top, there's a navigation bar with icons for closing, minimizing, and maximizing the window, followed by the text "API APIs & services - MyFirstProject" and "Google APIs Explorer". Below the bar is a URL bar indicating a secure connection to "https://developers.google.com/apis-explorer/?hl=en_US#p/vision/v1/". The main area features the Google logo and a search bar with the placeholder "Search for services, methods, and recent requests...". A blue rectangular box highlights the back arrow icon in the top left corner of the main content area. To the right of the search bar is a blue search button with a magnifying glass icon. On the far right of the page, there are several small, semi-transparent circular icons representing different tools or features.

APIs Explorer

Services

All Versions

Request History

Learn more about using the Google Cloud Vision API by reading the [documentation](#).

Services > Google Cloud Vision API v1

Authorize requests using OAuth 2.0: OFF [i](#)

vision.images.annotate Run image detection and annotation for a batch of images.

IDENTITY AND ACCESS MANAGEMENT (IAM)

IAM

- Set permissions for services and users

The screenshot shows the Google Cloud Platform IAM interface for the project "MyFirstProject". The left sidebar lists several options: "IAM & admin" (selected), "Quotas", "Service accounts", "Labels", "GCP Privacy & Security", "Settings", "Encryption keys", "Identity-Aware Proxy", "Roles" (selected), "Manage resources", and a back arrow. The main content area is titled "Permissions for project 'MyFirstProject'" and contains a table of members and their roles.

Type	Members	Role(s)	Actions
Compute Engine default service account 627857732929-compute@developer.gserviceaccount.com		Editor	<input type="button" value="Edit"/>
Google APIs service account 627857732929@cloudservices.gserviceaccount.com		Editor	<input type="button" value="Edit"/>
T. Andrew Binkowski abinkowski@uchicago.edu		Owner	<input type="button" value="Edit"/>

IAM

- IAM is for users
- Best practice in production is to limit access

The screenshot shows the Google Cloud Platform IAM & admin interface. The left sidebar has 'IAM' selected. The main area shows the IAM page with a table of members and their roles. A context menu is open over the 'Owner' role for T. Andrew Binkowski.

Type	Members	Role(s)
Compute Engine default service account	627857732929-compute@developer.gserviceaccount.com	Editor
Google APIs service account	627857732929@cloudservices.gserviceaccount.com	Editor
T. Andrew Binkowski	abinkowski@uchicago.edu	Owner

Context menu (Owner):

- Selected
- Owner

Project Roles:

- Project
- App Engine
- BigQuery
- Billing
- Cloud Debugger
- Cloud IAP
- Cloud SQL
- Cloud Scheduler
- Cloud Security Scanner
- Cloud Tasks
- Cloud Trace
- Compute Engine
- Datastore
- Error Reporting

Manage roles

IAM

- Service accounts are for services
- Default service account is for a VM associated with every account
 - Default behavior

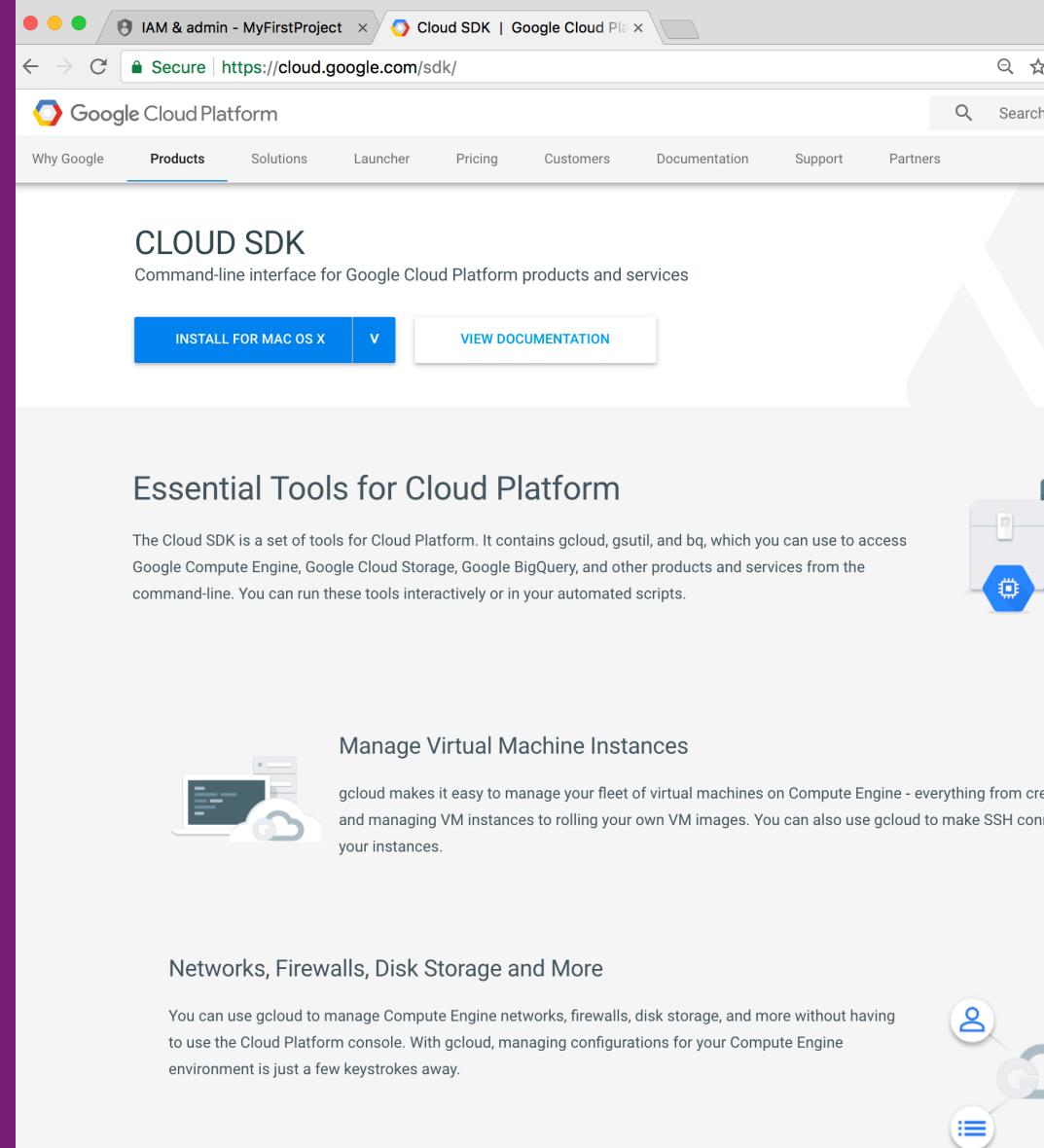
The screenshot shows the Google Cloud Platform IAM & admin Service Accounts page. The left sidebar has a 'Service accounts' section selected. The main area displays a table of service accounts for the project 'MyFirstProject'. One account is listed:

Service account name	Service account ID	Key ID	Key creation date	Options
Compute Engine default service account	627857732929-compute@developer.gserviceaccount.com	No keys		⋮

CLOUD SDK

CLOUD SDK

- Command line interface for GCP
 - gcloud (apis)
 - gsutil (storage)
 - bq (big query)
 - kubectl (containers)



The screenshot shows a web browser window for the Google Cloud Platform Cloud SDK page. The URL is <https://cloud.google.com/sdk/>. The page title is "Cloud SDK | Google Cloud Platform". The main heading is "CLOUD SDK" with the subtitle "Command-line interface for Google Cloud Platform products and services". Below the heading are two buttons: "INSTALL FOR MAC OS X" and "VIEW DOCUMENTATION". A section titled "Essential Tools for Cloud Platform" describes the Cloud SDK as a set of tools for Cloud Platform, including gcloud, gsutil, and bq. It mentions using these tools to access Google Compute Engine, Google Cloud Storage, Google BigQuery, and other products and services. Below this is a section titled "Manage Virtual Machine Instances" with a sub-section for "Networks, Firewalls, Disk Storage and More".

IAM & admin - MyFirstProject × Cloud SDK | Google Cloud Platform ×

Secure | https://cloud.google.com/sdk/

Google Cloud Platform

Why Google Products Solutions Launcher Pricing Customers Documentation Support Partners

Search

CLOUD SDK

Command-line interface for Google Cloud Platform products and services

INSTALL FOR MAC OS X V VIEW DOCUMENTATION

Essential Tools for Cloud Platform

The Cloud SDK is a set of tools for Cloud Platform. It contains gcloud, gsutil, and bq, which you can use to access Google Compute Engine, Google Cloud Storage, Google BigQuery, and other products and services from the command-line. You can run these tools interactively or in your automated scripts.

Manage Virtual Machine Instances

gcloud makes it easy to manage your fleet of virtual machines on Compute Engine - everything from creating and managing VM instances to rolling your own VM images. You can also use gcloud to make SSH connections to your instances.

Networks, Firewalls, Disk Storage and More

You can use gcloud to manage Compute Engine networks, firewalls, disk storage, and more without having to use the Cloud Platform console. With gcloud, managing configurations for your Compute Engine environment is just a few keystrokes away.



SEND FEEDBACK

Quickstart for Mac OS X

This page shows how to install the Google Cloud SDK, initialize it and run core `gcloud` commands from the command-line.

Before you begin

1. Make sure that Python 2.7 is installed on your system:

```
python -V
```

2. Download the archive file best suited to your operating system. Most machines will run the 64-bit package.

Platform	Package	Size	SHA256 Checksum
Mac OS X (x86_64)	google-cloud-sdk-172.0.1-darwin-x86_64.tar.gz	13.8 MB	31df8ec3f972d3cb5c3705118e6d468e9aee5607ebd0cf2bf2043ee6ad03c790
Mac OS X (x86)	google-cloud-sdk-172.0.1-darwin-x86.tar.gz	13.8 MB	043326392e7a10e0e6370b8a93bc2a2b027026a6556c0cbe529593498c479c29

<https://cloud.google.com/sdk/docs/quickstart-mac-os-x>

4. Set up the Cloud SDK for use. If you're having trouble getting the `gcloud` command to work, ensure your

IAM

- Install authorization and configuration

```
$ gcloud version  
$ gcloud auth login  
$ gcloud info --show-log  
$ gcloud config set project <my-project-id>  
$ gcloud init <my-project>
```

IAM



tabinkowski — -bash — 72×16

```
tabinkowski@Ts-MacBook-Pro ~
[513 % gcloud --version
Google Cloud SDK 172.0.1
app-engine-python 1.9.60
bq 2.0.26
core 2017.09.21
gcloud
gsutil 4.27
tabinkowski@Ts-MacBook-Pro ~
514 % █
```

QUICK START AND TUTORIALS

QUICK START AND TUTORIALS

- Really simple quick start tutorials are available from the console

The screenshot shows the Google Cloud Platform (GCP) dashboard for a project named "MyFirstProject". The main area displays several cards: "APIs & Services", "Logs", "Metrics", "Cloud Trace", "Logs", "Metrics", and "Cloud Trace". A large yellow arrow points from the top right towards the right sidebar. The sidebar contains the following sections:

- Google Cloud Platform**: Shows "All services normal" and links to "Go to Cloud status dashboard".
- Billing**: Shows "Estimated charges \$0.00" for the period Sep 1 – 25, 2017, and links to "View detailed charges".
- Error Reporting**: Shows "No sign of any errors. Have you set up Error Reporting?" and a link to "Learn how to set up Error Reporting".
- News**: Lists recent news items:
 - Committed use discounts for Google Compute Engine now generally available (3 days ago)
 - Announcing Stackdriver Debugger for Node.js (3 days ago)
 - Introducing faster GPUs for Google Compute Engine (4 days ago)A link "Read all news" is at the bottom.

QUICK START AND TUTORIALS

- Really simple quick start tutorials are available from the console

The screenshot shows the Google Cloud Platform Dashboard for a project named "MyFirstProject". The dashboard is divided into several sections:

- Project info:** Shows the project name (MyFirstProject), Project ID (myfirstproject-181100), and Project number (627857732929). It includes a link to "Go to project settings".
- APIs:** Shows a chart titled "Requests (requests/sec)" which displays "There is no data for this chart". It includes a link to "Go to APIs overview".
- Google Cloud Platform status:** Shows "All services normal" and a link to "Go to Cloud status dashboard".
- Billing:** Shows estimated charges for the billing period Sep 1 - 2017, and links to "View detailed charges".
- Error Reporting:** Shows "No sign of any errors. Have you up Error Reporting?" and a link to "Learn how to set up Error Reporting".
- News:** Lists recent news items:
 - Committed use discounts for Google Compute Engine now generally available (3 days ago)
 - Announcing Stackdriver Debug for Node.js (3 days ago)
 - Introducing faster GPUs for Compute Engine
- Tutorials and Examples:** A sidebar on the right lists several quick start and tutorial options:
 - Create a Linux virtual machine instance in Compute Engine in this guided walkthrough.**
 - Build a Compute Engine Application**: Learn how to spin up virtual machines using Google Compute Engine, Node.js, and MongoDB to create a To-Do app.
 - Try Container Engine**: Try out Container Engine by creating a Hello World app with a guided tutorial. Container Engine lets you package an application so you can easily deploy it to run in its own isolated environment.
 - Build a Guestbook on Container Engine**: Learn how to use Google Container Engine clusters built on the power of open source Kubernetes to deploy a Guestbook application.
 - Learn Cloud Pub/Sub**: Learn how to use Cloud Pub/Sub to connect your applications with a reliable, many-to-many messaging service on Google's infrastructure.
 - Learn to use Cloud Storage**: Cloud Storage is a powerful and simple storage service. In this tutorial you'll learn the basics by creating a storage bucket, and then uploading and sharing a sample file as a public URL link.
 - Try Cloud Vision API**: Take a tutorial and learn how to build a Vision API app that labels images automatically.
 - Try Dataflow**: Take an interactive tutorial and set up a pipeline to perform a word frequency count on works by Shakespeare.

QUICK START AND TUTORIALS

The screenshot shows the Google Cloud Platform 'Getting started' page with a blue header bar containing the title 'Google Cloud Platform', a project dropdown 'MyFirstProject', a search icon, and user profile icons.

Getting started

- Try Compute Engine**
Spin up virtual machines using Google Compute Engine, Node.js, and MongoDB to create a To-Do app in this guided walkthrough.
[Get started](#)
- Learn to use Cloud Storage**
Cloud Storage is a powerful and simple storage service. In this tutorial you'll learn the basics by creating a storage bucket, and then uploading and sharing a sample file as a public URL link.
[Get started](#)
- Learn Google Cloud Platform**
Take an interactive tutorial now and learn how to deploy and build simple applications.
[Get Started](#)
- Use Google APIs**
Enable APIs, create credentials, and track your usage
[API](#) [Enable and manage APIs](#)
- Create a Cloud SQL instance**
Cloud SQL is a MySQL database that runs in Google's cloud, with no installation or maintenance required
[Get started](#)
- Try App Engine**
Create and deploy a Hello World app
[Get started](#)
- Documentation**
 - [Learn about Compute Engine](#)
 - [Learn about Cloud Storage](#)
- Try BigQuery**

Compute Engine Quickstart
Build a to-do app with MongoDB
15 minutes
In this quickstart, you'll use Compute Engine to create a two-tier application. The front-end VM runs a Node.js todo web app, and the back-end VM runs MongoDB.
This tutorial will walk you through:

- Creating and configuring two VMs
- Setting up firewall rules
- Using SSH to install packages on your VMs

[Continue](#)

QUICK START AND TUTORIALS

Features Business Explore Marketplace Pricing This organization Search Sign in or Sign up

 Google Cloud Platform <https://github.com/GoogleCloudPlatform/Template/wiki/Template>

Repositories 418 People 434

Search repositories... Type: All ▾ Language: All ▾

php-docker
Docker images for running PHP applications on the App Engine Flexible Runtime 

PHP 84 30 Updated 10 minutes ago

forseti-security
google-cloud-platform security-tools

Python 146 40 Updated 13 minutes ago

Top languages
Python Java Shell Go JavaScript

Most used topics
google-cloud java docker

https://github.com/GoogleCloudPlatform

CLOUD SHELL

QUICK START AND TUTORIALS

The screenshot shows the Google Cloud Platform Dashboard for the project 'mpcs51033-2017-autumn-photos'. The dashboard includes sections for Project info, App Engine, Google Cloud Platform status, and Billing. A large yellow arrow points from the bottom left towards the 'Google Cloud Platform status' section.

Project info

- Project name: mpcs51033-2017-autumn-photos
- Project ID: mpcs51033-2017-autumn-photos
- Project number: 699588220284

[Go to project settings](#)

App Engine

Summary (count/sec)

Time	Count/sec
4:15	0.10
5 PM	0.08

4:15 4:30 4:45 5 PM

Google Cloud Platform status

All services normal

[Go to Cloud status dashboard](#)

Billing

Estimated charges: USD \$0.00
For the billing period starting Oct 1, 2019

[View detailed charges](#)

- Launch a shell to a VM for your project

QUICK START AND TUTORIALS

The screenshot shows the Google Cloud Platform dashboard with three main sections:

- Project info**:
 - Project name: mpcss51033-2017-autumn-photos
 - Project ID: mpcss51033-2017-autumn-photos
 - Project number: 699588220284
- App Engine**:
 - Summary (count/sec): A chart showing activity over time. The Y-axis ranges from 0.06 to 0.10. The X-axis shows time intervals.
- Google Cloud Platform status**:
 - All services normal
 - [Go to Cloud status dashboard](#)

```
Welcome to Cloud Shell! Type "help" to get started.  
Your Cloud Platform project in this session is set to mpcss51033-2017-autumn-photos.  
Use "gcloud config set project [PROJECT_ID]" to change to a different project.  
abinkowski@cloudshell:~ (mpcss51033-2017-autumn-photos)$ 
```

QUICK START AND TUTORIALS

```
abinkowski@cloudshell:~ (mpcs51033-2017-autumn-photos) $ more README-cloudshell.t
```

Welcome to Google Cloud Shell, a tool for managing resources hosted on Google Cloud Platform. The machine comes pre-installed with the Google Cloud SDK and other popular development tools.

Your 5GB home directory will persist across sessions, but the VM is ephemeral and will be destroyed approximately 20 minutes after your session ends. No system-wide change will persist.

Type "gcloud help" to get help on using Cloud SDK. For more examples, visit <https://cloud.google.com/shell/docs/quickstart> and <https://cloud.google.com/shell/docs/tutorials>.

Type "cloudshell help" to get help on using the "cloudshell" utility. Common functions are aliased to short commands in your shell, for example, you can type "dl <filename>" to download a file. Type "cloudshell aliases" to see these commands.

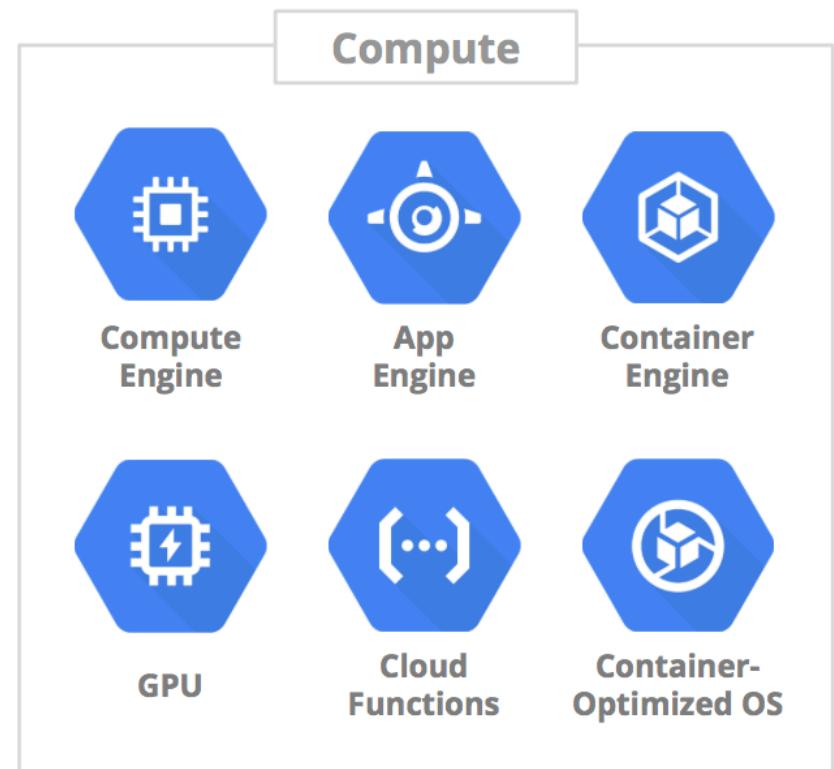
Type "help" to see this message any time. Type "builtin help" to see Bash internal commands.

```
abinkowski@cloudshell:~ (mpcs51033-2017-autumn-photos) $
```

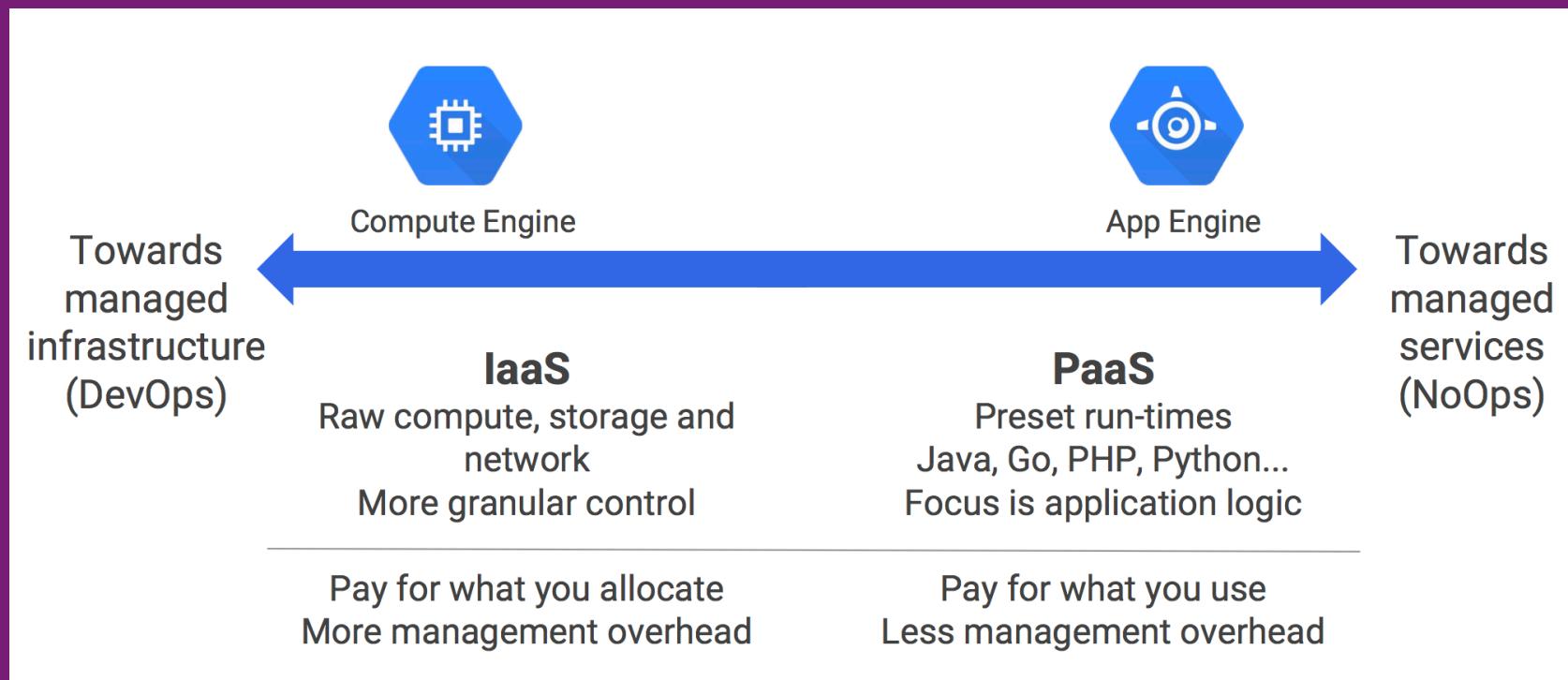
GCP COMPUTE (WITH APP ENGINE)

COMPUTE

- Compute options for all types of computing
 - Fully managed to no-ops



COMPUTE



- Infrastructure as a service to platform as a service

COMPUTE

Google Cloud Platform MyFirstProject ▾

Home

Cloud Launcher

Billing

API APIs & services

Support

IAM & admin

COMPUTE

App Engine

Compute Engine

Container Engine

Cloud Functions

STORAGE

Bigtable

API APIs

Requests (requests/sec)

0.03

0.02

0.01

Sep 25, 11:00 PM Sep 25, 11:38 PM

Requests: 0.0333

Go to APIs overview

CUSTOMIZE

TRY Compute Engine

Create a Linux virtual machine instance in Compute Engine in this guided walkthrough.

TRY Container Engine

Learn how to spin up virtual machines using Google Compute Engine, Node.js, and MongoDB to create a To-Do app.

TRY Compute Engine Application

Build a Compute Engine Application

Learn how to use Google Compute Engine clusters built on the power of open source Kubernetes to deploy a Guestbook application.

Build a Guestbook on Container Engine

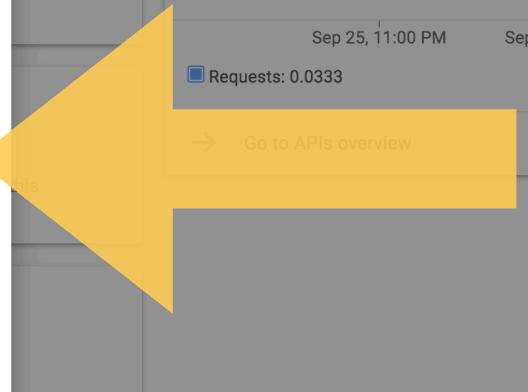
Learn how to use Google Container Engine clusters built on the power of open source Kubernetes to deploy a Guestbook application.

Learn Cloud Pub/Sub

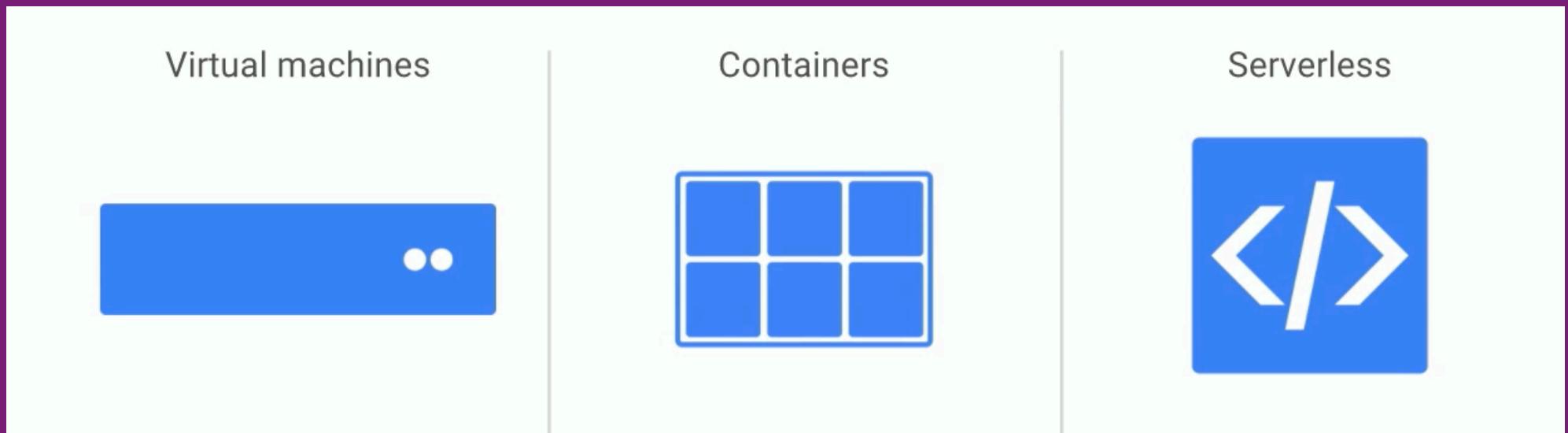
Learn how to use Cloud Pub/Sub to connect your applications with a reliable, many-to-many messaging service on Google's infrastructure.

Learn to use Cloud Storage

Cloud Storage is a powerful and simple storage service. In this tutorial you'll learn the basics by creating a storage bucket, and then uploading and sharing a sample file as a



COMPUTE



- Computing options on Google Cloud Platform

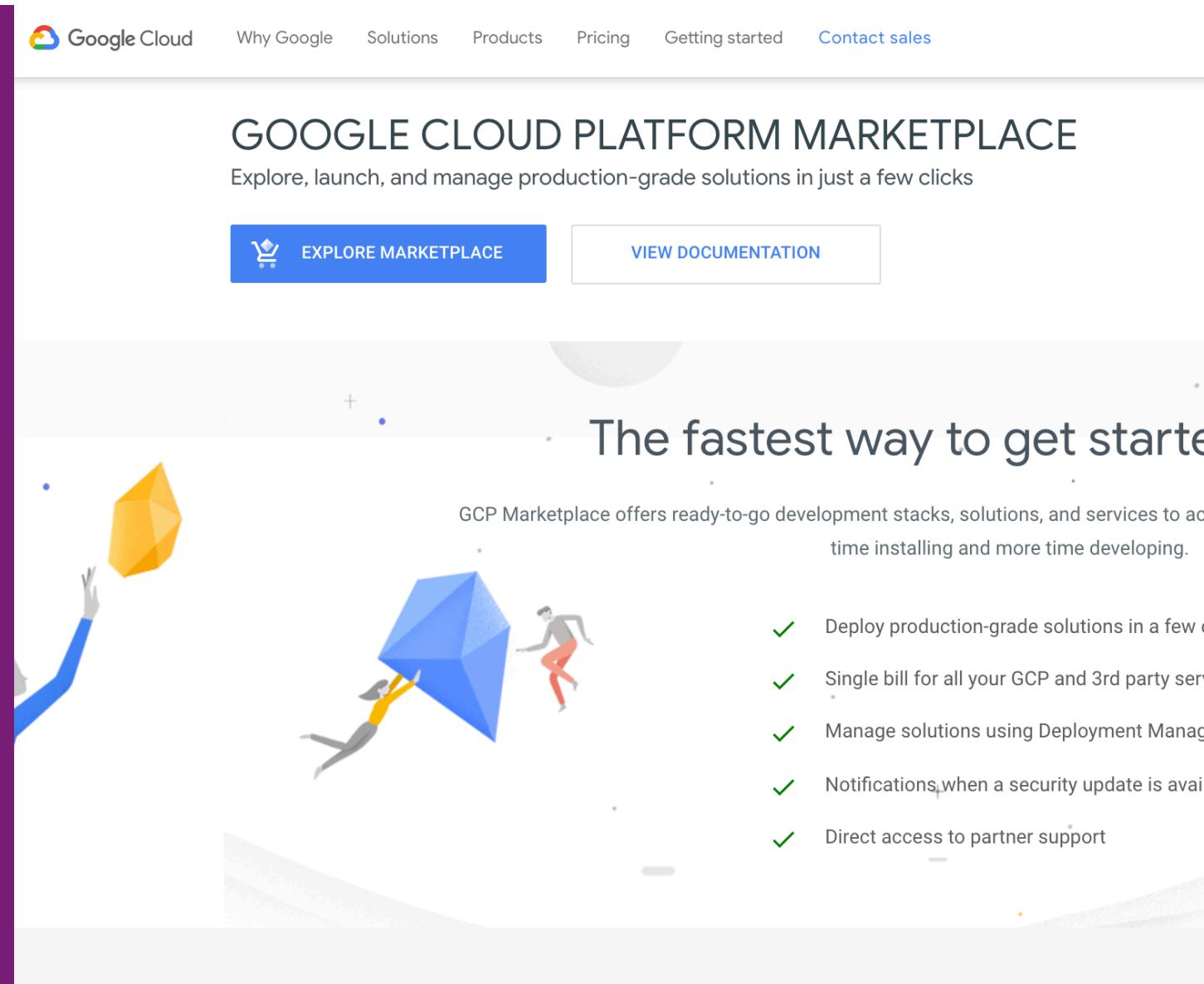
COMPUTE

- Virtual Machines
 - 1- 64 processors
 - .6 - 416 GB
 - 65 TB Persistent data
 - 3TB Ram



COMPUTE

- Cloud Marketplace (formerly launcher)
 - Prebuilt VM and container configurations

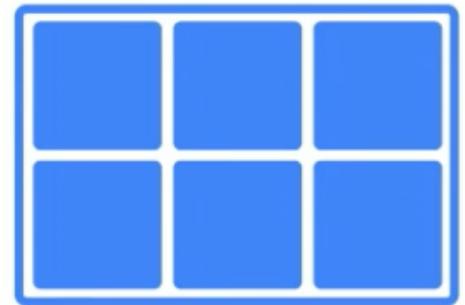


The screenshot shows the Google Cloud Platform Marketplace landing page. At the top, there's a navigation bar with links: Google Cloud, Why Google, Solutions, Products, Pricing, Getting started, and Contact sales. Below the navigation, the title "GOOGLE CLOUD PLATFORM MARKETPLACE" is displayed in large, bold letters, followed by the subtitle "Explore, launch, and manage production-grade solutions in just a few clicks". There are two prominent buttons: "EXPLORE MARKETPLACE" (blue) and "VIEW DOCUMENTATION" (white). The main visual features a stylized graphic of three people interacting with large, colorful geometric shapes (yellow, blue, and orange) that resemble 3D models or containers. To the right of the graphic, the text "The fastest way to get started" is displayed, followed by a description: "GCP Marketplace offers ready-to-go development stacks, solutions, and services to accelerate time installing and more time developing." A bulleted list of benefits follows:

- ✓ Deploy production-grade solutions in a few clicks
- ✓ Single bill for all your GCP and 3rd party services
- ✓ Manage solutions using Deployment Manager
- ✓ Notifications when a security update is available
- ✓ Direct access to partner support

COMPUTE

- Containers
 - Alternative to VM
 - Container operates on a part of a VM but thinks its a VM
 - Many containers can be used for a workflow
 - Each container would have a specific job



COMPUTE



App Engine flexible runtime

- Languages
 - Java 8 / Servlet 3.1 / Jetty 9
 - Python 2.7 & 3.5
 - Node.js,
 - Ruby
 - PHP
 - C



App Engine standard runtime

- Languages
 - Python 2.7
 - Java 7
 - PHP 5.5
 - Go
- Constrained capabilities
- Incredibly rapid scale

- App Engine variants are a container application

COMPUTE

- Serverless (platform as a service)



Cloud functions

- Javascript / Node.js
- Respond to events

APP ENGINE IN A NUTSHELL

APP ENGINE

- Google App Engine (GAE) is a Platform as a Service (PaaS) cloud computing platform for developing and hosting web applications in Google-managed data centers



Why Google **Products** Solutions Launcher Pricing Customers Documentation

GOOGLE APP ENGINE

Build scalable web and mobile backends in any language on Google's infrastructure

TRY IT FREE

App Engine for All

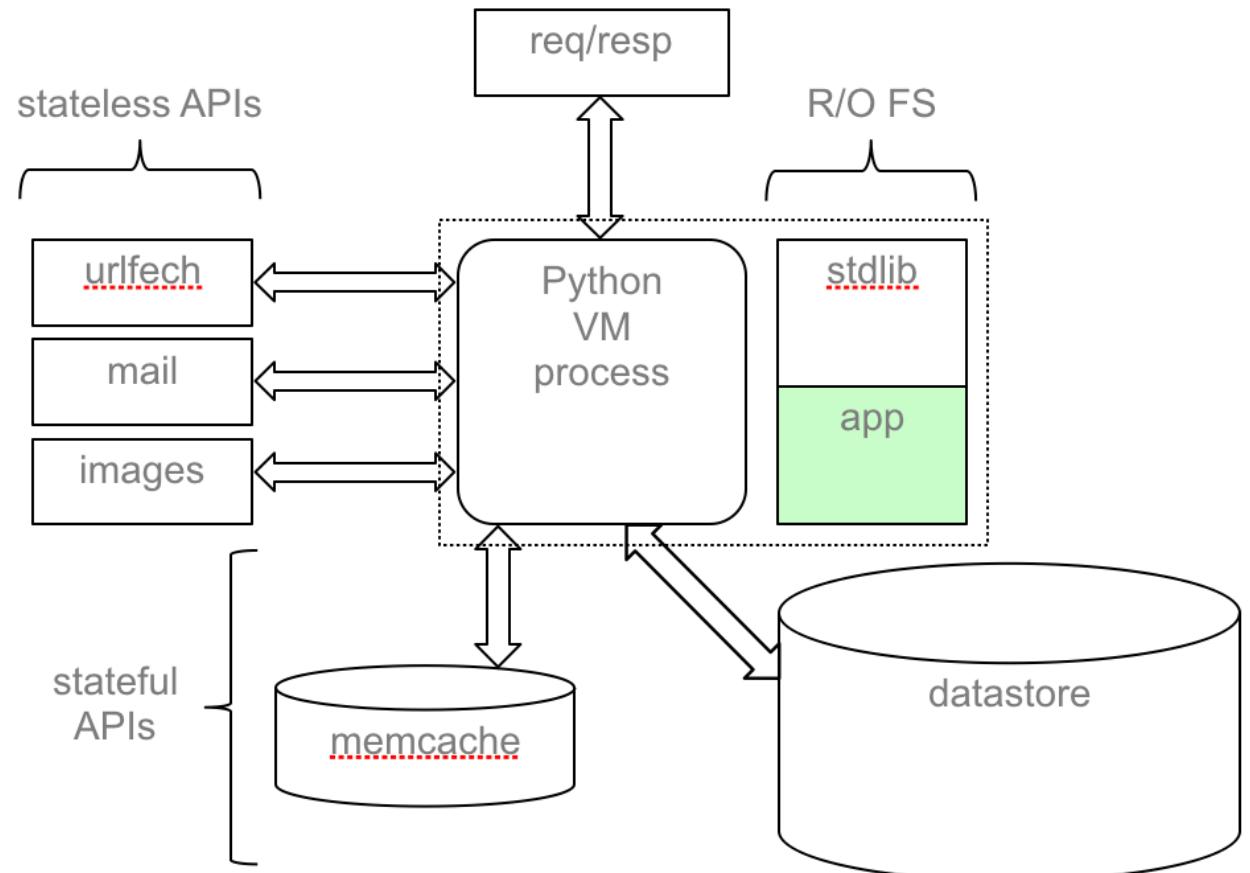
Build modern web and mobile applications on an open cloud platform: bring your own language runtimes, frameworks, and third party libraries. Google App Engine is a fully managed platform that completely abstracts away infrastructure so you focus only on code. Go from zero to planet-scale and see why some of today's most successful companies power their applications on App Engine.

For All Language Communities

Out of the box, App Engine supports Node.js, Java, Ruby, C#, Go, Python, and PHP. Developers from these language communities can be productive immediately in a familiar environment add code.

APP ENGINE

- App Engine architecture



VIA GUIDO VAN ROSSUM

APP ENGINE

- App Engine is tuned to do handle HTTP(S) requests
- App configuration is preconfigured
 - No performance tuning needed
 - Everything is built to scale
 - “infinite” number of apps, requests/sec, storage capacity



APP ENGINE

SECURITY

...and limitations

- Constrain direct OS functionality
 - No processes, threads, dynamic library loading
 - No sockets (use urlfetch API)
 - Can't write files (use datastore)
 - Disallow unsafe Python extensions (e.g. ctypes)
- Limit resource usage
 - Limit 1000 files per app (1MB)
 - Hard time limit of 10s per request
 - Requests must <300 msec CPU time
 - Hard limit of 1MB on request/response size, API call size, etc.
 - Quota system

APP ENGINE

SERVICES

- URLFetch – fetch web resources/services
- Images – manipulate images: resize, rotate, flip, crop
- Google Accounts
- Mail
- XMPP – instant messages
- Task Queue – message queue; allow integration with non-GAPPs
- Datastore – managing data objects
- Blobstore – large files, much larger than objects in datastore, use <key, object> to access

APP ENGINE

DATASTORE

- Entities have a Kind, a Key, and Properties
 - Entity ~~ Record ~~ Python dict ~~ Python class instance
 - Key ~~ structured foreign key; includes Kind
 - Kind ~~ Table ~~ Python class
 - Property ~~ Column or Field; has a type
- Key has either id or name

APP ENGINE

DATASTORE

- Properties are automatically indexed by type+value
 - There is an index for each Kind / property name combo
 - Whenever an entity is written all relevant indexes are updated
 - However Blob and Text properties are never indexed
- Supports basic and complex queries

PYTHON STANDARD ENVIRONMENT

PYTHON STANDARD ENVIRONMENT

- Standard Environment
 - Constrained, cheaper, scales better
- Flexible environment
 - Full control and access
 - Potentially more expensive
 - Scaling requires more involvement

Flexible environment

- Full [open source](#) language runtimes.
- Use any framework, library or binary of your choice.
- Code is portable to anywhere that supports Docker containers.
- Most cost-effective for applications that serve traffic continuously.
- [Python 2.7, 3.5](#)

[VIEW DOCS](#)

Standard environment

- Lightweight Python 2.7 runtime is optimized to scale nearly instantaneously to handle huge traffic spikes.
- Does not allow native code, filesystem access or arbitrary network connections. [Learn more](#)
- Uses proprietary APIs to simplify common tasks like database access, queuing and in-memory caching.
- Most cost-effective for applications that have significant periods where they are not serving traffic.
- [Python 2.7](#)

[VIEW DOCS](#)

PYTHON STANDARD ENVIRONMENT

Feature	Flexible environment	Standard environment
Instance startup time	Minutes	Milliseconds
Maximum request timeout	60 minutes	60 seconds
Background threads	Yes	Yes, with restrictions
Background processes	Yes	No
SSH debugging	Yes	No
Scaling	Manual, Automatic	Manual, Basic, Automatic
Writing to local disk	Yes, ephemeral (disk initialized on each VM startup)	No
Modifying the runtime	Yes (through Dockerfile)	No
Automatic in-place security patches	Yes (excludes container image runtime)	Yes
Network access	Yes	Only via App Engine services (includes outbound sockets)
Supports installing third-party binaries	Yes	No
Location	North America, Asia Pacific, or Europe	North America, Asia Pacific, or Europe
Pricing	Based on usage of vCPU , memory , and persistent disks	Based on instance hours

PYTHON 2 STANDARD ENVIRONMENT

- Limited number of third party packages and modules in standard environment
- There is no package manager for Python on App Engine
 - You have to include additional libraries as source code in your standard environment apps
 - Pure Python only (no C)

Name	Default version	Supported versions	Description
django	(None)	"1.2" "1.3" "1.4" "1.5" "1.9"	A full-featured web application framework for Python.
enum	(None)	"0.9.23"	A backport of the enum module introduced in python 3.4
endpoints	(None)	"1.0"	Libraries for building APIs in an App Engine application.
jinja2	(None)	"2.6"	A modern and designer friendly templating language for Python.
lxml	(None)	"2.3" "2.3.5" (alpha)	A Pythonic binding for the C libraries libxml2 and libxslt.
markupsafe	(None)	"0.15" "0.23"	A XML/HTML/XHTML markup safe string for Python.
matplotlib	(None)	"1.2.0"	A 2D plotting library which produces publication-quality figures.
MySQLdb	(None)	"1.2.4b4" (alpha) "1.2.4" (alpha) "1.2.5" (alpha)	A Python DB API v2.0 compatible interface to MySQL.
numpy	(None)	"1.6.1"	A general-purpose library for array-processing.
PIL	(None)	"1.1.7"	A library for creating and transforming images.
protorpc	"1.0"	"1.0"	A framework for implementing HTTP-based remote procedure call (RPC) services.
pytz	"2016.4"	"2016.4"	A library for cross-platform timezone calculations
crcmod	(None)	"1.7"	A library for generating Cyclic Redundancy Checks (CRC).
PyAMF	(None)	"0.6.1" "0.7.2" (alpha)	A library that provides (AMF) Action Message Format functionality.
pycrypto	(None)	"2.3" "2.6" "2.6.1"	A library of cryptography functions such as random number generation.
setuptools	(None)	"0.6c11"	A library that provides package and module discovery capabilities.
six	(None)	"1.9.0"	Abstract differences between py2.x and py3
ssl	(None)	"2.7" "2.7.11"	The SSL socket wrapper built-in module.
webapp2	"2.3"	"2.3" (deprecated) "2.5.1" "2.5.2"	A lightweight Python web framework.
webob	"1.1.1"	"1.1.1" "1.2.3"	A library that provides wrappers around the WSGI request environment.
werkzeug	"0.11.10"	"0.11.10"	A WSGI utility library.
yaml	"3.10"	"3.10"	A library for YAML serialization and deserialization.

PYTHON 3 STANDARD ENVIRONMENT

- Python 3 is idiomatic
- Removes App Engine specific features/limitations
- Not all features in Python 2 are released yet

[App Engine](#) > [Documentation](#) > [Python](#) > [Standard Documentation](#)

Understanding differences between Python 2 and Python 3 on the App Engine standard environment

The Python 3 runtime on App Engine standard environment is a second generation runtime. Sandboxing technology enables this runtime to support a fully idiomatic Python development experience.

Idiomatic Python development experience

The Python 3 runtime is built around three core ideas:

- Your app uses the latest version of the open source Python interpreter provided by the Python Software Foundation.
- Python's rich ecosystem of packages and frameworks, including those that use C code, are available to your app using a `requirements.txt` file.
- You don't need specialized, platform-specific knowledge to develop on App Engine.

The overall goal is that your app should be fully portable and run in any standard Python environment. Your app is no longer a standard Python app, not an App Engine Python app. As part of this shift, you are no longer using the App Engine APIs and services for your app's core functionality. At this time, App Engine API support is limited to Python 3.7 runtime.

Migrating between Python 2 and Python 3 on the App Engine standard environment

The Python 3 runtime on the App Engine standard environment is significantly different from the Python 2 runtime. It is designed to be more compatible with the Python 3 ecosystem and to provide a better development experience.

INSTALLING APP ENGINE

INSTALLING APP ENGINE

Download and Install the SDK for App Engine

[SEND FEEDBACK](#)

The SDK for App Engine includes a local development server as well as the tooling for deploying and managing your applications in App Engine.

Go

Java

PHP

Python

Was this page helpful? Let us know how we did:



[SEND FEEDBACK](#)

<https://cloud.google.com/appengine/docs/standard/python/download>

INSTALLING APP ENGINE

The preferred tooling for managing your App Engine applications in [Python](#) is now the Google Cloud SDK. The Cloud SDK includes a local development server as well as the tooling for deploying and managing your applications.

By downloading, you agree to be bound by the [Terms](#) that govern use of the SDK for App Engine.

To install the SDK for Python:

1. Install [Python version 2.7](#):

[DOWNLOAD AND INSTALL](#)

2. Install and initialize the Google Cloud SDK:

[DOWNLOAD AND INSTALL](#)

3. Run the following command to install the [gcloud component](#) that includes the App Engine extension for Python:

```
gcloud components install app-engine-python
```

4. Optional: Run the following command to install the [Extra Libraries](#) component for Python, which includes the [graphy](#)  and [Django](#) libraries:

```
gcloud components install app-engine-python-extras
```

INSTALLING APP ENGINE

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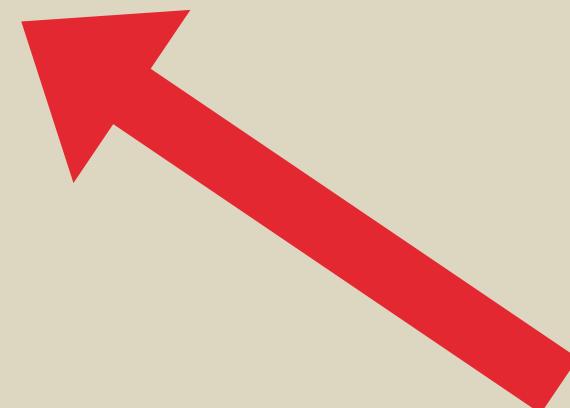
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gcloud components install app-engine-python-extras
```

INSTALLING APP ENGINE



A large red arrow points from the bottom left towards the terminal window, highlighting the file being edited.

```
# added by Anaconda2 4.3.0 installer
export PATH="/Applications/anaconda/bin:$PATH"

# The next line updates PATH for the Google Cloud SDK.
if [ -f '/Applications/google-cloud-sdk/path.bash.inc' ]; then source '/Applications/google-cloud-sdk/path.bash.inc'; fi

# The next line enables shell command completion for gcloud.
if [ -f '/Applications/google-cloud-sdk/completion.bash.inc' ]; then source '/Applications/google-cloud-sdk/completion.bash.inc'

#
export TERM=xterm-color
export GREP_OPTIONS='--color=auto' GREP_COLOR='1;32'
export CLICOLOR=1

# Aliases
alias clean='rm *~ *.o core .*~ #*'
alias h="history"
alias rm="rm -i"
alias mv="mv -i"
alias cp="cp -i"
alias m="more"

BLACK="\[\033[0m\]";
DARK_GRAY="\[\033[0;30m\]";
```

ASSIGNMENT 1

ASSIGNMENT

- Sign up for GCP (add educational credits)
- Sign up for GitHub (if you haven't)
- Post a comment on the forum introducing yourself

The screenshot shows a GitHub repository page for 'uchicago-cloud / mpcs51033-2019-summer-forum'. The 'Issues' tab is selected, showing 1 open issue. The search bar contains the filter 'is:issue is:open'. The open issue is titled 'Welcome to Backends for Mobile Applications', which was opened 18 hours ago by tabinks. A 'ProTip!' message suggests getting help via @tabinks if ears are burning.

uchicago-cloud / mpcs51033-2019-summer-forum

Code Issues 1 Pull requests 0 Projects 0

Filters is:issue is:open Labels

1 Open ✓ 0 Closed

Welcome to Backends for Mobile Applications
#1 opened 18 hours ago by tabinks

ProTip! Ears burning? Get @tabinks

© 2019 GitHub, Inc. Terms Privacy Security Status Help

ASSIGNMENT

Deploy to GCP

- Complete the following tutorials
 - Hello World (Python 2)
 - <https://cloud.google.com/appengine/docs/standard/python/quickstart>
 - Guestbook application (Python 2)
 - <https://cloud.google.com/appengine/docs/standard/python/getting-started/creating-guestbook>



Why Google Solutions Products

Compute Products

Google App Engine

Product Overview

Python Standard Environment

Documentation

[Quickstart](#)

How-to Guides

All How-to Guides

Installing Google Cloud SDK

Getting Started with Python in the Standard Environment

- ▶ Developing Python Apps on App Engine
- ▶ Managing and Configuring Your App
- ▶ Storing Data
- ▶ Access Control and User Authentication
- ▶ Caching Application Data
- ▶ Connecting to and from Your App
- ▶ Manipulating Images

ASSIGNMENT

- Guestbook application additions
 - Create shell commands using `curl` that allow you to interact with application from command line

```
curl -X POST -H -F caption='curl' -F "name=homer" https://<your app>
```

- Add properties to the `Greeting` entity that indicates the user agent that made the request

ASSIGNMENT

- Complete the following tutorials
 - Building a Python 3.7 App on App Engine
 - <https://cloud.google.com/appengine/docs/standard/python3/building-app/>



Why Google

Solutions

Products

Pricing

Getting started

Compute Products

Google App Engine

Product Overview

Python 3 Standard Environment

Documentation

Quickstart

Building an App

Overview

Creating Your Project

Writing Your Web Service

Deploying Your Web Service

Handling Data

Adding Firebase

Authenticating Users

Personalizing Data

Cleaning Up

How-to Guides

All How-to Guides

▶ Setting Up

▶ Designing Your App

▶ Defining Configuration Files

Testing and Deploying Your App

▶ Debugging Your App

Installing Google Cloud Client Libraries

▶ Storing Data and Files

Securing Your App

▶ Controlling Access

Authenticating Users

▶ Using a Custom Domain

▶ Managing Your App's Traffic

Scheduling Cron Jobs

App Engine > Documentation > Python > Standard Documentation

Building a Python 3.7 App on App

Use this guide to learn the basics of developing and deploying Python standard environment.

In this guide, you iterate through building and deploying versions of building up to a personalized web page that shows authenticated user request times.

The following tasks demonstrate the basic developer flow for creating storage and Firebase authentication ↗:

1. Creating your GCP project

Learn how to create a GCP project and then set up the App Engine

2. Writing your web service

Learn how to write and locally test a basic web service, and then deploying that web service to App Engine.

3. Deploying your web service to App Engine

Learn how to deploy your Python 3.7 code and then view your

4. Handling Data

Learn how to use Cloud Datastore to store and retrieve data at

5. Adding Firebase to your web service

Learn how to add Firebase to your GCP project and web service

6. Authenticating users with Firebase

Learn how to use Firebase Authentication to verify user credentials and access.

7. Personalizing data for authenticated users

ASSIGNMENT

- Review documentation (as needed)
 - App Engine for Python
 - Cloud Datastore Features on App Engine
- Brush up on Python/Flask
- Explore GCP Console (Cloud Shell)

<https://cloud.google.com/appengine/docs/standard/python/concepts>

App Engine > Documentation > Python > Standard Environment

Concepts



SEND FEEDBACK

App Engine for Python Concepts

An Overview of App Engine

An explanation of App Engine services, the building blocks of App Engine applications

The Python Runtime Environment

A description of the Python standard environment for App Engine and how it works.

How Requests are Handled

How requests to your application are understood and handled within App Engine.

How Requests are Routed

How HTTP requests from users and other applications can be routed using dispatch files.

How Instances are Managed

A description of how App Engine instances are managed and scale dynamically to meet demand.

Access Control

Set access control using roles at the project level.

Application Security

Steps you should take to identify vulnerabilities and protect your application.



THE UNIVERSITY OF
CHICAGO



MPCS 51033 • AUTUMN 2019 • SESSION 1

BACKENDS FOR MOBILE APPLICATIONS