

1 Google Cloud

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4 <CloudOnBoard>

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# Getting Started With Google Cloud

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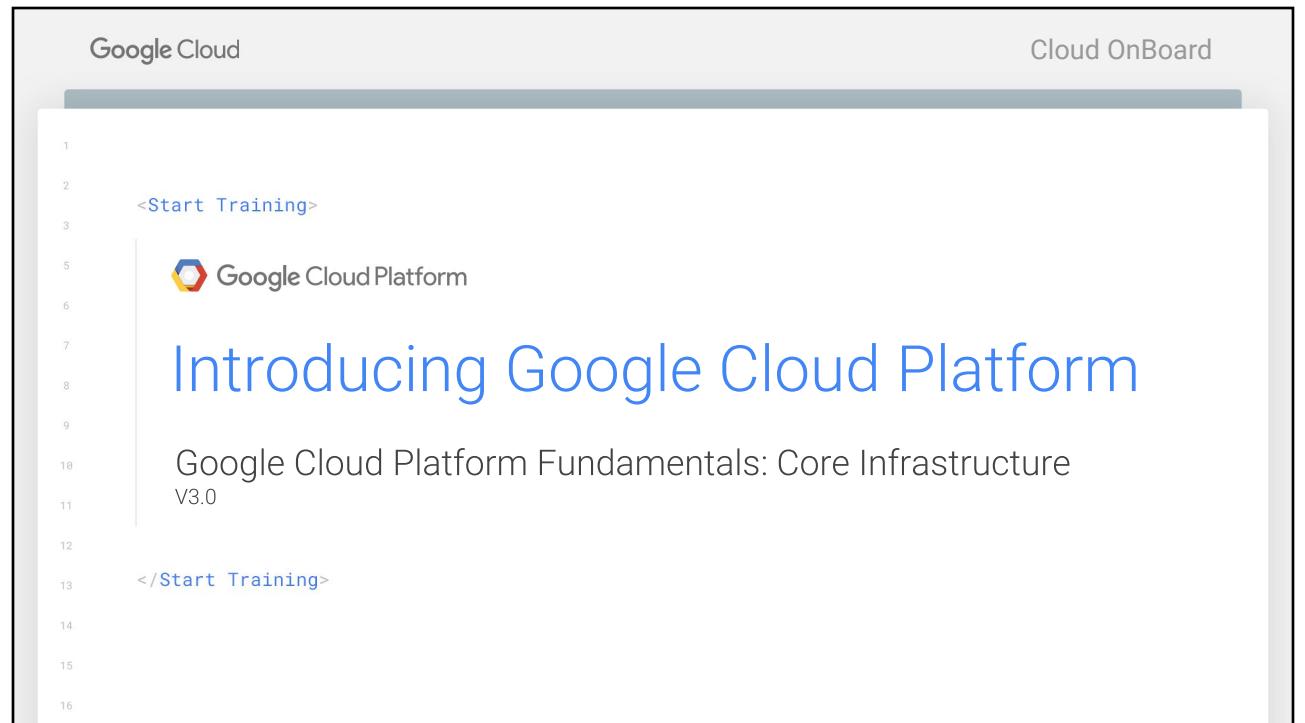
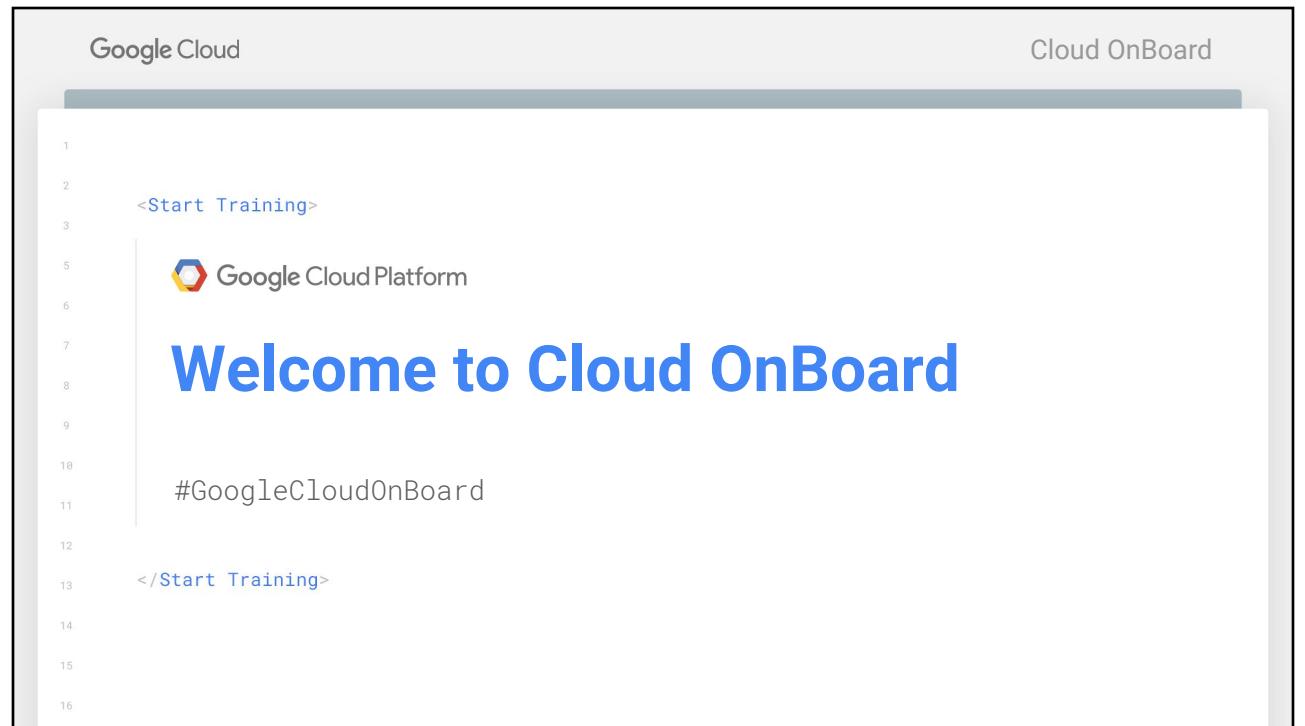
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16 </CloudOnBoard>

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## Agenda

1 → Introduction to Google Cloud Platform

2 → Quiz



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## Why choose Google Cloud Platform?

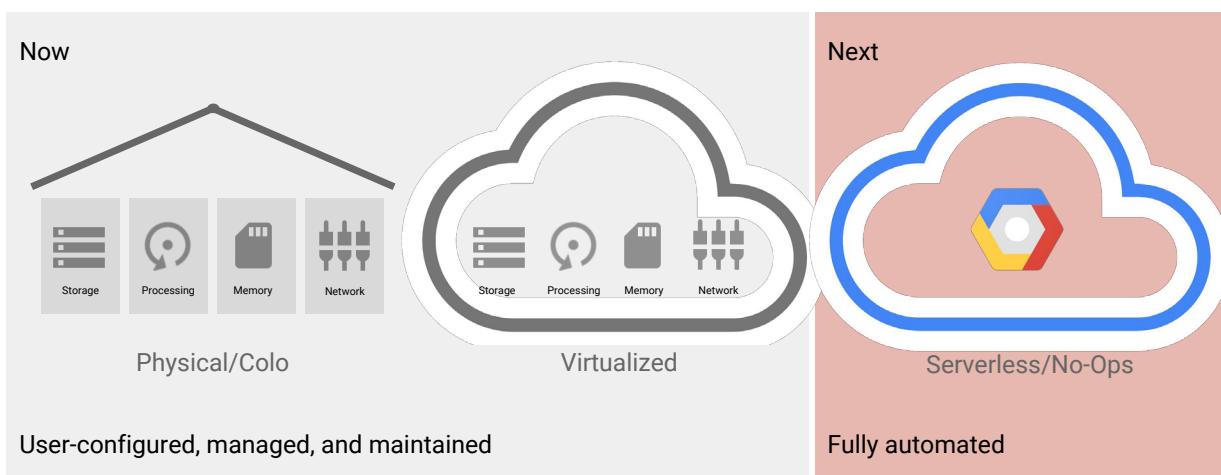
Google Cloud Platform enables developers to **build, test** and **deploy** applications on Google's *highly-scalable, secure, and reliable* infrastructure.

Choose from **computing, storage, big data/machine learning,** and **application** services for your *web, mobile, analytics, and backend* solutions.



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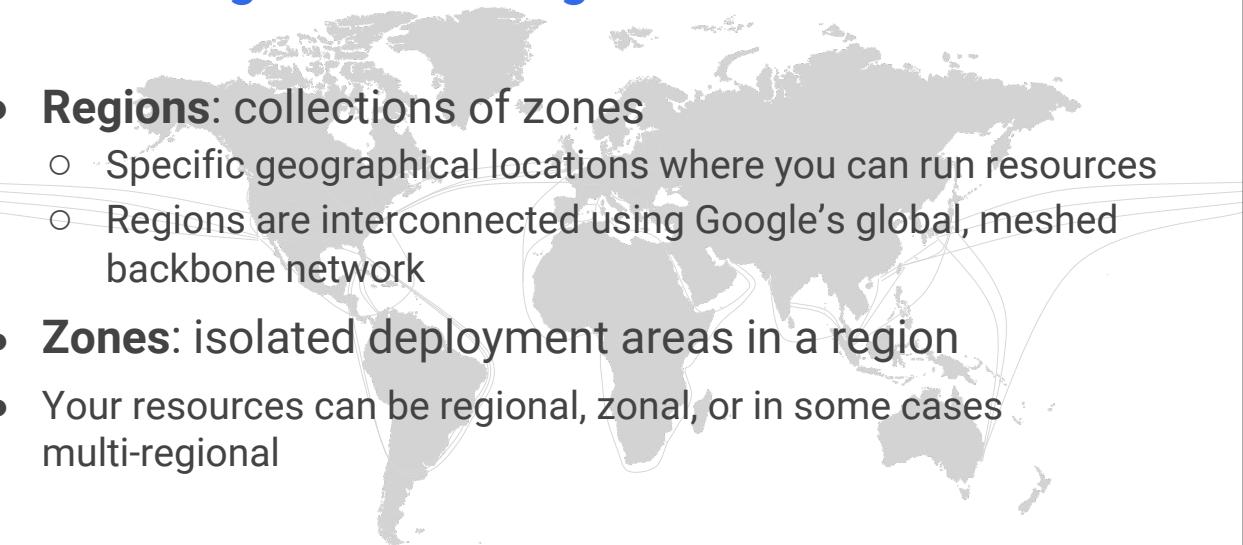
## The Future of Cloud Computing



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## GCP is organized into regions and zones

- **Regions:** collections of zones
  - Specific geographical locations where you can run resources
  - Regions are interconnected using Google's global, meshed backbone network
- **Zones:** isolated deployment areas in a region
- Your resources can be regional, zonal, or in some cases multi-regional



## Google's infrastructure: the most powerful on earth



## Google's commitment to environmental responsibility

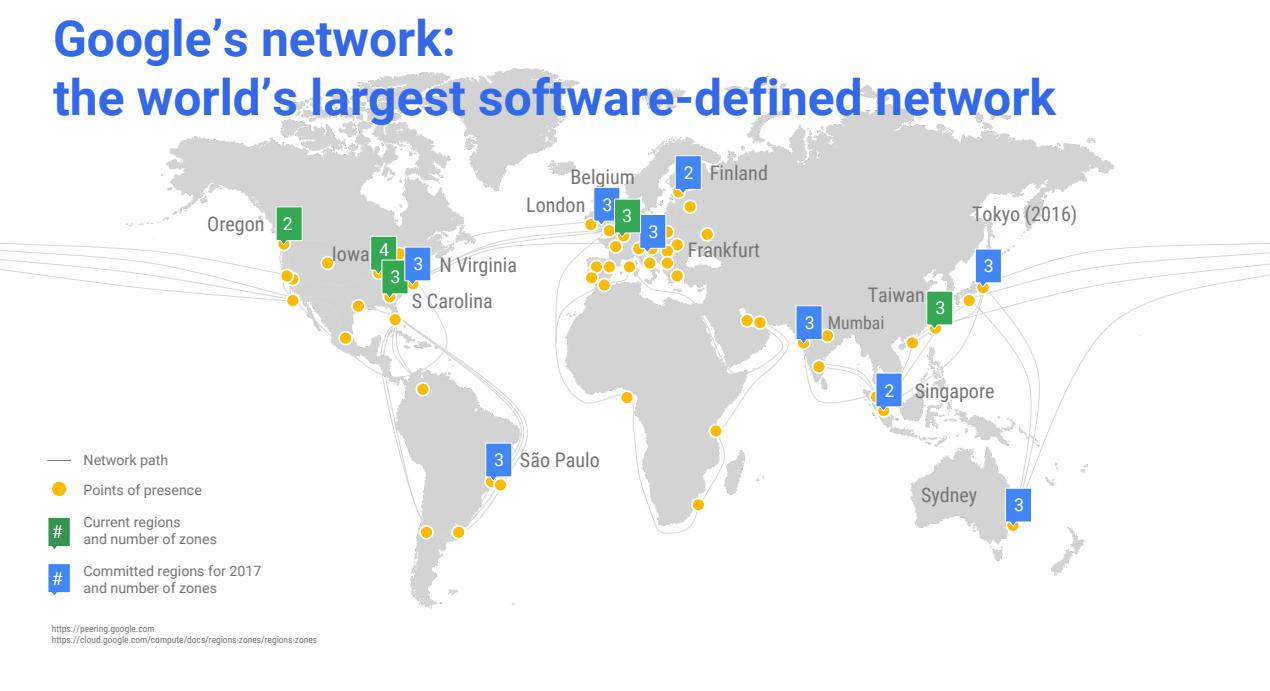
Developing our infrastructure while respecting our ecosystem

- Pioneering data center efficiency
- Largest private investor in renewables (wind, solar)
- First data centers to receive ISO 14001 certification
- 100% carbon neutral since 2007



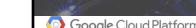
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## Google's network: the world's largest software-defined network

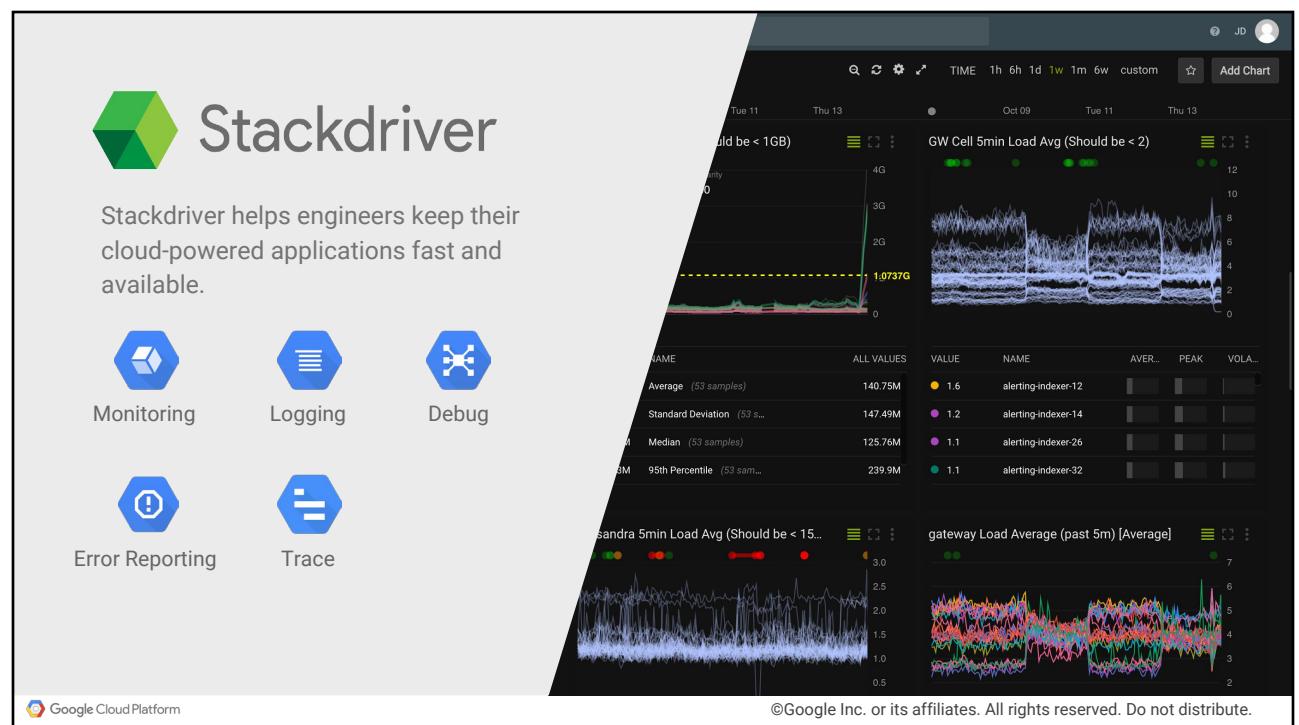
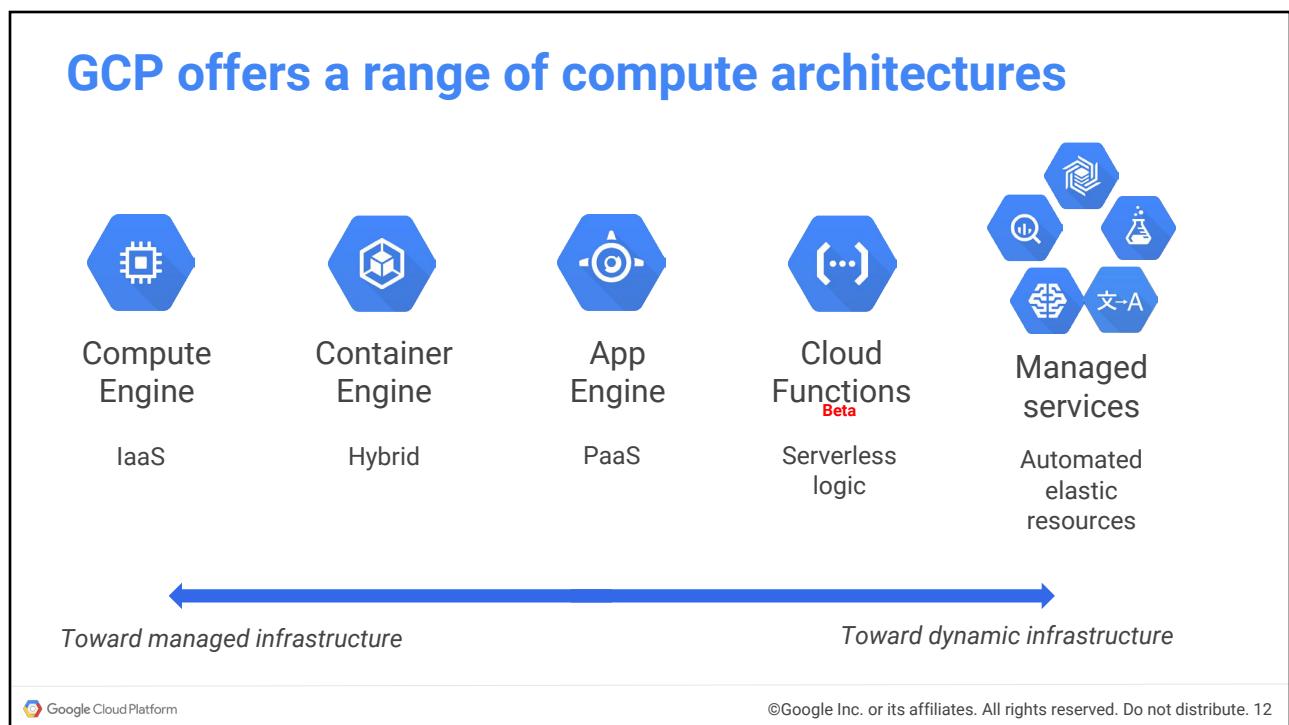
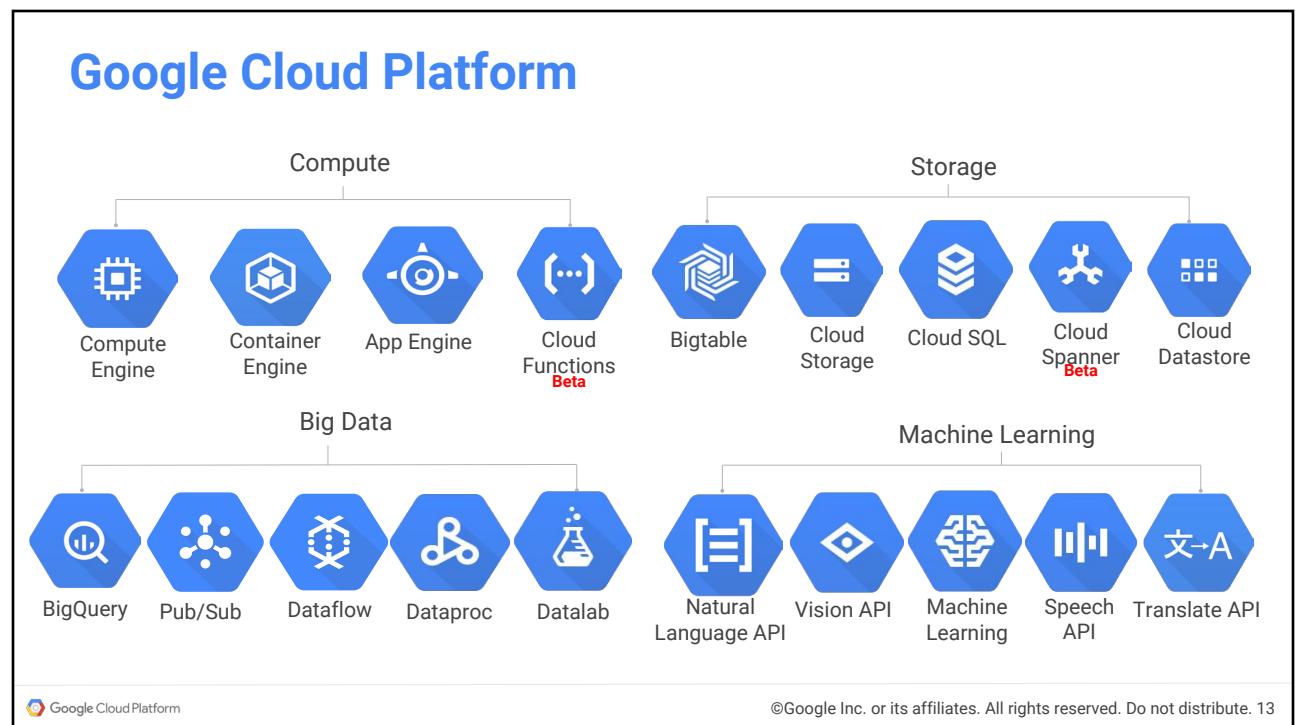
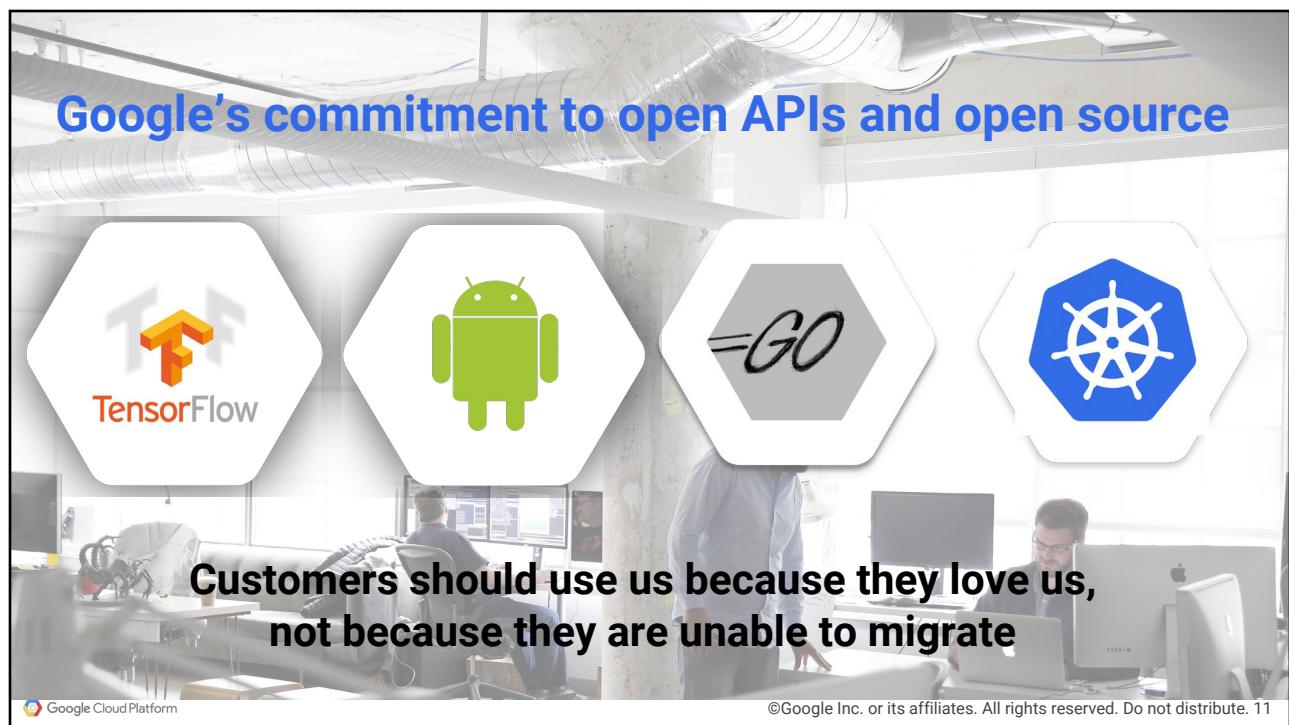


## Innovative, Customer-Friendly Pricing

- Billing in sub-hour increments
- Discounts for sustained-use
  - Automatically reward users who run virtual machines for over 25% of any calendar month
- Custom virtual-machine types
  - Pay only for the resources you need for your application



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## Agenda

1 → Introduction to Google Cloud Platform

2 → Quiz



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## Resources

- Why Google Cloud Platform?  
<https://cloud.google.com/why-google/>
- Pricing philosophy  
<https://cloud.google.com/pricing/philosophy/>
- Data Centers  
<https://www.google.com/about/datacenters/>
- Google Cloud Platform product overview  
<http://cloud.google.com/products/>
- Google Cloud Platform solutions  
<http://cloud.google.com/solutions/>



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## Quiz

Name 3 pricing innovations that make Google Cloud Platform the most cost-effective public cloud.

In addition to innovative pricing, name 3 benefits of using Google Cloud Platform.



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Google Cloud

Cloud OnBoard

<Start Training>



## Getting Started with Google Cloud Platform

Google Cloud Platform Fundamentals: Core Infrastructure V3.0

</ Start Training >

## Agenda

- 1 Google Cloud Platform Projects
- 2 Identity and Access Management (IAM)
- 3 Interacting with Google Cloud Platform
- 4 Quiz



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## Projects are uniquely named

- Projects use three identifying attributes:
  - Project Name
  - Project Number
  - Project ID
    - Also known as Application ID
- Interact with projects using the Cloud Console or the [Cloud Resource Manager API](#)



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## Projects organize resources

- All Google Cloud Platform services are associated with a project that is used to:
  - Track resource and quota usage
  - Enable billing
  - Manage permissions and credentials
  - Enable services and APIs



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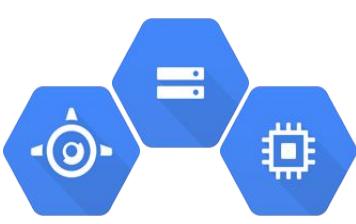
## Agenda

- 1 Google Cloud Platform Projects
- 2 Identity and Access Management (IAM)
- 3 Interacting with Google Cloud Platform
- 4 Quiz & Lab



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## Identity and Access Management



Who

can do what

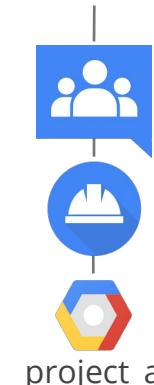
on which resource

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## You can define “curated roles”

Google Account (test@gmail.com)  
Service Account (test@project\_id.iam.gserviceaccount.com)  
Google Group (test@googlegroups.com)  
Google Apps Domain (test@example.com)



Google Group  
InstanceAdmin Role

- List of Permissions
- ✓ compute.instances.delete
  - ✓ compute.instances.get
  - ✓ compute.instances.list
  - ✓ compute.instances.setMachineType
  - ✓ compute.instances.start
  - ✓ compute.instances.stop
- ...

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## IAM predefines “primitive roles”



Owner

Invite members  
Remove members  
Can delete project  
Includes Editor rights



Editor

Deploy applications  
Modify code  
Configure services  
Includes Viewer rights



Viewer

Read-only access



Billing administrator  
Manage billing  
Add administrators  
Remove administrators

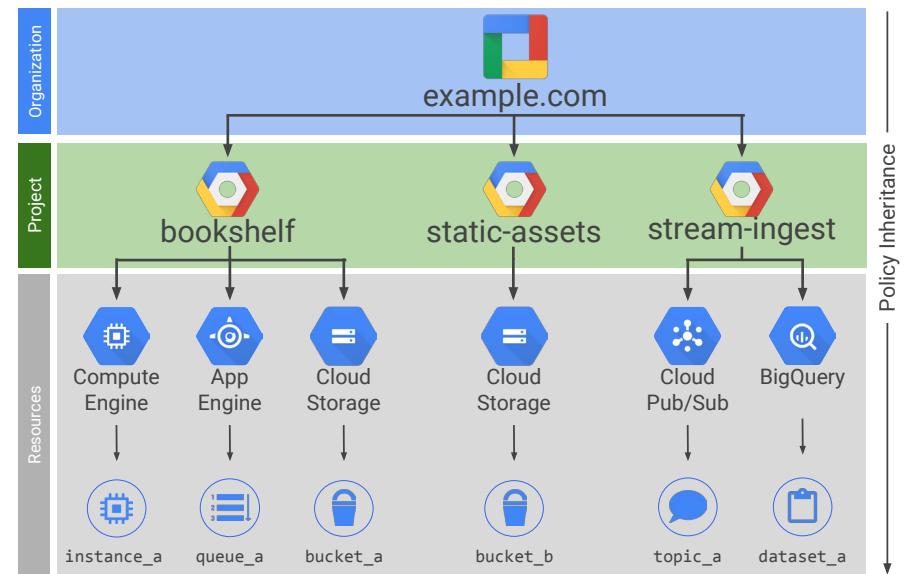
A project can have multiple owners, editors, viewers and billing administrators.

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## IAM Resource Hierarchy

- A policy is set on a resource
  - Each policy contains: Set of roles, role members
- Resources inherit policies from parent
  - Resource policies are a union of parent and resource
- If parent policy less restrictive, overrides more restrictive resource policy

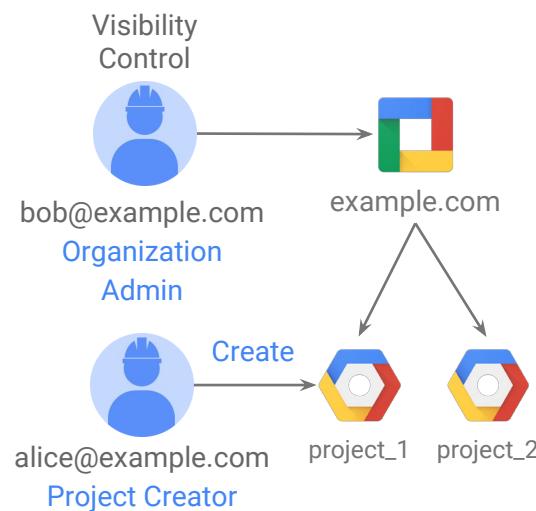


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## Organization node organizes projects

- Organization node is root node for Google Cloud resources
  - Can be managed via Cloud Resource Manager API
- 2 organization roles:
  - *Organization Admin* - Control over all cloud resources
  - *Project Creator* - Controls project creation

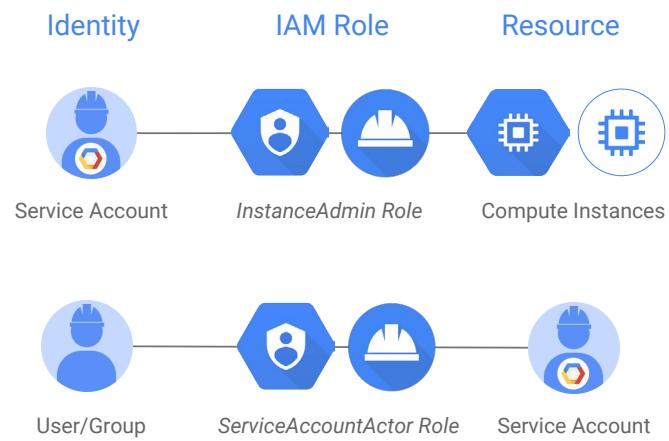


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## Service Accounts and IAM

- Service accounts authenticate with keys
  - Google manages keys, key rotation for Compute Engine and App Engine
- Can assign an IAM role to the service account
- Can also assign *ServiceAccountActor* role to users/groups



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## Service Accounts

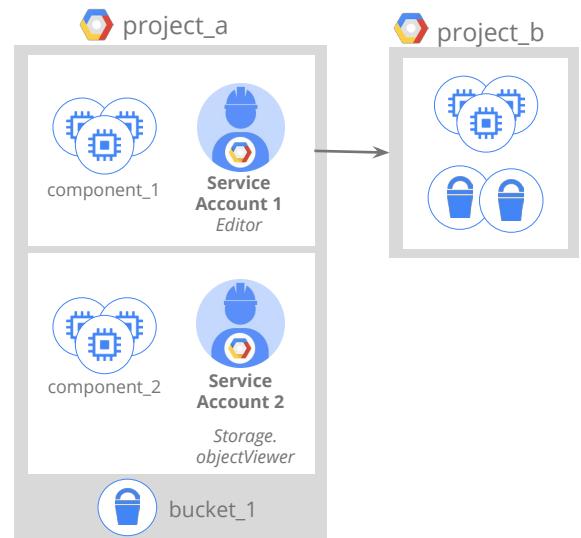
- Provide an identity for carrying out **server-to-server** interactions in a project
- Used to **authenticate** from one service to another
- Can be used with primitive and curated roles
- Identified with an **email** address:
  - **PROJECT\_NUMBER**@developer.gserviceaccount.com
  - **PROJECT\_ID**@developer.gserviceaccount.com

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## Example: Service Accounts and IAM

- VMs running component\_1 are granted Editor access to project\_b using Service Account 1
- VMs running component\_2 are granted objectViewer access to bucket\_1 using Service Account 2
- Service account permissions can be changed without recreating VMs



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## Agenda

- 1 Google Cloud Platform Projects
- 2 Identity and Access Management (IAM)
- 3 Interacting with Google Cloud Platform
- 4 Quiz

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## Google Cloud Platform Console

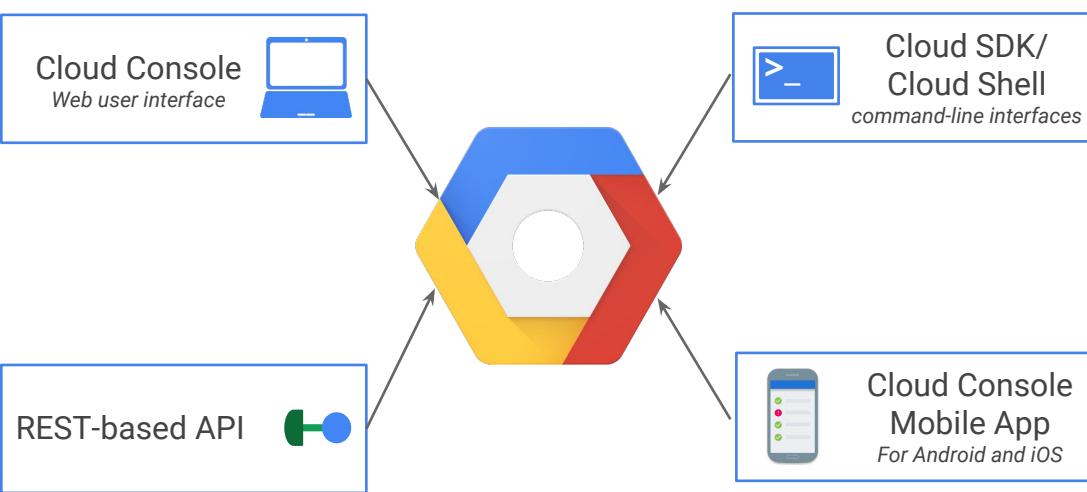
- Centralized console for all project data
- Developer tools
  - Cloud Source Repositories
  - Cloud Shell
  - Test Lab (mobile app testing)
- Access to product APIs
- Manage, create projects



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## Interacting with Google Cloud Platform



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## Google Cloud SDK

- SDK includes CLI tools for Cloud Platform products and services
  - gcloud, gsutil (Cloud Storage), bq (BigQuery)
- Available as Docker image
- Available via Cloud Shell
  - Containerized version of Cloud SDK running on Compute Engine instance



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## RESTful APIs

- Programmatic access to products and services
  - Typically use JSON as an interchange format
  - Use OAuth 2.0 for authentication and authorization
- Enabled through the Google Cloud Platform Console
- Most APIs include daily quotas and rates (limits) that can be raised by request
  - Important to **plan ahead** to manage your required capacity
- Experiment with [APIs Explorer](#)

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## APIs Explorer

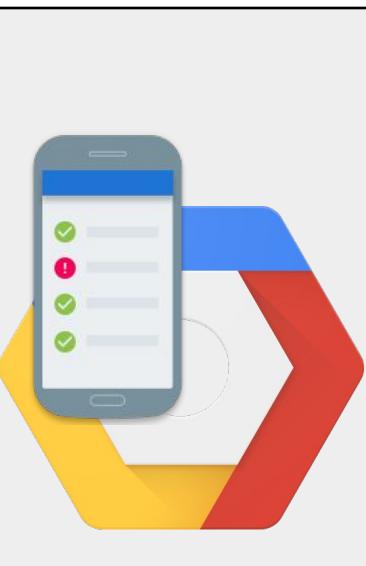
- The [APIs Explorer](#) is an interactive tool that lets you easily try Google APIs using a browser
- With the APIs Explorer, you can:
  - Browse quickly through available APIs and versions.
  - See methods available for each API and what parameters they support along with inline documentation.
  - Execute requests for any method and see responses in real time.
  - Make authenticated and authorized API calls with ease.

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## Cloud Console Mobile App

- Manage virtual machines and database instances
- Manage apps in Google App Engine
- Manage your billing
- Visualize your projects with a customizable dashboard



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## Client Libraries

- [Google Cloud Client Libraries](#)
  - Community-owned, hand-crafted client libraries
- [Google APIs Client Libraries](#)
  - Open source, generated
  - Support various languages
    - Java, Python, JavaScript, PHP, .NET, Go, Node.js, Ruby, Objective-C, Dart

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## Agenda

- 1 → Google Cloud Platform Projects
- 2 → Identity and Access Management (IAM)
- 3 → Interacting with Google Cloud Platform
- 4 → Quiz



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## Quiz: Service Accounts

Service accounts are used to provide which of the following?

- Authentication between Google Cloud Platform services
- Key generation and rotation when used with App Engine and Compute Engine
- A way to restrict the actions a resource (such as a VM) can perform
- A way to allow users to act with service account permissions
- All of the above



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## Quiz: Policies and Projects

*True or False:* If a Google Cloud IAM policy gives you Owner permissions at the project level, your access to a resource in the project may be restricted by a more restrictive policy on that resource.

*True or False:* All Google Cloud Platform resources are associated with a project.



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## Resources

- Cloud SDK installation and quick start  
[https://cloud.google.com/sdk/#Quick\\_Start](https://cloud.google.com/sdk/#Quick_Start)
- gcloud tool guide  
<https://cloud.google.com/sdk/gcloud/>
- IAM  
<https://cloud.google.com/iam/>
- Configuring permissions on Google Cloud Platform  
<https://cloud.google.com/docs/permissions-overview>
- Google Cloud Platform security  
<https://cloud.google.com/security/>

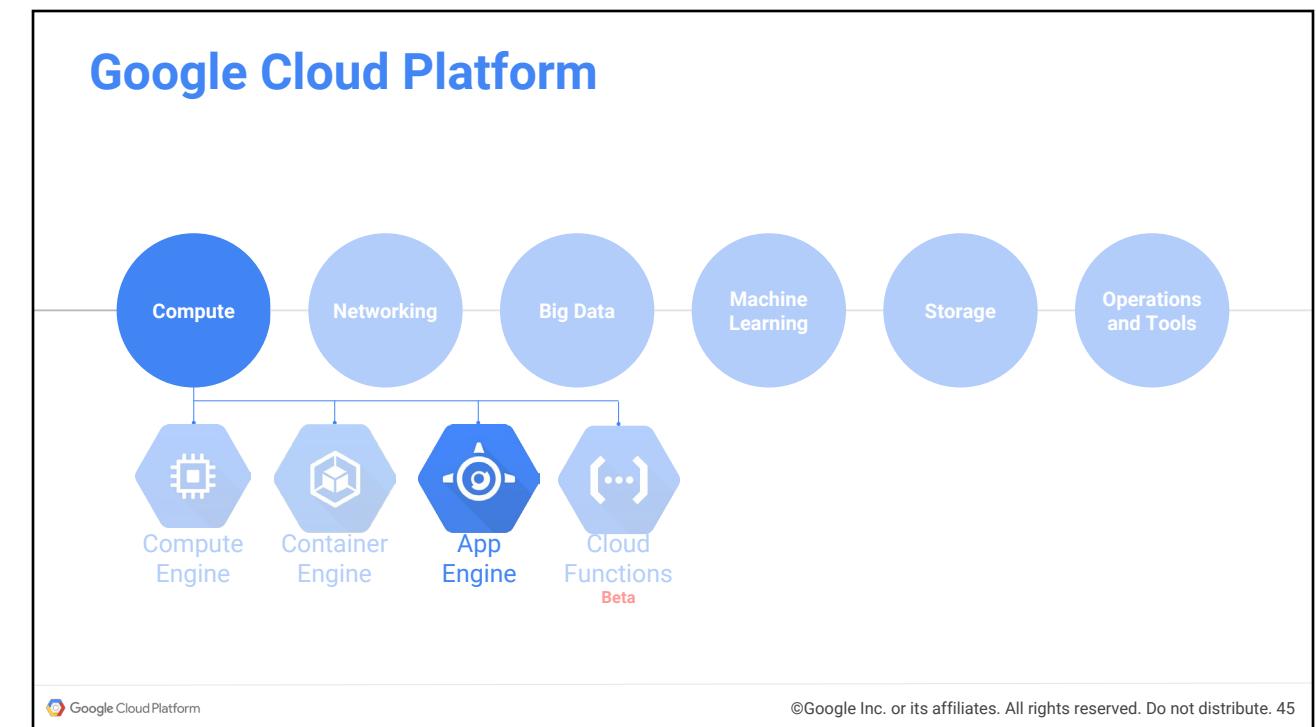


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Google Cloud

Cloud OnBoard

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<Start Training>  
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5 Google Cloud Platform  
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7 Google App Engine  
8 and Google Cloud Datastore  
9  
10  
11 Google Cloud Platform Fundamentals: Core Infrastructure  
V3.0  
12  
13 </Start Training>  
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15  
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## Agenda

- 1 Overview and Customer Stories
- 2 Google App Engine Standard Environment
- 3 Google App Engine Flexible Environment
- 4 Google Cloud Endpoints
- 5 Google Cloud Datastore
- 6 Quiz

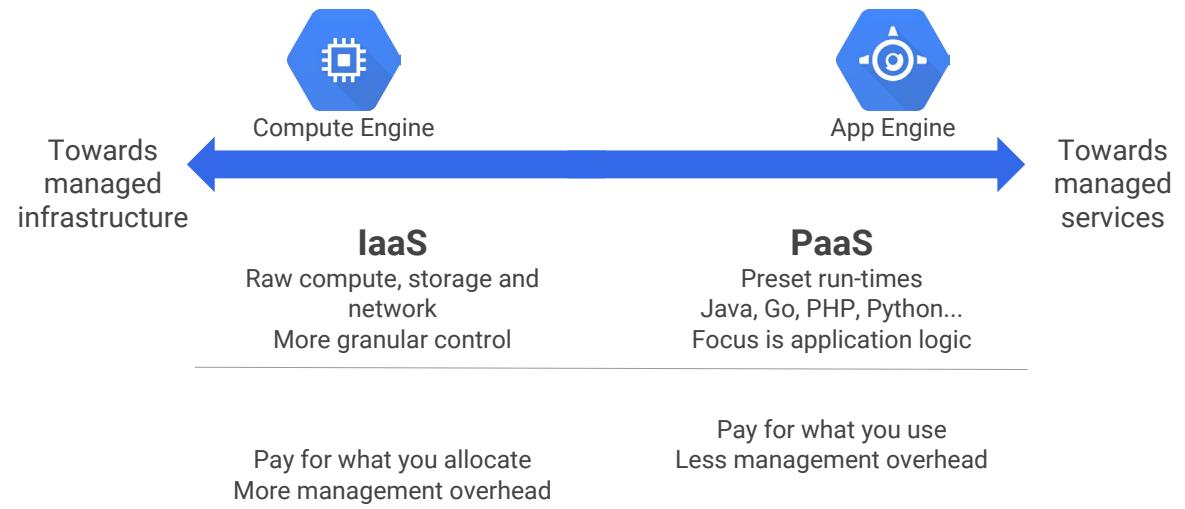
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## What is Google App Engine?

- A platform (platform as a service) for building scalable web applications and mobile backends
- App Engine makes deployment, maintenance, and scalability easy so you can focus on innovation

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## IaaS and PaaS



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## Agenda

- 1 Overview and Customer Stories
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## Snapchat

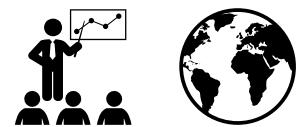
"App Engine enabled us to focus on developing the application. We wouldn't have gotten here without the ease of development that App Engine gave us."

Bobby Murphy, CTO

Snapchat sends  
**700 million**  
photos and videos each day



Google App Engine scaled seamlessly during growth to  
**millions of users**



Small team is able to innovate quickly and expand  
**globally**

## App Engine Standard Environment

- Easily deploy your applications
- Autoscale workloads to meet demand
- Economical
  - Free daily quota
  - Usage based [pricing](#)
- SDKs for development, testing and deployment



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## App Engine Standard Environment: requirements

- Specific versions of Java, Python, PHP, and Go are supported
- Need to conform to sandbox constraints:
  - No writing to local file system
  - Request timeouts at 60 seconds
  - Limit on 3rd-party software installations



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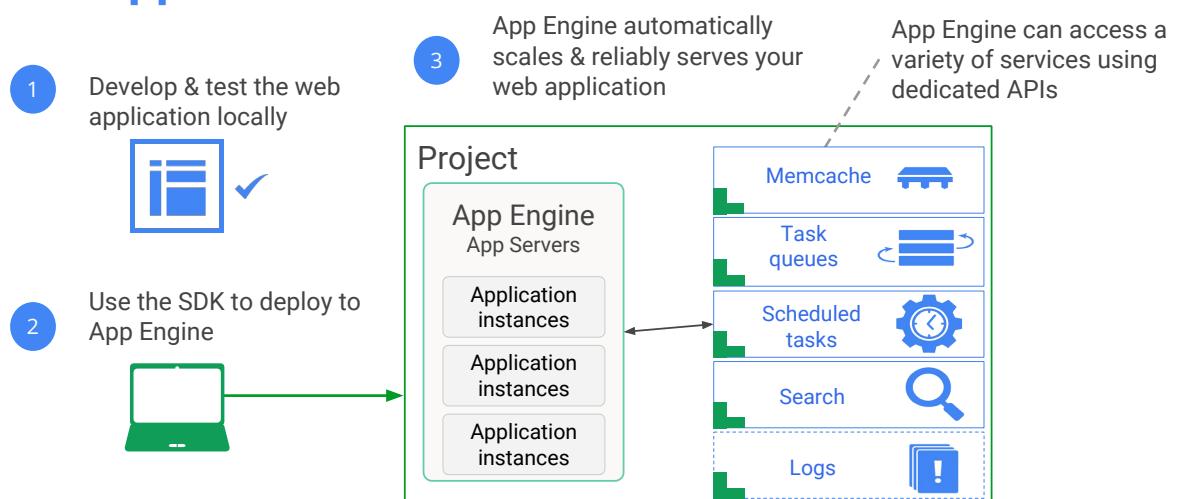
## Agenda

- 1 Overview and Customer Stories
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## Example App Engine Standard Workflow - Web Applications



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## App Engine Flexible Environment

- Build, deploy containerized apps with a click
- *Standard runtimes* - Python, Java, Go, Node.js
  - No sandbox constraints
  - Can access App Engine resources
- *Custom runtime support*
  - **Any language** that supports HTTP requests



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## App Engine Standard vs Flexible Environment

	Standard Environment	Flexible Environment
Instance startup	Milliseconds	Minutes
SSH access	No	Yes (not default)
Scaling	Manual, basic, automatic	Manual, automatic
Write to local disk	No	Yes (ephemeral)
Support for 3rd party binaries	No	Yes
Network access	Via App Engine services	Yes
Customizable stack	No	Yes
Pricing model	After free daily use, pay per instance class, with automatic shutdown	Pay for resource allocation per hour; no automatic shutdown

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## Google Cloud Endpoints: distributed API management

- An API console to help you create and maintain APIs
- Expose your API using a RESTful interface
- Control access and validate calls with JSON Web Tokens and Google API keys
  - Identify web, mobile users with Auth0 and Firebase Authentication
- Generate client libraries



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## Agenda

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- 3 Google App Engine Flexible Environment
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## Google Cloud Endpoints: supported platforms

- Supports App Engine Standard or Flexible Environment, Compute Engine, Container Engine
- Use Java or Python open source Frameworks or any other framework and language
- Supports iOS, Android, and JavaScript clients



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## Agenda

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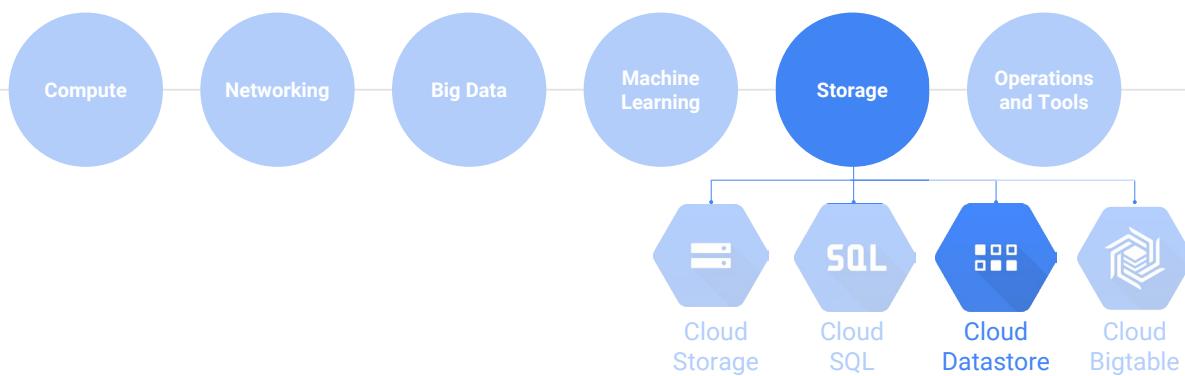
## Google Cloud Datastore: scalable NoSQL DB

- Database designed for application backends
- [NoSQL](#) store with automatic scaling to billions of rows
- Fully managed
- Built-in redundancy
- Supports [ACID](#) transactions

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## Google Cloud Platform



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## Google Cloud Datastore: benefits

- Schemaless access
  - No need to think about underlying data structure
- Local development tools
- Includes a free daily quota
- Access from anywhere through a [RESTful interface](#)

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## Agenda

- 1 Overview and Customer Stories
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- 3 Google App Engine Flexible Environment
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## Resources

- Overview: App Engine  
<https://cloud.google.com/appengine/>
- DevBytes - Your app, at scale with Google App Engine  
<https://www.youtube.com/watch?v=ytT2-kL9v2o>
- Datastore Concepts Overview  
<https://cloud.google.com/datastore/docs/concepts/overview>
- Getting started with Google Cloud Datastore API  
<https://cloud.google.com/datastore/docs/datastore-api-tutorial>

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## Quiz

Name 3 advantages of using the App Engine Flexible Environment over App Engine Standard.

True or False: Google Cloud Datastore supports ACID transactions.

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Google Cloud

Cloud OnBoard

<Start Training>



# Google Cloud Platform Storage Options

Google Cloud Platform Fundamentals: Core Infrastructure  
V3.0

</ Start Training >

## Agenda

- 1 Google Cloud Storage
- 2 Google Cloud Bigtable
- 3 Google Cloud SQL and Google Cloud Spanner
- 4 Comparing Storage Options
- 5 Quiz

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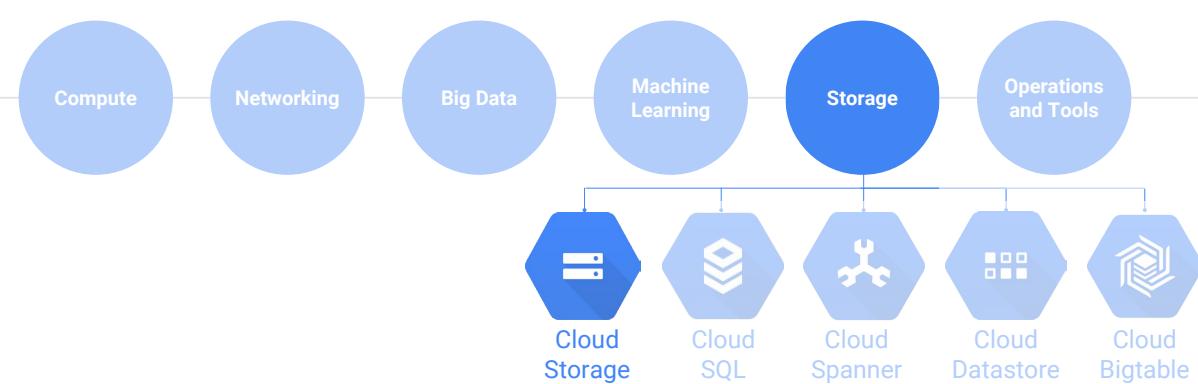
## Google Cloud Storage

- High performance, internet-scale, immutable BLOB (binary large object) storage
- Simple administration
  - Does not require capacity management
- Data encryption in-flight and at rest
- Four storage classes give customers flexibility

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## Google Cloud Platform



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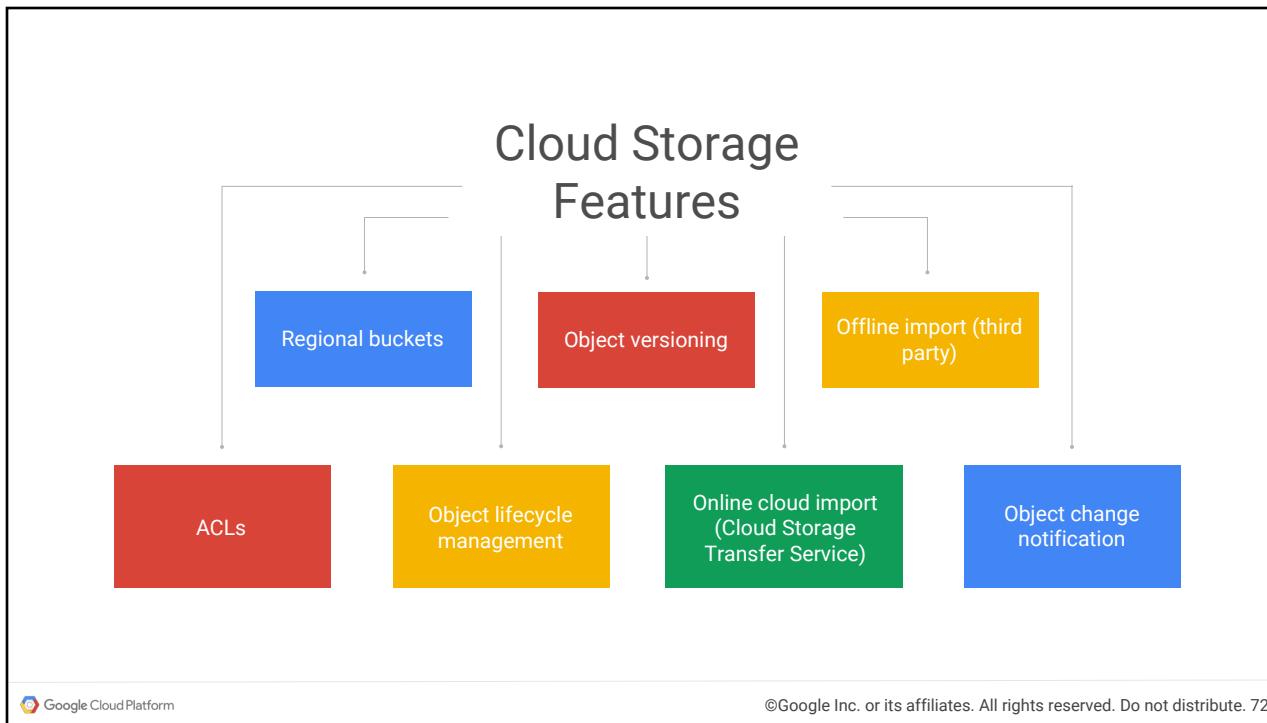
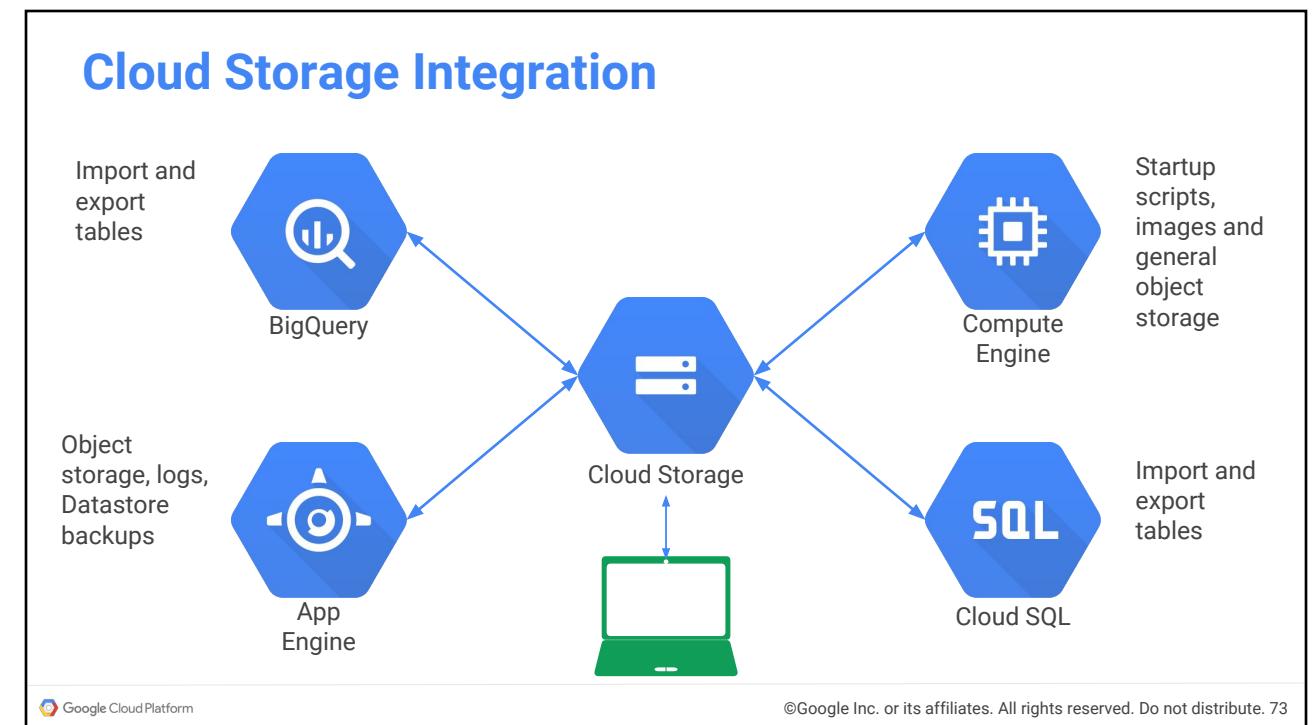
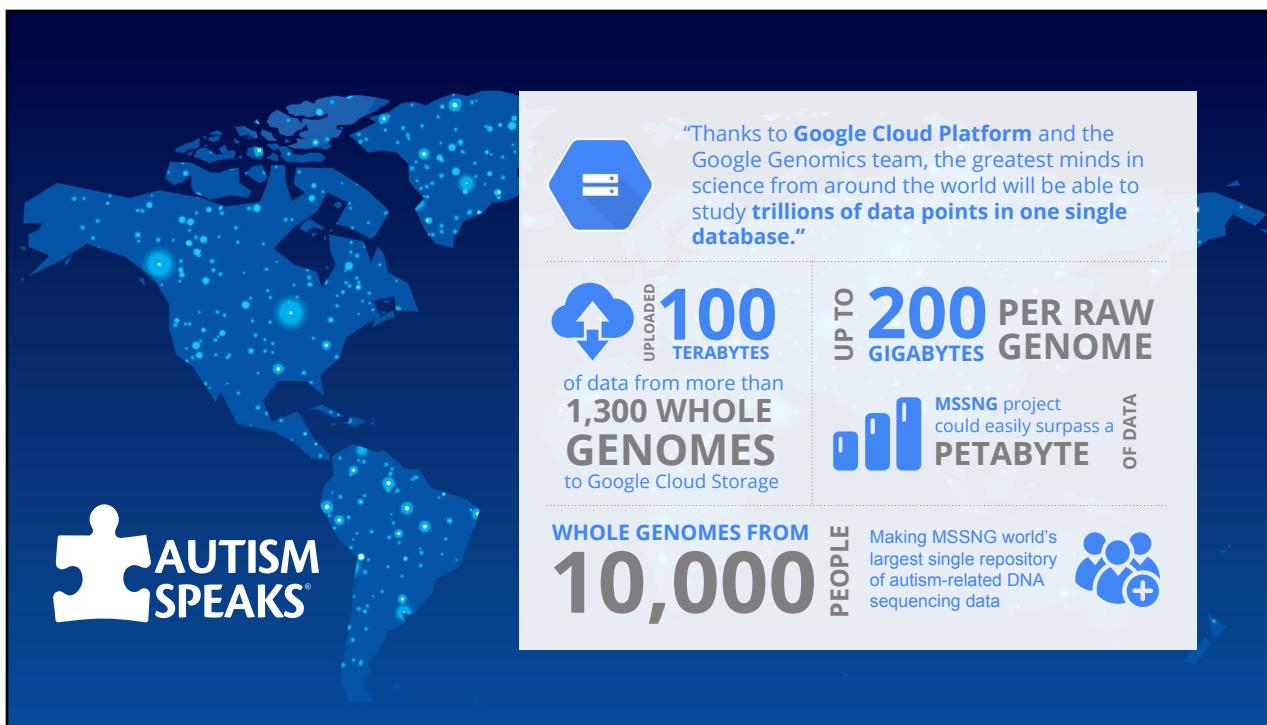
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## Choosing among Cloud Storage classes

Class	Multi-regional	Regional	Nearline	Coldline
Intended for data that is...	Most frequently accessed	Accessed frequently within a region	Accessed less than once a month	Accessed less than once a year
Availability SLA	99.95%	99.90%	99.00%	99.00%
Access APIs	<i>Consistent APIs</i>			
Access time	<i>Millisecond access</i>			
<a href="#">Storage price</a>	Price per GB stored per month			
<a href="#">Retrieval price</a>	Total price per GB transferred			
Use cases	Content storage and delivery	In-region data analytics, transcoding	Long-tail content, backups	Archiving, disaster recovery

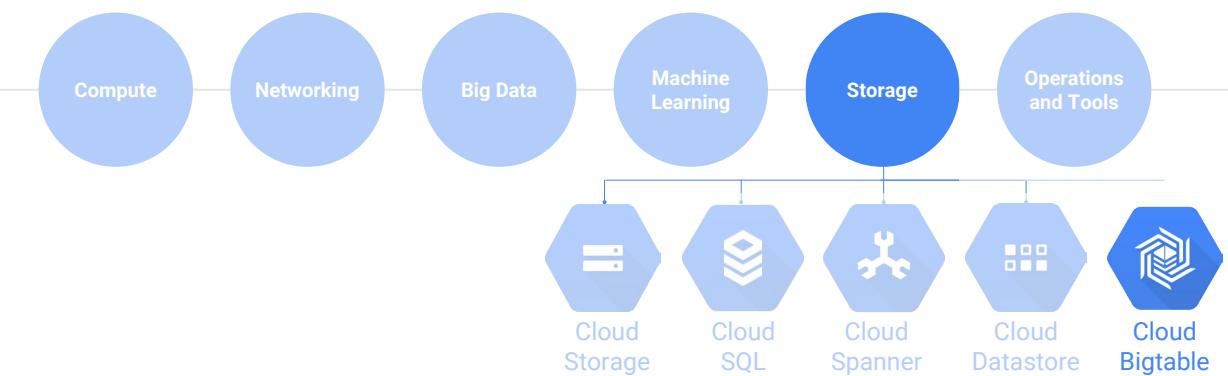
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- ## Agenda
- 1 Google Cloud Storage
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## Google Cloud Platform



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## Google Cloud Bigtable: protected, proven

- Replicated storage
- Data encryption in-flight and at rest
- Role-based ACLs
- Drives major applications such as Google Analytics and Gmail



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## Google Cloud Bigtable: managed NoSQL

- Fully managed, NoSQL, wide-column database service for large-workload applications - Terabytes to petabytes
- Integrated
  - Accessed using HBase API
  - Native compatibility with big data, Hadoop ecosystems



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## SUNGARD®

### Overview:

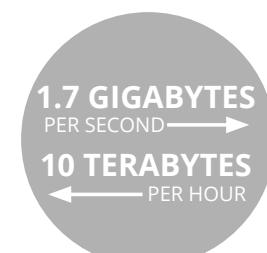
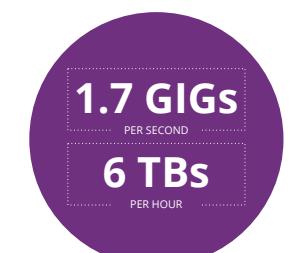
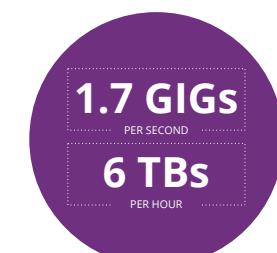
Data to process: Data in the Consolidated Audit Trail (CAT). A data repository of all equities and options orders, quotes, and events

### Challenges:

How to process the CAT and organize 100 billion market events into an “order lifecycle” in a 4 hour window  
Store 6 years (~30PB) of data



**Cloud Bigtable** to process and run queries and tolerate volume increases



## Bigtable Access Patterns



### Application API

Data can be read from and written to Cloud Bigtable through a data service layer like: Managed VMs, the HBase REST Server, a Java Server using the HBase client. Typically this will be to serve data to applications, dashboards and data services.

### Streaming

Data can be streamed in (written event by event) through a variety of popular stream processing frameworks like: Cloud Dataflow Streaming, Spark Streaming, and Storm.

### Batch Processing

Data can be read from and written to Cloud Bigtable through batch processes like: Hadoop MapReduce, Dataflow, Spark. Often, summarized or newly calculated data is written back to Cloud Bigtable or to a downstream database.

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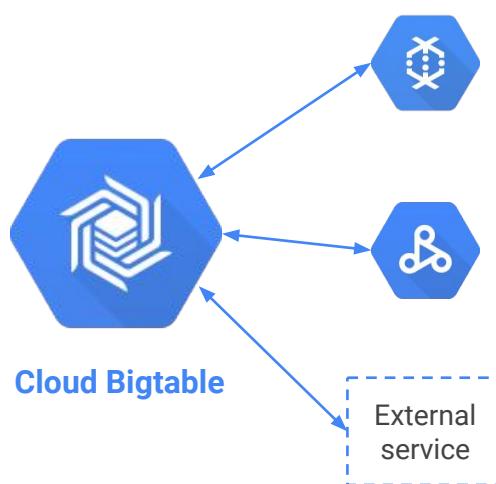
## Agenda

- 1 → Google Cloud Storage
- 2 → Google Cloud Bigtable
- 3 → Google Cloud SQL and Google Cloud Spanner
- 4 → Comparing Storage Options
- 5 → Quiz

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## Cloud Bigtable Integration



### Google Cloud Dataflow

Use Cloud Dataflow connector for Bigtable for batch and streaming operations in pipelines

### Google Cloud Dataproc

Use Bigtable HBase client to integrate Hadoop jobs with Cloud Dataproc

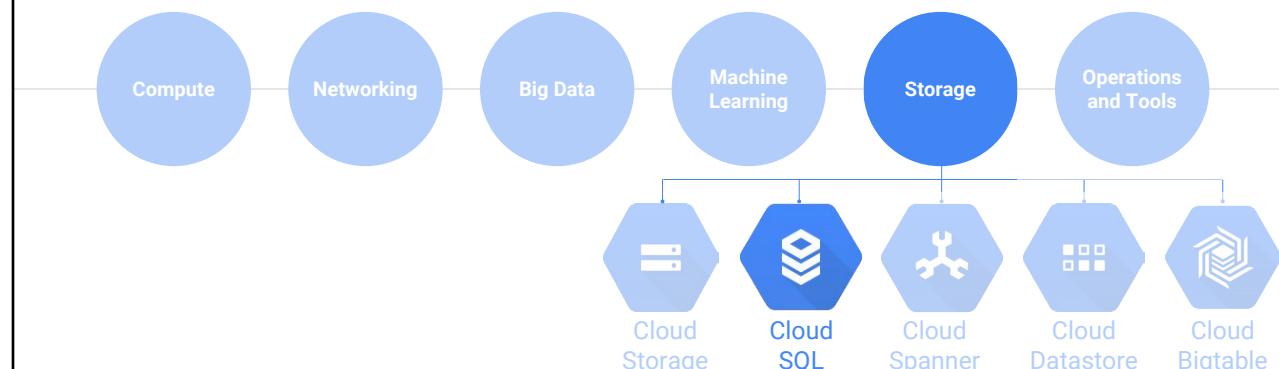
### On-premises, cloud-based Hadoop

Use Bigtable HBase client to integrate with Hadoop clusters

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## Google Cloud SQL: managed RDBMS

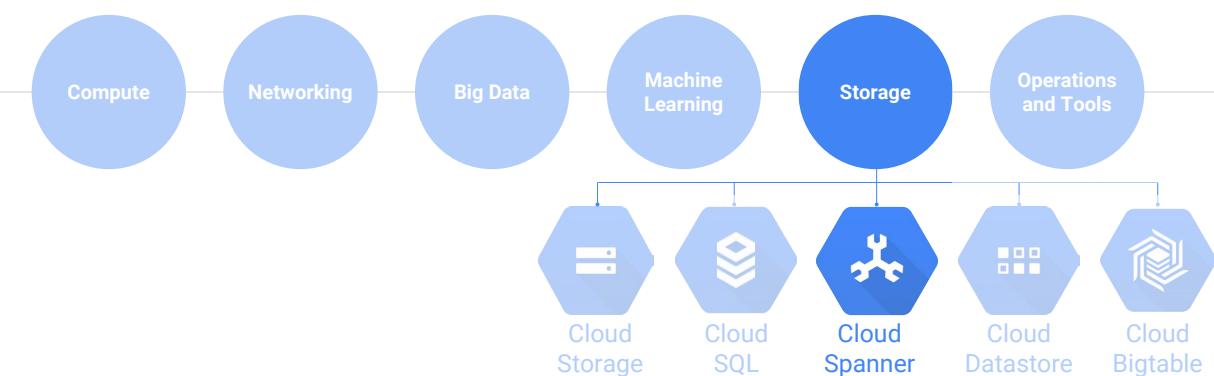
- Offers MySQL and PostgreSQL **Beta** databases as a service
- Automatic replication
- Managed backups
- Vertical scaling (read and write)
- Horizontal scaling (read)
- Google security



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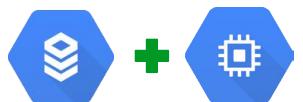
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## Cloud SQL Integration



Cloud SQL can be used with App Engine using standard drivers.

You can configure a Cloud SQL instance to follow an App Engine application.



Compute Engine instances can be authorized to access Cloud SQL instances using an external IP address.

Cloud SQL instances can be configured with a preferred zone.



Cloud SQL can be used with external applications and clients.

Standard tools can be used to administer databases.

External read replicas can be configured.

External service

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## Google Cloud Spanner **Beta**

- Cloud Spanner is a horizontally-scalable and strongly consistent relational database.
- Cloud Spanner supports:
  - Automatic replication
  - Strong global consistency
  - Managed instances with high availability
  - SQL (ANSI 2011 with extensions)



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## Agenda

1 Google Cloud Storage

2 Google Cloud Bigtable

3 Google Cloud SQL and Google Cloud Spanner

4 Comparing Storage Options

5 Quiz

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## Comparing Storage Options: use cases



<b>Good for:</b> Structured and unstructured binary or object data	<b>Good for:</b> Getting started, App Engine applications	<b>Good for:</b> "Flat" data, Heavy read/write, events, analytical data	<b>Good for:</b> Web frameworks, existing applications	<b>Good for:</b> Large-scale database applications (> ~2 TB)
<b>Use cases:</b> Images, large media files, backups	<b>Use cases:</b> User profiles, product catalog	<b>Use cases:</b> AdTech, Financial and IoT data	<b>Use cases:</b> User credentials, customer orders	<b>Use cases:</b> Whenever high I/O, global consistency is needed

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## Comparing Storage Options: Technical details

	Cloud Datastore	Cloud Storage	Cloud SQL (1st and 2nd Generation)	Cloud Spanner	Bigtable
Storage type	NoSQL, document	Object (BLOB) store	Relational SQL	Relational SQL	NoSQL, wide-column
Overall capacity	Terabytes +	Petabytes +	up to 500 GB	Petabytes	Petabytes +
Unit size	1 megabyte / entity	5 TB / object	Standard MySQL limits	10,240 MiB / row	Recommended: ~10 MB per cell, ~100 MB for all values per row
Transactions	Yes	No	Yes	Yes	No
Complex queries	No	No	Yes	Yes	No

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## Agenda

1 Google Cloud Storage

2 Google Cloud SQL and Google Cloud Spanner

3 Google Cloud SQL

4 Comparing Storage Options

5 Quiz

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## Quiz

You are developing an application that transcodes large video files. Which storage option is the best choice for your application?

You manufacture devices with sensors and need to stream huge amounts of data from these devices to a storage option in the cloud. Which Google Cloud Platform storage option is the best choice for your application?



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Google Cloud

Cloud OnBoard

<Start Training>



## Google Container Engine

Google Cloud Platform Fundamentals: Core Infrastructure  
V3.0

</Start Training>

## Resources

- Overview: Cloud Storage  
<https://cloud.google.com/storage/>
- DevBytes - File storage in the cloud  
<https://www.youtube.com/watch?v=vylap827rHs>
- Cloud SQL: Features, case studies, pricing, & documentation  
<https://cloud.google.com/sql/>
- Getting started with Google Cloud SQL  
<https://cloud.google.com/sql/docs/quickstart>
- Overview of Cloud Bigtable  
<https://cloud.google.com/bigtable/docs/overview>



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## Agenda

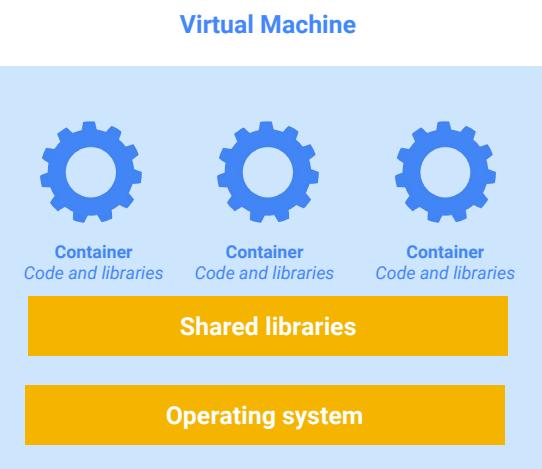
- 1 → Introduction to Containers
- 2 → Kubernetes
- 3 → Google Container Engine
- 4 → Quiz



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## What is a Container?

- Virtualization at the operating system layer
- Separates operating system from application code and dependencies
- Isolates individual processes
- Popular implementations include [Docker](#) and [rkt](#)



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## Agenda

- 1 → Introduction to Containers
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## Why Use Containers?

- Support **consistency** across **development, testing, and production** environments
- **Loose coupling** between application and operating system layers
- Much simpler to **migrate workloads** between on-premises and cloud environments
- Support **agile** development and operations

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## Kubernetes ("k8s")

- [Open source](#) container cluster orchestration system
  - Automates deployment, scaling, and operations for container clusters
- Based on Google's experience over 10+ years
- Built for a multi-cloud world:
  - Public, private, hybrid



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## Kubernetes eases application maintenance

- *Workload portability*
  - Run in many environments, across cloud providers
  - Implementation is open and modular
- *Rolling updates*
  - Upgrade application with zero downtime
- *Persistent storage*
  - Abstracts details of how storage is provided from how it is consumed



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## Agenda

- 1 → Introduction to Containers
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## Kubernetes makes applications more elastic

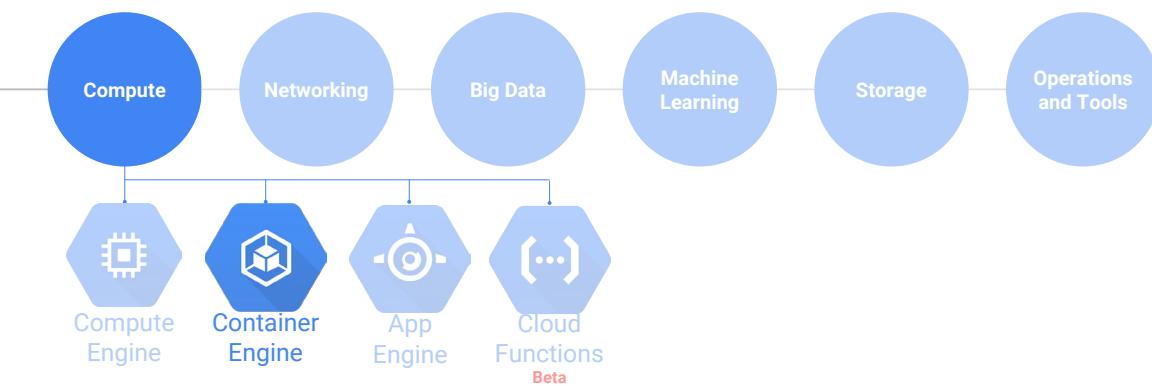
- *Multi-zone clusters*
  - Run a single cluster in multiple zones
- *Load balancing*
  - External IP address routes traffic to correct port
- *Autoscaling*
  - Automatically adapt to changes in workload



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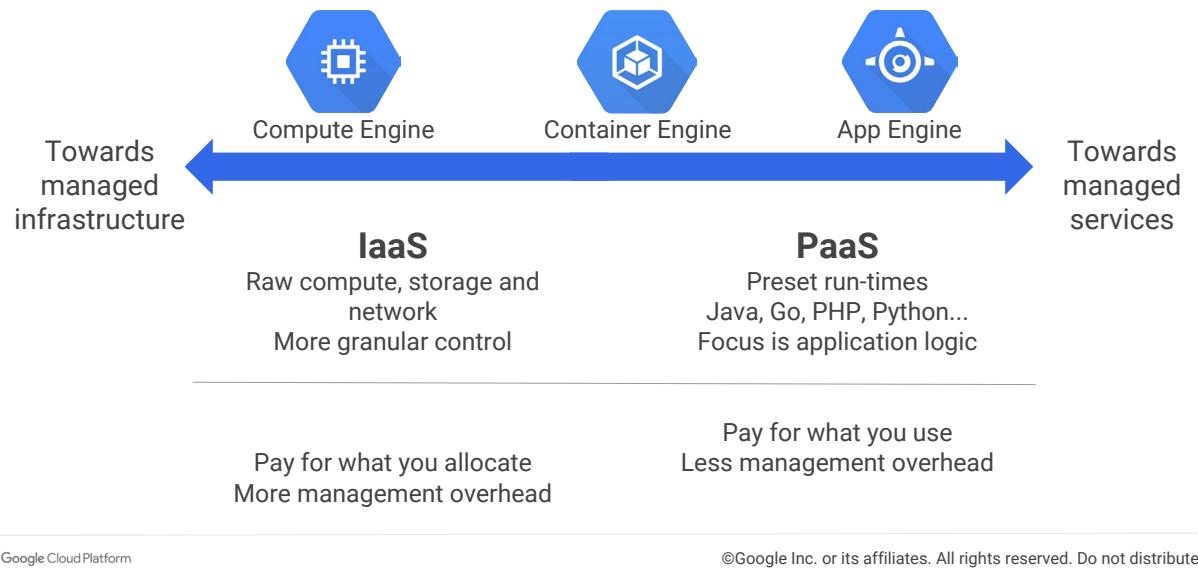
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## IaaS and PaaS



## Why use Google Container Engine?

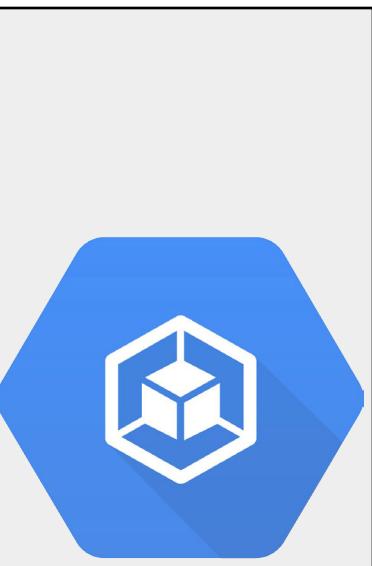
- Decouples operational, development concerns
- Manages and maintains
  - Logging, health management, monitoring
- Easily update Kubernetes versions as they are released



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## Google Container Engine manages and runs containers

- Fully managed cluster management and orchestration system for running containers
  - Based on [Kubernetes](#)
  - Uses Compute Engine instances and resources
- Uses a declarative syntax to manage applications
  - Declare desired application configuration, Container Engine implements, manage



## GKE's complementary services

- [Google Cloud Container Builder](#)
  - Create Docker container images from app code in Google Cloud Storage
- [Google Container Registry](#)
  - Secure, private Docker image storage



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"Our platform sometimes has to be deployed on a cluster. How do we enable containers to communicate from different hosts? Google has the answer: [Kubernetes](#). This awesome tool helps us manage our clusters of containers as if they were a single system."

		
<b>scale</b>	<b>speed</b>	<b>-30%</b>
Docker containers automate scalability	REST APIs speed provisioning of new instances; JAVA applications can be deployed in minutes	Administrative costs reduced by 30%

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## Agenda

- 1 → Introduction to Containers
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### Deploying Apps: Container Engine vs App Engine

	Container Engine	App Engine Standard	App Engine Flexible
<i>Language support</i>	Any	Java, Python, Go & PHP	Any
<i>Service model</i>	Hybrid	PaaS	PaaS
<i>Primary use case</i>	Container-based workloads	Web and mobile applications	Web and mobile applications, container-based workloads

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### Quiz

Name two reasons for deploying applications using containers.

True or False: Kubernetes lets you manage container clusters in multiple cloud providers.

True or False: GCP provides a secure, high-speed container image storage service for use with Container Engine.

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## Resources

- Container Engine Overview  
<https://cloud.google.com/container-engine/>
- Container Engine tutorials  
<https://cloud.google.com/container-engine/docs/tutorials>
- Kubernetes  
<http://kubernetes.io/>

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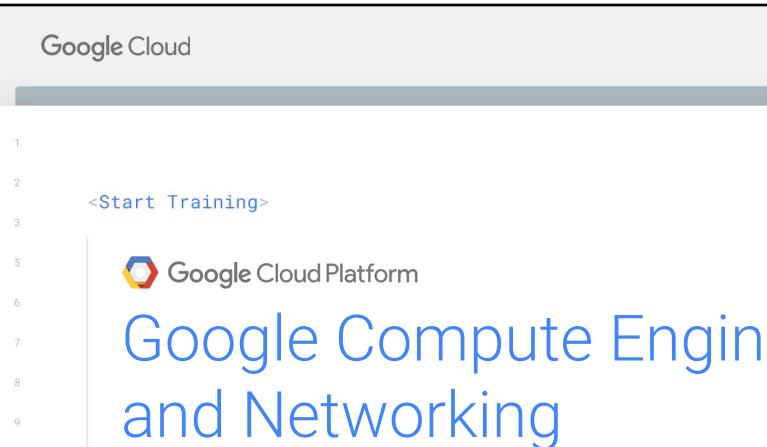
11

## Agenda

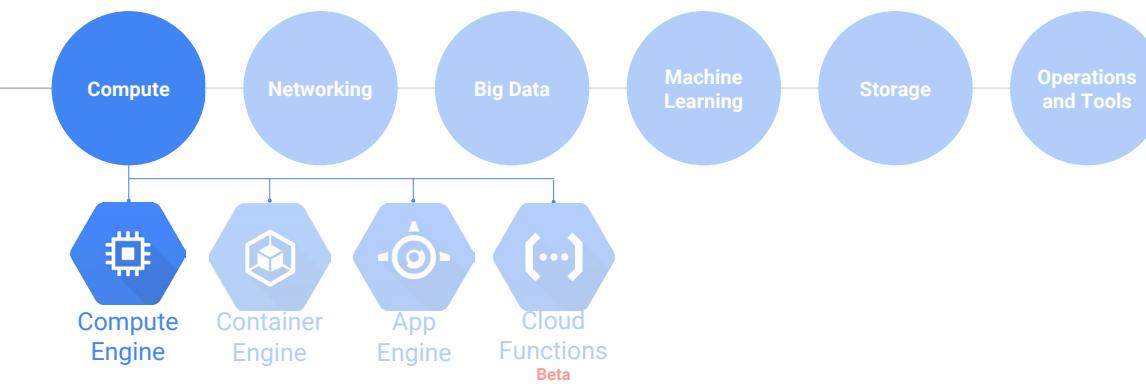
- 1 → Google Compute Engine Overview
- 2 → Google Cloud Networking
- 3 → Operations and Tools
- 4 → Comparing Compute Options
- 5 → Quiz

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11

## Google Compute Engine: managed VMs

- High CPU, high memory, standard and shared-core machine types
- Persistent disks
  - Standard, SSD, local SSD
  - Snapshots
- Robust networking features



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## Google Compute Engine: innovative pricing

- **Per-minute** billing, sustained use discounts
- Preemptible instances
- High throughput to storage at no extra cost
- Custom machine types - Only pay for the hardware you need



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## Google Compute Engine: many VM options

- High CPU, high memory, standard and shared-core machine types
- Persistent disks
  - Standard, SSD, local SSD
  - Snapshots
- Resize disks, migrate instances with no downtime
- Instance metadata and startup scripts



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Compute Engine reduces render farm load during periods of peak production



Consumes processing power of up to **15,000** Intel cores at peak rendering times



Faster rendering time means visual designers can get results and make tweaks more quickly

**\$300,000+** saved due to eliminating idle cores during production “quiet times”

“By adding Compute Engine to our workflow and allowing our in-house capacity to focus on the studio work, everyone’s project gets computing time – **and the creative team can get as imaginative as they want to, with fast views of new iterations.**”



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## Agenda

- 1 → Google Compute Engine Overview
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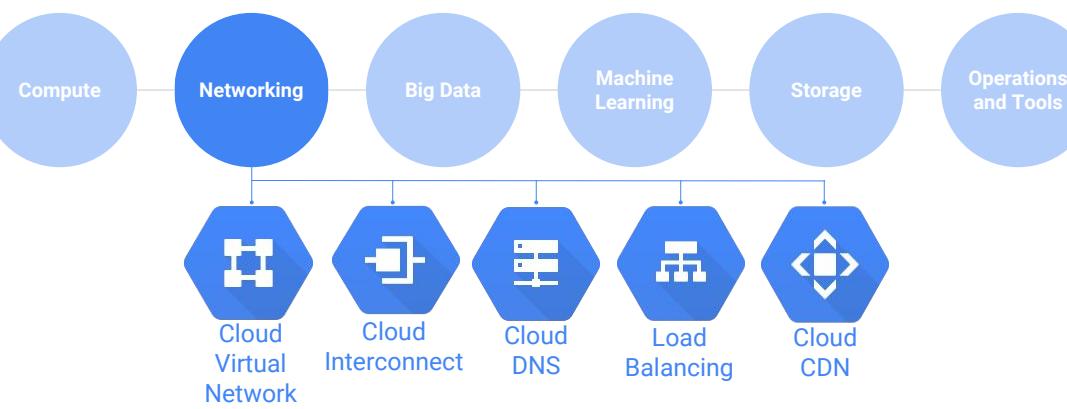
## Cloud Virtual Network

- Managed networking functionality for Cloud Platform resources
- Provision Google Cloud Platform resources, connect them to each other and isolate them from one another in a Virtual Private Cloud (VPC)

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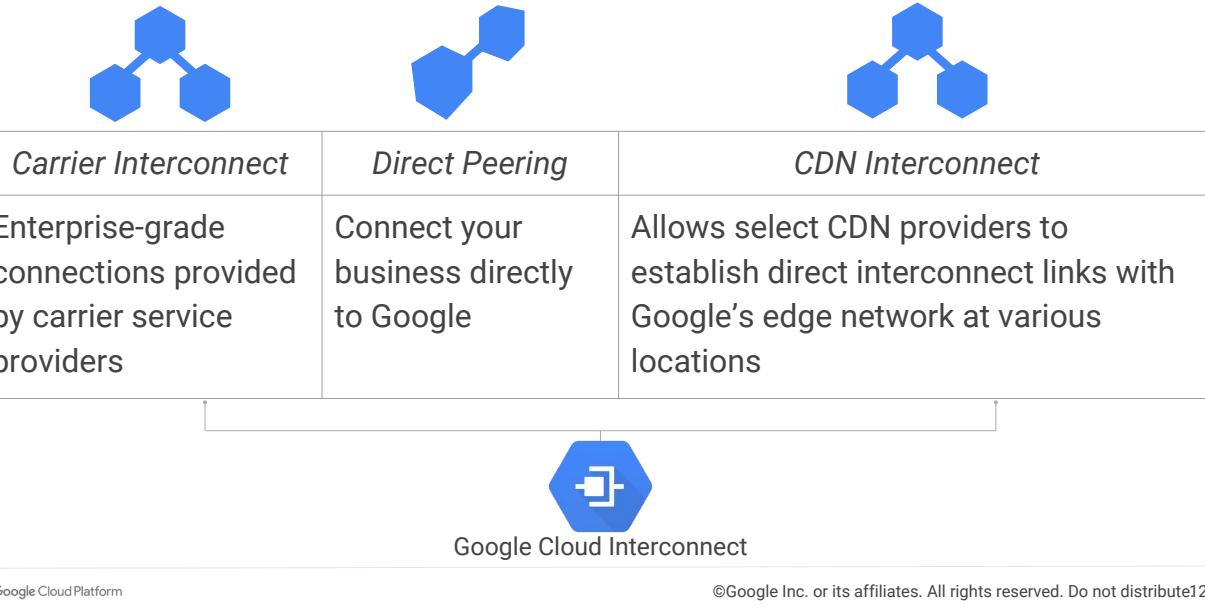
## Cloud Virtual Network's internetworking features

- Fine-grained networking policies
- Granular IP address range selection
- Routes
- Firewalls
- Virtual Private Network (VPN)
- Cloud Router

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## Google Cloud Interconnect



## Google Cloud Load Balancing: HTTP(s)

- Balance HTTP-based traffic across multiple Compute Engine regions
- Global, external IP address routes traffic
- Scalable, requires no pre-warming and provides resilience, fault tolerance



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## Google Cloud DNS

- Highly available and scalable [DNS](#)
  - Translates domain names into IP addresses
- Create managed zones, then add, edit, delete DNS records
  - Programmatically manage zones and records using RESTful API or command-line interface



## Google Cloud Load Balancing: TCP/SSL, UDP

- Spread TCP/SSL and UDP traffic over pool of instances within a Compute Engine region
  - Ensures only healthy instances handle traffic
- Scalable, requires no pre-warming



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## Google Cloud CDN (Content Delivery Network)

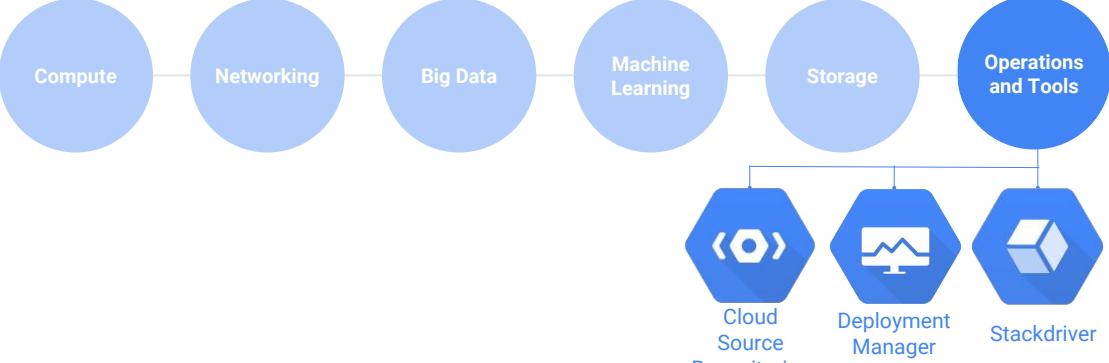
- Use Google's globally distributed edge caches to cache HTTP(S) load balanced content far closer to your users than your instances
  - Faster delivery of content to users while reducing costs
- Cloud CDN uses caches at network locations to store responses generated by instances



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- 1 Google Compute Engine Overview
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## Google Stackdriver

- Integrated monitoring, logging, diagnostics
- Powerful data, analytics tools
- Collaborations with PagerDuty, BMC, Splunk, others
- Works across Google Cloud Platform, Amazon Web Services
- Open source agents, integration



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## Google Stackdriver's areas of focus

### Monitoring

Platform, system, and application metrics  
Uptime/health checks  
Dashboards and alerts

### Trace

Latency reporting and sampling  
Per-URL latency and statistics

### Logging

Platform, system, and application logs  
Log search/view/filter  
Log-based metrics

### Error Reporting

Error notifications  
Error dashboard

### Debugger

Debug applications



## Google Cloud Source Repositories Beta

- Fully-featured Git repositories hosted on Google Cloud Platform
- Supports collaborative development of cloud apps
- Includes integration with Stackdriver debugger



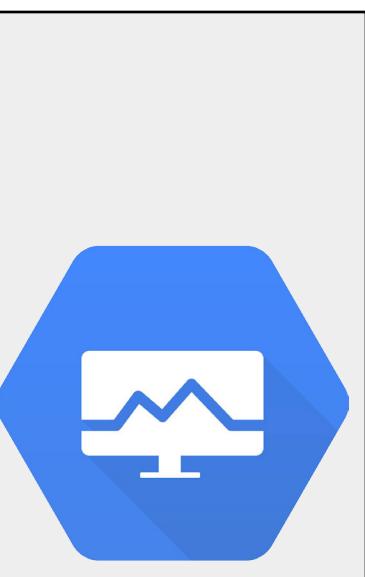
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## Google Cloud Deployment Manager

- Infrastructure management service
- Create a .yaml template describing your environment and use Deployment Manager to create resources
- Provides repeatable deployments



## Agenda

- 1 → Google Compute Engine Overview
- 2 → Google Cloud Networking
- 3 → Operations and Tools
- 4 → Comparing Compute Options
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## Google Cloud Functions<sup>Beta</sup>

- Create single-purpose functions that respond to events without a server or runtime
  - Event examples: New instance created, file added to Cloud Storage
- Written in Javascript, execute in managed Node.js environment on Google Cloud Platform



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## Agenda

- 1 → Google Compute Engine Overview
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## Comparing compute options

Service	Compute Engine	Container Engine	App Engine Standard	App Engine Flex	Cloud Functions <sup>Beta</sup>
Language support	Any	Any	Java, Python, Go and PHP	Java, Python, Node.js, Ruby, PHP, .NET core, and Go; or supply your own runtime	JavaScript
Service model	IaaS	Hybrid	PaaS	PaaS	Serverless
Use cases	General computing workloads	Container-based workloads	Web and mobile applications	Web and mobile applications, container-based workloads	Ephemeral functions responding to events

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## Quiz

Name 3 robust networking services available to your applications on Google Cloud Platform.

Name 3 Compute Engine pricing innovations

True or False: Google Cloud Load Balancing lets you balance HTTP traffic across multiple Compute Engine regions.

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## Resources

- Google Compute Engine  
<https://cloud.google.com/compute/docs/>
- Google Cloud CDN  
<https://cloud.google.com/cdn/docs/>
- Google Cloud Stackdriver  
<https://cloud.google.com/stackdriver/docs/>
- Google Cloud Deployment Manager  
<https://cloud.google.com/deployment-manager/docs/>
- Google Cloud Source Repositories  
<https://cloud.google.com/source-repositories/docs/>



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## Agenda

- 1 → Google Cloud Big Data Platform
- 2 → Google Cloud Machine Learning Platform
- 3 → Quiz



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Google Cloud

Cloud OnBoard

1  
2 <Start Training>  
3



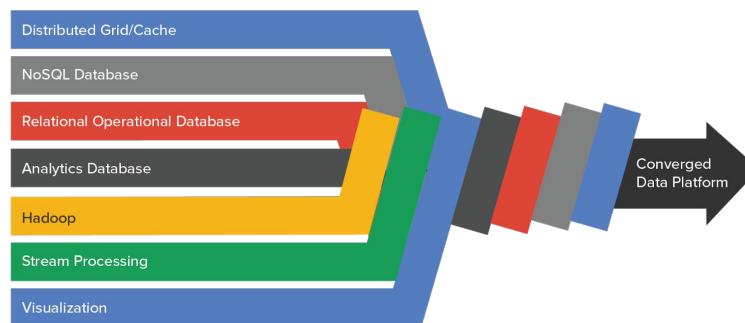
## Big Data and Machine Learning

Google Cloud Platform Fundamentals: Core Infrastructure  
V3.0

11 </Start Training>  
12  
13  
14  
15  
16

## Google Cloud Big Data Platform

Reduces integration risk, accelerates time to value

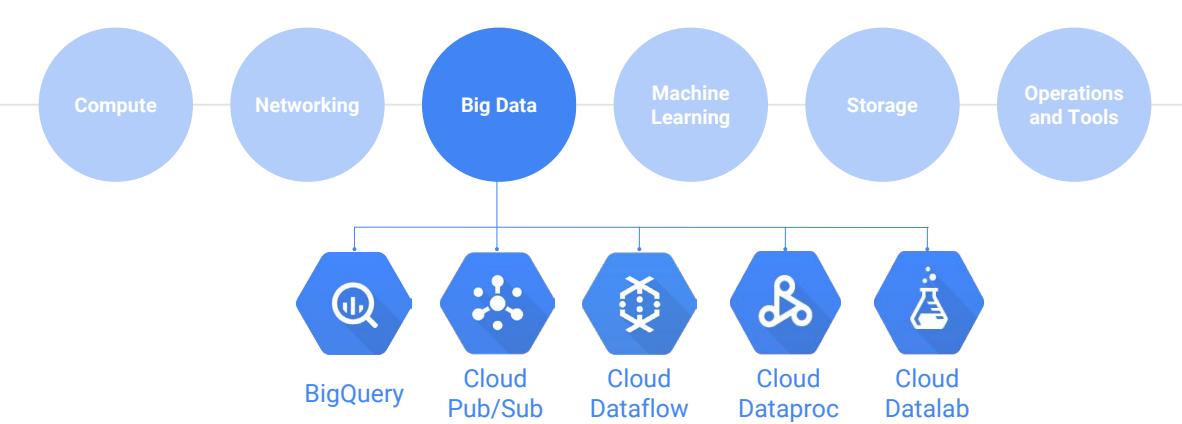


Integrated, NoOps cloud data platform for building scalable, secure and reliable data-driven applications that transform businesses and user experiences.

- Faster time-to-value
- Real-time applications
- Access to innovation, including machine learning
- Completeness

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## Google Cloud Platform



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## BigQuery: a fully-managed data warehouse

- Provides near real-time interactive analysis of massive datasets (hundreds of TBs)
- Query using SQL syntax (SQL 2011)
- Zero administration for performance and scale



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## Big Data Services



BigQuery

Analytics database;  
Stream data at 100,000  
rows per second



Pub/Sub

Scalable & flexible  
enterprise messaging



Dataflow

Stream & batch  
processing; Unified and  
simplified pipelines



Dataproc

Managed Hadoop  
MapReduce, Spark,  
Pig, and Hive service

Fully Managed, NoOps Services

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## BigQuery runs on Google's secure, high-performance infrastructure

- Compute and storage are separated with a terabit network in between
- You only pay for storage and processing used
- Automatic discount for long term data storage



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**BigQuery at UC Denver Anschutz Medical Campus**

Personalized medicinal care for each patient

**6 million**  
Genetic makeup, health history and treatments of over 6 million patients

**8 hrs → 15 min**  
BigQuery reduced time to execute complex analyses on the entire set of patient records to just 15 minutes

## Why use Google Cloud Pub/Sub?

- Use cases:

- Building block for data ingestion in Dataflow, Internet of Things (IoT), Marketing Analytics
- Foundation for Dataflow streaming
- Push notifications for cloud-based applications
- Connect applications across Google Cloud Platform (push/pull between Compute Engine and App Engine)

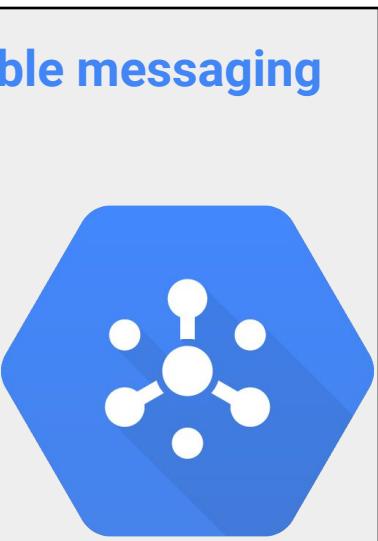


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## Google Cloud Pub/Sub: scalable, reliable messaging

- Supports many-to-many asynchronous messaging
  - Application components make push/pull subscriptions to topics
- Includes support for offline consumers
- Based on proven Google technologies
- Integrates with Cloud Dataflow for data processing pipelines



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## Google Cloud Dataflow: managed data pipelines

- Processes data using Compute Engine instances
  - Clusters are sized for you
  - Automated scaling, no instance provisioning required
- Write code once and get **batch and streaming**
  - Transform-based programming model



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## Why use Google Cloud Dataflow?

- Use cases:
  - ETL (extract/transform/load) pipelines to move, filter, enrich, shape data
  - Data analysis - batch computation or continuous computation using streaming
  - Orchestration - create pipelines that coordinate services, including external services
- Integrates with GCP services like Cloud Storage, Cloud Pub/Sub, BigQuery, Bigtable
  - Open source [Java](#) and [Python](#) SDKs



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## Why use Google Cloud Dataproc?

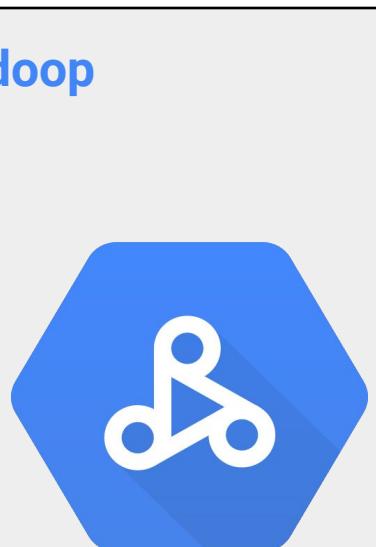
- Use cases:
  - Easily migrate on-premises Hadoop jobs to the cloud
  - Quickly analyze data (like log data) stored in Cloud Storage - create a cluster in less than 2 minutes then delete it immediately
  - Use Spark/Spark SQL to quickly perform data mining and analysis
  - Use Spark Machine Learning Libraries (MLlib) to run classification algorithms



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## Google Cloud Dataproc: managed Hadoop

- Fast, easy, managed way to run Hadoop and Spark/Hive/Pig on Google Cloud Platform
- Create clusters in 90 sec or less
- Scale clusters up and down even when jobs are running



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## Google Cloud Datalab: interactive data exploration

- Interactive tool for large-scale data exploration, transformation, analysis, visualization
- Integrated, open source
  - Runs on Google App Engine
  - Built on Jupyter (formerly IPython)



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## Why use Google Cloud Datalab?

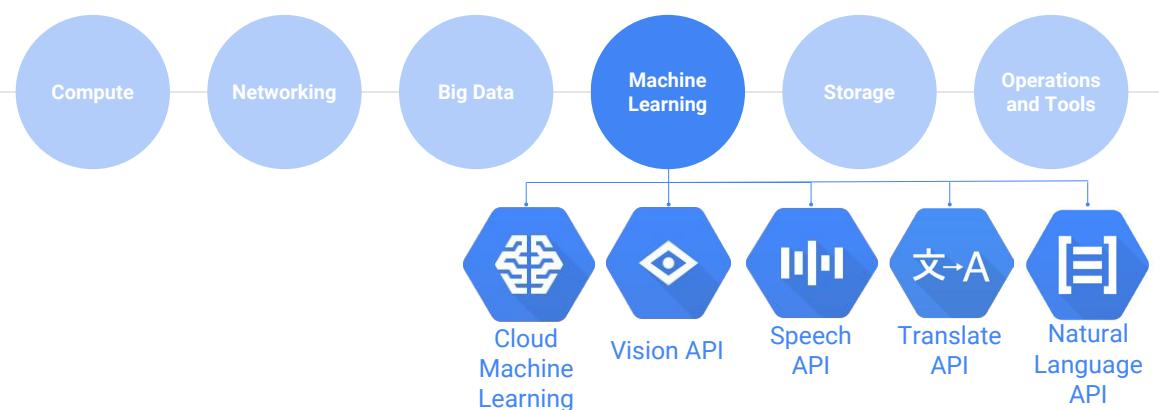
- Create and manage code, documentation, results, visualizations in intuitive notebook format
  - Use Google Charts or matplotlib for easy visualizations
- Analyze data in BigQuery, Compute Engine, and Cloud Storage using Python, SQL, and JavaScript
- Easily deploy models to BigQuery



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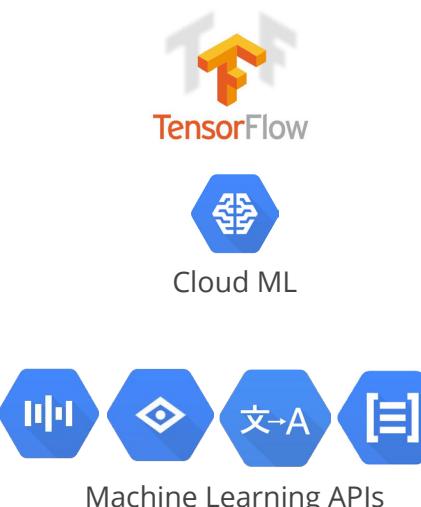
## Agenda

- 1 Google Cloud Big Data Platform
- 2 Google Cloud Machine Learning Platform
- 3 Quiz

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## Google Cloud Machine Learning Platform



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- Open source tool to build and run neural network models
  - Wide platform support: CPU or GPU; mobile, server, or cloud
  - Developed by researchers and engineers at Google Brain

### Fully managed machine learning service

- Faster training, better accuracy versus competing systems
- Familiar notebook-based developer experience
- Optimized for Google infrastructure; Integrates with BigQuery and Cloud Storage

### Pre-trained machine learning models built by Google

- *Speech*: Stream results in real-time, detects 80 languages
- *Vision*: Identify objects, landmarks, text, content
- *Translate*: Language translation including detection
- *Natural Language*: Structure, meaning of text

## Google Cloud Machine Learning Use Cases

### Structured Data

#### Classification/ Regression

- Customer churn analysis
- Product diagnostics
- Forecasting

#### Recommendation

- Content personalization
- Product X-sells/up-sells

#### Anomaly Detection

- Fraud detection
- Asset sensor diagnostics
- Log metric anomalies

### Unstructured Data

#### Image Analytics

- Identify damaged shipments
- Explicit content classification
- Identify "styles" in images

#### Text Analytics

- Call center log analysis
- Language identification
- Topic classification

#### Sentiment analysis

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## Speech API Beta

- Recognizes over 80 languages and variants
- Can return text in real-time
- Highly accurate, even in noisy environments
- Access from any device
- Powered by Google's machine learning



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## Vision API

- Analyze images with a simple REST API
  - Face detection, logo detection, label detection, and so on
- With the Cloud Vision API, you can:
  - Gain insight from images
  - Detect inappropriate content
  - Analyze sentiment
  - Extract text



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## Natural Language API

- Uses machine learning models to reveal structure, meaning of text
- Extract information about people, places, events mentioned in text documents, news articles, blog posts
- Analyze text uploaded in request or integrate with Cloud Storage



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## Translate API

- Translate arbitrary strings between thousands of language pairs
- Programmatically detect a document's language
- Support for dozens of languages



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## Agenda

- 1 → Google Cloud Big Data Platform
- 2 → Google Cloud Machine Learning Platform
- 3 → Quiz

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## Machine Learning APIs

Enable apps that see, hear, and understand.



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## Quiz

Name two use cases for Google Cloud Dataproc.

Name two use cases for Google Cloud Dataflow.

Name three use cases for the Google machine learning platform

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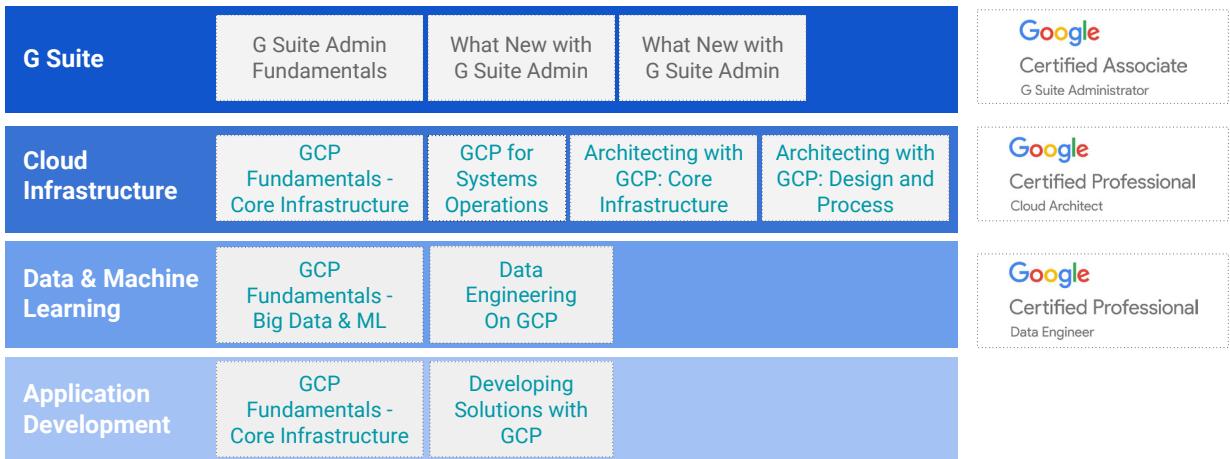
## Resources

- Google Big Data Platform  
<https://cloud.google.com/products/#big-data>
- Google Machine Learning Platform  
<https://cloud.google.com/products/#machine-learning>

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## Google Cloud Technical Training and Certification



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Google Cloud

Cloud OnBoard

<Start Training>

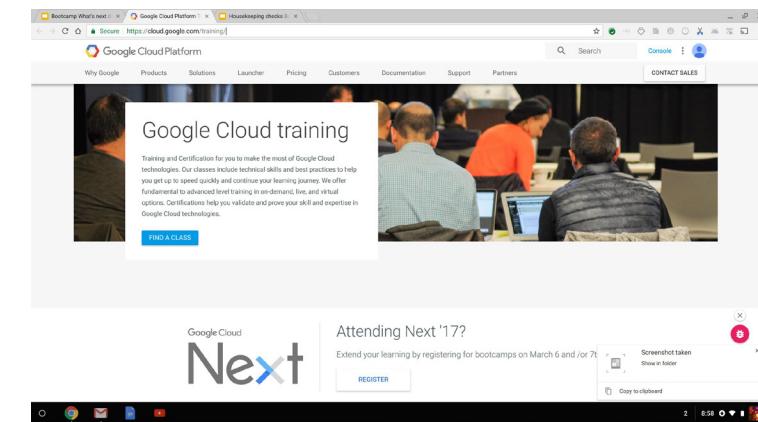


## Igniting Your Career with Google Cloud

Training & Certification

</Start Training>

## Training and Certification Schedule

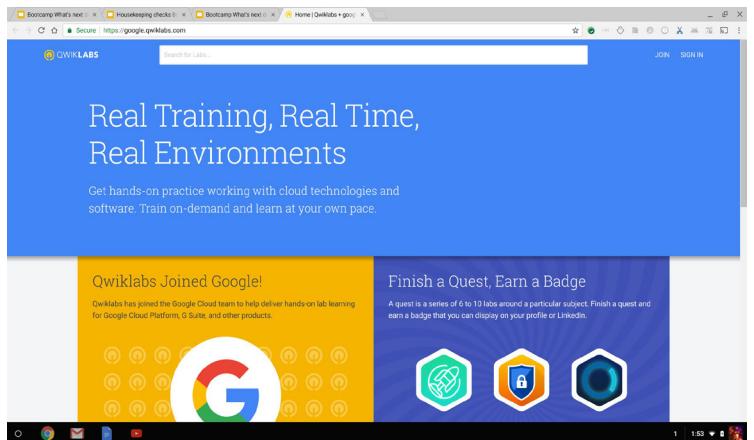


[cloud.google.com/training](http://cloud.google.com/training)

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## Google Cloud Self Paced Qwiklabs

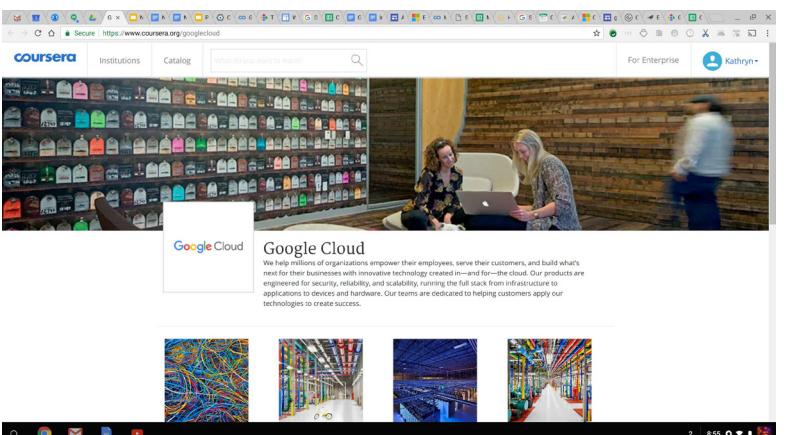


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1  
2  
3 <thankYou!>  
4  
5  
6  
7 See you  
8 next time  
9  
10  
11 </thankYou!>  
12  
13  
14  
15  
16

## Google Cloud Coursera



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