Google Cloud for Newbies

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… for Newbies

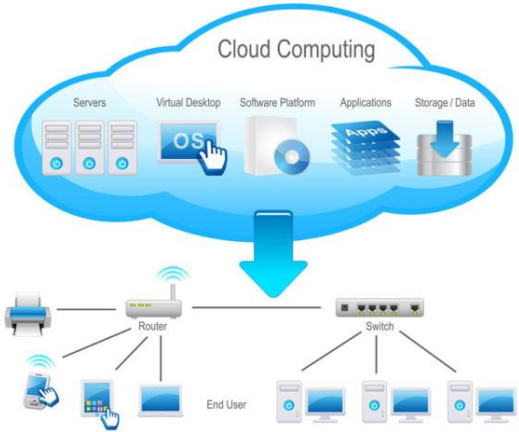
Because I'm new too !

Overview

- What is Cloud Computing?
- A Brief History
- Google Cloud
- GCP Resource Hierarchy
- GCP Projects
- VPCs - Virtual Private Clouds
- GCE - Google Compute Engine

What is Cloud Computing?

- Limitless pool of compute and storage resources.
- Accessed through a network.
- Physical infrastructure abstracted by provider.
- Virtual access typically via web portal, API, CLI.
- Resources geographically dispersed.
  - Supports high availability, low latency, data sovereignty, etc.
- Customer's rent resources and "pay-as-you-go".
  - Many options are free to try.
- Unlocks new levels of compute automation and efficiency.



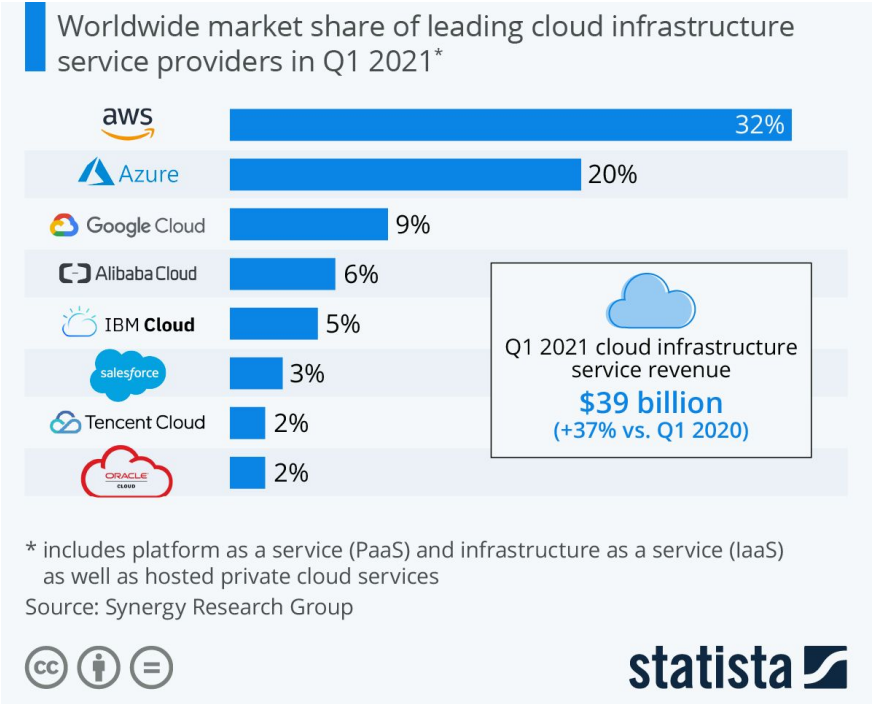
Milestones in Cloud Computing

Year	Milestone
2006	AWS launched - Introduces S3 (object store) and EC2 (virtual machines).
2008	Google releases GAE (PaaS).
2010	Microsoft's Azure launched. Amazon store moved to AWS. Google releases GCS (object store). Rackspace and NASA launch OpenStack.
2012	Google introduces GCE (virtual machines). Netflix migrates all infrastructure to AWS.

Milestones in Cloud Computing

Year	Milestone
2014	AWS introduces Lambda (FaaS).
2015	Kubernetes 1.0 released.
2016	Google Container Engine GA (eventually rebranded to Google Kubernetes Engine).
2017	GCP introduces Functions (FaaS).
2018	AWS EKS released.
2021	Google begins the YouTube migration to GCP.

Cloud Market Share



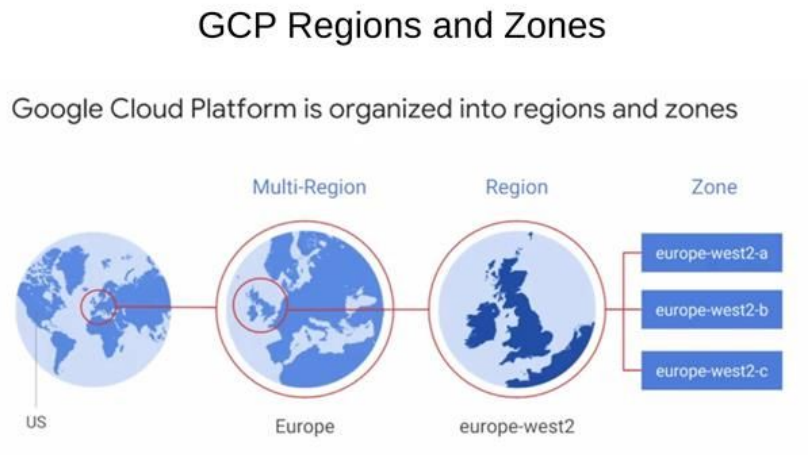
https://www.statista.com/chart/18819/worldwide-market-share-of-leading-cloud-infrastructure-service-providers/

Google Cloud

- 29 regions, 88 zones.
  - Toronto region opened in 2021.
- 146 network edges, 200+ countries.
- 100+ cloud products.
- Specialties:
  - Integrating with Google Workspace.
  - Fast (low latency) networking.
  - Global over regional.
  - Big data analytics.
  - Kubernetes.
  - AI / machine learning.
  - Enabling devops / SRE practices.

Regions and Zones

Locations	Description
Zone	A distinct GCP data centre. Fast connections to other zones in the same region.
Region	A collection of zones. At least 3 zones per region.
Multi-Region	Some services are aware of multiple regions. Useful in high availability and low latency use cases.
Network Edge	Also called PoPs. Provides subset of services that are in a GCP Region.

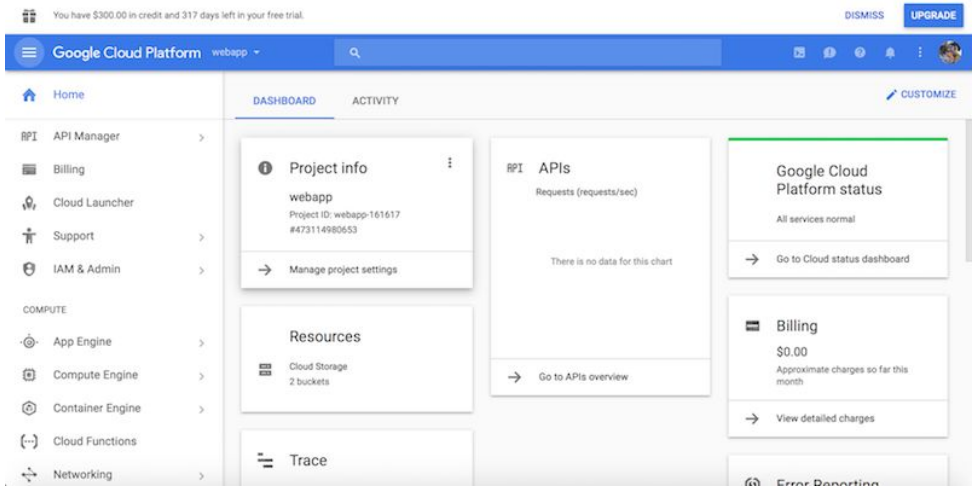


GCP Admin Tools

- GCP Cloud Console.
- GCP SDK.
- GCP Cloud Shell.

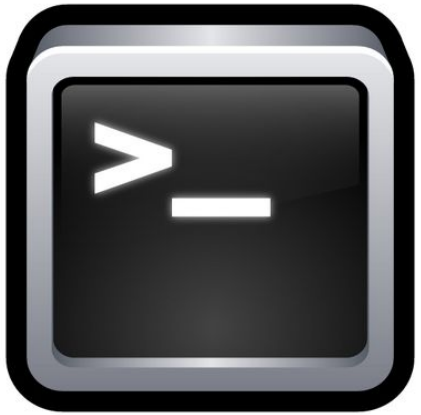
GCP Cloud Console

- Web browser interface for GCP admin interactions.
- Allows provisioning for all GCP services in one location.
- Also provides centralized logging, monitoring, and debugging capabilities.



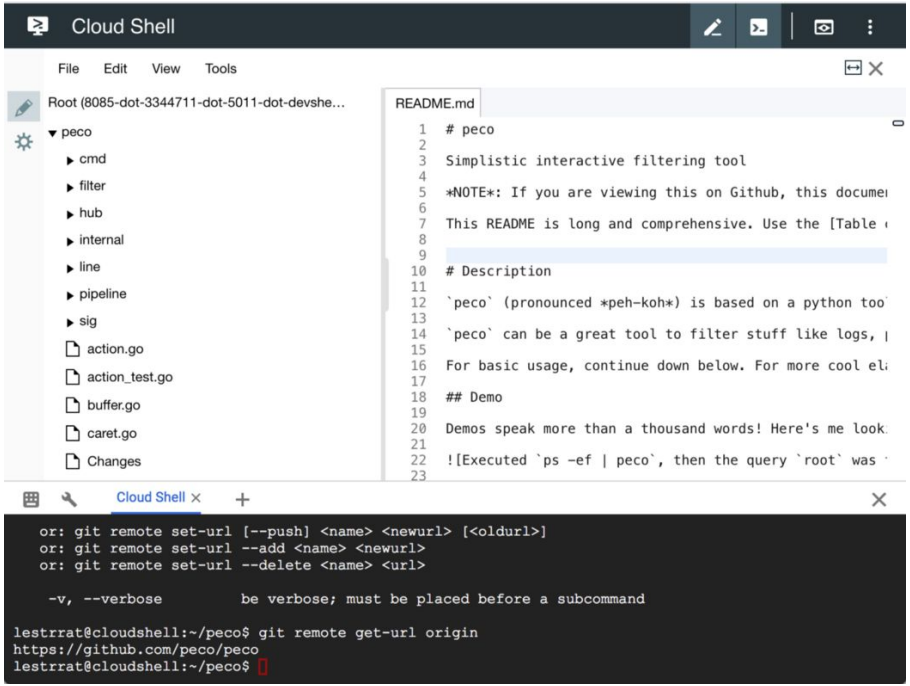
GCP SDK

- Includes CLI tools for managing GCP - gcloud, gsutil, bq
- Also, language specific cloud client libraries.
- Easy access through Cloud Shell.
- Can be installed locally.
  - https://cloud.google.com/sdk/docs/install
- Also has a Docker image available.



GCP Cloud Shell

- Admin VM for your personal use.
- CLI access to your cloud resources inside a browser.
- Manage GCP resources without having to install the Cloud SDK.
  - Always up to date and authenticated.
- Like a private DMZ host without the overhead of managing a DMZ.



Cloud Shell Demo

Cloud Shell Editor

```
$ echo "testing cloud shell editor" > foo
$ edit foo
```

Networking Packages

```
$ sudo apt install -y iputils-ping nmap ncat \
  traceroute arping
```

Cloud Shell Networking

Basic Networking

```
$ ifconfig -a
$ route -vn
$ curl api.ipify.org
$ ping vicpimakers.ca
$ ping -6 vicpimakers.ca   # ?
```

From the Internet to Cloud Shell VM

```
$ ping <cloud shell public IP>
$ nmap <cloud shell public IP>
```

Cloud Shell - gcloud

GCP SDK - gcloud

```
$ gcloud config list
$ gcloud config get-value project
$ gcloud config set compute/region us-west2
$ gcloud config set compute/zone us-west2-c
$ gcloud config list
```

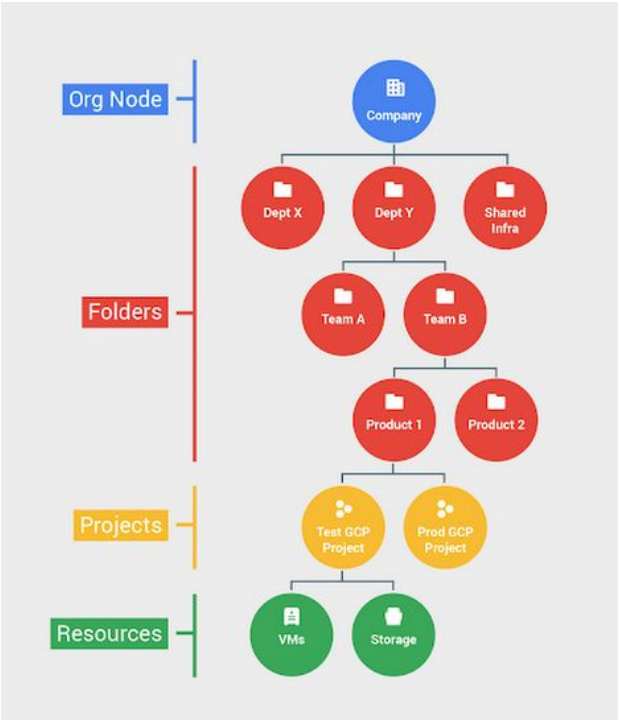
GCP Services (APIs)

GCP Services

```
$ gcloud services list --available | head
$ gcloud services list --available | grep NAME | wc -l
$ gcloud services list --enabled | grep NAME
$ gcloud services enable container.googleapis.com  # k8s
$ gcloud services list --enabled | grep NAME
```

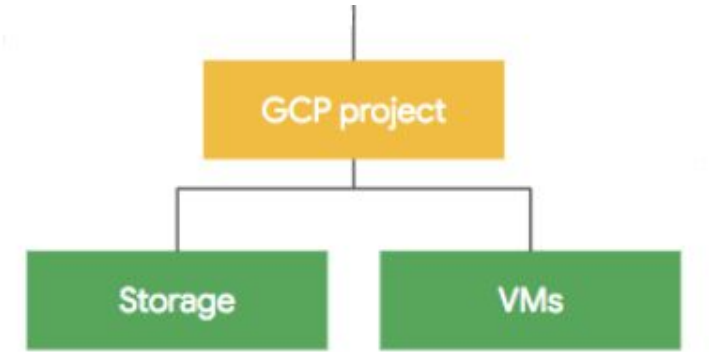
GCP Resource Hierarchy

- The resource hierarchy allows an organization to logically group access control policies and config settings
- 3 levels - Organization, Folders, and Projects
- Top level is the Organization where high-level policies and restrictions are set.
- Folders provide further grouping of resources (typically aligned with an org-chart view of a business)
- Projects are the leaf nodes in the hierarchy
- Projects are where the actual cloud resources reside and are managed at this level.

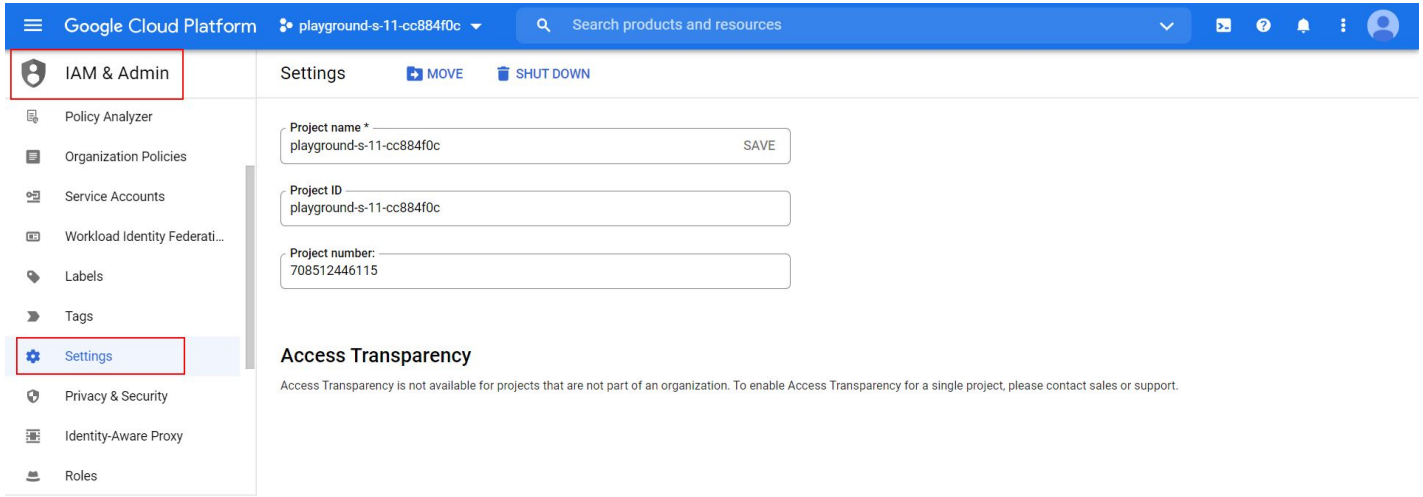


GCP Project

- A project organizes all your Google Cloud resources.
- Provides access to a subset of APIs and cloud resources
  - e.g. object store buckets, VMs, storage, etc.
- Associated to a billing account.
- Best practice - One project per application per environment.
  - e.g.
    - my-web-app-prod
    - my-web-app-dev
    - my-api-app-prod
    - My-api-app-dev



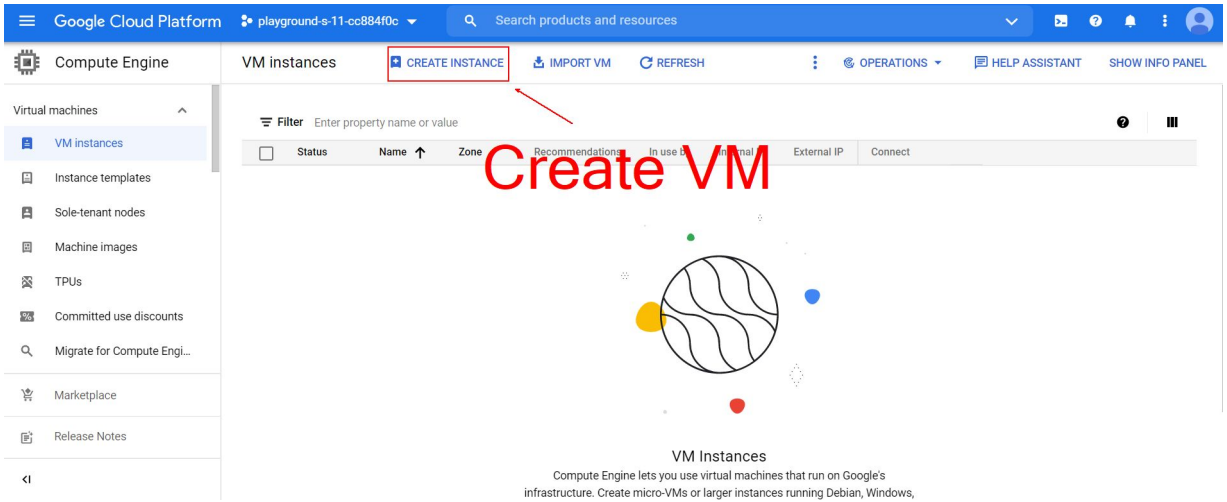
GCP Project




```
$ gcloud projects list
$ gcloud projects describe [project-name]
```

GCE - Google Compute Engine

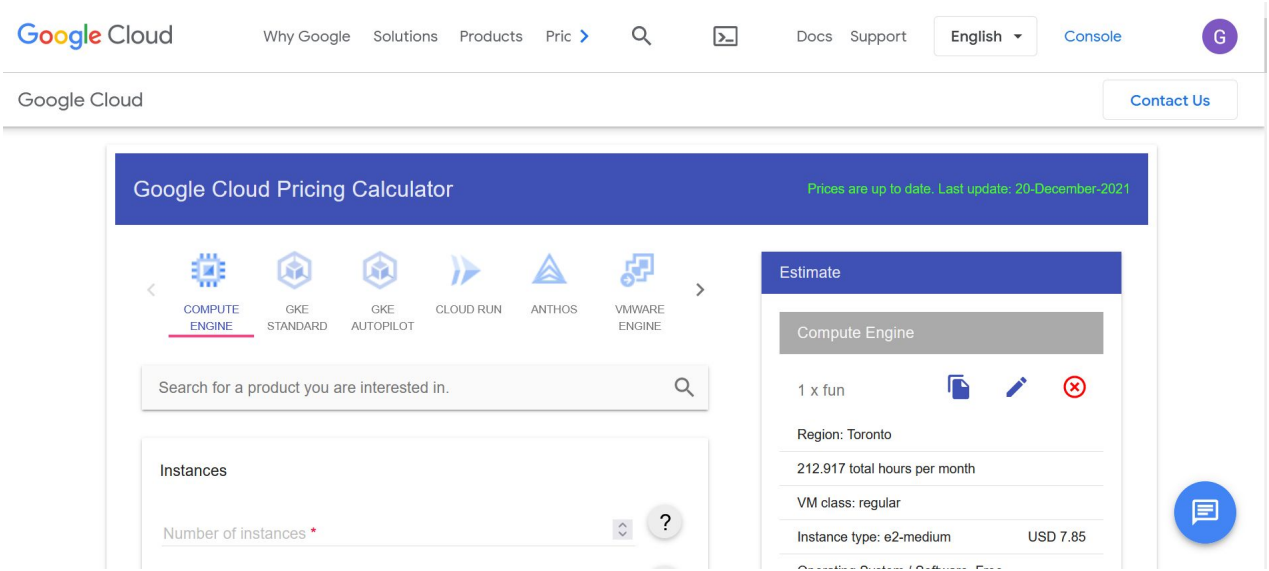
Service that allows you to create and run VMs in Google Cloud.



Try preemptibility ON for cost savings.

GCP Cost Estimates

https://cloud.google.com/products/calculator



GCE - Google Compute Engine

GCE through Cloud Shell

```
# Clean up old VM
$ gcloud compute instances list
$ gcloud compute instances delete myvm
$ gcloud compute instances list
# New VM instance
$ gcloud compute instances create myvm2
$ gcloud compute instances describe myvm2
$ gcloud compute instances ssh mymv2
```

GCE - Metadata Server

- Each GCE VM has access to its own metadata server for management and automation.

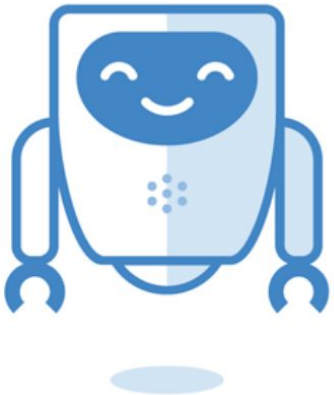
```
$ grep metadata /etc/hosts
169.254.169.254 metadata.google.internal  # Added by Google
```

- IPv4 link local address - https://en.wikipedia.org/wiki/Link-local_address
  - i.e. only valid for communications inside the local network (broadcast domain).
  - Routers will not forward outside the local network.
- Metadata endpoint provides useful information for the local compute node.

```
$ curl -H "Metadata-Flavor:Google" \
  metadata.google.internal/computeMetadata/
$ curl -H "Metadata-Flavor: Google" \
  metadata.google.internal/computeMetadata/v1/instance/image
$ curl -H "Metadata-Flavor:Google" \
  metadata.google.internal/computeMetadata/v1/project/attributes/ssh-keys
```

GCP Service Accounts

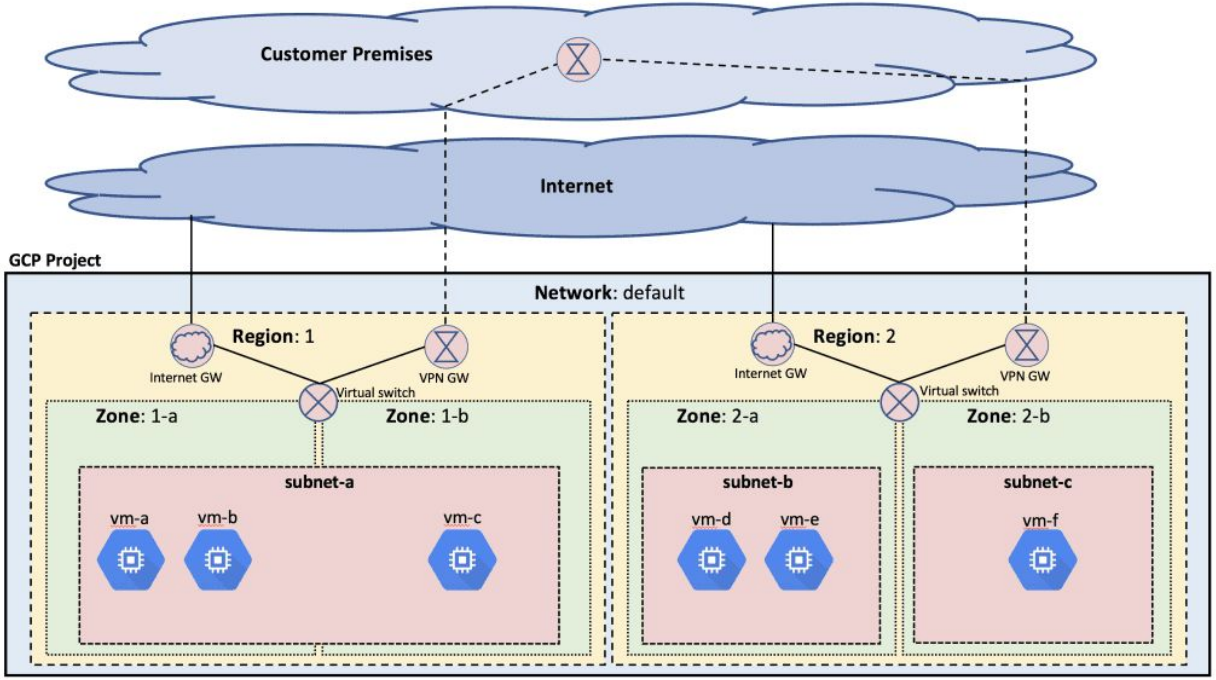
- Special account used by an app or compute workload rather than a person.
- Applications use service accounts to make authorized API calls.
- Can be given permissions to access various cloud resources.
- In essence, it is the identity of the service.
- Think of it as your bot for enabling automation.



Virtual Private Cloud

- A virtual version of the traditional on-prem physical network.
- Unlike other cloud providers, VPCs are global in GCP.
  - i.e. VPC subnets can be located in regions all across the world.
- Each region is assigned one or more subnets.
  - Private IPv4 addresses by default.
  - Public IPv6 /?, if dual stack is enabled.
- You VM can communicate in the VPC privately.
  - This privacy extends across the global if you're using VMs in different regions.
- This global VPC abstracts many complexities encountered with on-prem networks.

Virtual Private Cloud



GCE - Cloud Shell Hacking

WIP

GCE - Cloud Console

WIP

Logging

WIP

Telemetry

WIP

GCP Trial Account & Free Tier

Trial Account

- https://cloud.google.com/free
- $300 in free credits for 90 days.
- **Note** - Will need your credit card to sign-up for the trial.

Free Tier

- Offered for various GCP services.
- Usage limits applied before the charging begins.
- https://cloud.google.com/free/docs/gcp-free-tier/#free-tier-usage-limits
- **Note** - Set up billing alerts **and** MFA for peace of mind.

Summary

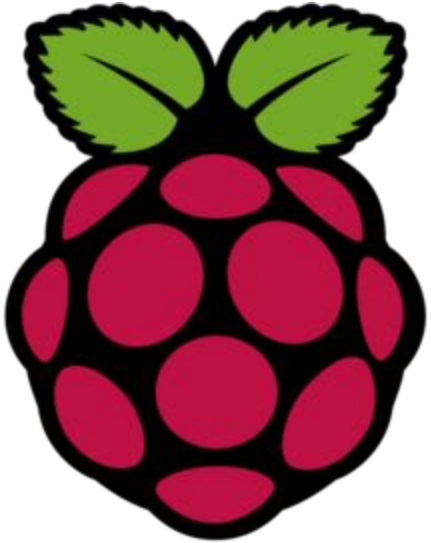
WIP

Possible Future Discussions

- Google Kubernetes Engine
- Cloud DNS
- App Engine
- Cloud Load Balancer
- Cloud Pub/Sub
- Cloud Functions
- Cloud Operations Suite
- Database services
- Machine Learning services

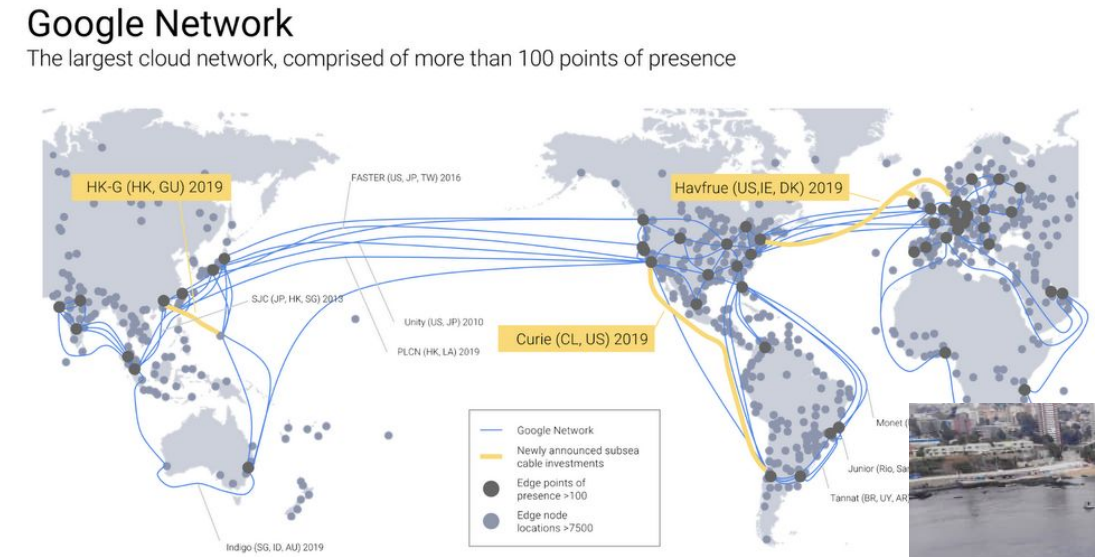
VicPiMakers and Others Slack

- Please let us know if you want an invite to this Slack group

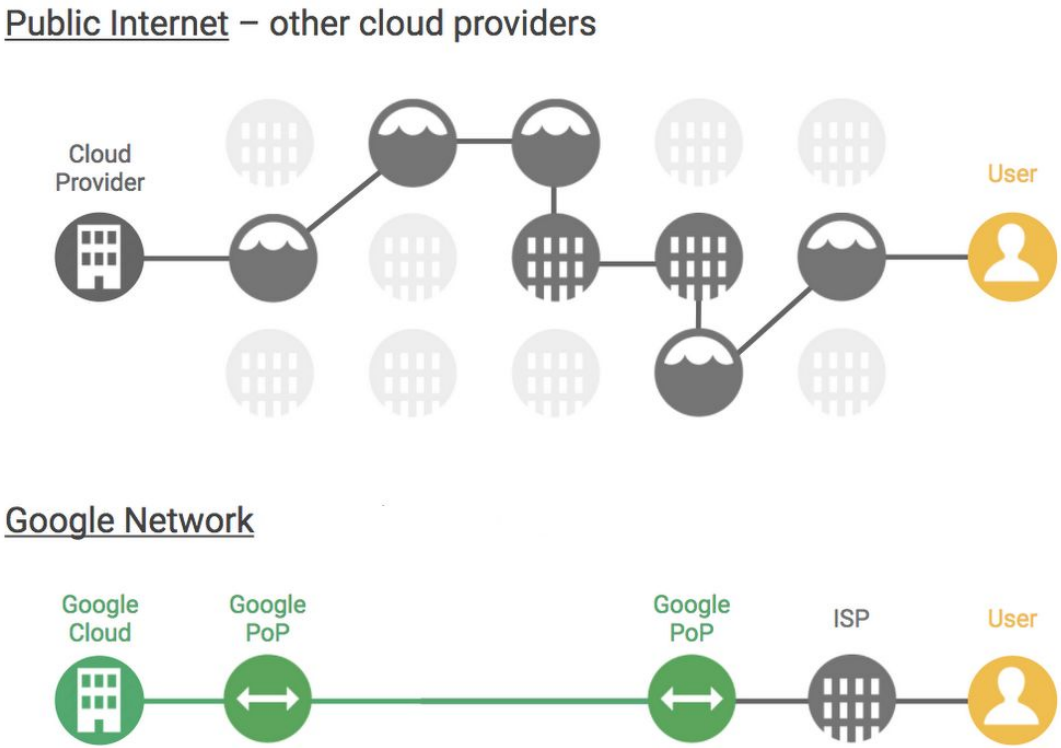


Backup Slides

Google's Network



Google's Network



Cloud Shell - gsutil

GCP SDK - gsutil

```
$ gsutil ls
$ gsutil mb gs://my-gsutil-demo-23711
$ gsutil ls
$ gsutil cp foo gs://my-gsutil-demo-23711
$ gsutil ls gs://my-gsutil-demo-23711
$ gsutil cp gs://my-gsutil-demo-23711/foo bar
$ cat bar
```