



Google Cloud Platform

An **IN ACTION** introduction

<https://cloud.google.com>

Carminc Spagnuolo, PhD

What is “cloud”?

The term “cloud” has been used in many different contexts and it has many different definitions, so it makes sense to define the term:

Cloud is a collection of services that helps developers focus on their project rather than on the infrastructure that powers it.

In more concrete terms, cloud services are things like Amazon Elastic Compute Cloud (EC2) or Google Compute Engine (GCE), which provide APIs to provision virtual servers (or services as storage and other computing tools), where customers pay per hour for the use of these servers.

What is Google Cloud Platform?

- There are many cloud providers out there, including Google, Amazon, Microsoft, Rackspace, DigitalOcean, and more.
- Each provides many similar products, the implementation and details of how these products work tends to vary quite a bit.
- Google Cloud Platform (often abbreviated as GCP) is a collection of products that allows the world to use some of Google's internal infrastructure.

What is Google Cloud Platform?

- This collection includes many things that are common across all cloud providers, such as on-demand virtual machines via Google Compute Engine or object storage for storing files via Google Cloud Storage.
- It also includes APIs to some of the more advanced Google- built technology, like Bigtable, Cloud Datastore, or Kubernetes.

Getting started with GCP



Signing up for GCP

Before you can start using any of Google's Cloud services, you first need to sign up for an account.




1. Instructions for Student Coupon Retrieval (\$50)


- MS Teams - **Channel GCP - Account**
- Students can request coupons from the URL and redeem them until: **1/7/2022**
- Coupons Valid Through: **1/3/2023**


Getting started with GCP

2. Google is generous enough to give \$300 worth of google cloud credit to the new google/gmail users [free-trial](#)  required! 

<https://cloud.google.com>

 [Why Google](#) [Solutions](#) [Products](#) [Pricing](#) [Getting Started](#)   [Docs](#) [Support](#)

 [English](#)

[Console](#) 

[Contact Us](#) [Get started for free](#)

New customers get \$300 in free credits to spend on Google Cloud. All customers get free usage of 20+ products. [See offer details.](#)

Accelerate your transformation with Google Cloud

Build apps faster, make smarter business decisions, and connect people anywhere.


[Get started for free](#) [Contact sales](#)

Google Cloud Next'22

Save the date:
October 11–13, 2022

[Get updates](#)

Sign up for updates on [sessions](#), [special offers](#), and [keynotes](#).



Develop new apps and experiences faster

Avoid vendor lock-in and speed up development with Google Cloud's commitment to open source, [multicloud, and hybrid cloud](#).

Enable smarter decision making across your organization

Give anyone on your team access to business insights with Google Cloud's machine learning and [advanced analytics](#) capabilities.

Transform how you connect and collaborate

Reimagine how you connect [in-person and remotely](#) with integrated video calling, email, chat, and document collaboration apps.

Build and invest in your cloud with confidence

Protect your data with [advanced security services](#), save money with [innovative pricing](#), and run your apps on the [cleanest cloud](#) in the industry.

Exploring the console

The screenshot displays the Google Cloud Platform console interface for a project named 'My First Project'. The top navigation bar includes the Google Cloud Platform logo, the project name, a search bar, and various utility icons. Below the navigation bar, the dashboard is organized into several sections:

- Project info:** Displays project details such as Project name (My First Project), Project number (8362986199), and Project ID (pivotal-realm-341308). It includes a link to 'ADD PEOPLE TO THIS PROJECT' and a button to 'Go to project settings'.
- Resources:** Lists various cloud resources including BigQuery, SQL, Compute Engine, Storage, Cloud Functions, and App Engine, each with a brief description.
- Trace:** Shows a message 'No trace data from the past 7 days' and a button to 'Get started with Trace'.
- Getting Started:** Provides links for 'Explore and enable APIs', 'Deploy a prebuilt solution', and 'Add dynamic logging to a running application'.
- API APIs:** A chart showing 'Requests (requests/sec)' over time. The chart area displays a warning: 'No data is available for the selected time frame.' Below the chart is a button to 'Go to APIs overview'.
- Google Cloud Platform status:** Displays the status of Google Cloud SQL, including a message about password validation errors and a link to 'Go to Cloud status dashboard'.
- Billing:** Shows 'Estimated charges' for the billing period Feb 1 - 21, 2022, with a total of USD \$0.00. It includes a link to 'View detailed charges'.
- Monitoring:** Offers options to 'Create my dashboard', 'Set up alerting policies', and 'Create uptime checks'. It also has a button to 'View all dashboards' and a link to 'Go to Monitoring'.
- API Error Reporting:** Indicates 'No sign of any errors. Have you set up Error Reporting?' and provides a link to 'Learn how to set up Error Reporting'.
- News:** Features a link to 'Introducing Google Cloud's Tomcat migration tooling'.

Check "Billing"

The screenshot shows the Google Cloud Platform Billing Overview page. The left sidebar contains navigation links: Billing account, Overview, Reports, Cost table, Cost breakdown, Commitments, Commitment analysis, Budgets & alerts, Billing export, Pricing, and Account management. The main content area is titled 'Overview' and 'BILLING ACCOUNT OVERVIEW'. It features a 'Current month' section for February 1 - 21, 2022, showing 'Month-to-date total cost' and 'End-of-month total cost (forecasted)' both at \$0.00. Below this is a 'Cost trend' section for February 1, 2021 - February 28, 2022, showing 'Average monthly total cost' at \$0.00. A red arrow points from the 'View report' link under 'Current month' to the 'Credits' section on the right. The 'Credits' section is highlighted with a red box and shows a 'Remaining credits' gauge at \$100.00, with a breakdown of 'Concurrent and parallel programming on the cloud' at \$100.00. The 'Billing health checks' section shows 0 critical issues, 1 warning, and 1 success. The 'Top projects' section is partially visible at the bottom.

Billing account
Account di fatturazione per studenti

Overview

Current month
February 1 - 21, 2022

Month-to-date total cost \$0.00

End-of-month total cost (forecasted) \$0.00

[View report](#)

Cost trend
February 1, 2021 - February 28, 2022

Average monthly total cost \$0.00

[View report](#)

Billing account [Manage](#)
Account di fatturazione per studenti, 018E04-9C5704-0D8837

Organization
unisa.it

Billing health checks

Check out your account health results to avoid common billing-related issues and adopt our best practice recommendations. [Learn more](#)

0 1 1

[View all health checks](#)

Credits

\$100.00

Remaining credits
Out of \$100.00

Remaining credits

Concurrent and parallel programming on the cloud \$100.00

[Credit details](#)

Top projects

Understanding projects

- When we first signed up for Google Cloud Platform, we learned that a new project is created automatically, and that projects have something to do with isolation, but what does this mean? And what are projects anyway?
- **Projects** are primarily a container for all the resources we create.
- For example, if we create a new VM, it will be “owned” by the parent project.
- Projects also act as a way of **isolating** things from one another, sort of like having a workspace for a specific purpose.

Understanding projects

- If you create new service account credentials (which we'll do later) inside one project, say `project-a`, those credentials have access to resources only inside `project-a` unless you explicitly grant more access.
- When running commands, those commands can access anything that you have access to inside the Cloud Console, which includes all of the projects you've created.

Using GCP


1. Cloud Console in the browser.

2. [gcloud SDK](#)

- Integrate with APIs using Client Libraries for Java, Python, Node.js, Ruby, Go, .NET, and PHP.
- Script or interact with cloud resources at scale using the Google Cloud CLI.
- Accelerate local development with emulators for Pub/Sub, Spanner, Bigtable, and Datastore.

Using GCP

3. [Google Cloud CLI](#) lets you manage resources and services from the command line. It also contains service and data emulators to speed up local development.
4. [Cloud Shell](#) lets you code or use a terminal directly in the web-browser.
5. [Cloud Code](#) provides IDE extensions for VSCode and IntelliJ.

 Please select your preferred method and install it for the next!

! Cloud Shell is a ready-to-use starting point for your learning.

Interacting with GCP

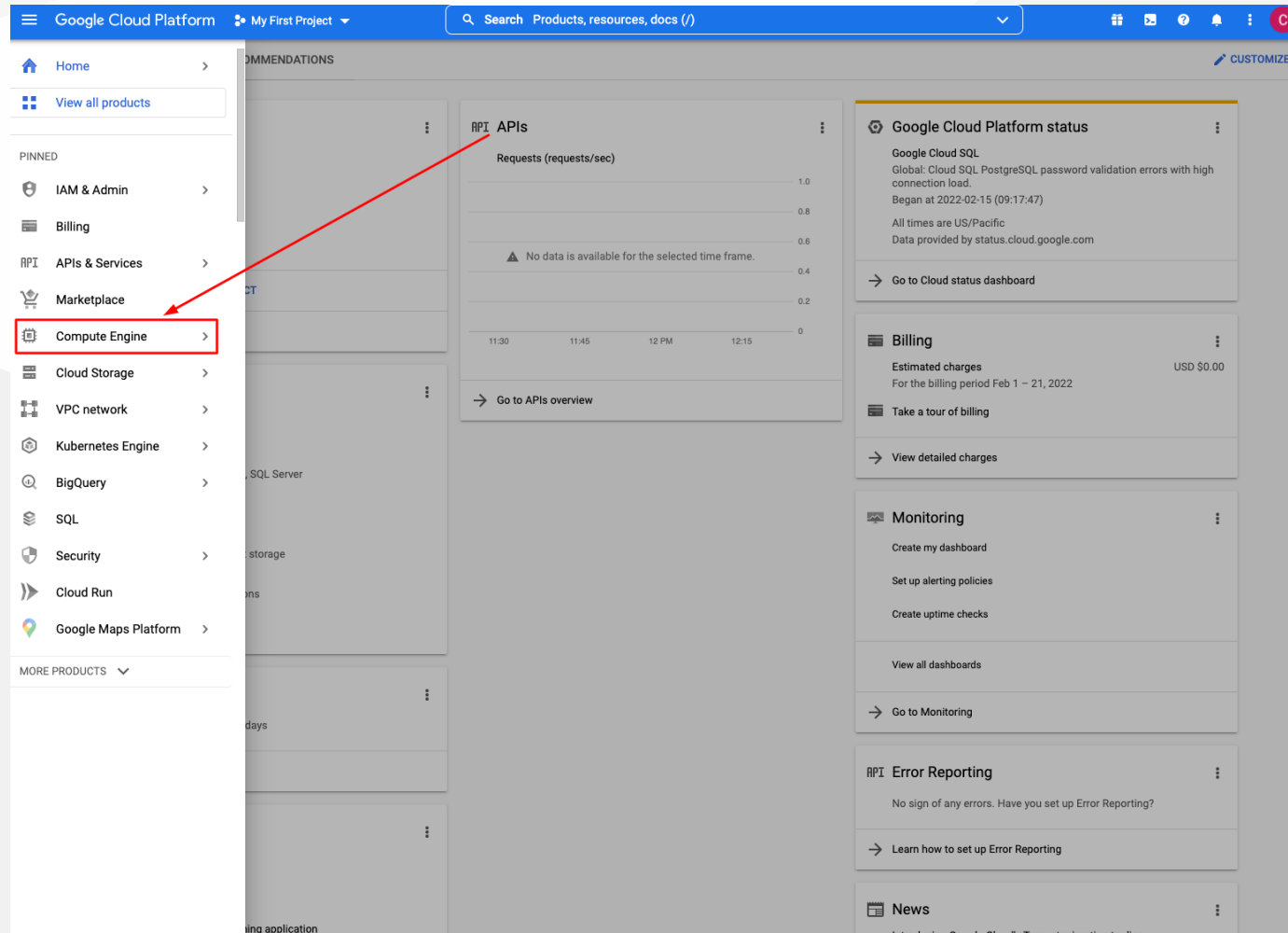
Let's start:

- by launching a virtual machine in the cloud
- and then writing a script to terminate the virtual machine in JavaScript.

Prerequisites:

- access to cloud shell or gcloud ready in your dev environment.

Google Compute Engine



Google Compute Engine

The screenshot displays the Google Cloud Platform interface for managing VM instances. The top navigation bar includes the Google Cloud Platform logo, the current project 'My First Project', a search bar, and various utility icons. The left sidebar lists navigation options under 'Virtual machines', 'Storage', 'Instance groups', 'VM Manager', 'Bare Metal Solution', and 'Catalogue'. The main content area is titled 'VM instances' and features a 'Filter' bar, a table with columns for Status, Name, Zone, Recommendations, In use by, Internal IP, External IP, and Connect, and a central graphic with the text 'VM Instances' and a descriptive paragraph. The right sidebar shows a 'Select an instance' panel with tabs for PERMISSIONS, LABELS, and MONITORING, and a message: 'Please select at least one resource.'

Google Cloud Platform My First Project Search Products, resources, docs (/)

Compute Engine VM instances CREATE INSTANCE IMPORT VM REFRESH START / RESUME OPERATIONS HELP ASSISTANT HIDE INFO PANEL

Virtual machines

- VM instances
- Instance templates
- Sole-tenant nodes
- Machine images
- TPUs
- Committed use discounts
- Migrate for Compute Engi...

Storage

- Disks
- Snapshots
- Images

Instance groups

- Instance groups
- Health checks

VM Manager

- OS patch management
- OS configuration manage...

Bare Metal Solution

- Servers

Catalogue

- Marketplace
- Release Notes

Filter Enter property name or value

Status	Name	Zone	Recommendations	In use by	Internal IP	External IP	Connect
--------	------	------	-----------------	-----------	-------------	-------------	---------

VM Instances

Compute Engine lets you use virtual machines that run on Google's infrastructure. Create micro-VMs or larger instances running Debian, Windows, or other standard images. Create your first VM instance, import it using a migration service, or try the quickstart to build a sample app.

CREATE INSTANCE TAKE THE QUICKSTART

Select an instance

PERMISSIONS LABELS MONITORING

Please select at least one resource.

Create Instance: Name/Machine Type

Name *
my-first-gcp-vm ?

Labels ?
[+ ADD LABELS](#)

Region *
us-central1 (Iowa) ?
Region is permanent

Zone *
us-central1-a ?
Zone is permanent

Monthly estimate
\$7.11
That's about \$0.01 hourly
Pay for what you use: No upfront costs and per second billing
[▼ DETAILS](#)


Machine configuration

Machine family
[GENERAL-PURPOSE](#) [COMPUTE-OPTIMIZED](#) [MEMORY-OPTIMIZED](#) [GPU](#)

Machine types for common workloads, optimized for cost and flexibility

Series
E2 ▼
CPU platform selection based on availability

Machine type
e2-micro (2 vCPU, 1 GB memory) ▼



vCPU
1 shared core

Memory
1 GB


Create Instance: Boot disk Ubuntu

Container ?

Deploy a container image to this VM instance

DEPLOY CONTAINER

Boot disk ?

Name	my-first-gcp-vm
Type	New balanced persistent disk
Size	10 GB
Image	 Ubuntu 18.04 LTS

CHANGE

Identity and API access ?

Service accounts ?

Service account
Compute Engine default service account

Access scopes ?

- ☒ Allow default access
- ☐ Allow full access to all Cloud APIs
- ☐ Set access for each API

Monthly estimate

\$7.11

That's about \$0.01 hourly

Pay for what you use: No upfront costs and per second billing

▼ DETAILS

Your first VM is ready

Google Cloud Platform

My First Project

Search Products, resources, docs (/)

Compute Engine

Virtual machines

VM instances

Instance templates

Sole-tenant nodes

Machine images

TPUs

Committed use discounts

Migrate for Compute Engi...

Storage

Disks

Snapshots

Images

Instance groups

Instance groups

Health checks

VM Manager

VM instances

CREATE INSTANCE

IMPORT VM

REFRESH

OPERATIONS

HELP ASSISTANT

LEARN

HIDE INFO PANEL

INSTANCES

INSTANCE SCHEDULE

VM instances are highly configurable virtual machines for running workloads on Google infrastructure. [Learn more](#)

Filter Enter property name or value

<input type="checkbox"/>	Status	Name ↑	Zone	Recommendations	In use by	Internal IP	External IP	Connect
<input type="checkbox"/>	✓	my-first-gcp-vm	us-central1-a			10.128.0.4 (nic0)	34.71.220.2	SSH ▾ ⋮

Related actions

DISMISS

View billing report

View and manage your Compute Engine billing

Monitor VMs

View outlier VMs across metrics like CPU and network

Explore VM logs

View, search, analyze, and download VM instance logs

Set up firewall rules

Control traffic to and from a VM instance

Patch management

Schedule patch updates and view patch compliance on VM instances

Select an instance

PERMISSIONS

LABELS

MONITORING

Please select at least one resource.

Check the External IP

← my-first-gcp-vm

EDIT

RESET

CREATE MACHINE IMAGE

CREATE SIMILAR

STOP

OPERATIONS

DETAILS

OBSERVABILITY

OS INFO

SCREENSHOT

GPUs

None

Networking

Public DNS PTR Record

None

Total egress bandwidth tier

—

NIC type

—

[VIEW IN NETWORK TOPOLOGY](#)

Firewalls

HTTP traffic

Off

HTTPS traffic

Off

Network tags

None

Network interfaces

Name ↑	Network	Subnetwork	Primary internal IP	Alias IP ranges	External IP	Network tier ?	IP forwarding
nic0	default	default	10.128.0.4		34.71.220.249 (Ephemeral)	Premium	Off

Storage

Boot disk

Name ↑	Image	Interface type	Size (GB)	Device name	Type	Encryption	Mode	When deleting instance
my-first-gcp-vm	ubuntu-1804-bionic-v20220213	SCSI	10	my-first-gcp-vm	Balanced persistent disk	Google-managed	Boot, read/write	Delete disk

On the command line: gcloud

The screenshot displays the Google Cloud Platform (GCP) dashboard for a project named "My First Project". The dashboard includes sections for Project info, Resources, Compute Engine, Google Cloud Platform status, Billing, and Monitoring. A red arrow points to the "Google Cloud Platform status" section, which reports a "Global: Cloud SQL PostgreSQL password validation errors with high connection load" starting at 2022-02-15 09:17:47. Below the dashboard, a terminal window shows the execution of gcloud commands to list compute instances and their details.

```
Cloud Shell
Terminal (pivotal-realm-341308) x +
Welcome to Cloud Shell! Type "help" to get started.
Your Cloud Platform project in this session is set to pivotal-realm-341308.
Use "gcloud config set project [PROJECT_ID]" to change to a different project.
ospagnuolo@cloudshell:~ (pivotal-realm-341308) $ gcloud compute instances list
NAME: my-first-gcp-vm
ZONE: us-central1-a
MACHINE TYPE: e2-micro
PREEMPTIBLE: true
INTERNAL IP: 10.128.0.4
EXTERNAL IP: 34.71.220.249
STATUS: RUNNING
ospagnuolo@cloudshell:~ (pivotal-realm-341308) $
```

Ready for your first gcloud command



CLOUD SHELL

Terminal

(pivotal-realm-341308) X + ▾

```
Welcome to Cloud Shell! Type "help" to get started.
Your Cloud Platform project in this session is set to pivotal-realm-341308.
Use "gcloud config set project [PROJECT_ID]" to change to a different project.
cspagnuolo@cloudshell:~ (pivotal-realm-341308)$ gcloud compute instances list
NAME: my-first-gcp-vm
ZONE: us-central1-a
MACHINE_TYPE: e2-micro
PREEMPTIBLE: true
INTERNAL_IP: 10.128.0.4
EXTERNAL_IP: 34.71.220.249
STATUS: RUNNING
cspagnuolo@cloudshell:~ (pivotal-realm-341308)$
```

Connecting to your instance

```
CLOUD SHELL
Terminal (pivotal-realm-341308) x + v

cspagnuolo@cloudshell:~ (pivotal-realm-341308)$ gcloud compute ssh my-first-gcp-vm
Did you mean zone [europe-west1-b] for instance: [my-first-gcp-vm] (Y/n)? n

No zone specified. Using zone [us-centrall-a] for instance: [my-first-gcp-vm].
Enter passphrase for key '/home/cspagnuolo/.ssh/google_compute_engine':
Welcome to Ubuntu 18.04.6 LTS (GNU/Linux 5.4.0-1064-gcp x86_64)

* Documentation:  https://help.ubuntu.com
* Management:    https://landscape.canonical.com
* Support:        https://ubuntu.com/advantage

System information as of Mon Feb 21 12:08:27 UTC 2022

System load:  0.02          Processes:           109
Usage of /:   17.9% of 9.52GB Users logged in:          0
Memory usage: 20%          IP address for ens4: 10.128.0.4
Swap usage:   0%

0 updates can be applied immediately.

New release '20.04.3 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

Last login: Mon Feb 21 12:07:00 2022 from 34.78.77.228
cspagnuolo@my-first-gcp-vm:~$
```

Checking your Project ID

The screenshot shows the Google Cloud Platform console interface. A red arrow points to the 'My First Project' dropdown in the top navigation bar. A 'Select from' dialog box is open, displaying a list of projects. The 'ID' column for the selected project, 'My First Project', is highlighted with a red box, showing the value 'pivotal-realm-341308'.

Name	ID
My First Project	pivotal-realm-341308
unisa.it	806642050185

In your own code: google-cloud-*

- In this example we use JavaScript and NodeJS from the Cloud Shell.
- Before start install the required libs.

```
$ npm install --save @google-cloud/compute@0.7.1
```

In your own code: google-cloud-*

```
const gce = require('@google-cloud/compute')({
  projectId: 'your-project-id'
});
const zone = gce.zone('us-central1-a');
console.log('Getting your VMs...');
zone.getVMs().then((data) => {
  data[0].forEach((vm) => {
    console.log('Found a VM called', vm.name);
  });
  console.log('Done. ');
});
```

In your own code: google-cloud-*

```
$ node script.js  
Getting your VMs...  
Found a VM called my-first-gcp-vm  
Done.
```

In your own code: google-cloud-*

```
const gce = require('@google-cloud/compute')({
  projectId: 'your-project-id'
});
const zone = gce.zone('us-central1-a');
console.log('Getting your VMs...');
zone.getVMs().then((data) => {
  data[0].forEach((vm) => {
    console.log('Found a VM called', vm.name);
    console.log('Stopping', vm.name, '...');
    vm.stop((err, operation) => {
      operation.on('complete', (err) => {
        console.log('Stopped', vm.name);
      });
    });
  });
});
```

In your own code: google-cloud-*

```
$ node script.js  
Getting your VMs...  
Found a VM called my-first-gcp-vm  
Stopping my-first-gcp-vm ...  
Stopped my-first-gcp-vm
```



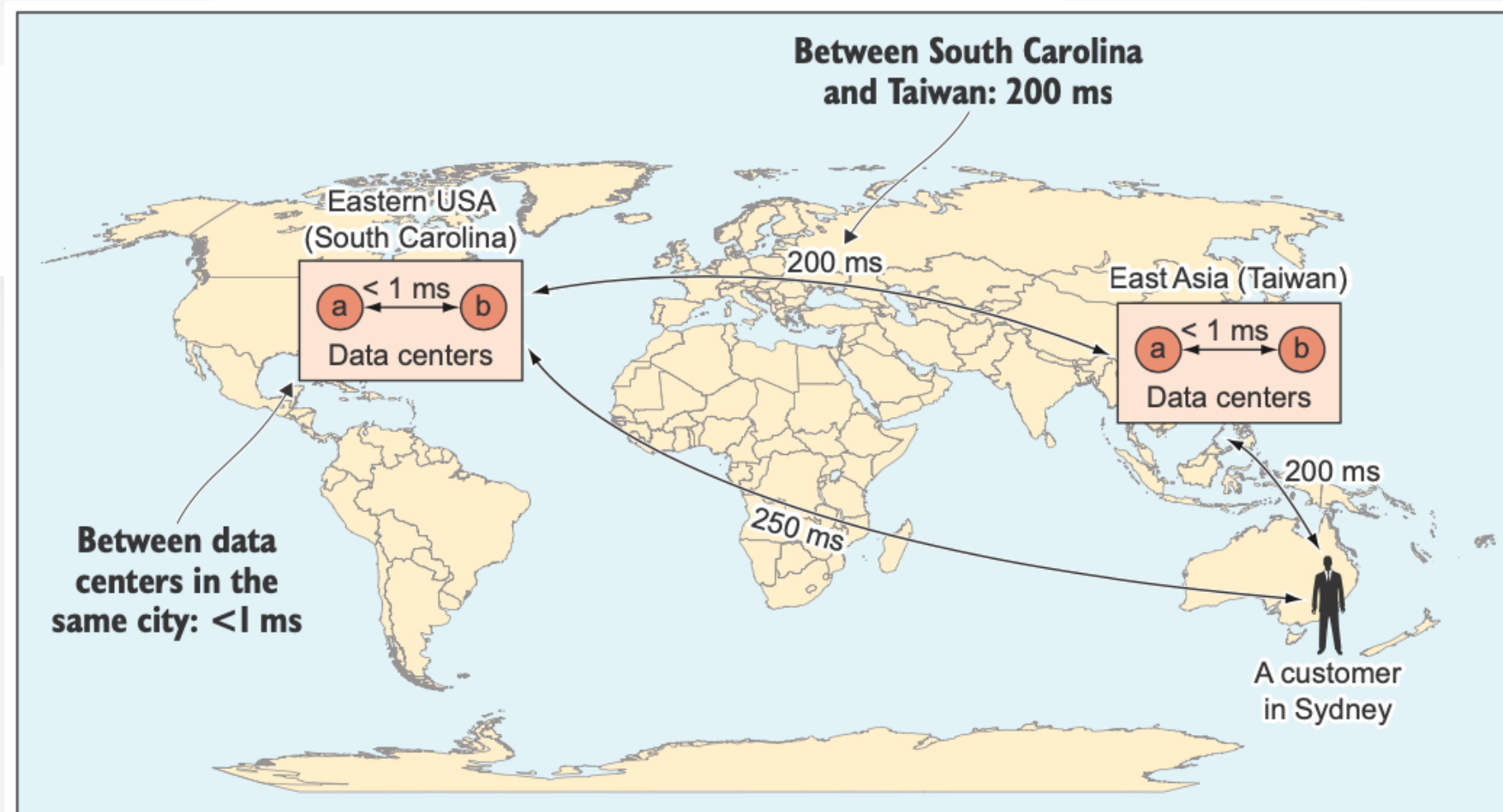
The cloud data center

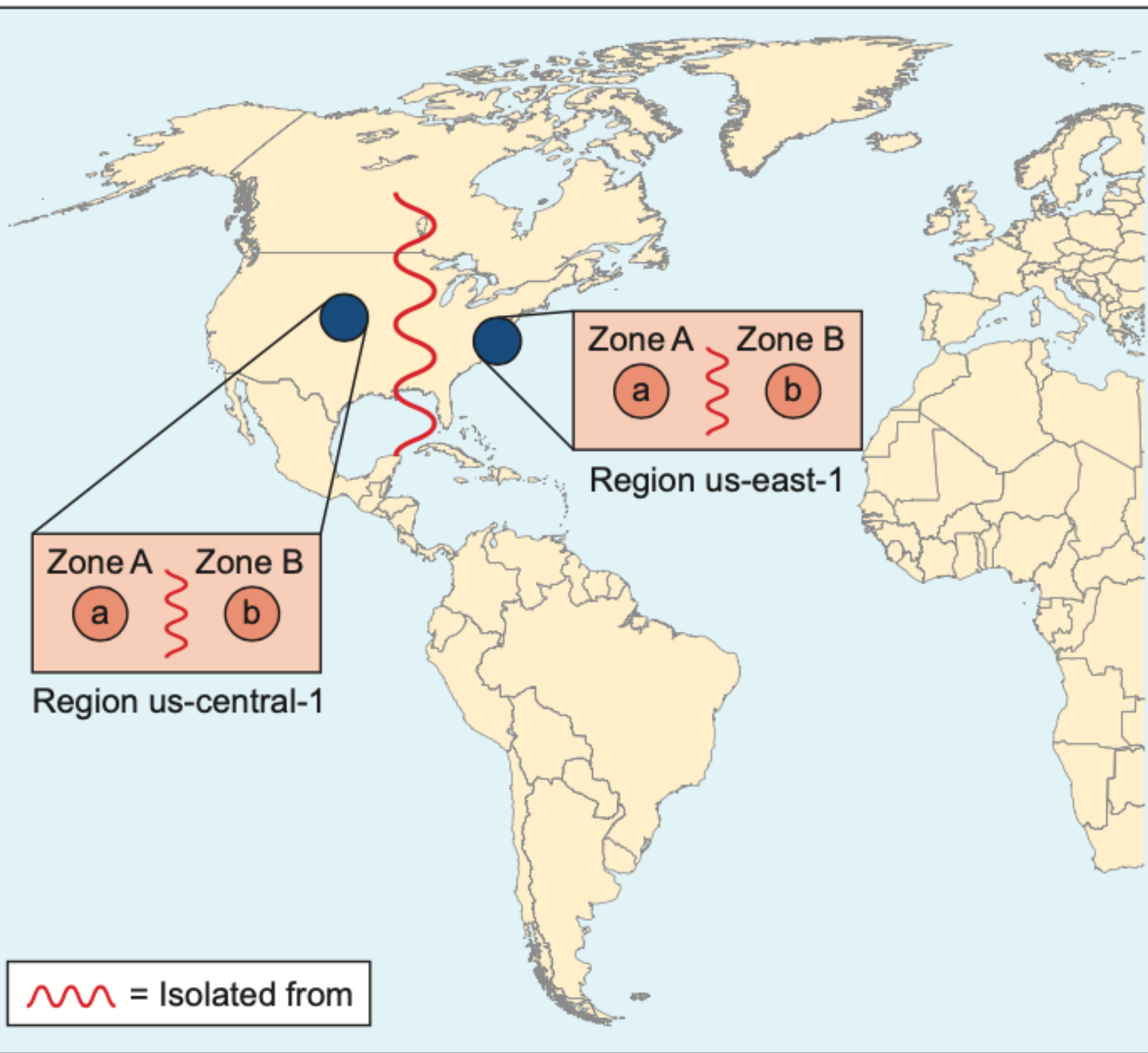
- If you've ever paid for web hosting before, it's likely that the computer running as your web host was physically located in a data center.
- Cloud is similar to traditional hosting.
- Now we highlight some of the details of Google Cloud Platform's data centers.

Data center locations



Network latency to reach clients





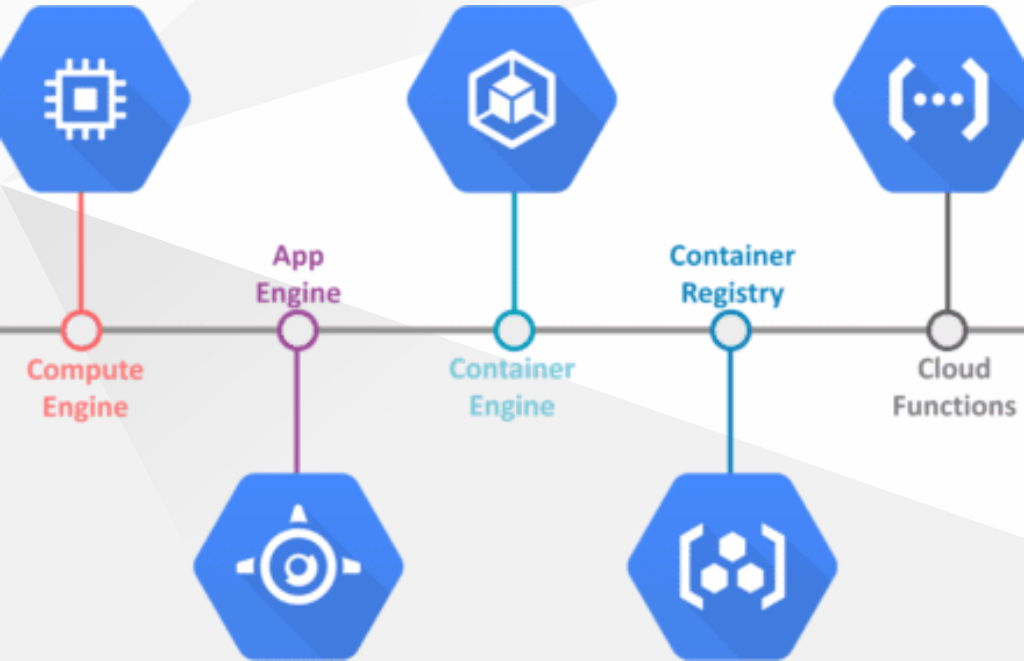
- A **zone** is the smallest unit in which a resource can exist. A unique identifier for a particular facility like **us-east1-b**.
- A collection of zones is called a **region**, such as Council Bluffs, Iowa, USA.

Google Cloud Platform Services Overview

Google Cloud Platform services

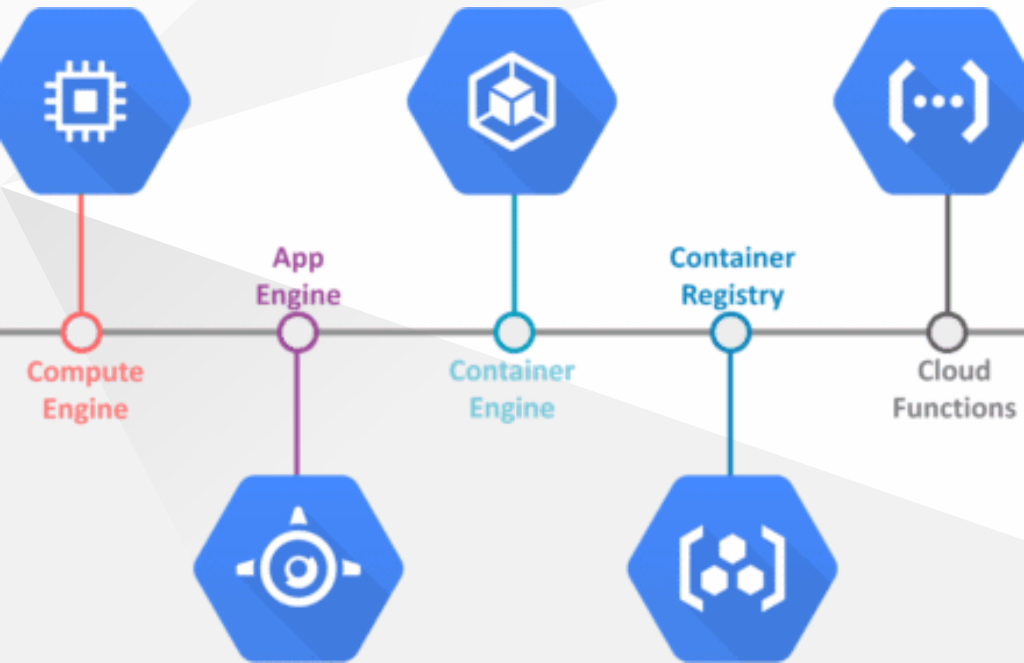
COMPUTE	STORAGE/DATABASES	NETWORKING	BIG DATA/IoT	MACHINE LEARNING
<ul style="list-style-type: none">■ Compute Engine■ App Engine■ Container Engine■ Cloud Functions	<ul style="list-style-type: none">■ Cloud Storage■ Cloud SQL■ Cloud Bigtable■ Cloud Spanner■ Cloud Datastore■ Persistent Disk■ Data Transfer	<ul style="list-style-type: none">■ Virtual Private Cloud (VPC)■ Cloud Load Balancing■ Cloud CDN■ Cloud Interconnect■ Cloud DNS	<ul style="list-style-type: none">■ BigQuery■ Cloud Dataflow■ Cloud Dataproc■ Cloud Datalab■ Cloud Dataprep■ Cloud Pub/Sub■ Genomics■ Google Data Studio■ Cloud IoT Core	<ul style="list-style-type: none">■ Cloud Machine Learning Engine■ Cloud Jobs API■ Cloud Natural Language API■ Cloud Speech API■ Cloud Translation API■ Cloud Vision API■ Cloud Video Intelligence

Computing Service



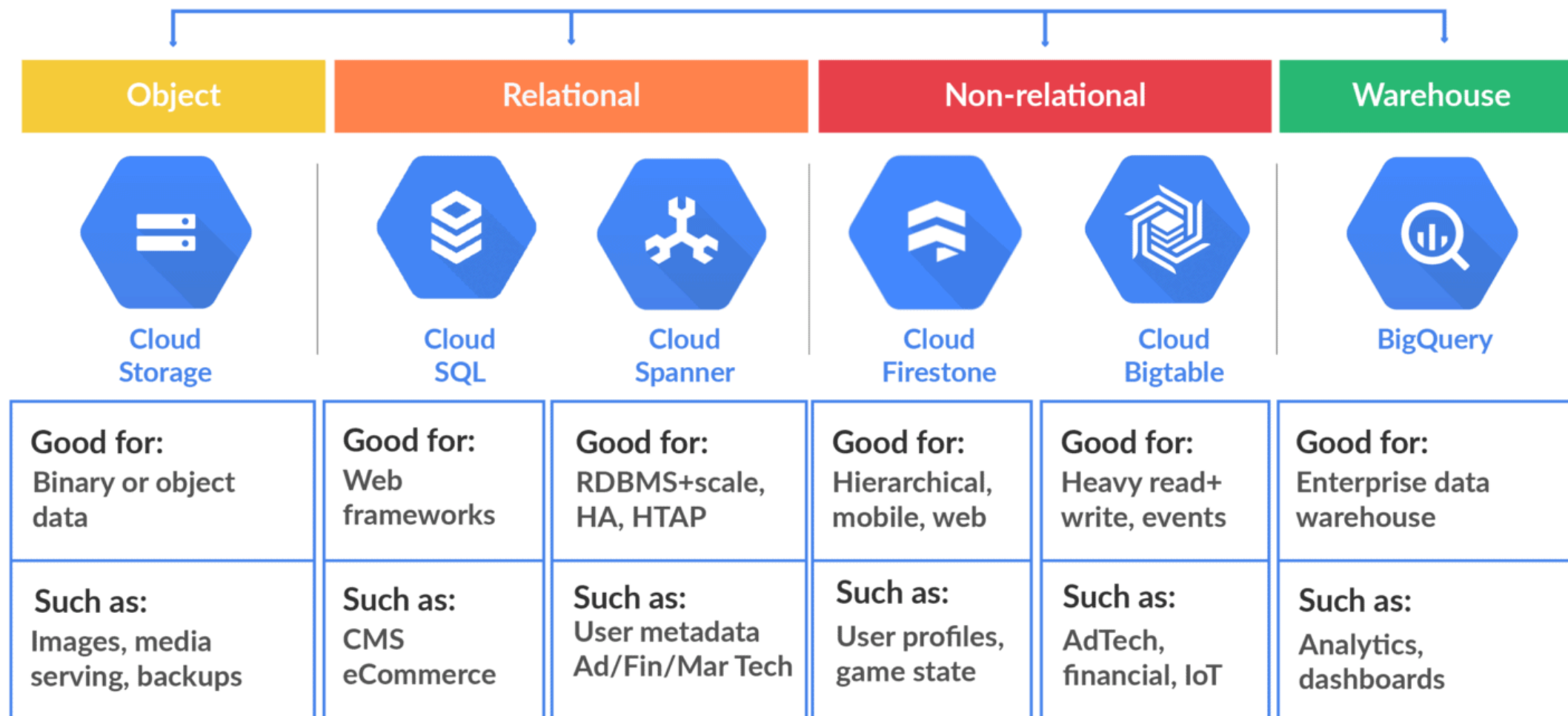
- **Compute engine** is IaaS (Infrastructure As A Service).
- **Google App Engine** is PaaS (Platform As A Service) used for building scalable web applications and IoT backends.
- **Cloud Functions** is a functions as a service (FaaS).

Computing Service



- **Google Kubernetes Engine/ Container Engine** is a strong Cluster Manager and balanced system for running Docker containers.
- **Google Cloud Container Registry** is a private Docker repository to manage Docker Images.

Storage And Database Services



Storage And Database Services

- **Cloud Storage** is a service for storing objects in Google Cloud. An object is an immutable piece of data consisting of a file of any format.
- **Cloud SQL** fully-managed database service (relational).
- **Cloud Bigtable** is a high-performance NoSQL Big Data database service.
- **Cloud Datastore** is a NoSQL database that stores data in JSON documents (similar to MongoDB).

Storage And Database Services

- **Persistent Disk** is a service that provides SSD and HDD storage that can be attached to instances running in either Compute Engine or Container Engine.
- **Cloud Spanner** is a managed globally distributed relational database with ACID transactions, strong consistency, SQL semantics, horizontal scaling, and high availability features.

Network Services

Cloud Virtual
Network



Cloud Load
Balancing



Cloud CDN



Cloud Interconnect



Cloud DNS



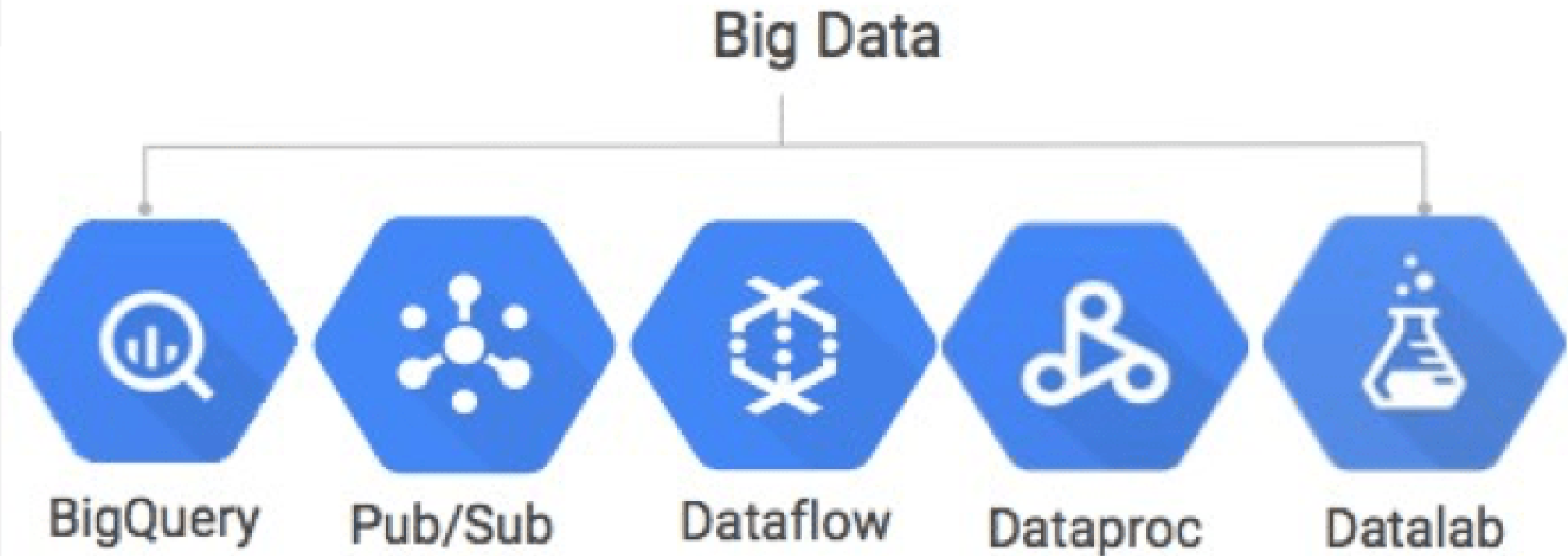
Network Services

- **Virtual Private Cloud (VPC)** provides a set of networking services that are used by VM instances.
- **Cloud Load Balancing** is a process of distributing workloads across many computing resources.
- **Cloud DNS (Domain Naming System)** is a scalable, reliable, and managed authoritative DNS service running on the same infrastructure as Google.

Network Services

- **Cloud CDN (Content Delivery Network)** is a geographically distributed network that consists of proxy servers and their data centers.
- **Google Cloud Interconnect** allows Cloud platform customers to connect to Google via enterprise-grade connections with higher availability and lower latency than their existing Internet connections.

Big Data Services



Big data Services

- **BigQuery** is a fully managed data analysis service that enables users to:
 - create custom schemas to organize data into tables and datasets;
 - load data from different sources;
 - use SQL like commands to query large data;
 - make use of web UI, command-line interface, or API;
 - manage and protect data.

Big Data Services

- **Cloud Dataflow** provides a set of managed services and a set of SDKs that can be used to perform batch and streaming data processing tasks.
- **Google Cloud Pub/Sub** is an asynchronous, serverless, large-scale, reliable real-time messaging service.
- **Cloud Dataproc** is a managed Spark and Hadoop service used to process big datasets using the powerful and open tools in the Apache big data ecosystem.
- **Cloud Datalab** is an interactive Jupyter like notebook used to explore, collaborate, analyze, and visualize data.

Machine Learning Services

Custom ML models



TensorFlow



Machine Learning
Engine

Pre-trained ML models



Vision API



Speech API



Jobs API



Natural
Language API



Translation
API



Video
Intelligence API

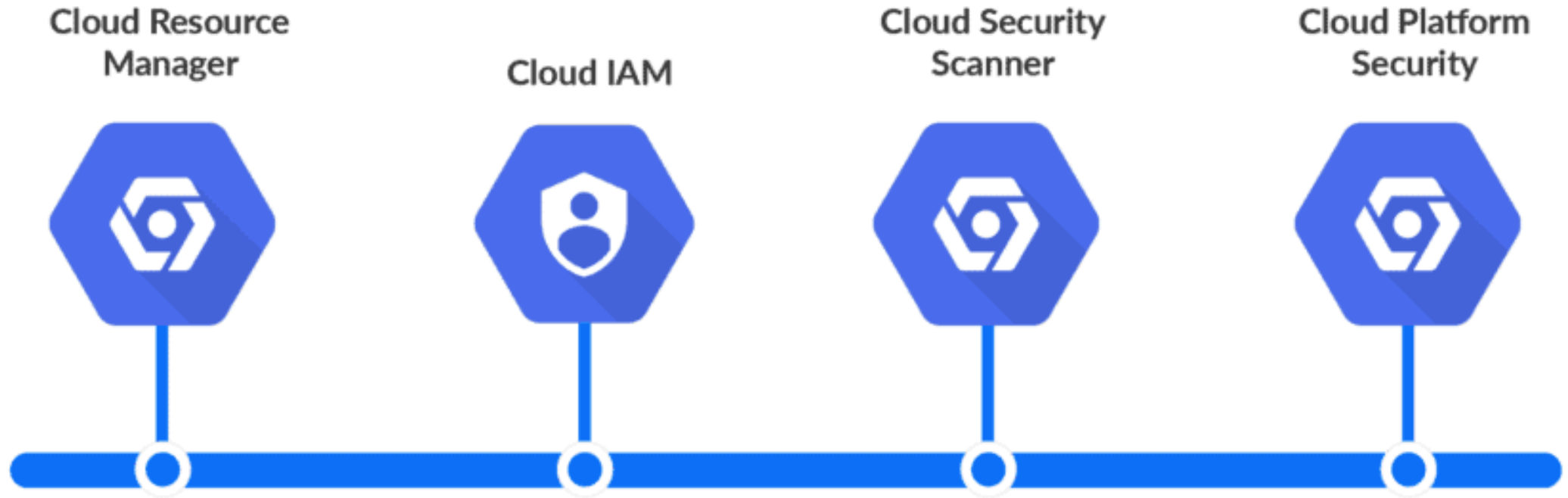
Machine Learning Services

- **Cloud Machine Learning** is a managed service that enables users to build Machine Learning models based on mainstream frameworks like [TensorFlow](#).
- **Cloud AutoML** is a Machine Learning product that enables developers who are not that experienced in this field to provide train their high-quality models by Google's transfer learning and Neural Architecture Search.
- **Cloud Vision API** is a REST API used for image recognition and classification.

Machine Learning Services

- **Cloud Speech API** is a REST API that can be used to convert audio to text recognizing over 110 languages and variants, to support customer's global user base.
- **Cloud Natural Language API** allows users to add sentiment analysis, entity analysis, entity-sentiment analysis, content classification, and syntax analysis.
- **Translate API** allows the users to quickly translate source text into any of over a hundred supported languages. Language detection helps out in cases when the source language is unknown.

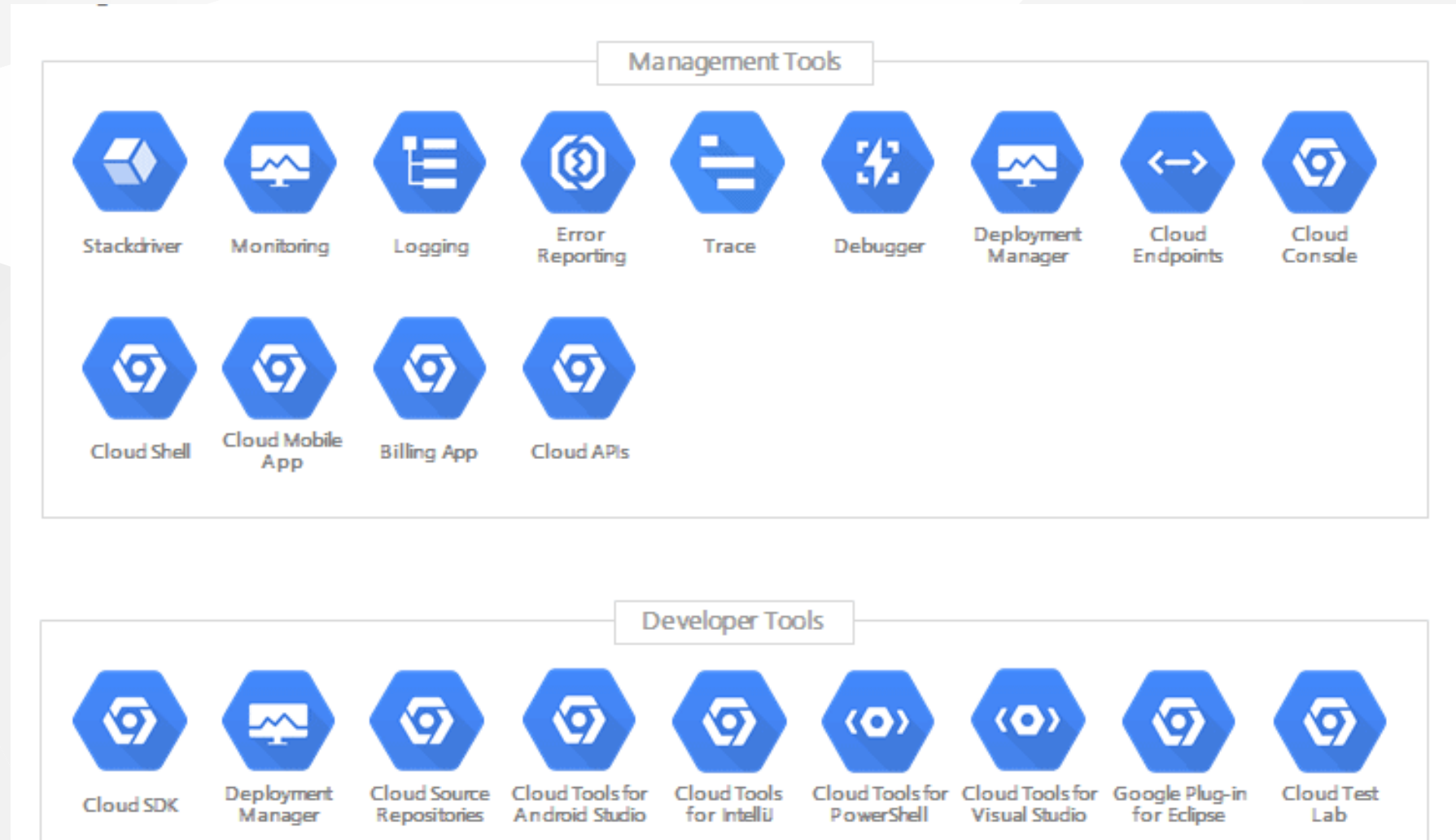
Identity And Security Services



Identity And Security Services

- **Google Cloud IAM** can be defined as a framework of policies and technologies for ensuring that authorized people in an enterprise have the appropriate access to technology and resources.
- **Cloud Resource Manager** is used for programmatically managing resource containers used for grouping and hierarchically organizing GCP resources.
- **Cloud Security Scanner** is a web security scanner for common vulnerabilities in App Engine applications, like cross-site-scripting (XSS), Flash injection, mixed content, and outdated or insecure libraries.

Management And Developer Tools



In-depth view of Google Compute Engine (GCE)

But first.. Launching your first (or second) VM

👍 If you don't have gcloud installed yet, check out <https://cloud.google.com/sdk> for instructions on how to get set up, or use the Cloud Shell.

- The first thing you'll need to do is authenticate using `gcloudauth login`.
- `gcloud config set project your-project-id-here`

But first.. Launching your first (or second) VM

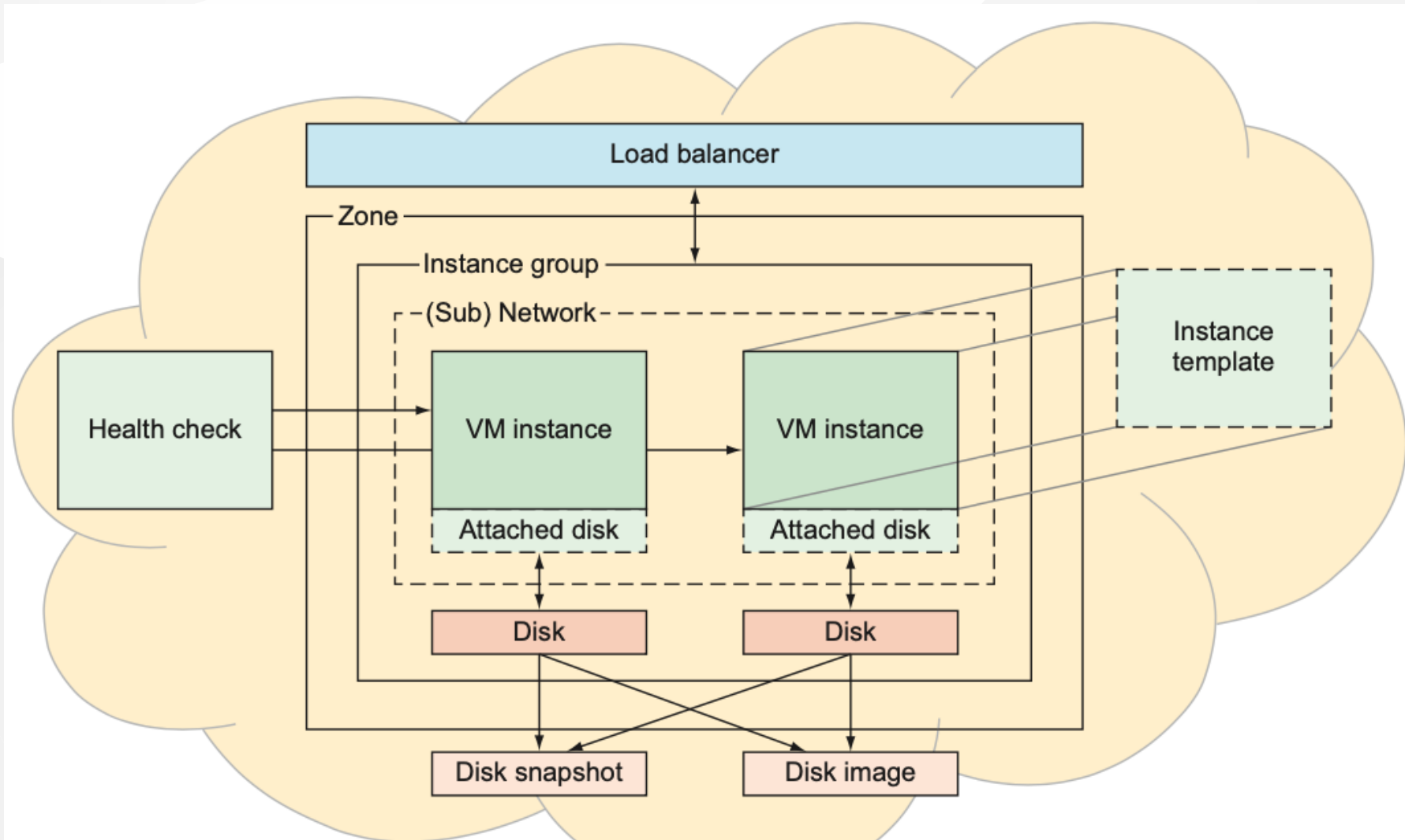
```
$ gcloud compute instances create test-instance-1 --zone us-central1-a
```

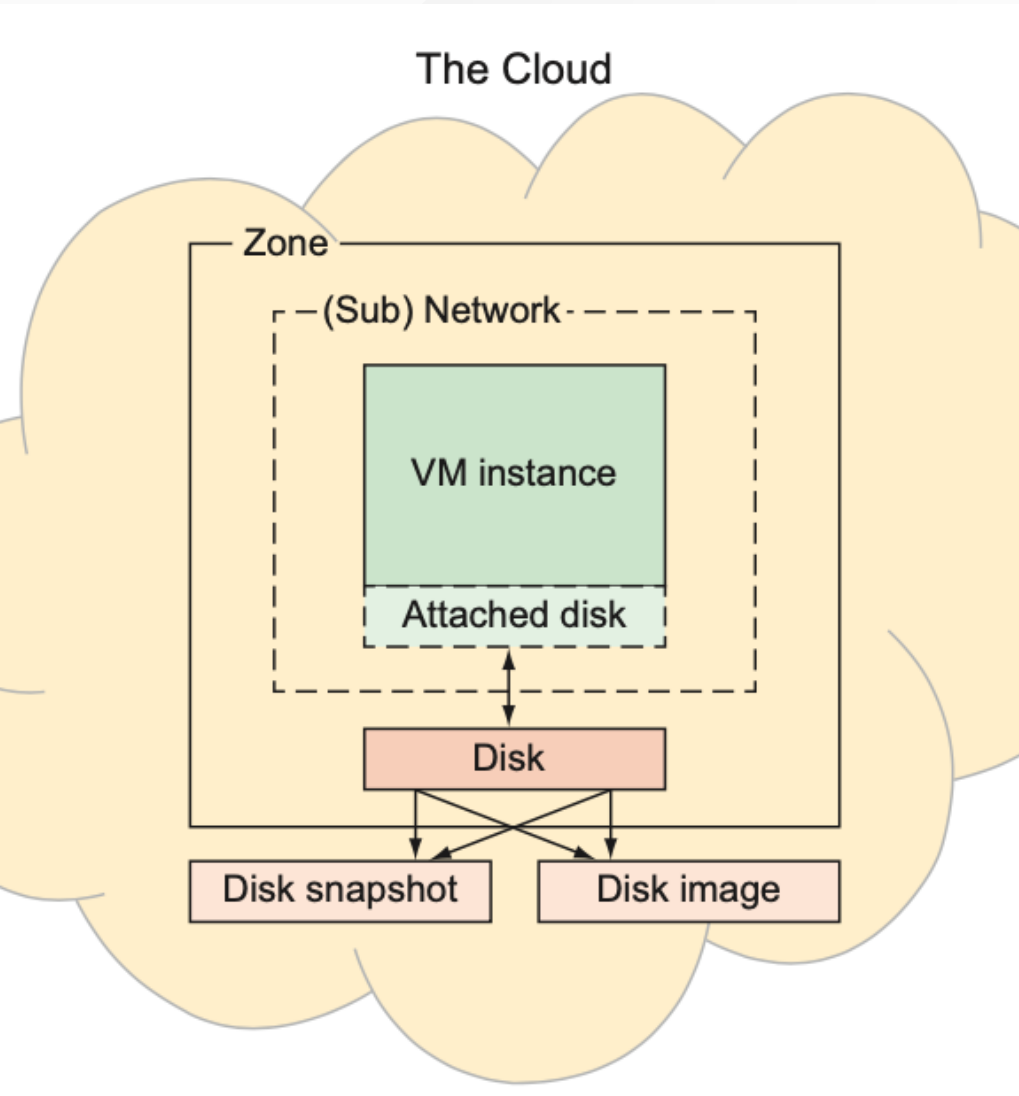
↪ connect to the instance over SSH

```
$ gcloud compute ssh --zone us-central1-a test-instance-1
```

💡 If you are looking for your instance also in the web console ➡ use the refresh button.

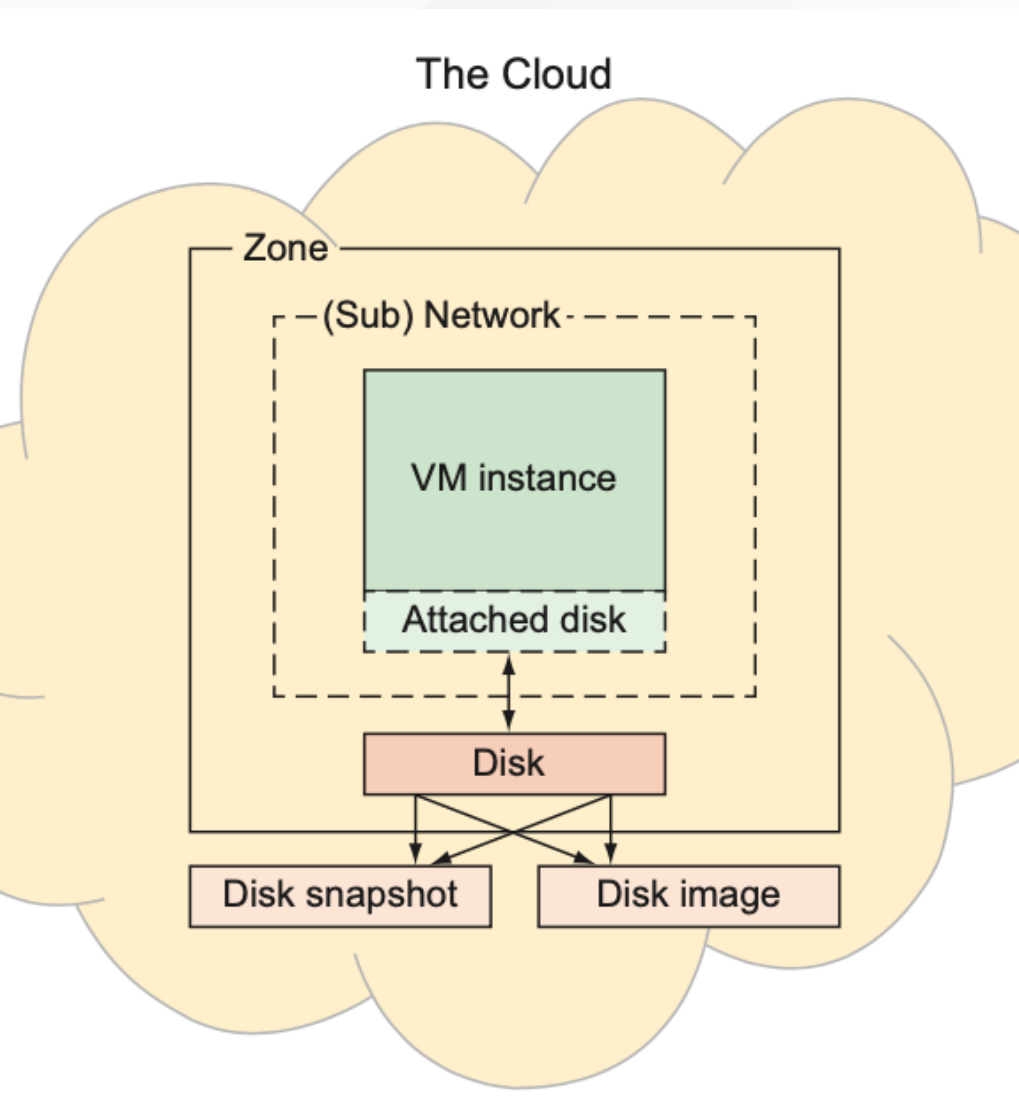
But ... what happened?





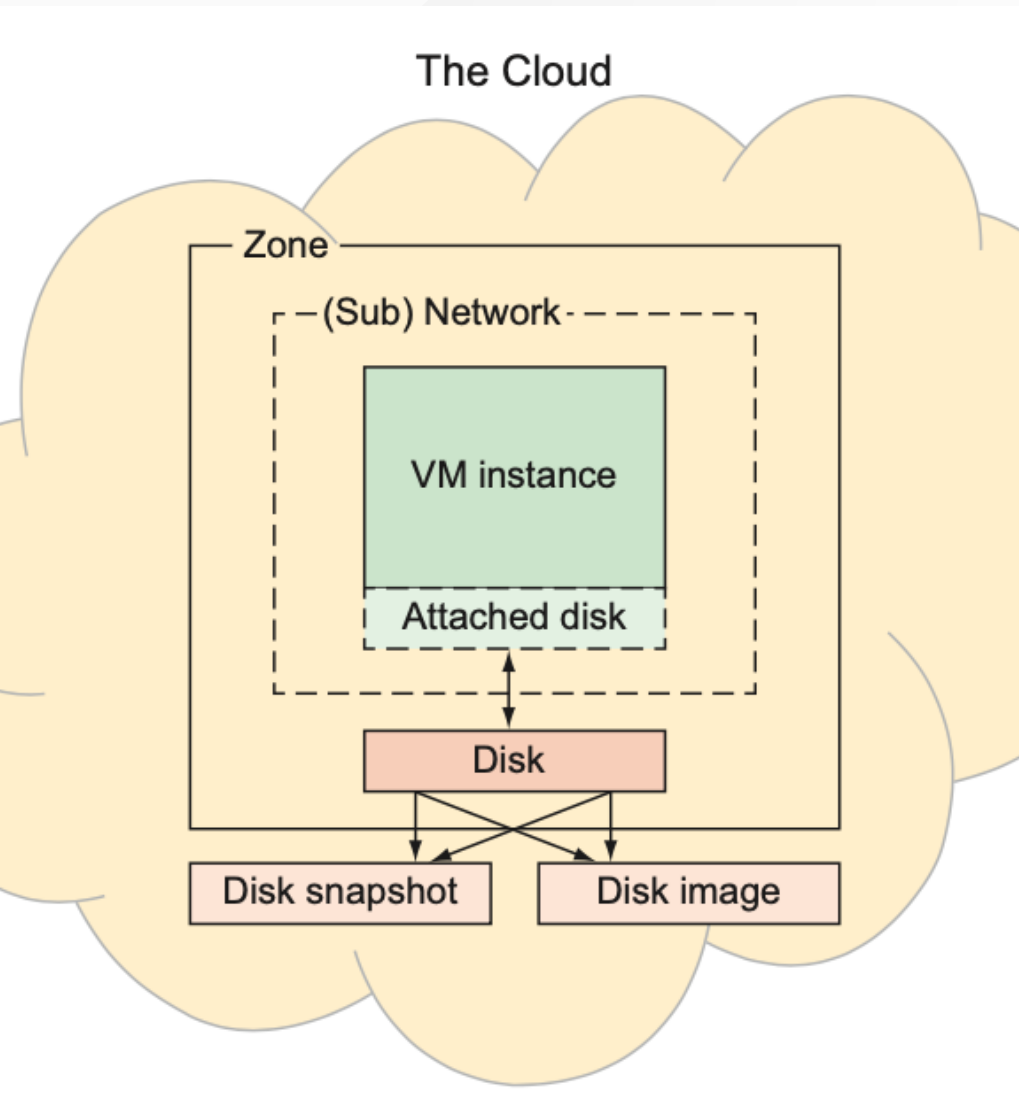
Block storage with Persistent Disks

- A persistent **disk** is a bit like an external hard drive.
- Cloud hosting providers came up with a storage service that looked and acted like a regular disk but was replicated and highly available.



Block storage with Persistent Disks

- A **snapshot** is a check-point for the data on your disk.
- It uses differential storage, storing only what's changed from one snapshot to the next.
- **Images** are similar to snapshots in that both can be used as the source of content when you create a new disk.



Block storage with Persistent Disks

- Every time you create a new VM from a base operating system, you're using an image under the hood.
- The primary difference is that an image doesn't rely on differential storage like snapshots do, which means it may be more expensive to keep around.

Understanding pricing

The basic features of GCE have straightforward prices, whereas some of the more advanced features can get complicated, and even more complicated when you consider an important discount available for sustained use.

You need to consider three factors for pricing with GCE:

1. Computing capacity using CPUs and memory.
2. Storage using persistent disks.
3. Network traffic leaving Google Cloud.

Computing capacity

- The most common way of using GCE is with a predefined instance type, such as `n1-standard-1`.
- By turning on an instance of a particular predefined type, you're charged a specific amount every hour for the use of the computing capacity.
- That capacity is a set amount of CPU time, which is measured in vCPUs (a virtual CPU measurement), and memory, which is measured in GB.

Computing capacity

- Each predefined type has a specific number of vCPUs, a specific amount of memory, and a fixed hourly cost.
- [Price list](#)
- [Compute Engine](#)

Computing capacity: Spot VMs

- [Spot VM](#) are available at much lower price—a 60-91% discount—compared to the price of standard VMs.
- However, Compute Engine might preempt Spot VMs if it needs to reclaim those resources for other tasks.
- At this uncertain preemption time, Compute Engine either stops (default) or deletes your Spot VMs depending on your specified termination action for each VM.



- [Google Cloud documentation](#)

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