

Google Cloud Platform (GCP) Fundamentals



Google Cloud

Sadok Smine



Introduction to Google Cloud Platform

Overview of Cloud Computing

Introduction to GCP and its benefits

Understanding GCP's global infrastructure

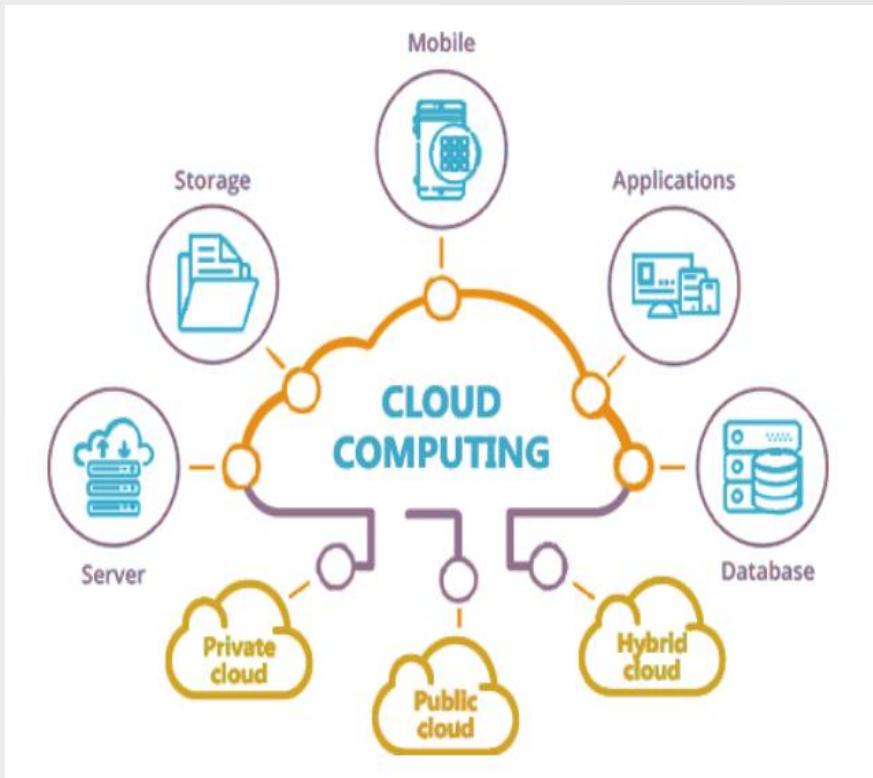
Regions and Zones

Getting started with GCP Console and Cloud Shell

Overview of Cloud Computing

“Cloud computing is the on-demand availability of computer system resources, especially data storage and computing power, without direct active management by the user.”

Wikipedia



On-Demand Self-Service

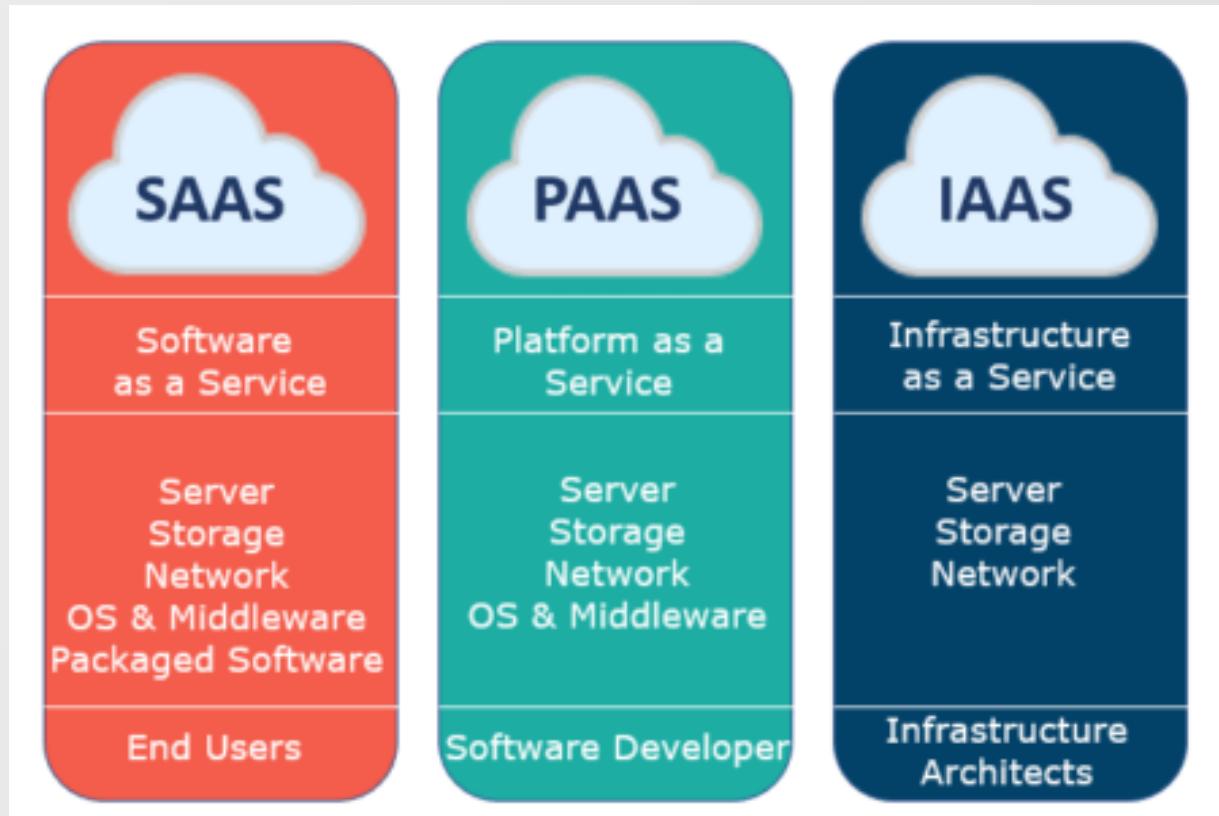
Broad Network Access

Resource Pooling

Rapid Elasticity

Measured Service

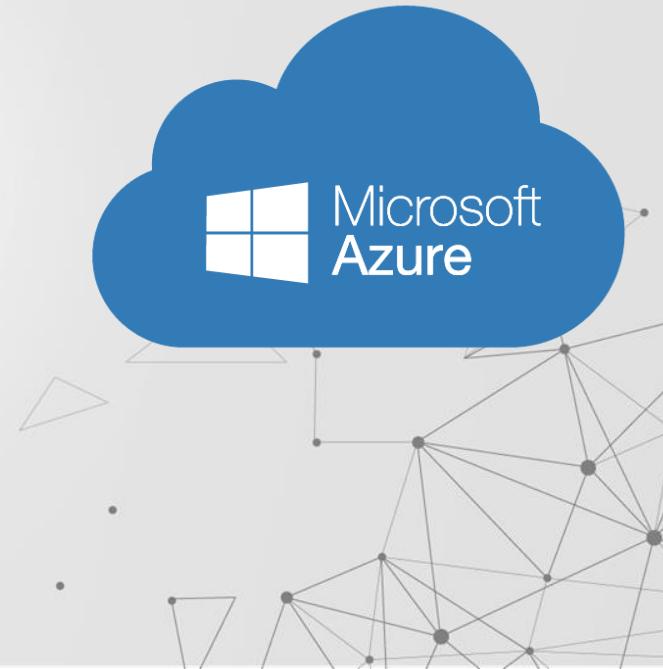
Cloud Computing Service Models



Cloud Service Providers



Google Cloud



Introduction To GCP and it's Benefits

GCP, short for Google Cloud Platform, is a suite of cloud computing services provided by Google. It offers a wide range of infrastructure and platform services to help businesses build, deploy, and scale applications and services in the cloud.

Infrastructure

Data Centers Worldwide

Compute Services

GCE, GKE, App Engine

Storage and Databases

GCS, Cloud SQL, Cloud Bigtable, BigQuery

Networking

VPC, Cloud Load Balancing, Cloud CDN, Cloud Interconnect

Machine Learning and AI

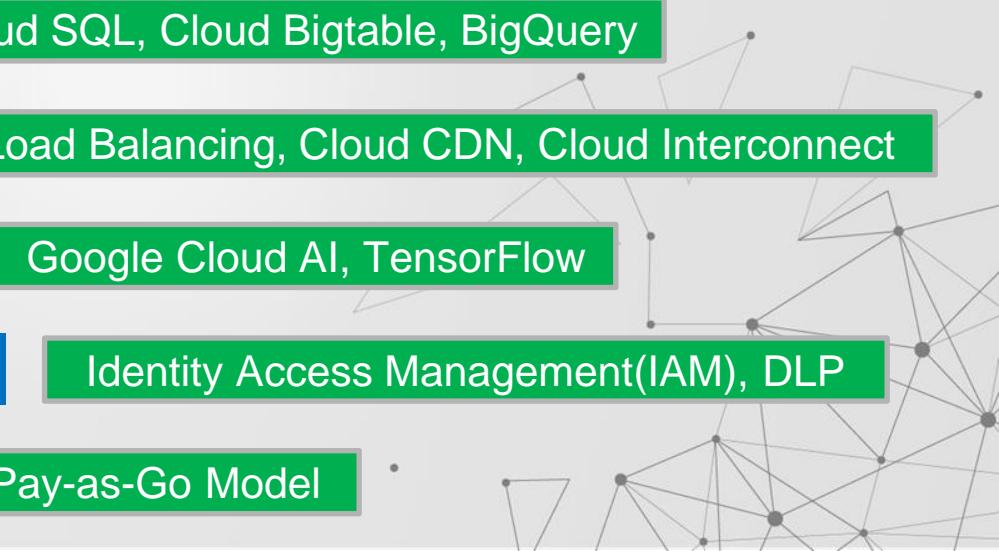
Google Cloud AI, TensorFlow

Security and Compliance

Identity Access Management(IAM), DLP

Cost-Efficiency

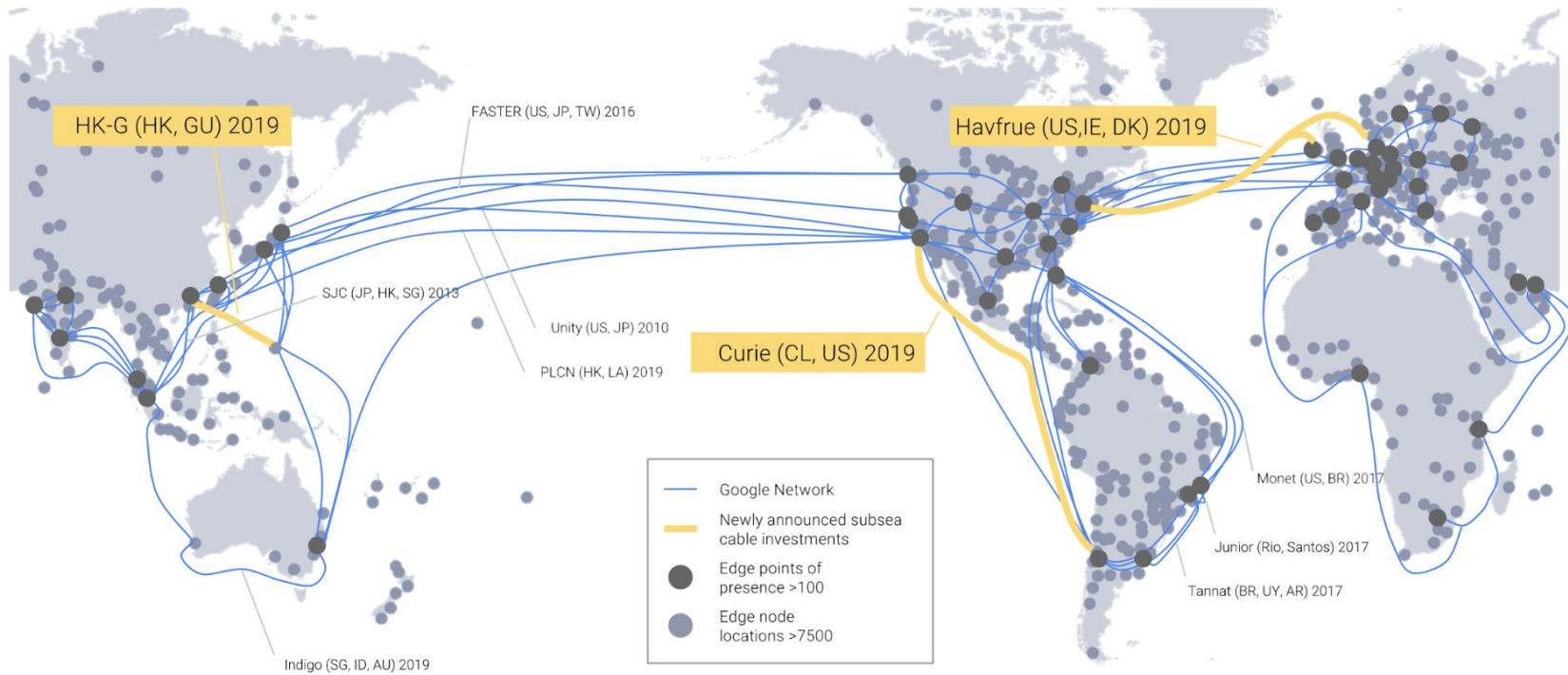
Pay-as-Go Model



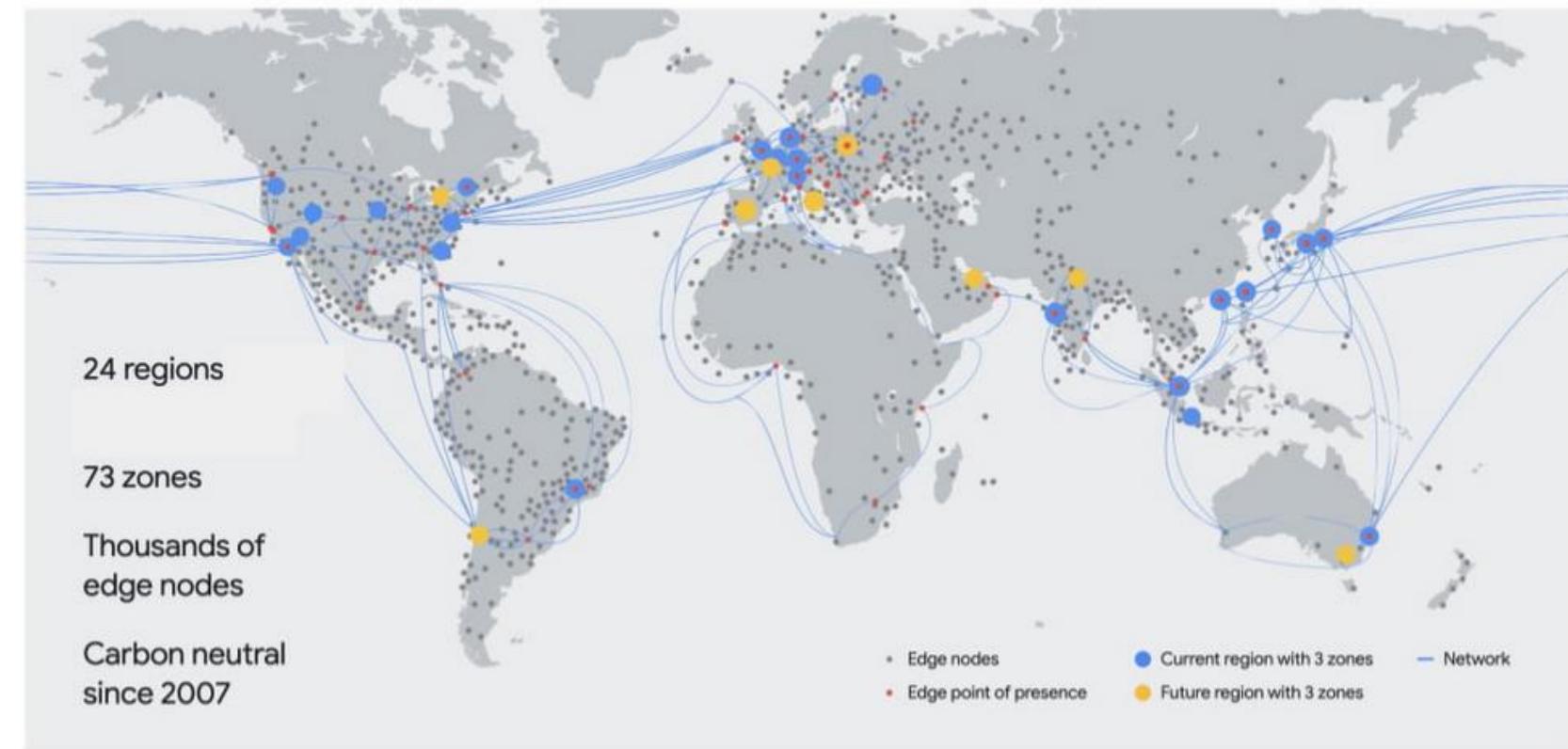
Understanding GCP's Global Infrastructure

Google Network

The largest cloud network, comprised of more than 100 points of presence

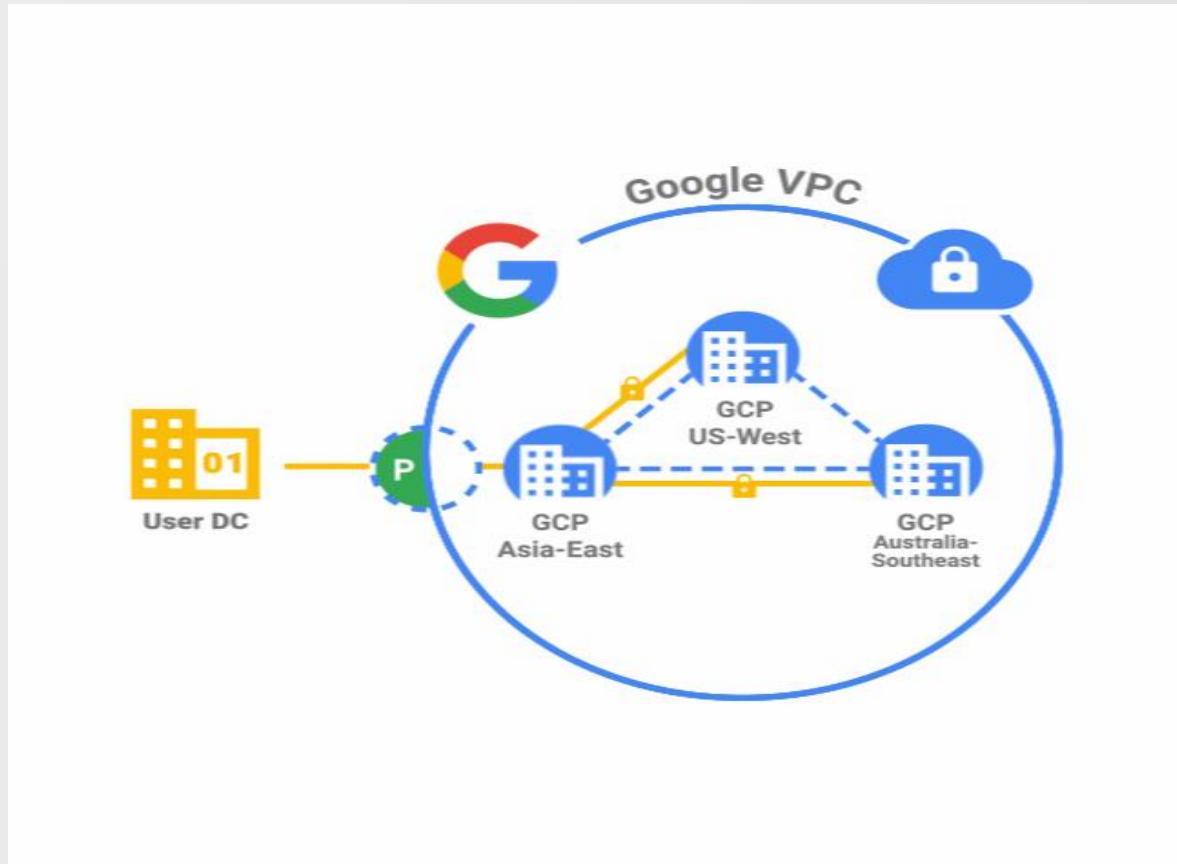


Points of Presence (Edge Network)



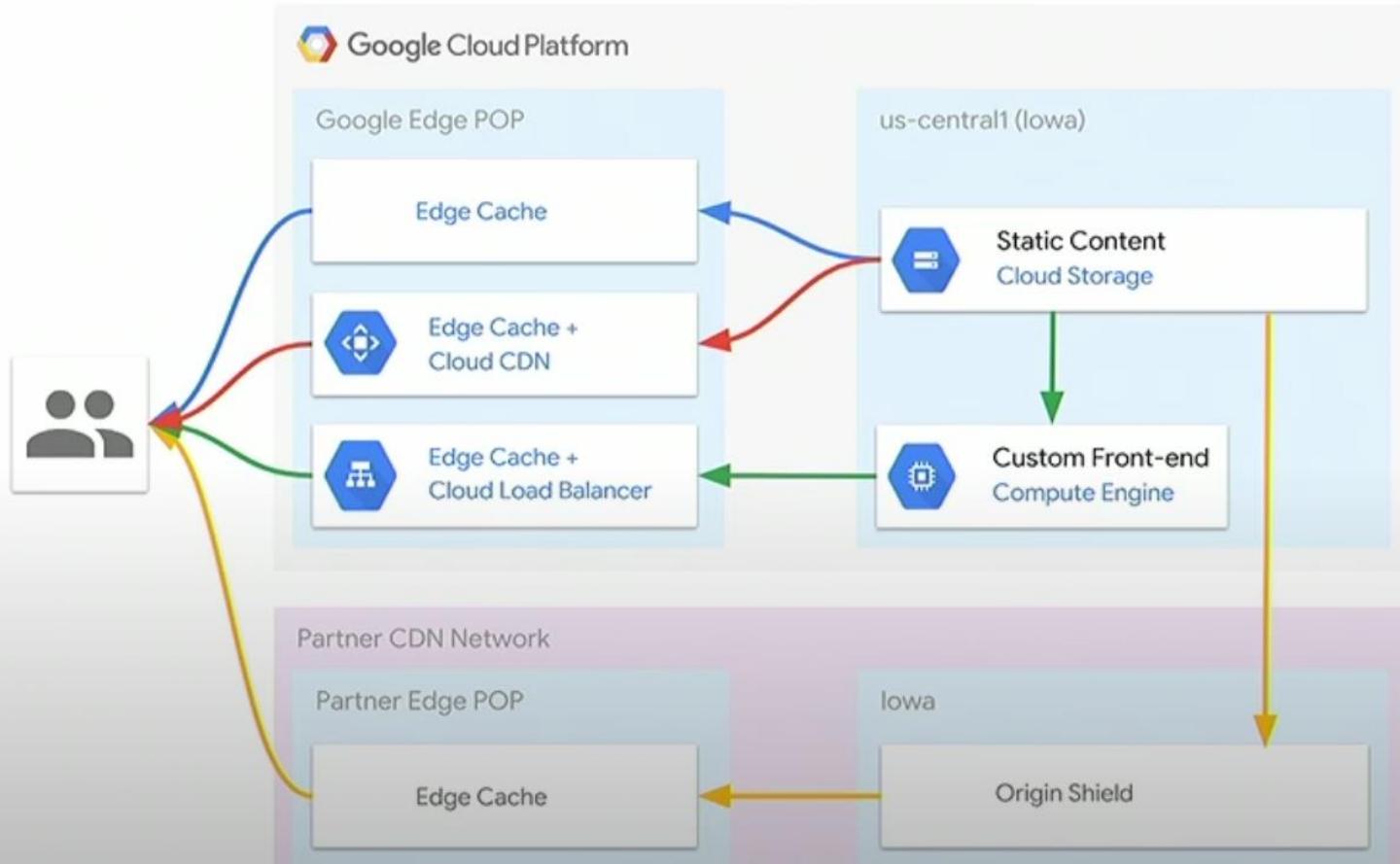
Source: <https://cloud.google.com/blog/products/networking/understanding-google-cloud-network-edge-points>

GCP's Interconnectivity



Source: <https://cloudplatform.googleblog.com/2018/06/Partner-Interconnect-now-generally-available.html>

GCP's Edge Caches



Source: <https://stackoverflow.com/questions/39802631/is-google-cloud-storage-an-automagical-global-cdn>

Global Load Balancing



In Conclusion

Deploy applications and services

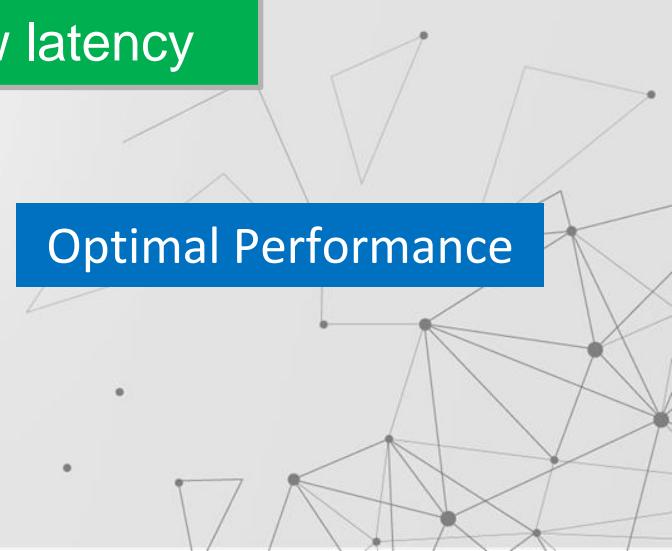
Replicate data for Disaster Recovery

Deliver content with low latency

High Availability

Reliability

Optimal Performance



Setting up a GCP Account



Getting started with GCP Console and Cloud Shell





Google Cloud Compute Services

Introduction to Compute Engine

Creating and Managing Virtual Machine Instances

Introduction to Kubernetes Engine

Introduction to App Engine

Introduction to Cloud Functions

Introduction to Compute Engine

Compute Engine is an Infrastructure as a Service (IaaS) offering that allows users to create and manage virtual machines (VMs) in the cloud. Compute Engine provides scalable and flexible computing resources, enabling users to run their applications and workloads efficiently.



**Google
Compute
Engine**



Virtual Machine Instances

A virtual machine is the virtualization or emulation of a computer system. Virtual machines are based on computer architectures and provide the functionality of a physical computer.

Google Cloud My First Project Search (/) for resources, docs, products, and more Search

Create an instance EQUIVALENT CODE HELP ASSISTANT

To create a VM instance, select one of the options:

- New VM instance
Create a single VM instance from scratch
- New VM instance from template
Create a single VM instance from an existing template
- New VM instance from machine image
Create a single VM instance from an existing machine image
- Marketplace
Deploy a ready-to-go solution onto a VM instance

Name * instance-2

Labels [+ ADD LABELS](#)

Region * us-central1 (Iowa) Zone * us-central1-a

Machine configuration

General purpose Compute optimized Memory optimized GPUs

Machine types for common workloads, optimized for cost and flexibility

Series E2

CPU platform selection based on availability

Machine type

Choose a machine type with preset amounts of vCPUs and memory that suit most workloads. Or, you can create a custom machine for your workload's particular needs. [Learn](#)

Pricing summary

Monthly estimate **\$25.46**
That's about \$0.03 hourly

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

Item	Monthly estimate
2 vCPU + 4 GB memory	\$24.46
10 GB balanced persistent disk	\$1.00
Total	\$25.46

[Compute Engine pricing](#)

[LESS](#)

CREATE CANCEL EQUIVALENT CODE

Preemptible Instances

[← Create an instance](#)

To create a VM instance, select one of the options:

- New VM instance**
Create a single VM instance from scratch
- New VM instance from template**
Create a single VM instance from an existing template
- New VM instance from machine image**
Create a single VM instance from an existing machine image
- Marketplace**
Deploy a ready-to-go solution onto a VM instance

Metadata
You can set custom metadata for an instance or project outside of the server-defined metadata. This is useful for passing in arbitrary values to your project or instance that can be queried by your code on the instance. [Learn more](#)

[+ ADD ITEM](#)

Availability policies

VM provisioning model

- Standard**
Ideal for most workloads
- Spot**
Ideal for fault-tolerant workloads

On VM termination

Stop

Choose what happens to your VM when it's preempted or reaches its time limit

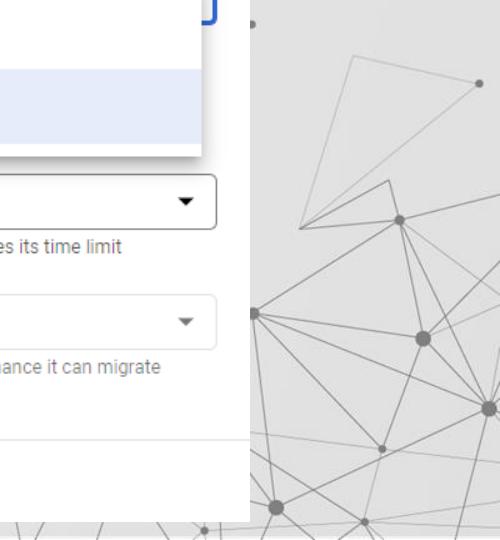
On host maintenance

Terminate VM instance

When Compute Engine performs periodic infrastructure maintenance it can migrate your VM instances to other hardware without downtime

Automatic restart

CREATE **CANCEL** **EQUIVALENT CODE**



Persistent Disks



Create a disk

Single zone

Regional

Create a failover replica in the same region for high availability. Storage and data replication is provided between both zones. [Learn more](#)

Region *

us-central1 (Iowa)

Zone *

us-central1-a

Source

Create a blank disk, apply a bootable disk image, or restore a snapshot of another disk in this project.

Disk source type *

Blank disk

Disk settings

Disk type *

Balanced persistent disk

[COMPARE DISK TYPES](#)

Size *

100

GB

ID

CREATE

CANCEL

EQUIVALENT COMMAND LINE

Images and Snapshots



Create an image



Images

[+] CREATE IMAGE



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IMAGES

IMAGE IMPORT HISTORY



Enter property name or value

Status	Name	Last modified	Action
<input type="checkbox"/>	c0-deeplearning-common-cpu-v20230501-debian-10	a few hours ago	
<input type="checkbox"/>	c0-deeplearning-common-cpu-v20230501-debian-10-py37	a few hours ago	
<input type="checkbox"/>	c0-deeplearning-common-cu113-v20230501-debian-10	a few hours ago	
<input type="checkbox"/>	c0-deeplearning-common-cu113-v20230501-debian-10-py37	a few hours ago	
<input type="checkbox"/>	c1-deeplearning-tf-1.15-cu110-v20221107-debian-10	a few hours ago	

Name *

image-1



Name is permanent

Source *

Disk



Source disk *



Location

 Multi-regional Regional

Select location

Family



Description

CREATE

CANCEL

EQUIVALENT COMMAND LINE

INFO PANEL

LEARN

Selected images



Actions





Create a snapshot

.

Snapshots are backups of persistent disks. They're commonly used to recover, transfer, or make data accessible to other resources in your project. [Learn more](#)



Name *

snapshot-2

Name is permanent



Description



Source disk *



Type



Snapshot

Best for long-term backup and disaster recovery

.

Archive snapshot

Best for cost-efficient data retention



Location



There may be a network transfer fee if you choose to store this snapshot in a location different



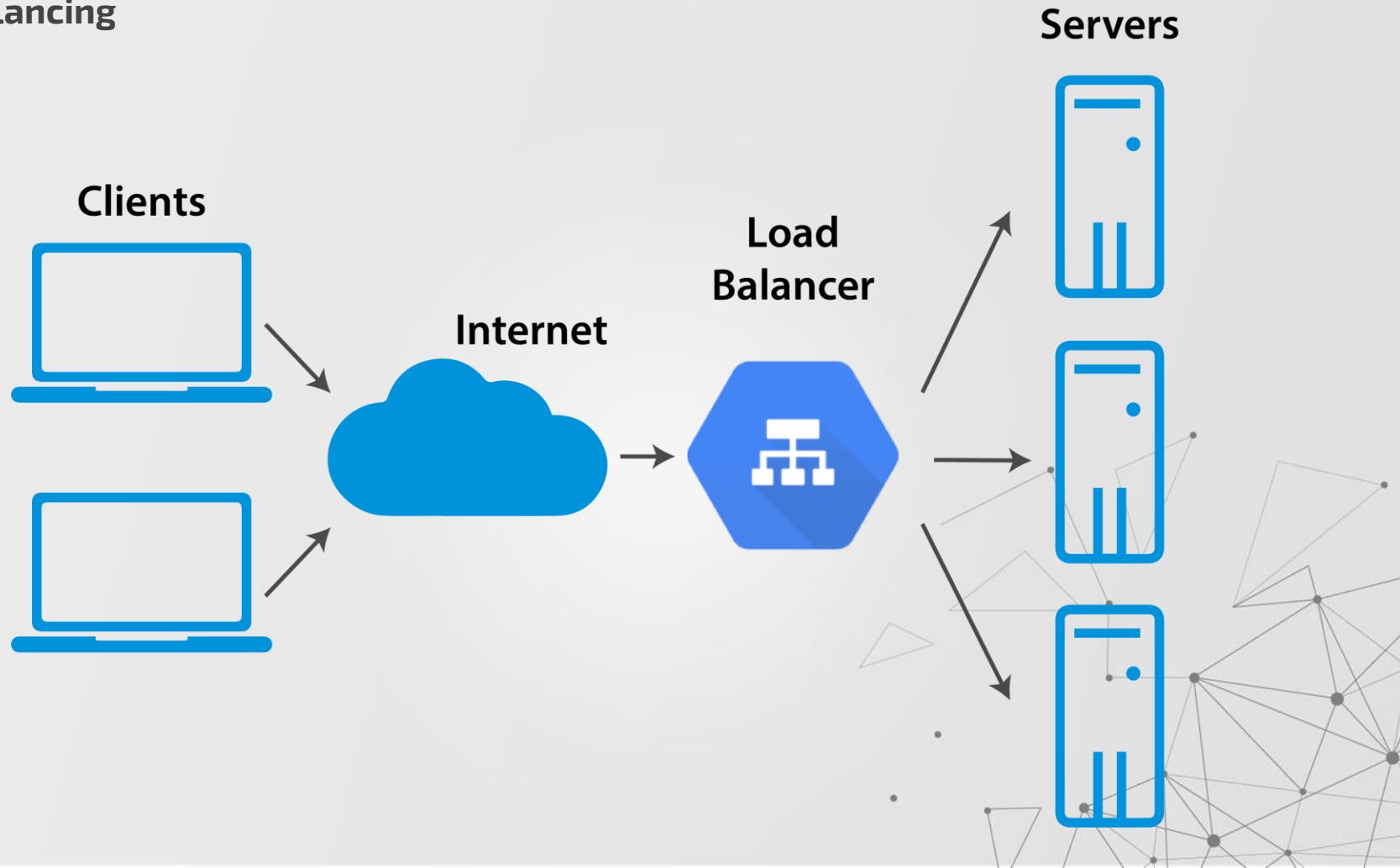
CREATE

CANCEL

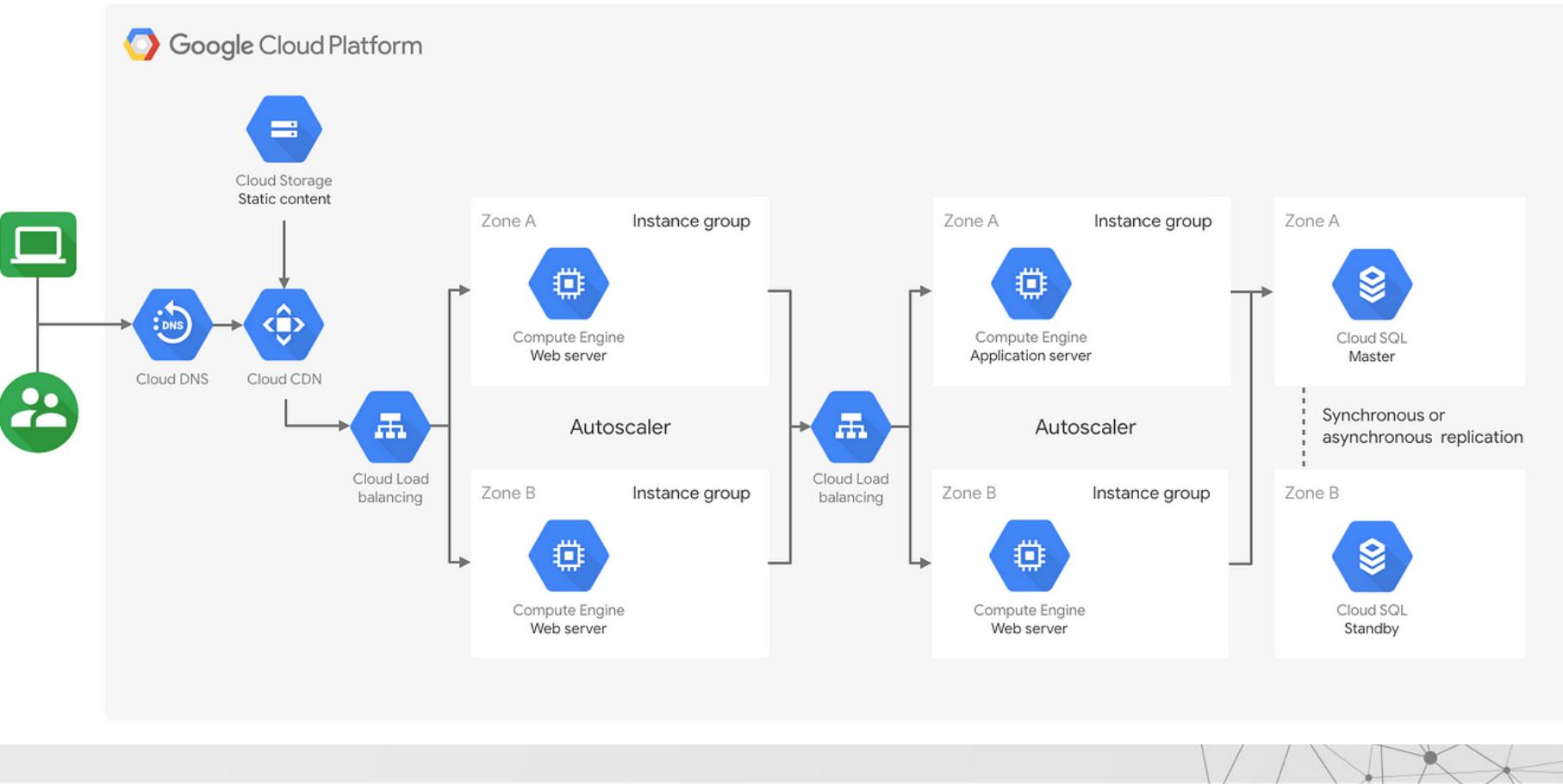
EQUIVALENT COMMAND LINE



Load Balancing



Autoscaling

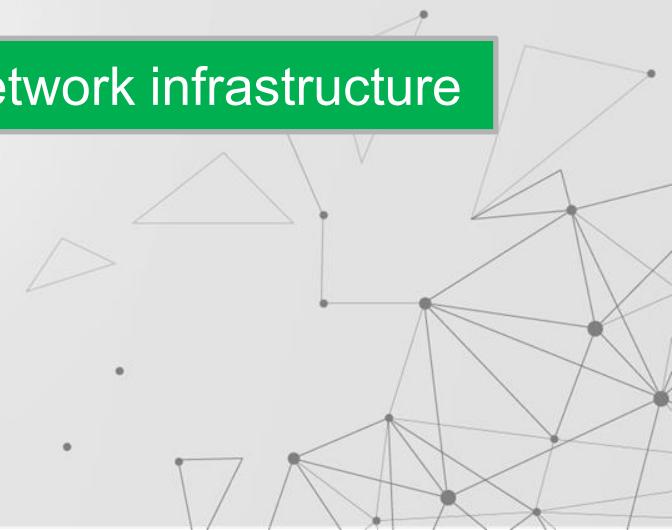


In Conclusion

Flexibility, Scalability and Reliability

Provision and Manage VMs

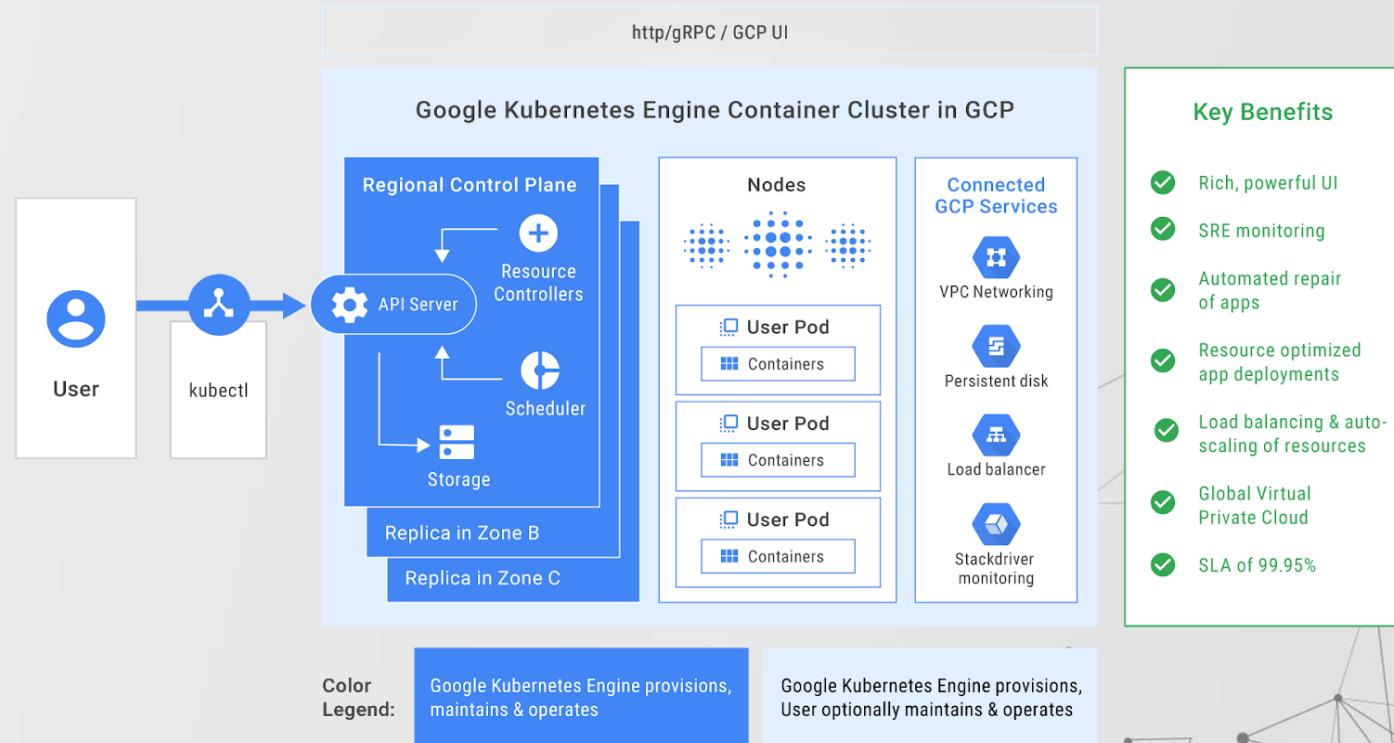
Access to Google's Global network infrastructure

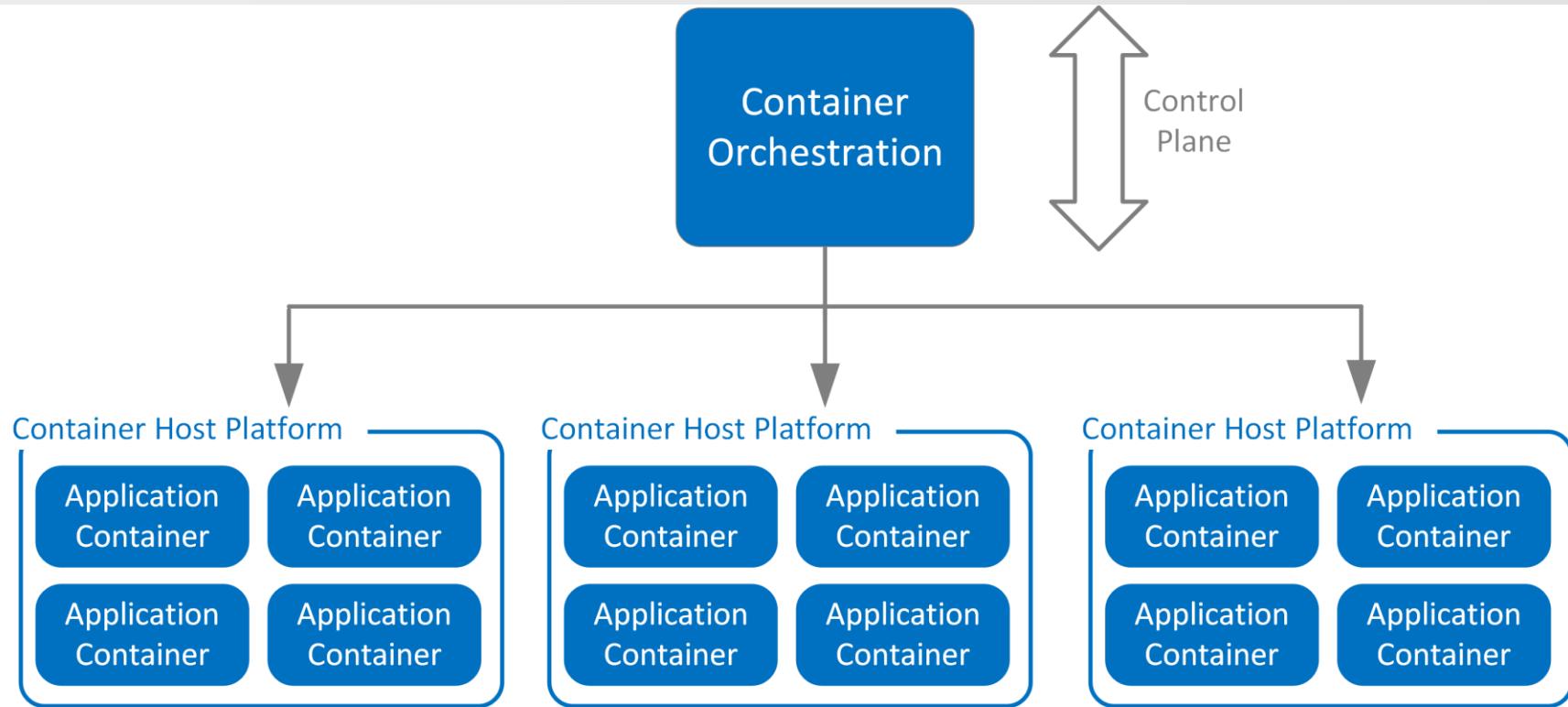


Google Kubernetes Engine (GKE)

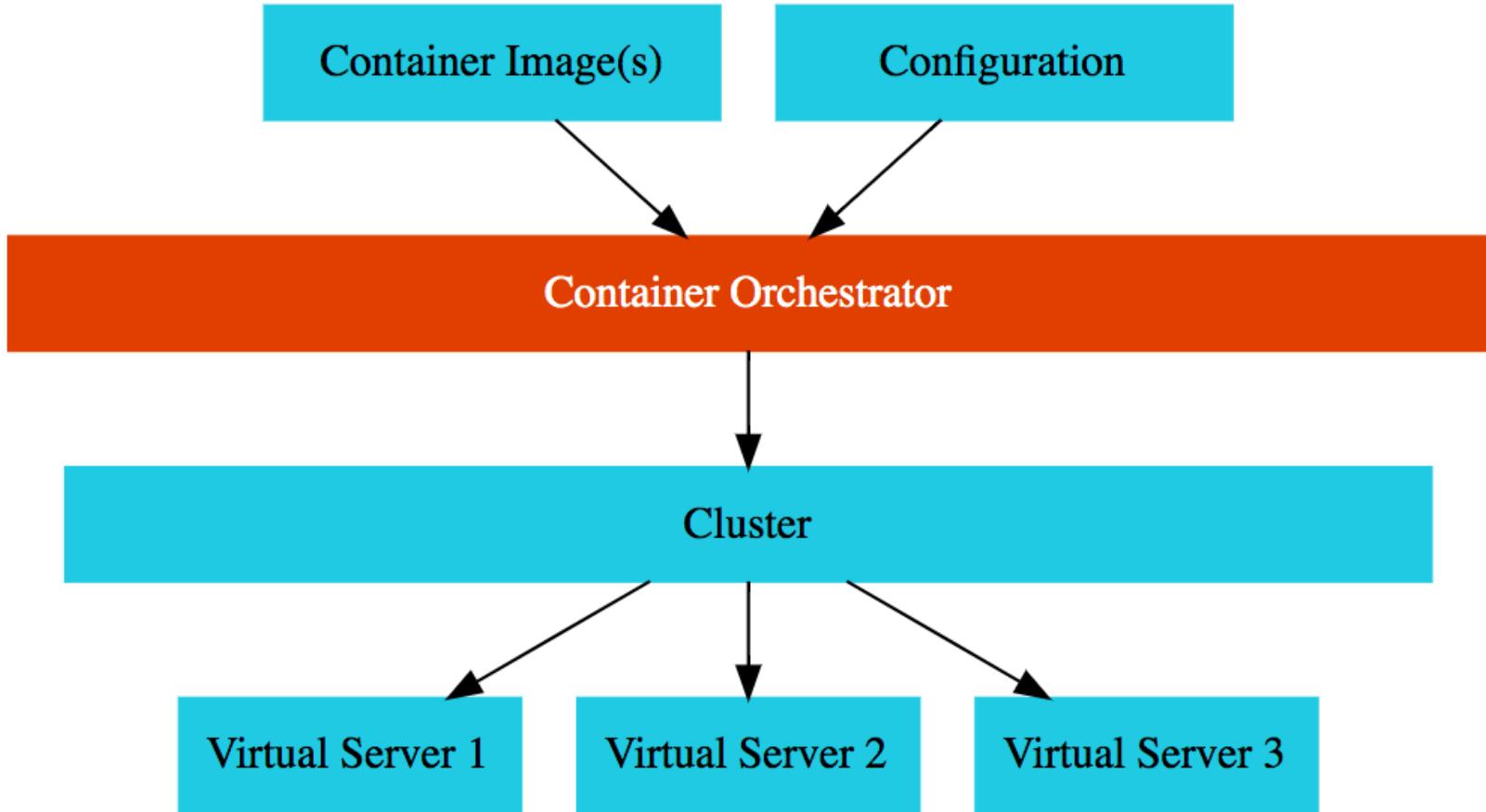
"GKE is a Google-managed implementation of the Kubernetes open source container orchestration platform."

-Google Cloud Documentation



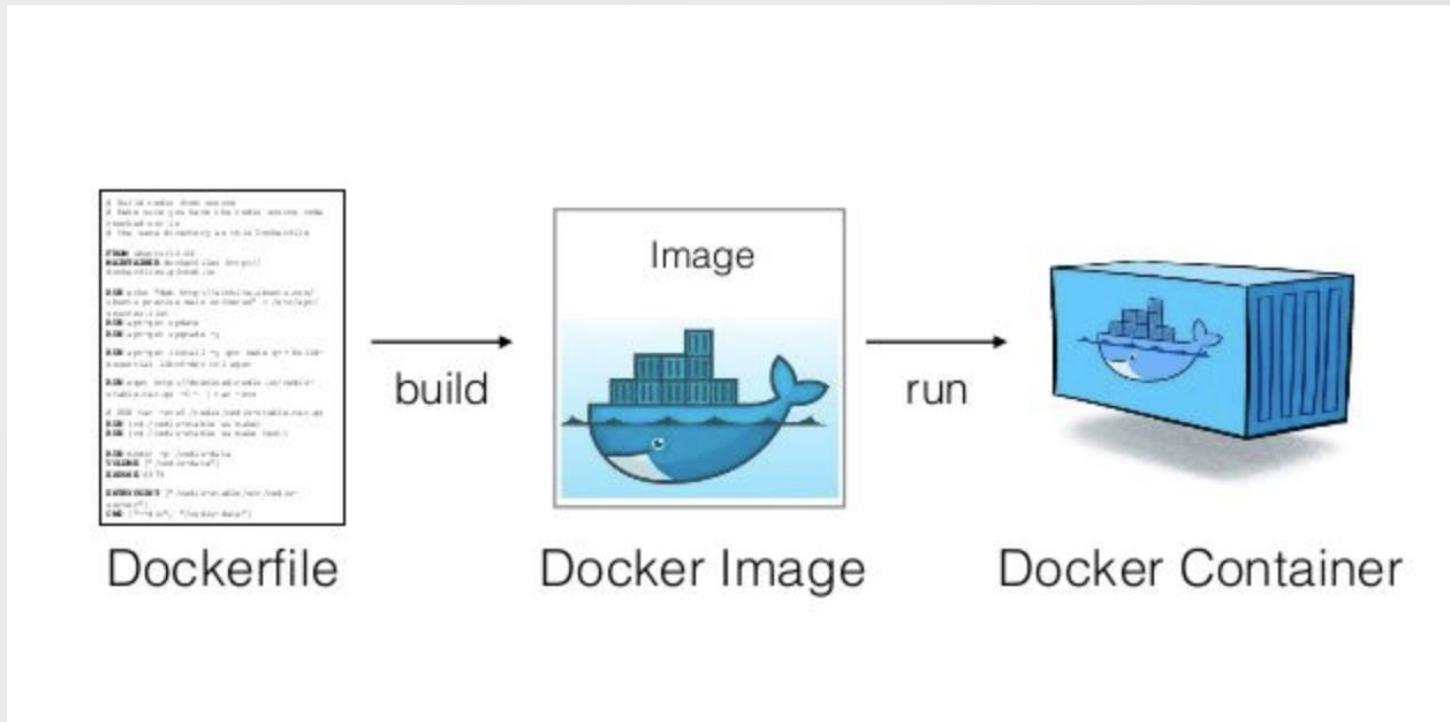






Containers

Containers are lightweight, standalone executable software packages that encapsulate all the components an application needs to run: code, runtime, system libraries, and system settings. Containers are isolated from each other and from the host system. This ensures that the application runs consistently across different computing environments.



Use Cases for GKE

- ✓ Robotics
- ✓ Financial services
- ✓ Gaming
- ✓ Retail
- ✓ Healthcare
- ✓ Education

Google

CapitalOne

The New York Times

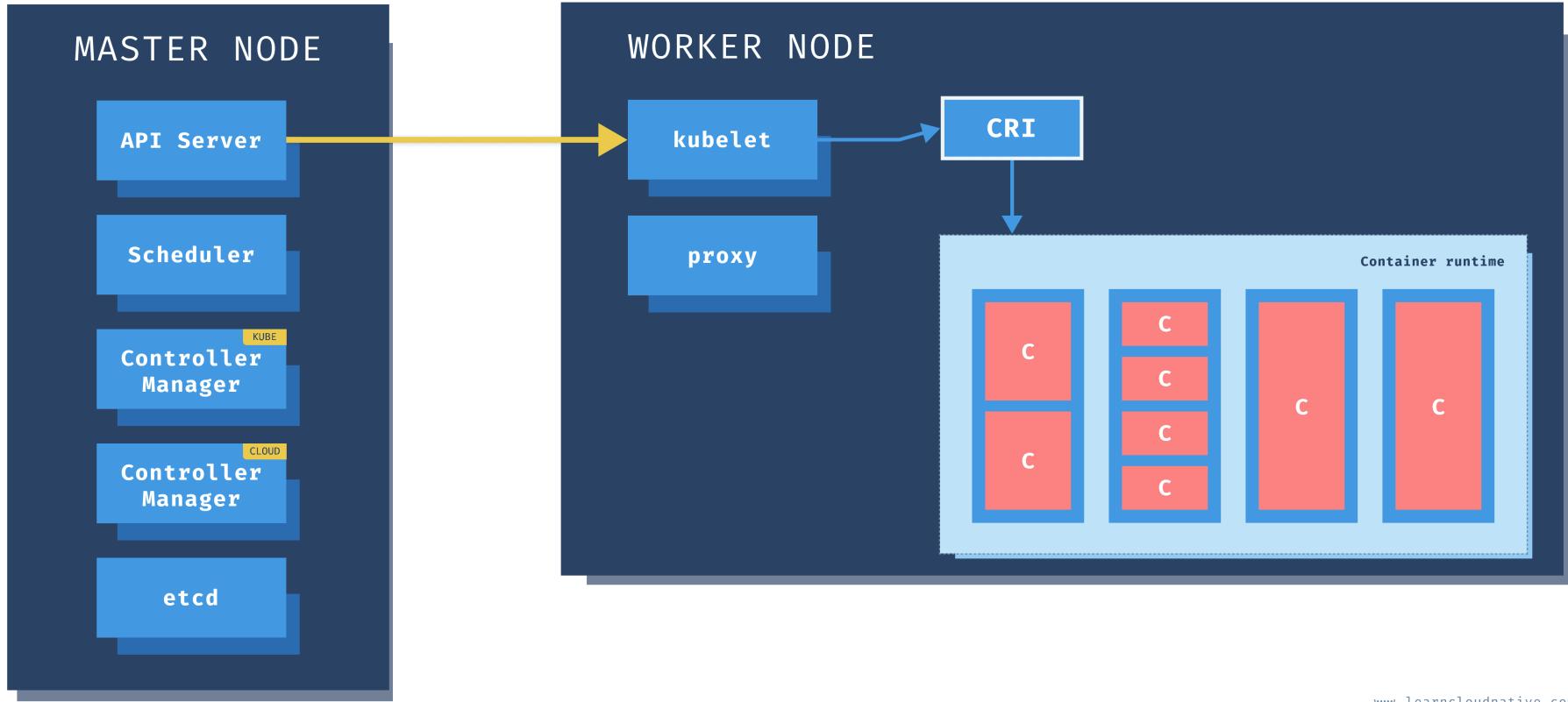


Spotify®

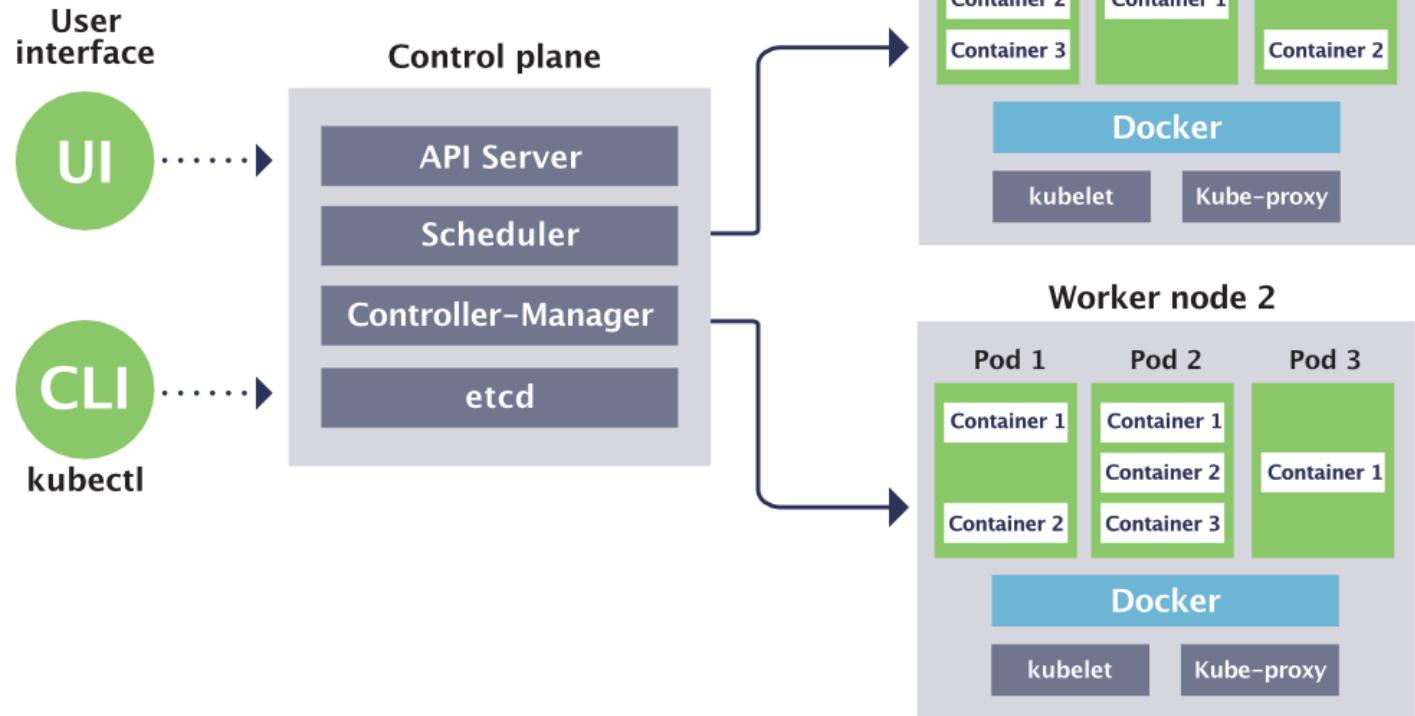
tinder



How GKE Works



Kubernetes architecture



Autopilot Clusters

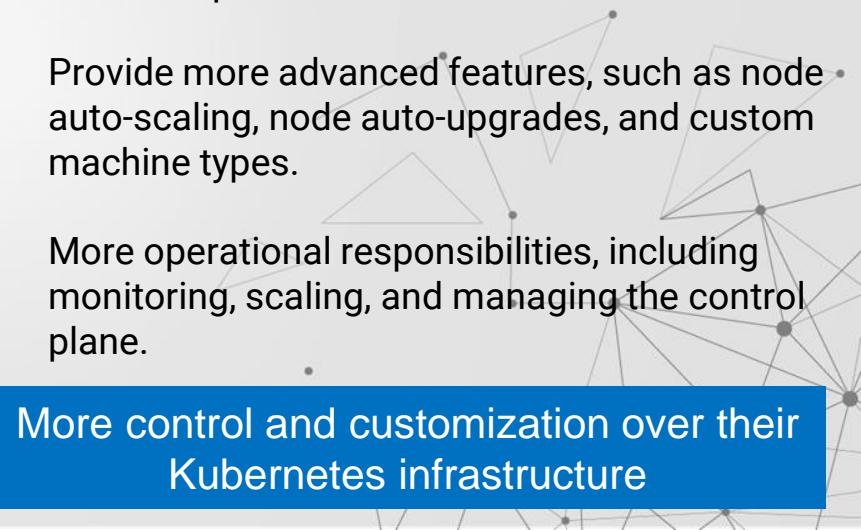
- GCP takes care of managing and scaling the control plane, including the master nodes, etcd storage, and cluster upgrades.
- Cluster scaling, node upgrades, and health monitoring, reducing the operational overhead for the user.
- The cluster automatically provisions and scales nodes.
- Automatically adjust the number of nodes based on workload demand.

Simplified, fully managed experience with automatic scaling and upgrades

Standard Clusters

- More flexibility and control over the Kubernetes infrastructure.
- More control over the management of the control plane, including upgrades, patching, and customization options.
- Allocate specific resources or isolate workloads.
- Provide more advanced features, such as node auto-scaling, node auto-upgrades, and custom machine types.
- More operational responsibilities, including monitoring, scaling, and managing the control plane.

More control and customization over their Kubernetes infrastructure



Introduction to App Engine

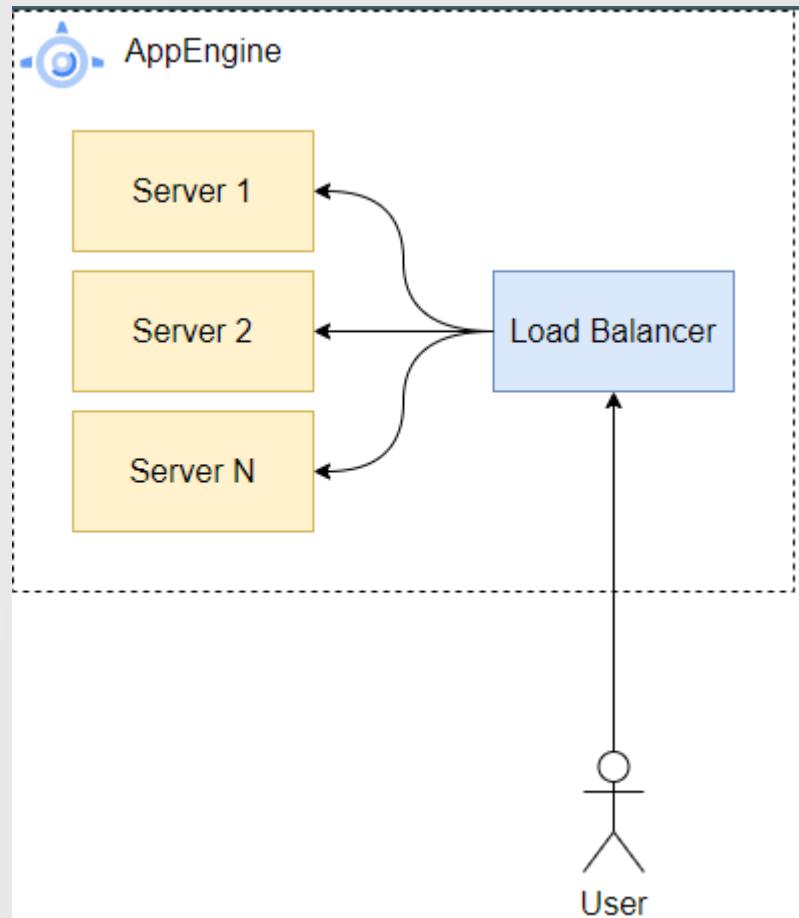
App Engine is a Platform as a Service (PaaS) offering provided by Google Cloud Platform. It allows developers to build and deploy scalable web applications and services without worrying about infrastructure management. App Engine handles the underlying infrastructure, auto-scaling, and load balancing, allowing developers to focus on writing code and delivering applications.



App Engine

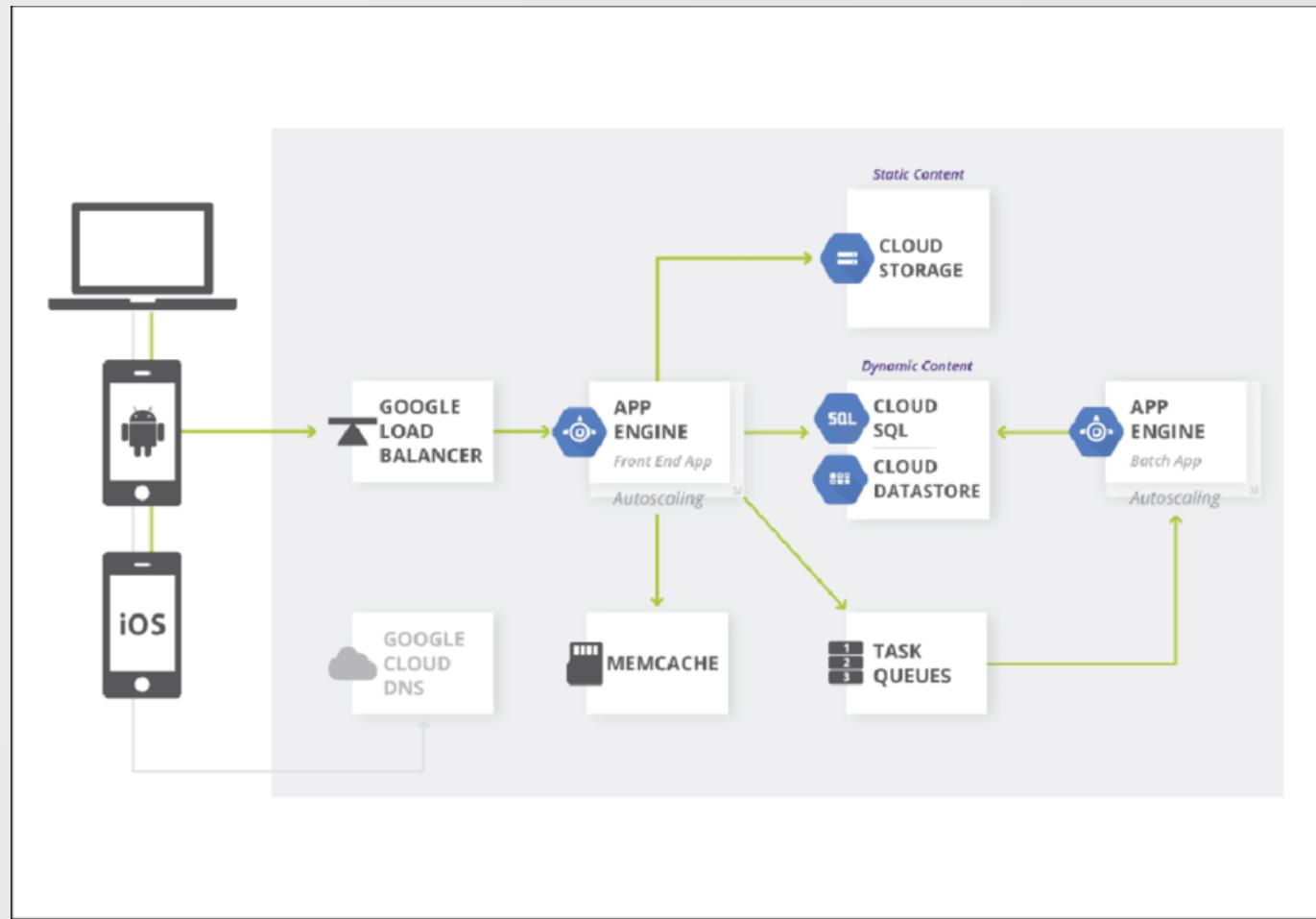


Autoscaling



Source: <https://www.sohamkamani.com/cloud/appengine-scaling/>

Data Storage



Introduction to Cloud Functions

Cloud Functions is a serverless compute service. It allows you to write and deploy lightweight, event-driven functions that automatically execute in response to events from various GCP services or external triggers. Cloud Functions abstracts away the underlying infrastructure, so you can focus on writing code and building applications without managing servers or scaling concerns.



Features of Cloud Functions

Pay-per-Use Model

You are only billed for the time your functions are actively executing and the resources they consume.

Auto-scaling

Cloud Functions automatically scales the execution environment based on the incoming event rate. As the event load increases, additional instances of the function are created to handle the workload.

Integration with GCP Services

Cloud Functions seamlessly integrates with various GCP services, enabling you to build serverless applications that utilize other GCP resources.

Monitoring and Logging

Cloud Functions provides logging and monitoring tools that help you understand what is happening in your functions.



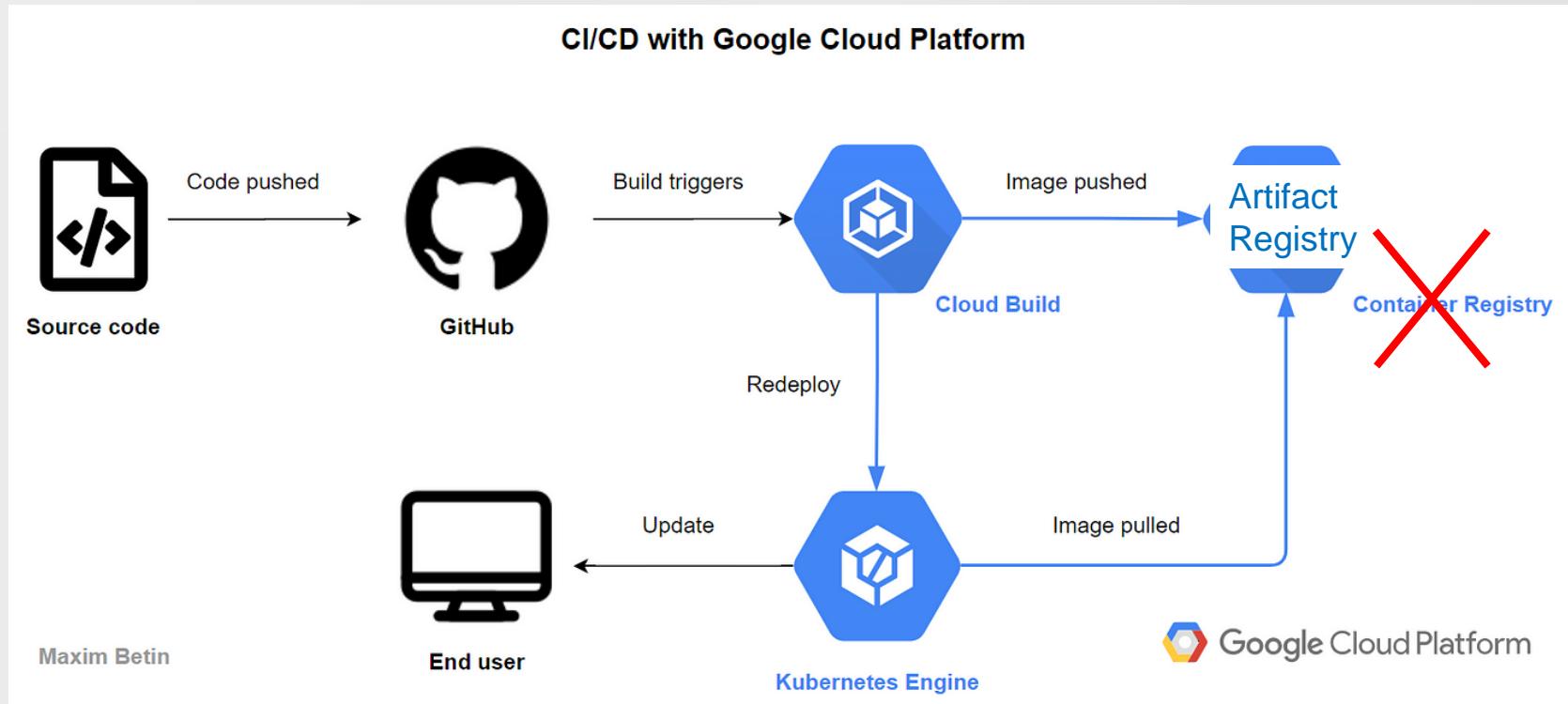


Developer Tools (CI/CD) in GCP

Introduction to Artifact Registry and Container Registry
Introduction to Cloud Build and Cloud Deploy
Introduction to Cloud Run

Continuous Integration and Continuous Delivery (CI/CD)

CI/CD stands for Continuous Integration and Continuous Delivery/Deployment. It's a software engineering practice where code changes are automatically built, tested, and prepared for a release to production. This approach allows software to be developed and delivered more frequently and reliably.



Introduction to Artifact Registry and Container Registry

Container Registry

Definition: GCR is a managed service that lets users store, manage, and secure Docker container images. It's fully integrated with popular continuous integration (CI) and continuous delivery (CD) systems, and it also works seamlessly with Google Kubernetes Engine (GKE).

Artifact Registry

Google Artifact Registry expands on the capabilities of GCR. It's a more comprehensive service that supports not only Docker container images but also other types of artifacts like Java packages (Maven), Node.js packages (npm), Python packages (PyPI), and more.





Feature	Container Registry	Artifact Registry
Granular IAM		✓
Regional repositories		✓
Multiple repositories per project		✓
Language packages support		✓
OS packages support		✓
CMEK support	✓	✓
VPC-SC support	✓	✓
Pub/Sub notifications	✓	✓
Built-in vulnerability scanning	✓	✓
Integration with Binary Authorization	✓	✓



Introduction to Cloud Build

Google Cloud Build is a fully managed continuous integration and continuous deployment (CI/CD) platform that lets developers build, test, and deploy applications in the cloud.





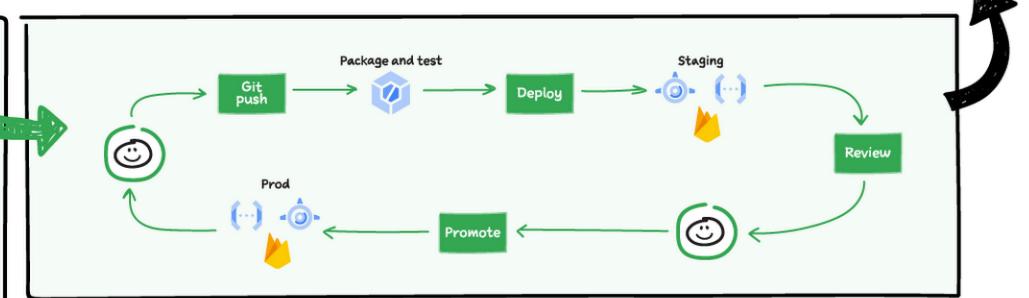
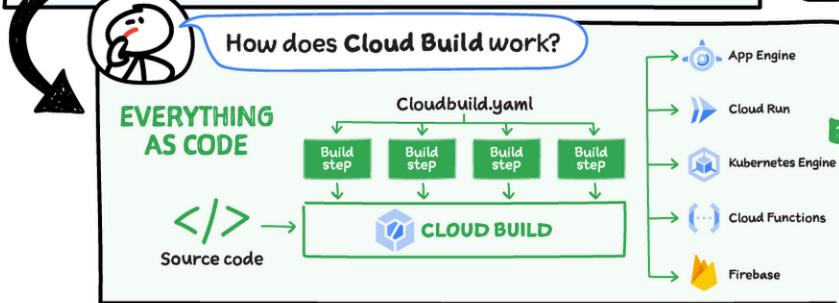
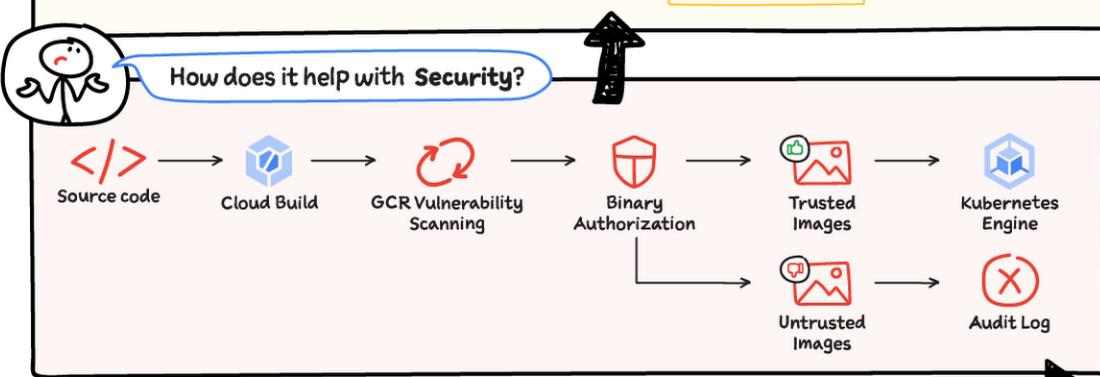
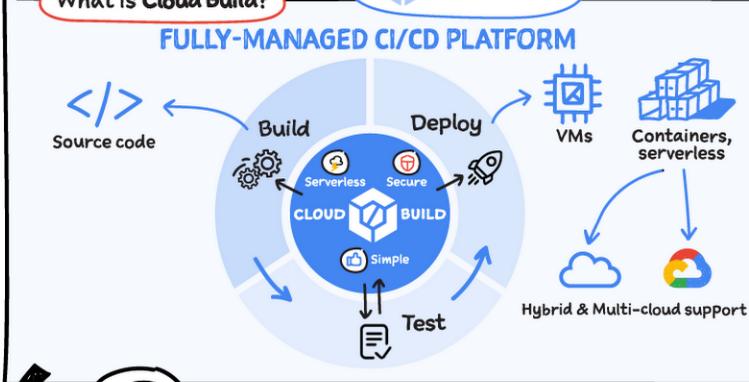
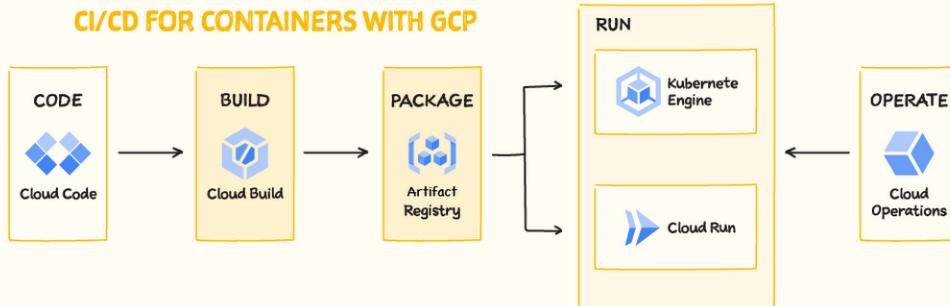
Cloud Build #GCPSketchnote

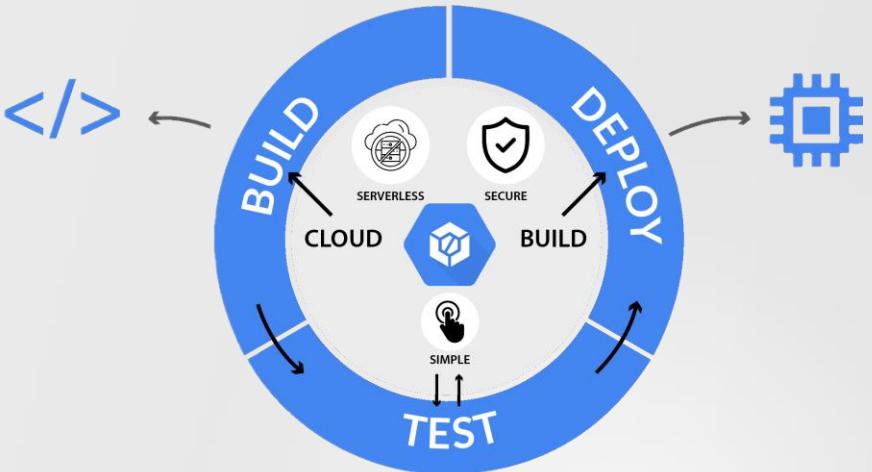
@PVERGADIA THECLOUDGIRL.DEV 11.6.2020



How do I create a cloud native CI/CD pipeline for containers?

CI/CD FOR CONTAINERS WITH GCP

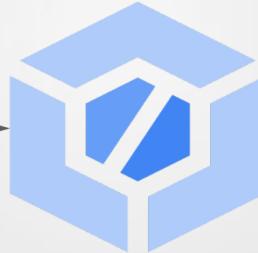




Commit & Push Code

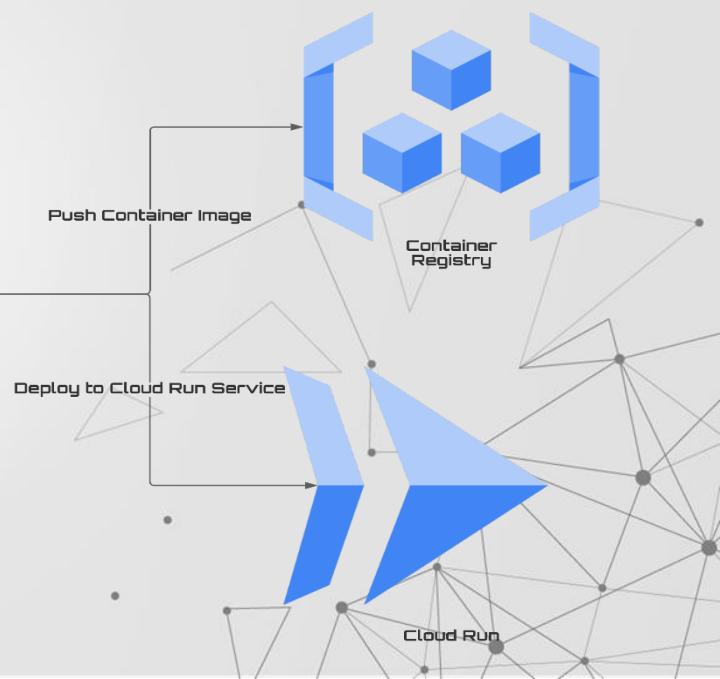


Cloud Source Repositories



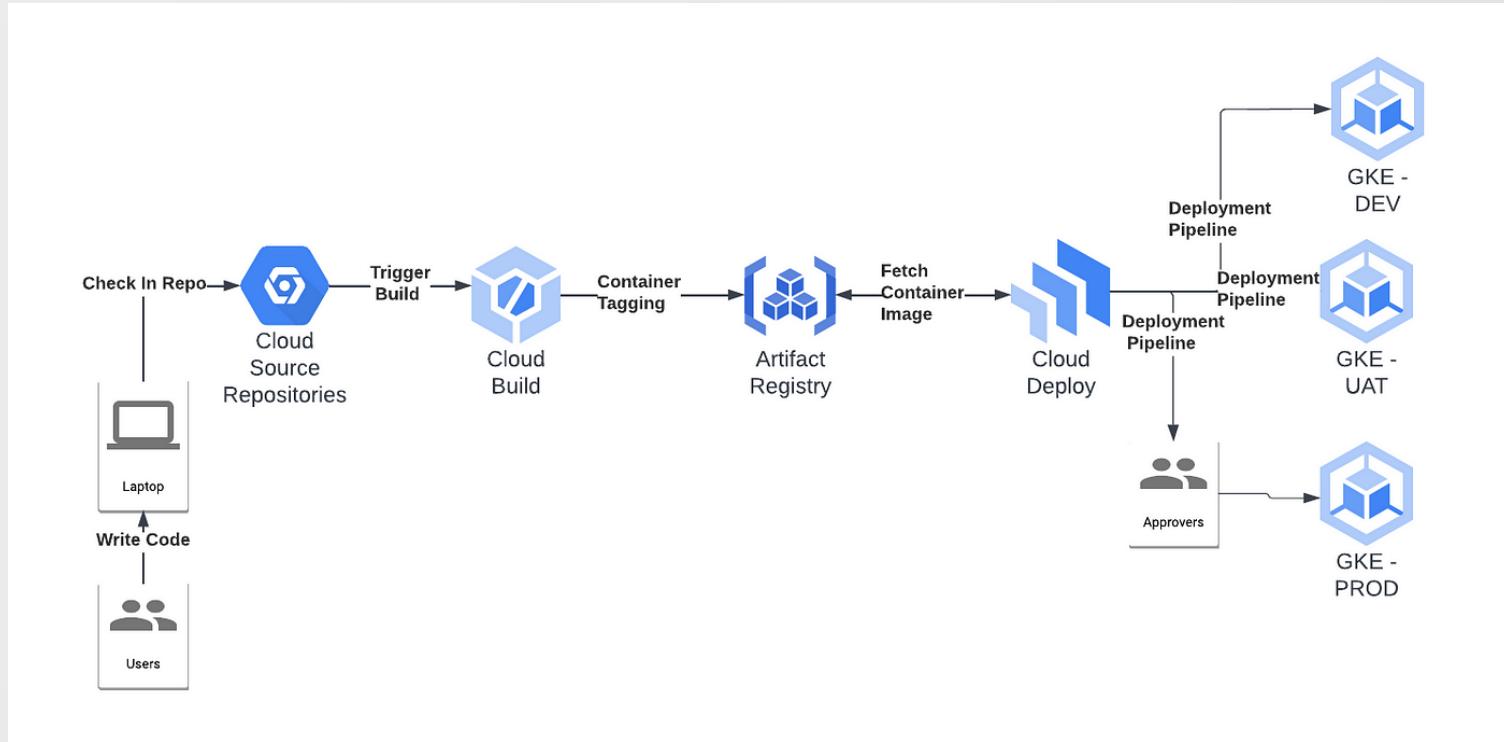
Cloud Build

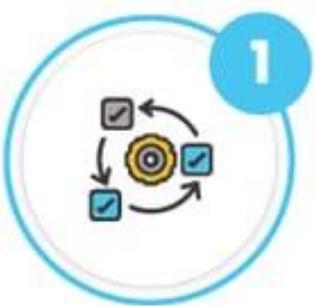
Trigger



Introduction to Cloud Deploy

Cloud Deploy is a service that lets you automate and manage the deployment of your built artifacts to environments like Google Kubernetes Engine (GKE) and Cloud Run.





Flexibility to scale quickly with business demand



Portability to run anywhere



High availability through self-healing



Cost optimization



Multi-cloud

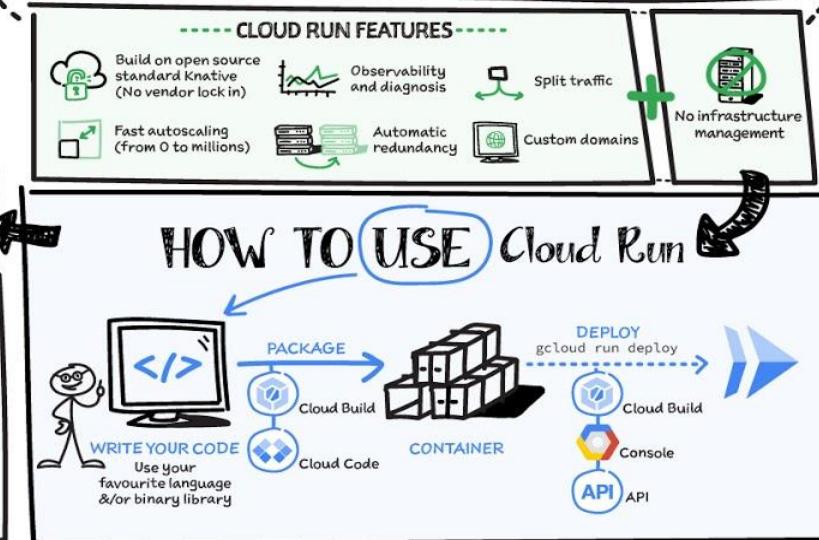
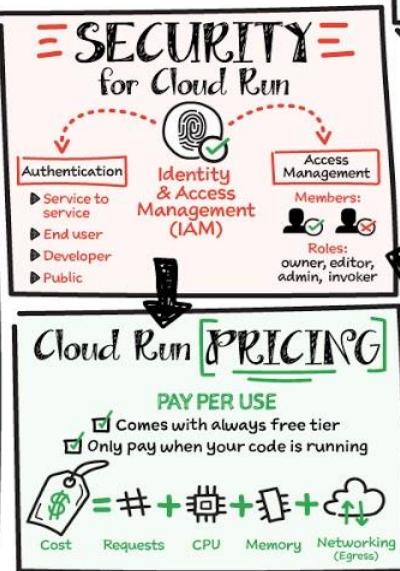
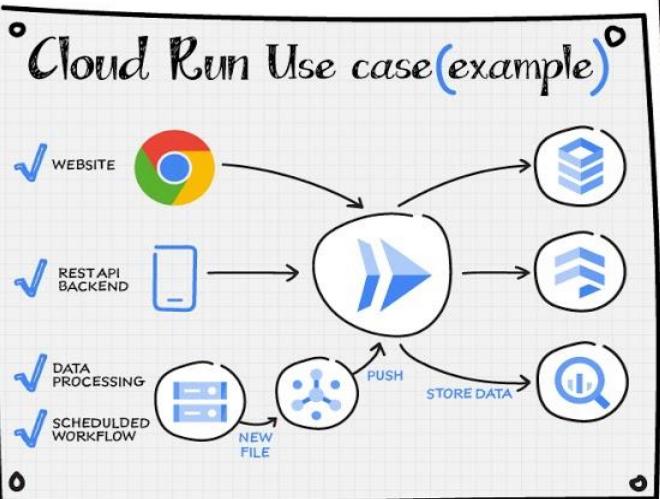
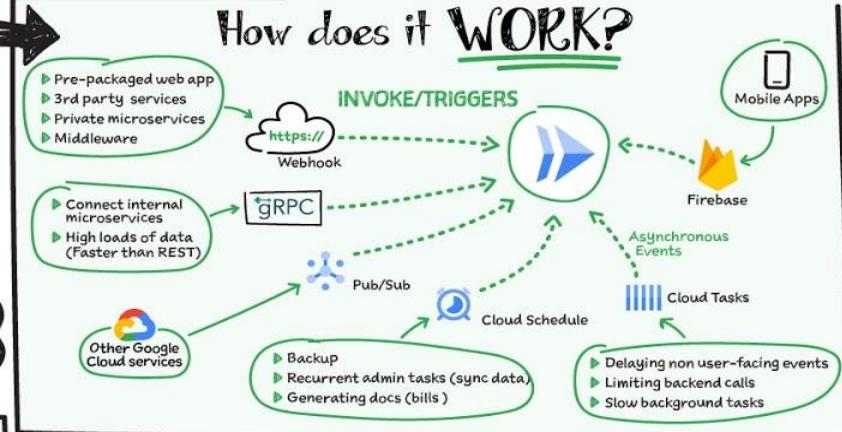
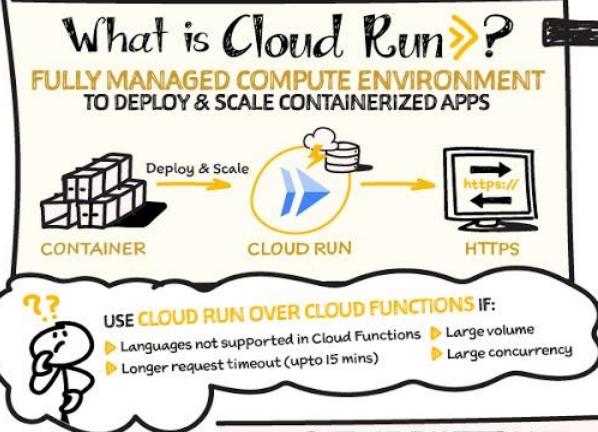
Introduction to Cloud Run

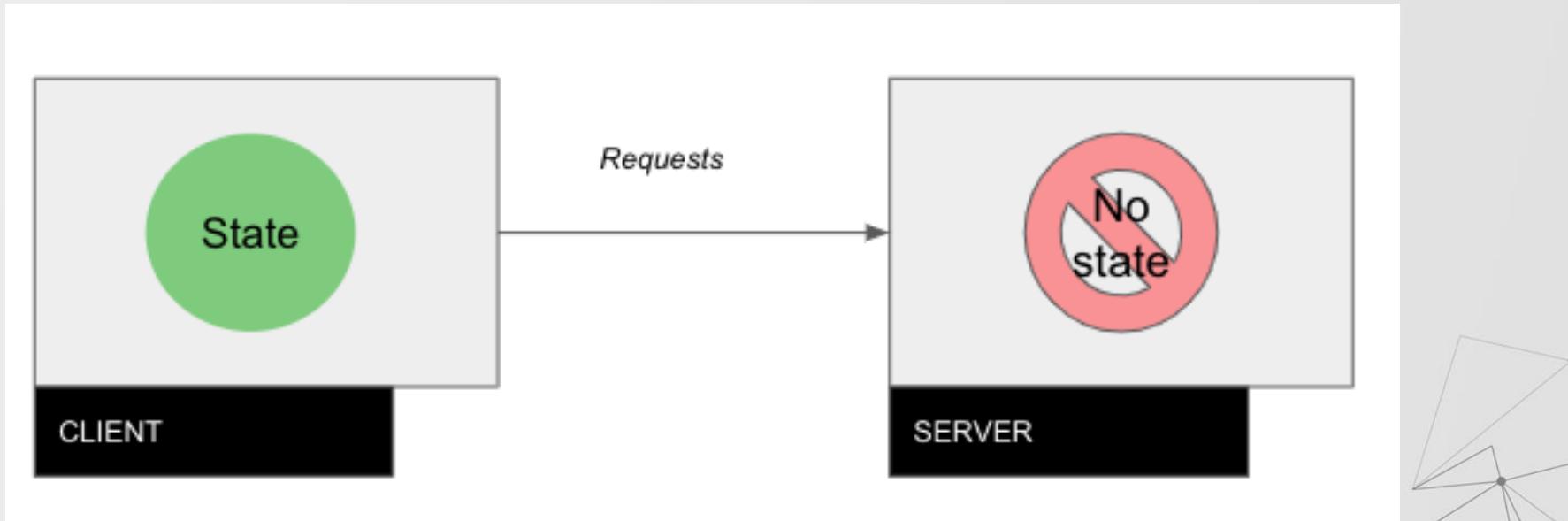
GCP Cloud Run is a managed compute platform that automatically scales stateless containers. It allows you to run your applications without worrying about server infrastructure.





Cloud Run



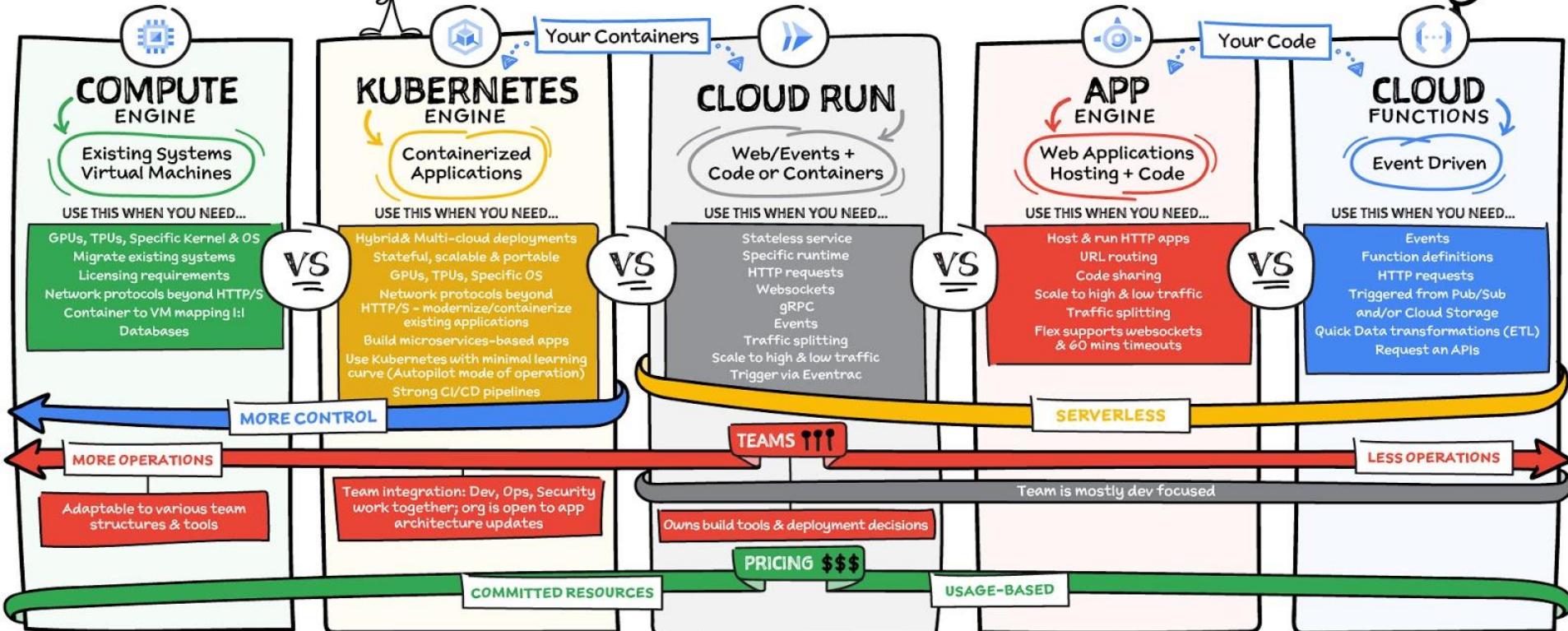




Where should I run my stuff? IT DEPENDS...



PRO TIP: YOU CAN USE THEM TOGETHER



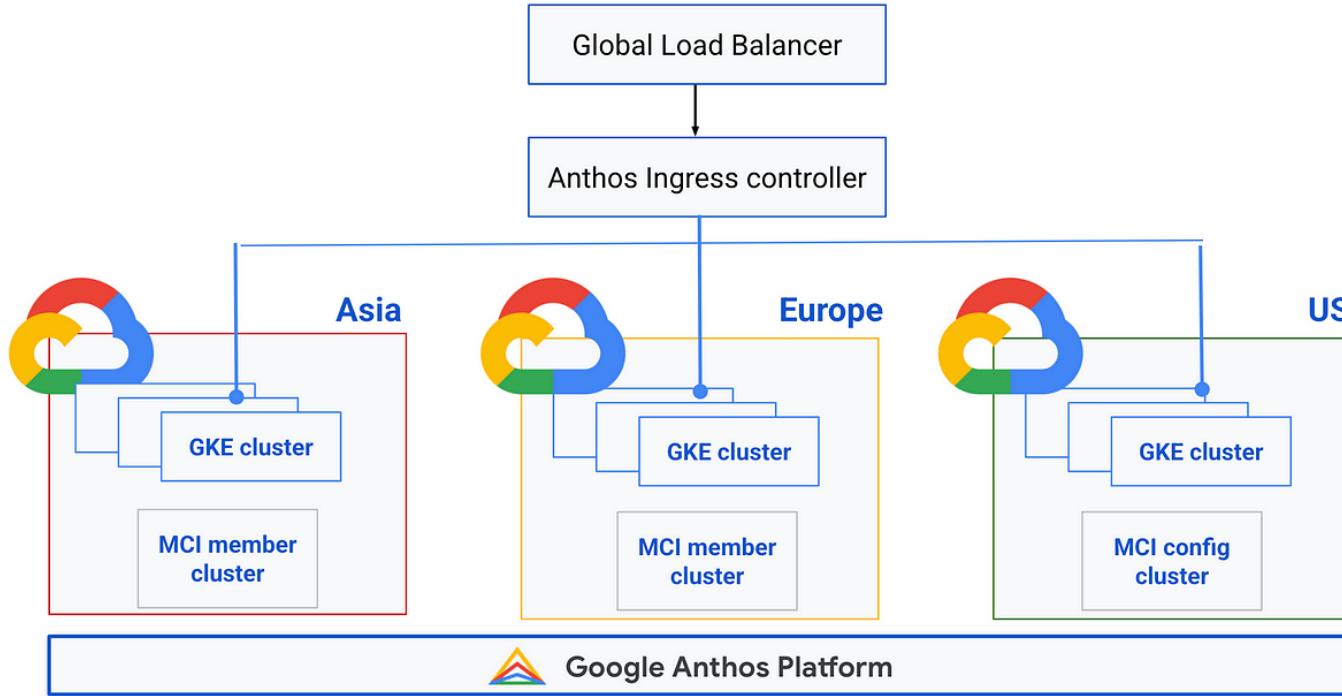


Introduction To Anthos

Introduction to Anthos
Working with Anthos

Introduction to Anthos

Samajik's Users

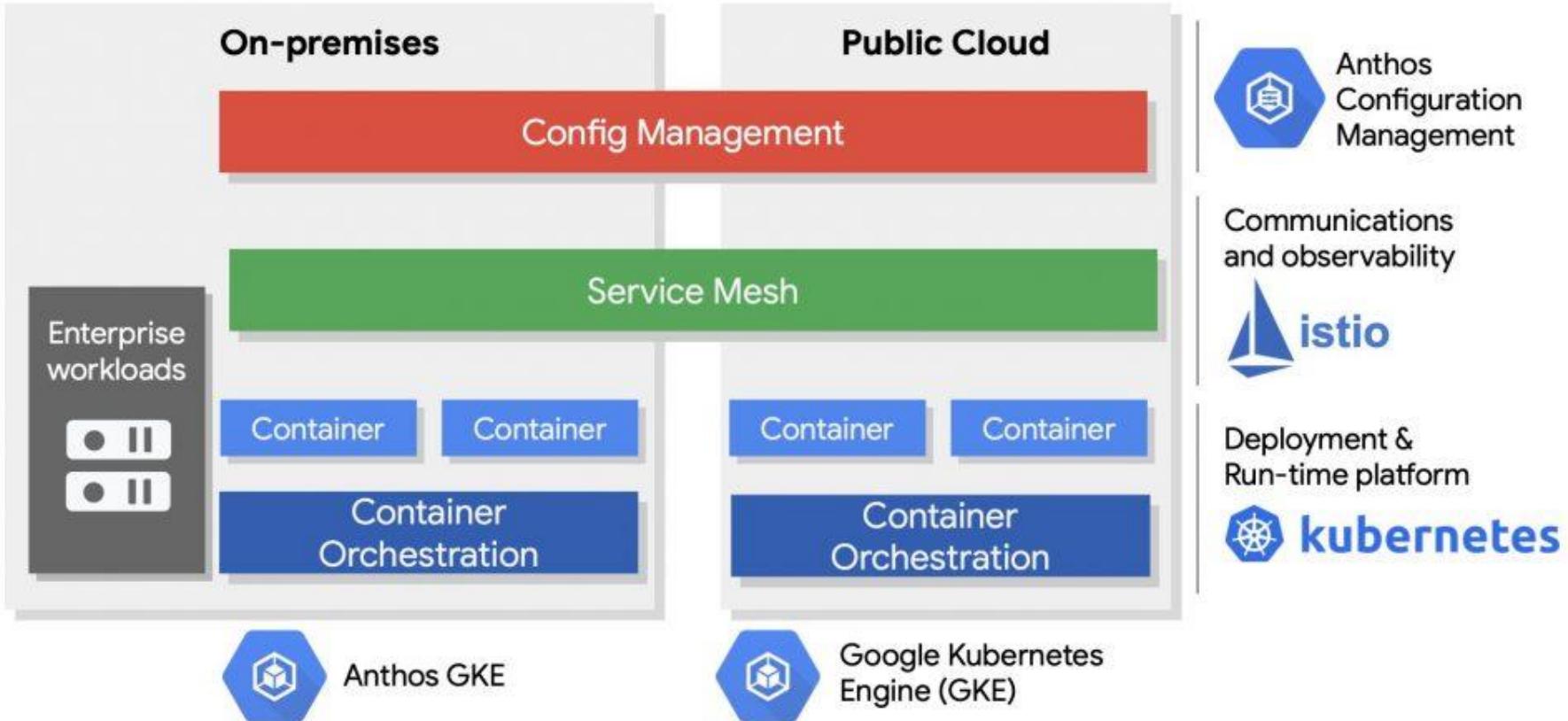


Anthos is an application management platform that provides a consistent development and operations experience for both on-premises and cloud environments. Its primary goal is to enable enterprises to build and manage modern hybrid applications across environments.



- Create a unified cloud operating model to create, update, and optimize container clusters wherever they are.
- Modernize applications and infrastructure in-place.
- Scale large multi-cluster applications as fleets - logical groupings of similar environments - with consistent security, configuration, and service management.
- Enforce consistent governance and security from a unified control plane.





Service Mesh

Advanced Features

Rajneesh Aggarwal

Service Mesh Federation

Common authentication & authorization

Traffic management across multiple admin domains

Supporting Migration scenarios

Encrypt Communication between Meshes

Canary Releases

Testing a small percentage of user traffic

Better Risk Management

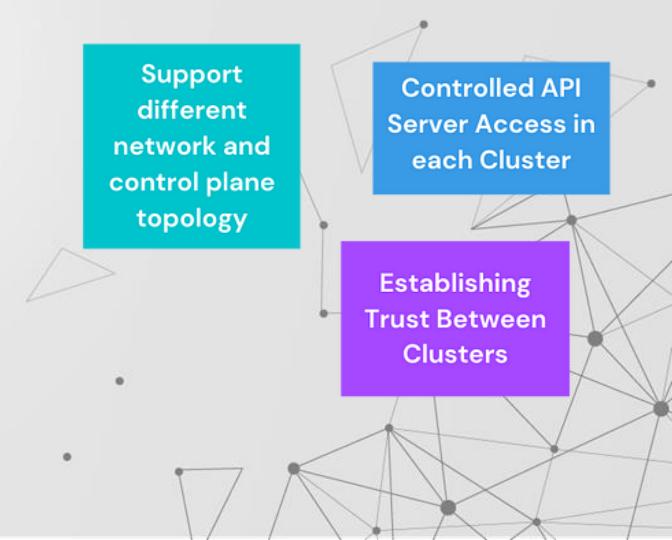
Gradual Incremental Deployment

Multi-Cluster Mesh

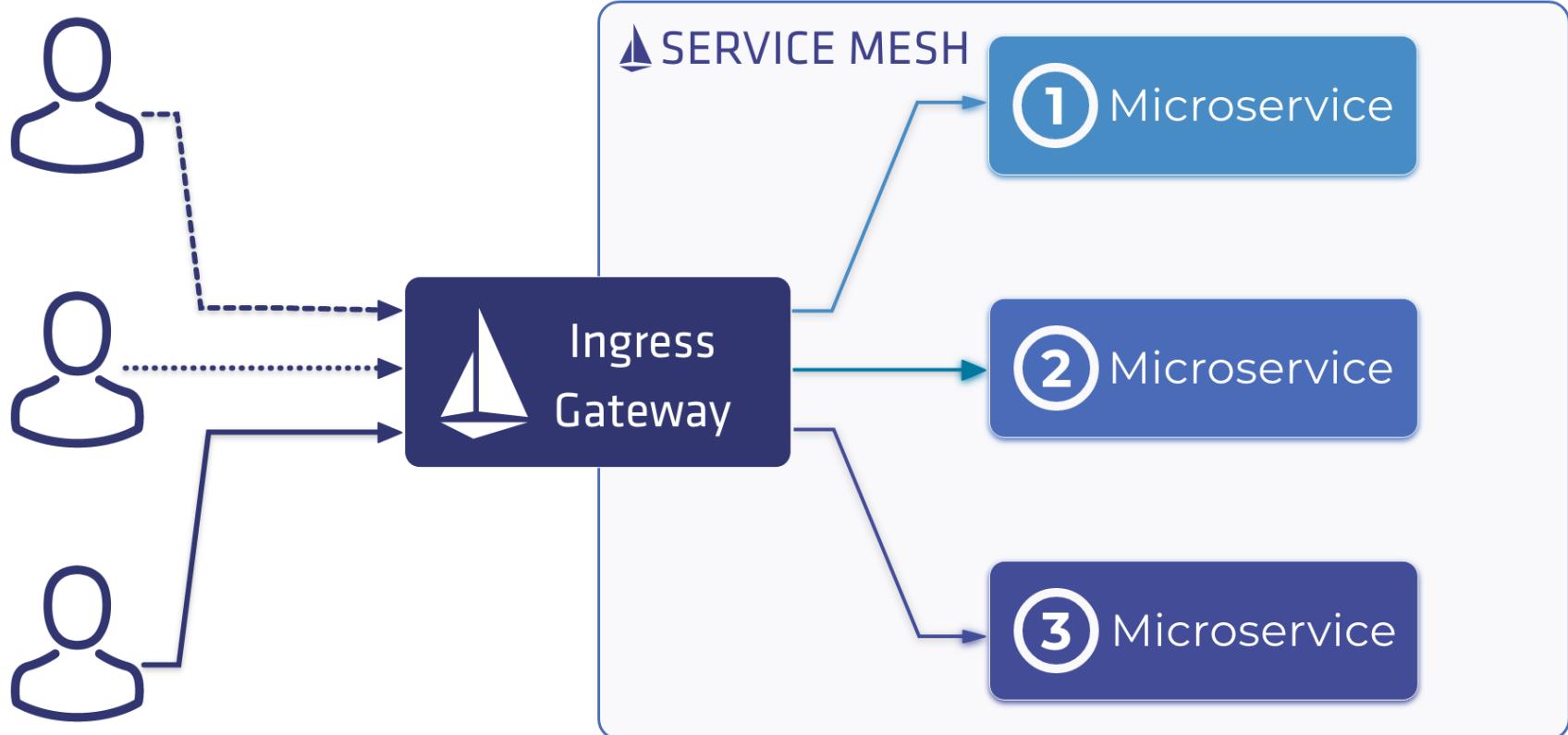
Support different network and control plane topology

Controlled API Server Access in each Cluster

Establishing Trust Between Clusters



Istio Ingress Gateway



BANZAICLOUD



Anthos Config Management

Config Controller managed by Google

GitOps

Config Sync

Resource Mgmt

Kubernetes API server & Config Connector

Policy Mgmt

Policy Controller



GKE



GCP Resources

Google Compute
Engine (GCE)

Google Kubernetes
Engine (GKE)



Multi-Cloud
Cluster



Anthos

Hybrid-Cluster

Data Center (On-Premise)

Hyper-Converged
Infrastructure



CISCO | hp HPE | Dell EMC |
VMware | Lenovo#



Use Cases

- ✓ A financial organization wants to maintain sensitive data on-premises while leveraging the scalability and services of the cloud for application processing. They could deploy Anthos to maintain a consistent Kubernetes environment both on-premises and in GCP, ensuring seamless workload management and migration.
- ✓ A retail company has an old monolithic application running on virtual machines. They can utilize Migrate for Anthos to containerize this application and move it to a GKE cluster, benefiting from the scalability and resilience of Kubernetes without a full rewrite of the application.
- ✓ A multinational enterprise with multiple Kubernetes clusters spread across different regions and clouds can use Anthos Config Management to enforce a consistent set of network policies, security settings, and configurations across all these clusters, ensuring uniformity and adherence to corporate standards.
- ✓ An e-commerce platform is leveraging microservices for various functionalities like payment, inventory, and user management. By deploying Anthos Service Mesh, they can gain granular control over the traffic between these services, implement resilient communication patterns, and obtain in-depth telemetry.

Centralized Control Plane

Service Management with Anthos Service Mesh

Enhanced Observability

Traffic Management

Security





Storage and Database Services

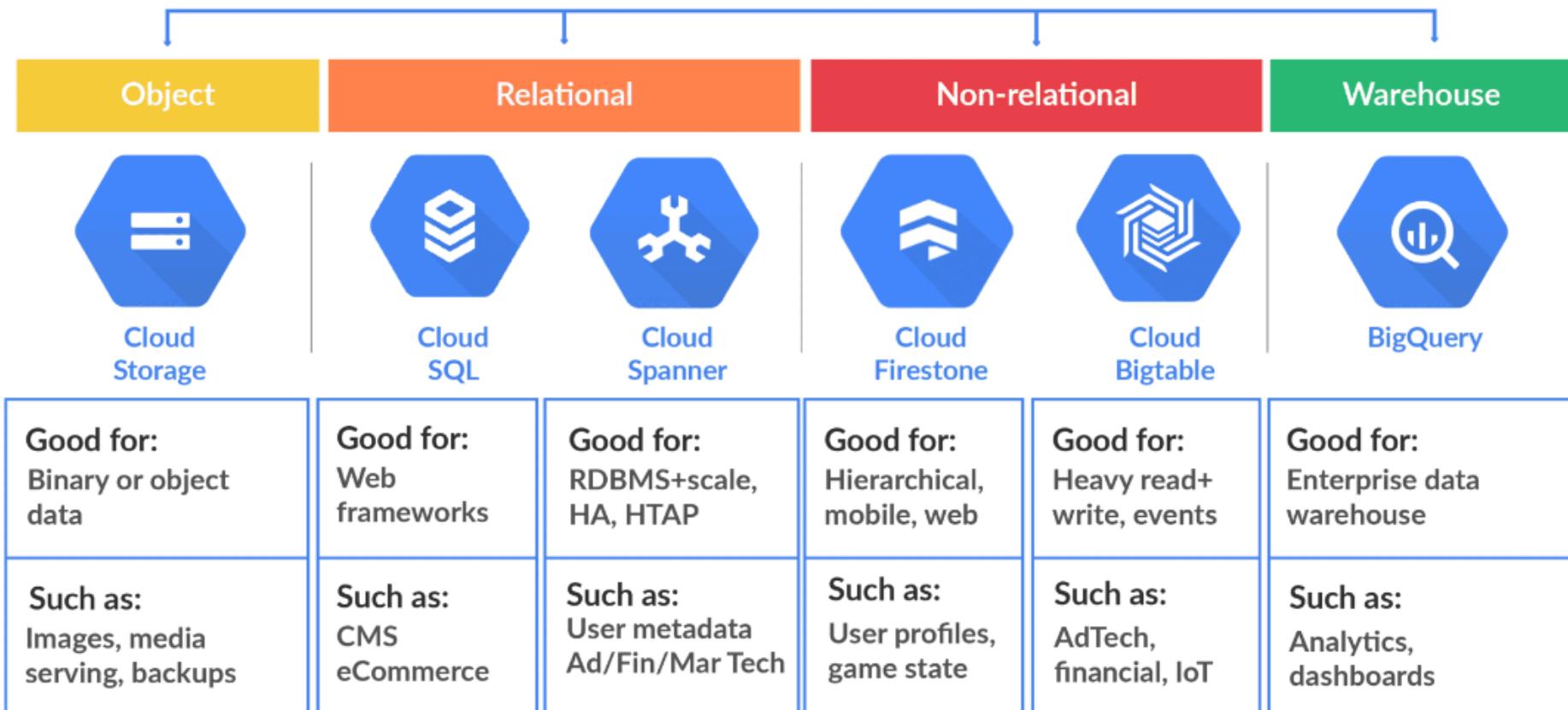
Overview of Storage Options in GCP

Introduction to Cloud Storage

Introduction to SQL databases in GCP

Introduction to NoSQL databases in GCP

Overview of Storage Options in GCP



Object Storage: Google Cloud Storage (GCS)

Cloud Storage is an object storage service that provides secure and scalable storage for any type of data. It offers multiple storage classes with different availability, durability, and cost characteristics.



- Storing and serving static website assets like HTML, CSS, and images.
- Storing large media files such as videos, images or audio files.
- Archiving data for long-term storage and compliance purposes.



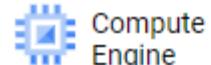
Working with Cloud Storage Buckets

Cloud Storage buckets are the fundamental storage containers in Google Cloud Platform's Cloud Storage service.

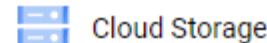
Cloud Storage buckets are highly scalable, durable, and accessible from anywhere on the internet.

Organization: Example Inc.

Project: Messaging app



Compute
Engine



Cloud Storage



BigQuery



Bucket: photos



Billing



Monitoring

Object: puppy.png

Introduction to SQL (Structured Query Language-Relational) databases in GCP

Relational Databases

Tables: Represent entities or concepts in the real world. Each table consists of rows and columns. Each column represents a specific attribute or property of the entity, while each row represents a specific instance of the entity.

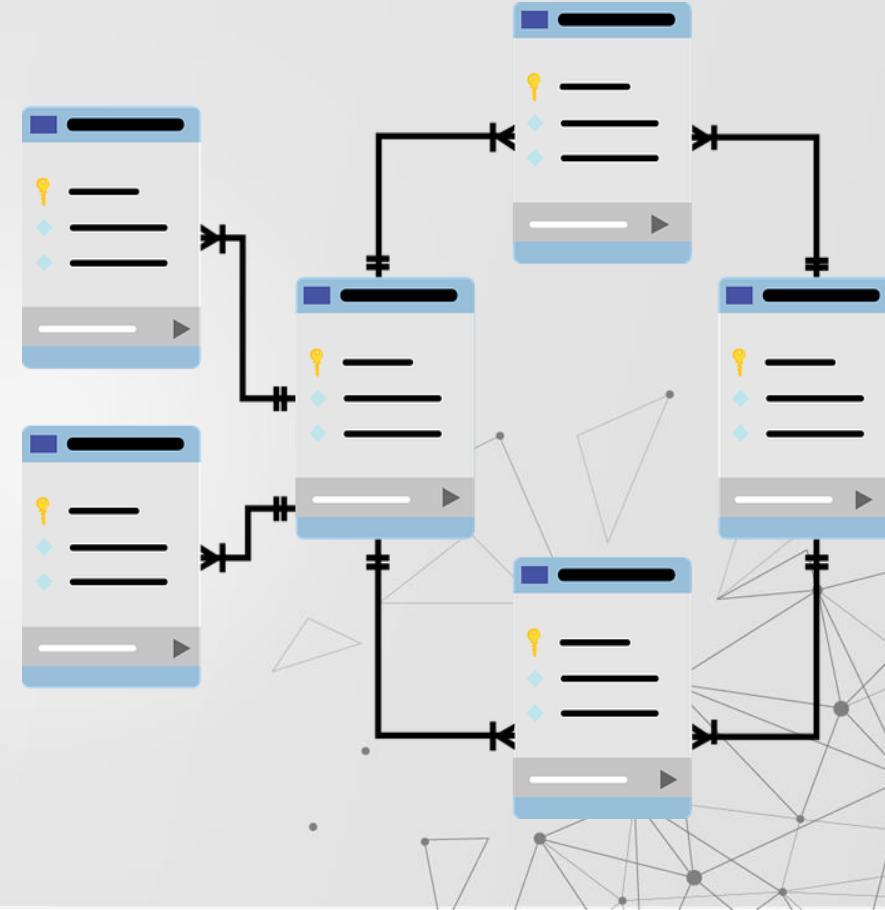
Keys are used to uniquely identify rows within a table. The primary key is a column or a combination of columns that uniquely identifies each row in the table. Additionally, foreign keys establish relationships between tables by referencing the primary key of another table.

Relational databases allow establishing relationships between tables using keys. Types of relationships:

One-to-One (1:1): Each row in one table is associated with exactly one row in another table.

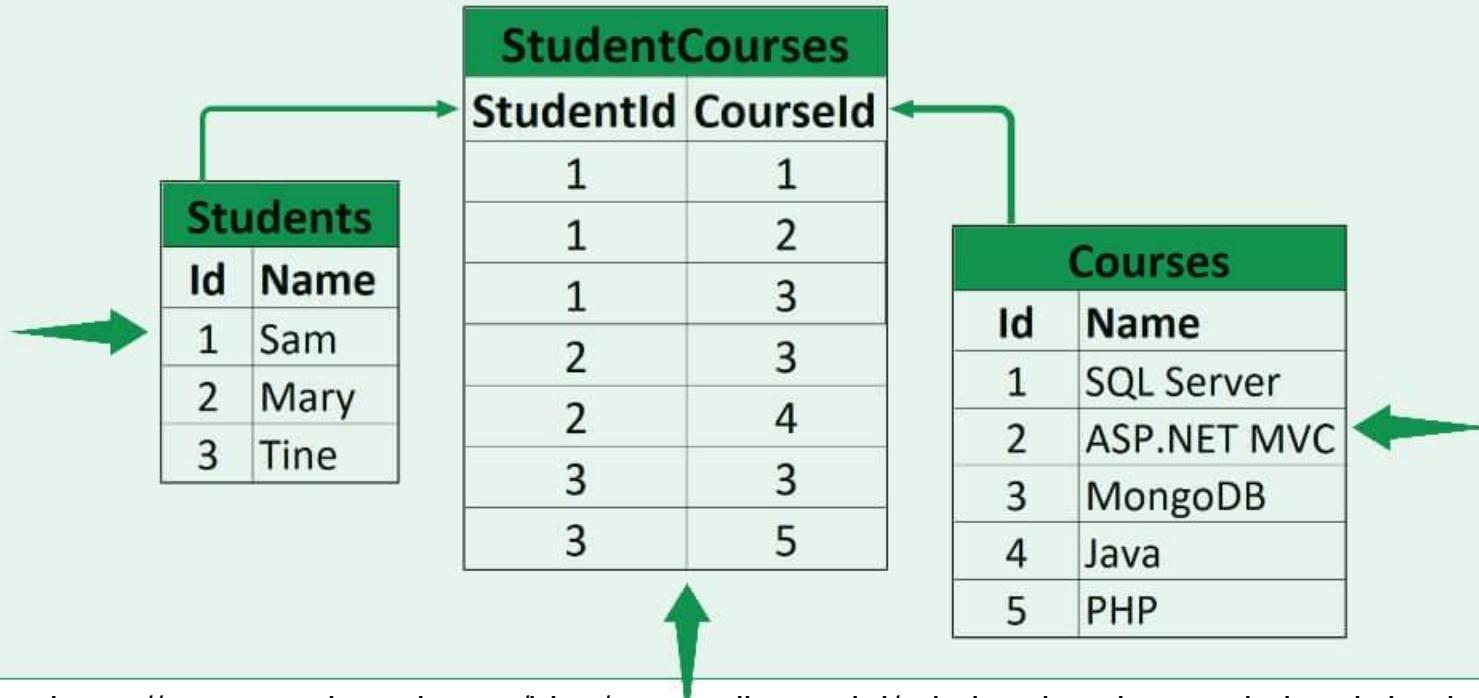
One-to-Many (1:N): Each row in one table can be associated with multiple rows in another table.

Many-to-Many (M:N): Multiple rows in one table can be associated with multiple rows in another table, requiring an intermediary table to establish the relationship.



Example:

Relational Database



Source: <https://www.pragimtech.com/blog/mongodb-tutorial/relational-and-non-relational-databases/>

Cloud SQL

Cloud SQL is a fully managed relational database service. It offers managed instances of popular relational database engines like MySQL, PostgreSQL, and SQL Server. Cloud SQL simplifies the process of setting up, managing, and scaling relational databases in the cloud.



- Hosting web applications with a relational database backend.
- Managing e-commerce product catalogs and inventory.
- Storing structured data requiring ACID (Atomicity, Consistency, Isolation, Durability) compliance.



MySQL:

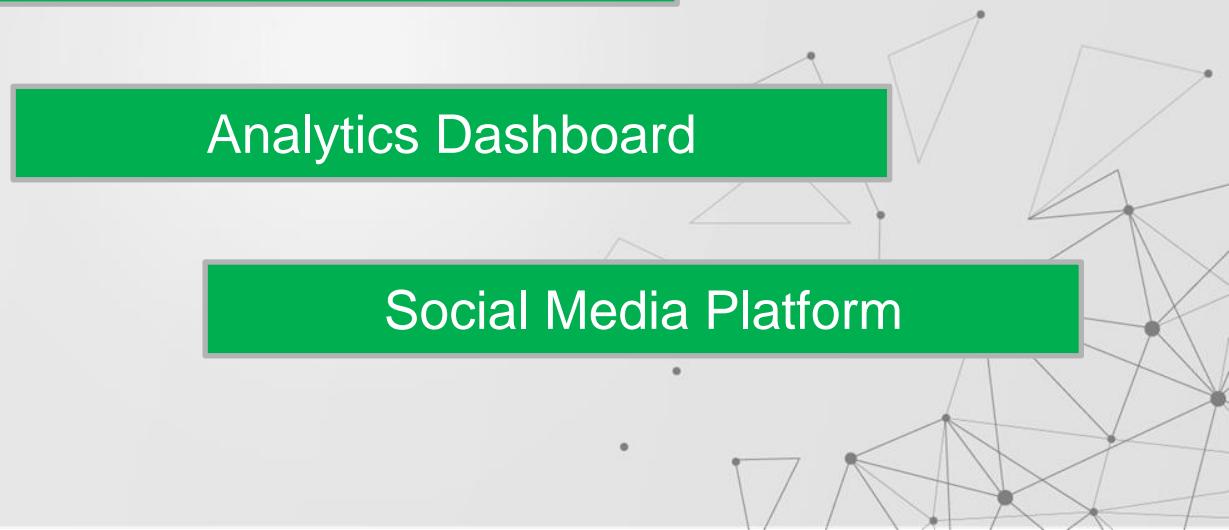
MySQL is a widely used open-source relational database management systems (RDBMS) known for its speed, simplicity, and scalability.

Content Management System (CMS)

E-commerce Application

Analytics Dashboard

Social Media Platform



PostgreSQL:

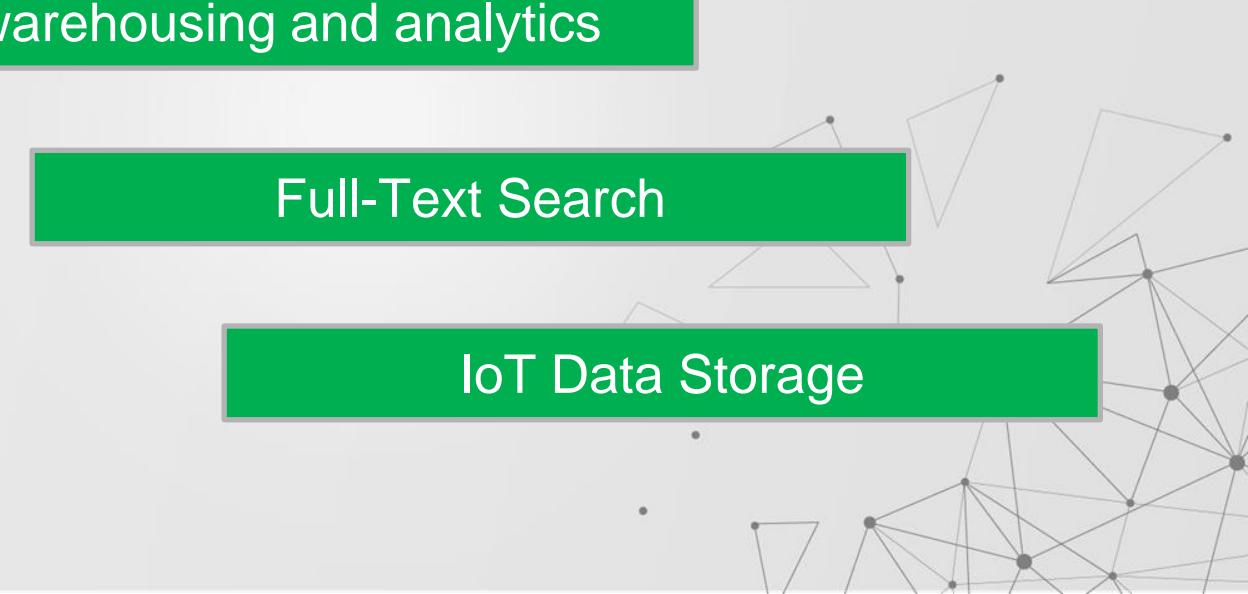
PostgreSQL is a powerful open-source RDBMS known for its advanced features, data integrity, and extensibility. It excels in scenarios that require complex data models, reliability, and flexibility.

Geospatial Application

Data warehousing and analytics

Full-Text Search

IoT Data Storage



SQL Server:

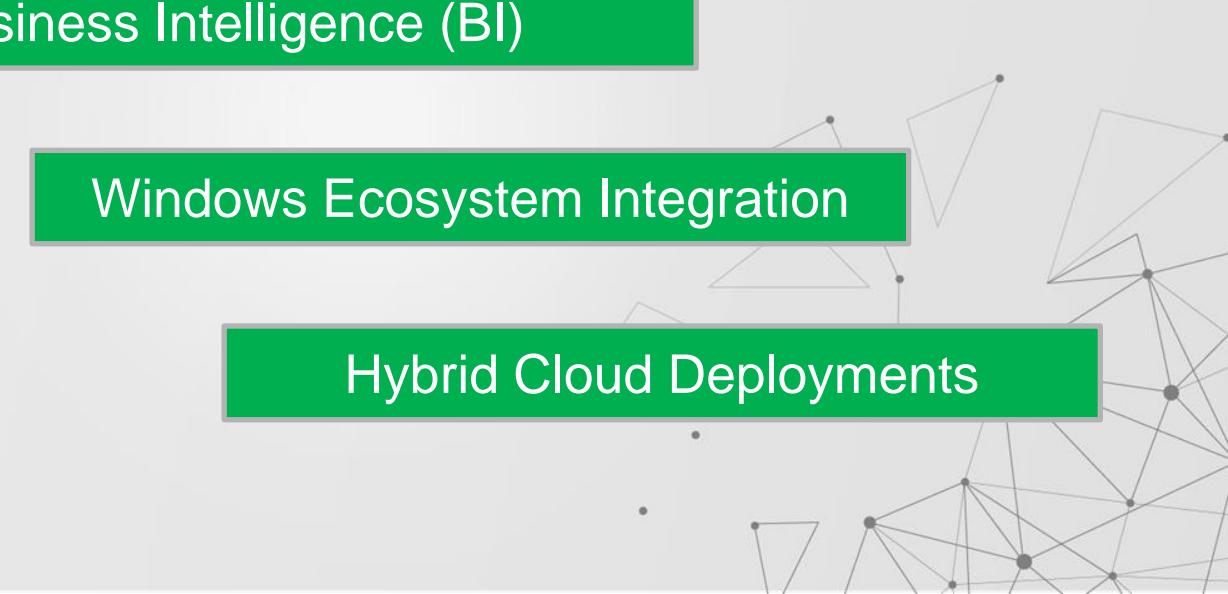
SQL Server is a proprietary RDBMS developed by Microsoft. It offers a comprehensive set of features and integrates well with Microsoft's ecosystem.

Enterprise Application

Business Intelligence (BI)

Windows Ecosystem Integration

Hybrid Cloud Deployments



Cloud Spanner

Cloud Spanner is a globally distributed, horizontally scalable, and strongly consistent relational database service. It provides the benefits of a traditional relational database with the scalability of NoSQL databases.



Cloud
Spanner

- Financial applications that require strong consistency requirements.
- High-volume transactional systems with global user bases.
- Implementing real-time inventory management systems.



Introduction to NoSQL databases in GCP

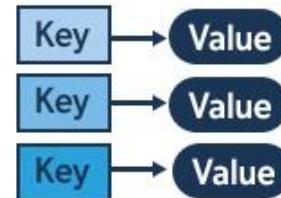
NoSQL (Not Only SQL) databases: Non-Relational Databases

NoSQL (Not Only SQL) databases are a type of database management system that provide a flexible and scalable approach to storing and retrieving data. Unlike traditional relational databases, NoSQL databases offer alternative data models and do not adhere to the rigid structure of tables, rows, and columns.

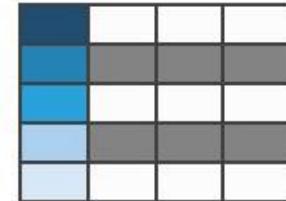
- ✓ Flexible Data Models
 - Data schema changing or not well-defined upfront
- ✓ Horizontal Scalability
 - High scalability and performance
- ✓ No Fixed Schema
 - Data can be modified without modifying schema

NoSQL

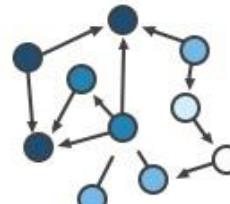
Key-Value



Column-Family



Graph



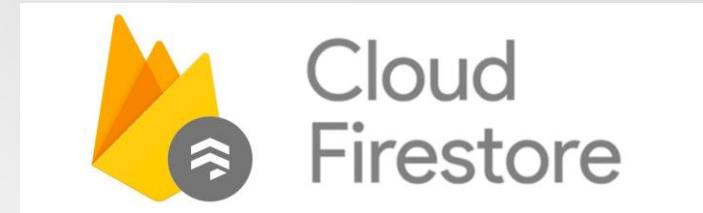
Document



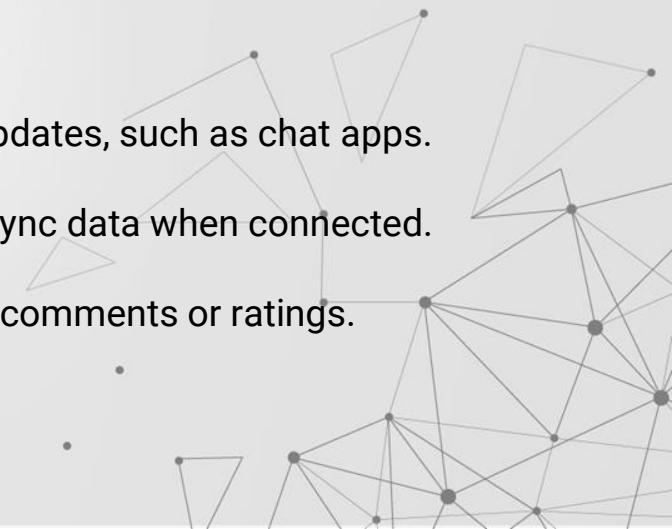
NoSQL Databases in Google Cloud Platform

Cloud Firestore

Cloud Firestore is a NoSQL document database. It follows a document-based data model, where data is organized into collections and documents. Each document is a set of key-value pairs. Firestore provides real-time data synchronization, seamless scalability, and powerful querying capabilities. It is commonly used for web and mobile applications, collaborative apps, chat platforms, and real-time analytics.



- Building collaborative applications with real-time data updates, such as chat apps.
- Creating mobile apps that work seamlessly offline and sync data when connected.
- Implementing user-generated content systems, such as comments or ratings.



Cloud Datastore

Cloud Datastore is a NoSQL document database that provides high scalability and automatic scaling based on demand. It offers a schemaless data model, allowing for flexible and dynamic data structures.



- ✓ Building multi-tenant applications with flexible data schemas
- ✓ Managing user-generated content
- ✓ Implementing user profiles with variable attributes



	Firestore in Native mode	Firestore in Datastore mode
Data model	Document database organized into documents and collections.	Entities organized into kinds and entity groups.
Storage Layer	New storage layer that is always strongly consistent	New storage layer that is always strongly consistent
Queries and transactions	<ul style="list-style-type: none">Strongly consistent queries across the entire databaseUp to 500 documents per transaction across any number of collections.	<ul style="list-style-type: none">Removes the previous consistency limitations of DatastoreStrongly consistent queries across the entire databaseTransactions can access any number of entity groups
Datastore v1 API support	No, requests are denied	Yes
Firestore v1 API support	Yes	No, requests are denied
Real-time updates	Supports the ability to <i>listen</i> to a document or a set of documents for real-time updates.	Not supported

Change database to **Native mode**:

```
gcloud alpha firestore databases update --type=firebase-native
```

Change database to **Datastore mode**:

```
gcloud alpha firestore databases update --type=datastore-mode
```



Cloud Bigtable

Cloud Bigtable is a high-performance, fully-managed NoSQL database service that excels at large-scale data processing and analytics workloads. It is built on Google's internal Bigtable technology and offers low latency and high throughput.



Google
BigTable

- Analyzing large volumes of time-series data, such as stock market data or IoT sensor readings.
- Powering real-time analytics and reporting applications.
- Storing and analyzing logs and clickstream data.



- Install the cbt cli

```
gcloud components install cbt
```

- Connect to the instance

```
echo project = PROJECT_ID >> ~/.cbtrc && echo instance = quickstart-instance >> ~/.cbtrc
```





Networking and Security in GCP

Introduction to Virtual Private Cloud (VPC), subnets, and firewall rules

Hybrid Connectivity

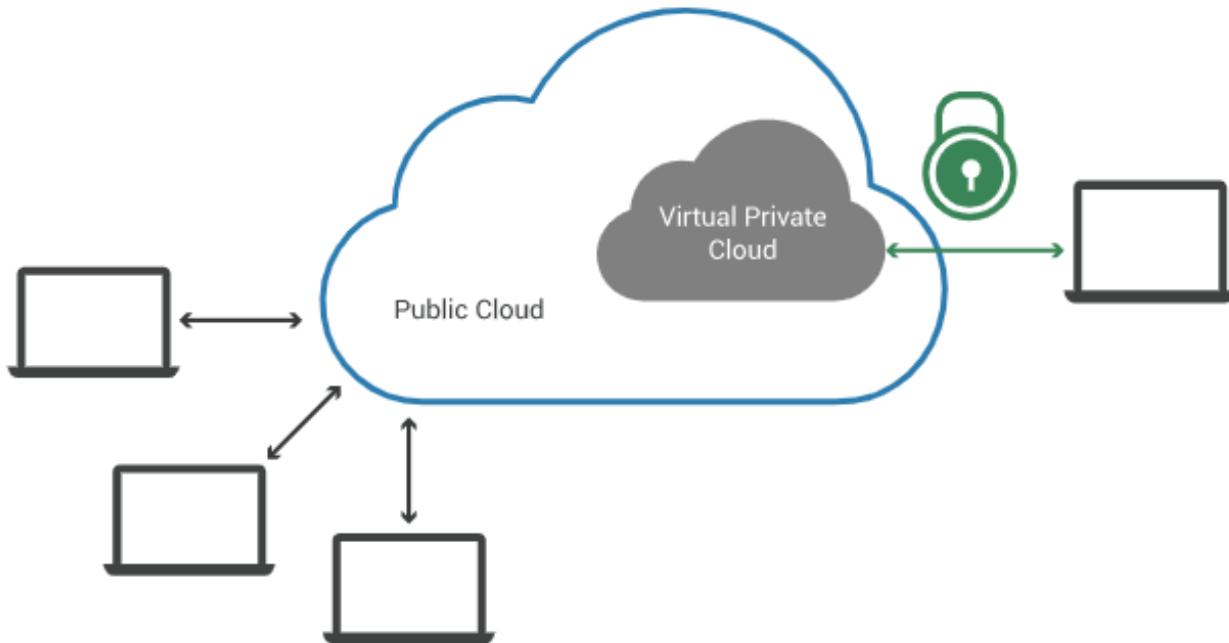
Introduction to Cloud DNS

Introduction to Cloud Load Balancing and Cloud CDN

Security Services in GCP

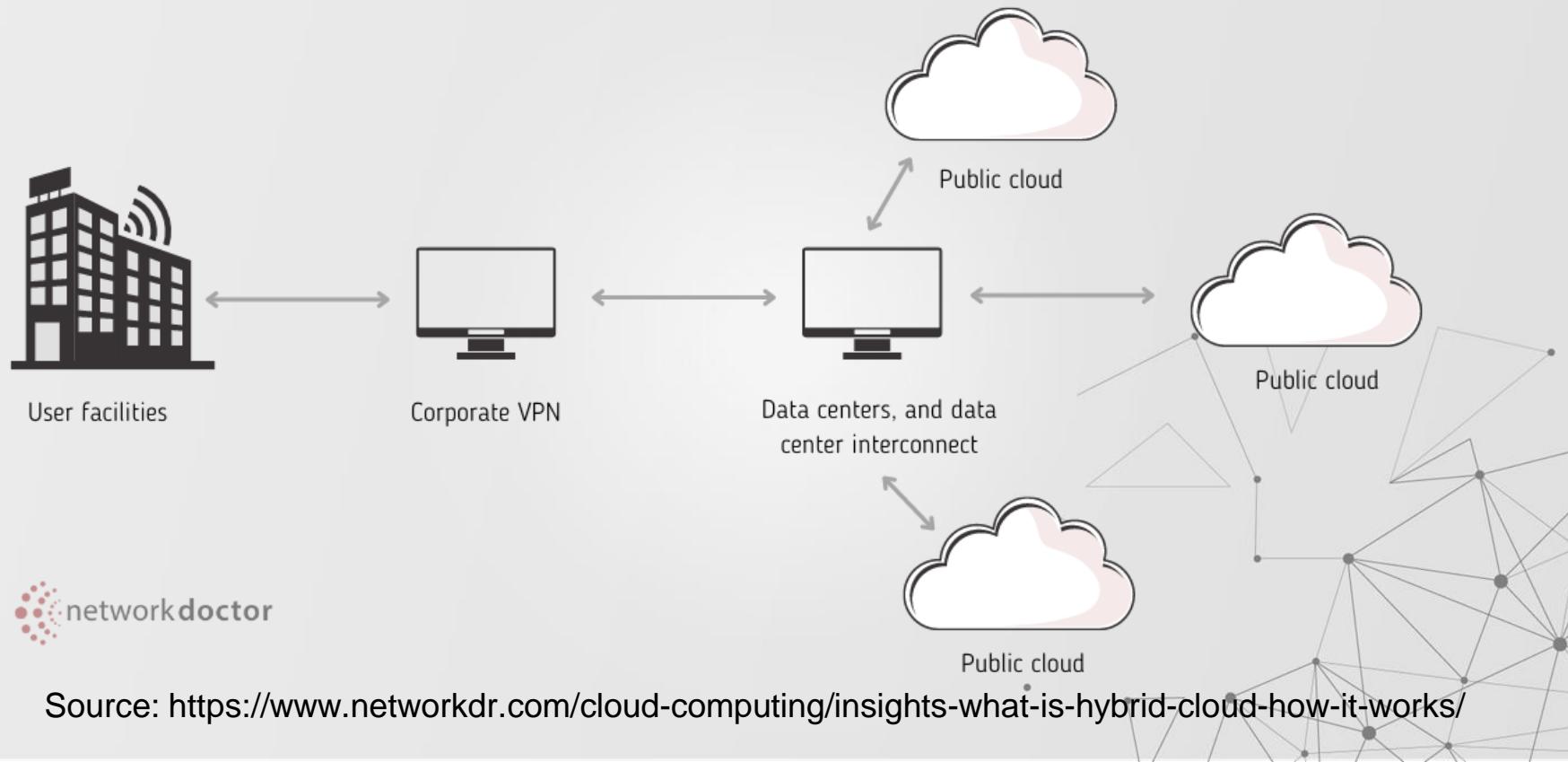
Introduction to Virtual Private Cloud (VPC)

Virtual Private Cloud (VPC) is a networking service that provides a virtual network environment for your cloud resources. It allows you to create, manage, and control your own private network in the cloud, providing isolation and security for your applications and services.



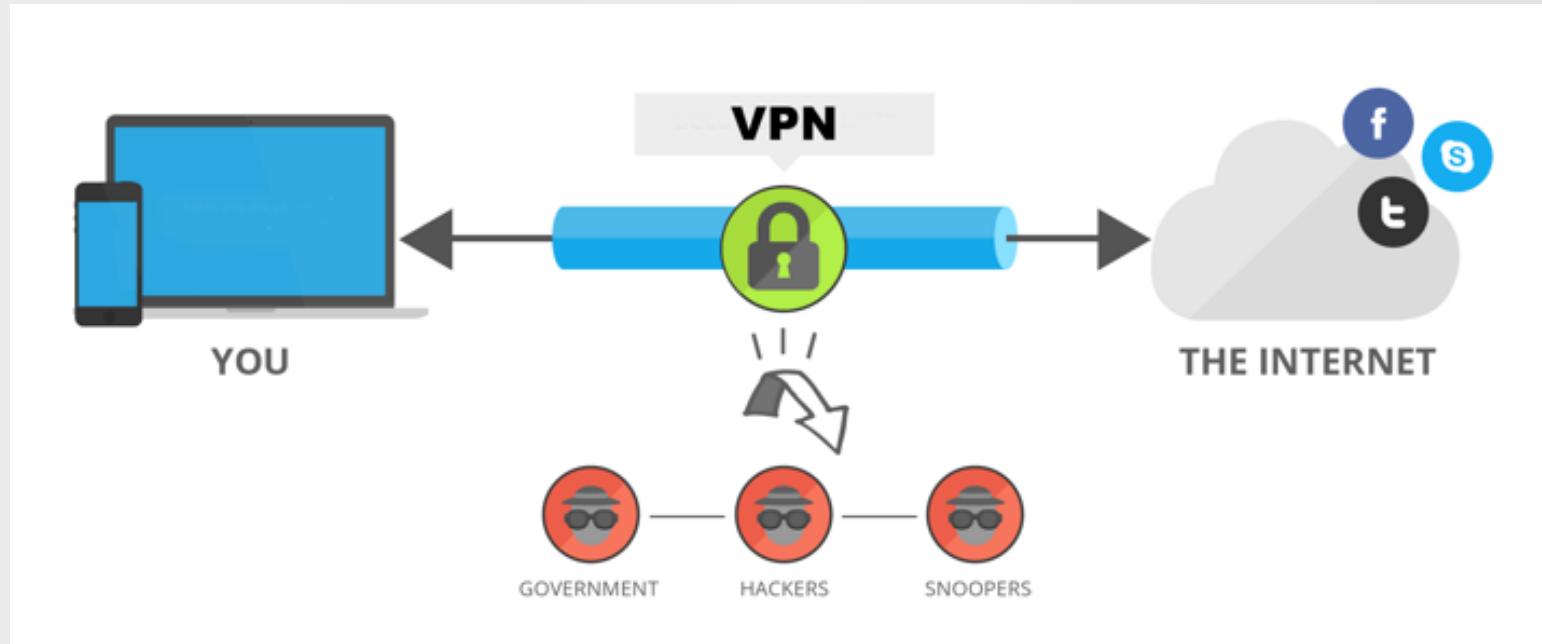
Hybrid Connectivity

Hybrid connectivity in Google Cloud Platform (GCP) refers to the ability to establish connections between your on-premises infrastructure and resources in the cloud.



Virtual Private Network (VPN)

VPN (Virtual Private Network) is a technology that provides a secure and encrypted connection over a public network, such as the internet, between your local network (on-premises network) and a remote network such as a VPC.



Types of peer VPN Gateways

On-Premises VPN Gateway

On-



set
ability
t



Another Cloud Provider's VPN Gateway



Third-Party VPN Service Provider



NordVPN®



ExpressVPN



ProtonVPN



HIDE^{me}

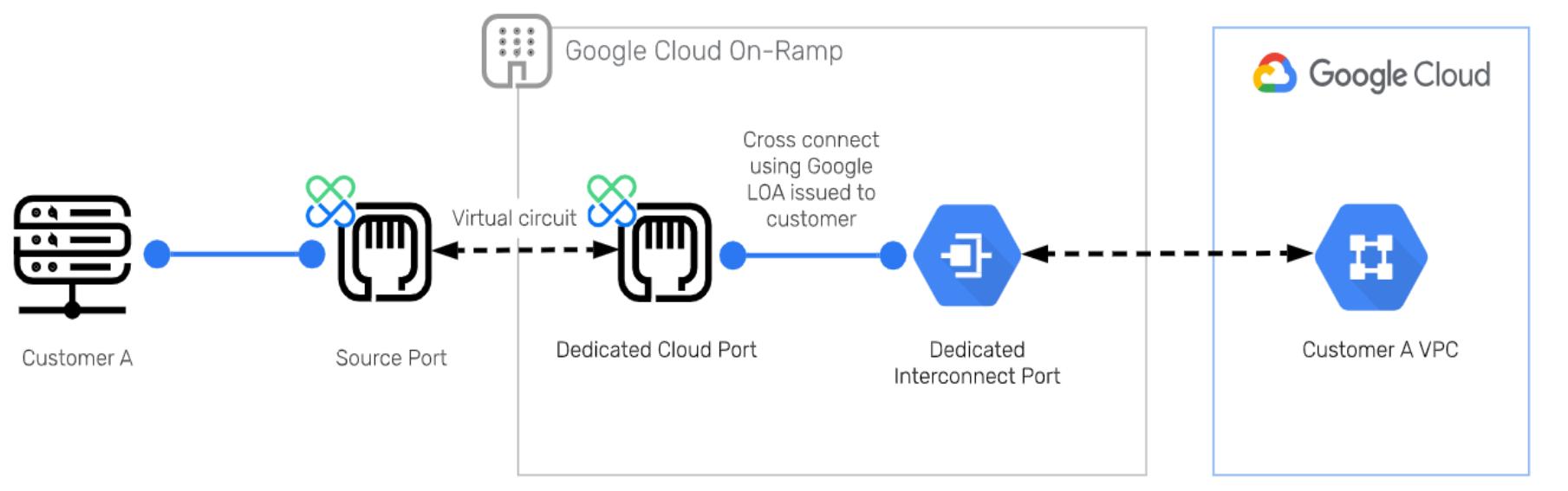


Surfshark®



Cloud Interconnect

An interconnect is a networking solution that enables private and high-bandwidth connectivity between your on-premises infrastructure and the resources hosted on GCP.



Source: <https://docs.packetfabric.com/cloud/google/overview/>

Benefits of Cloud Interconnect

Enterprise Hybrid Cloud

Data Transfer and Backup

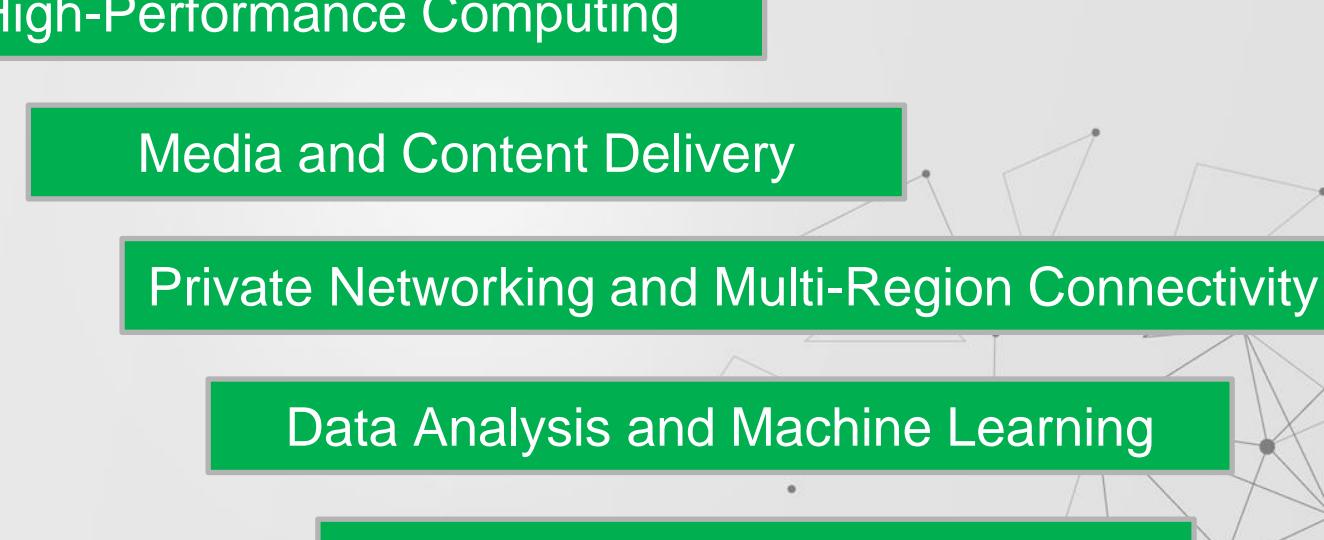
High-Performance Computing

Media and Content Delivery

Private Networking and Multi-Region Connectivity

Data Analysis and Machine Learning

Financial Services



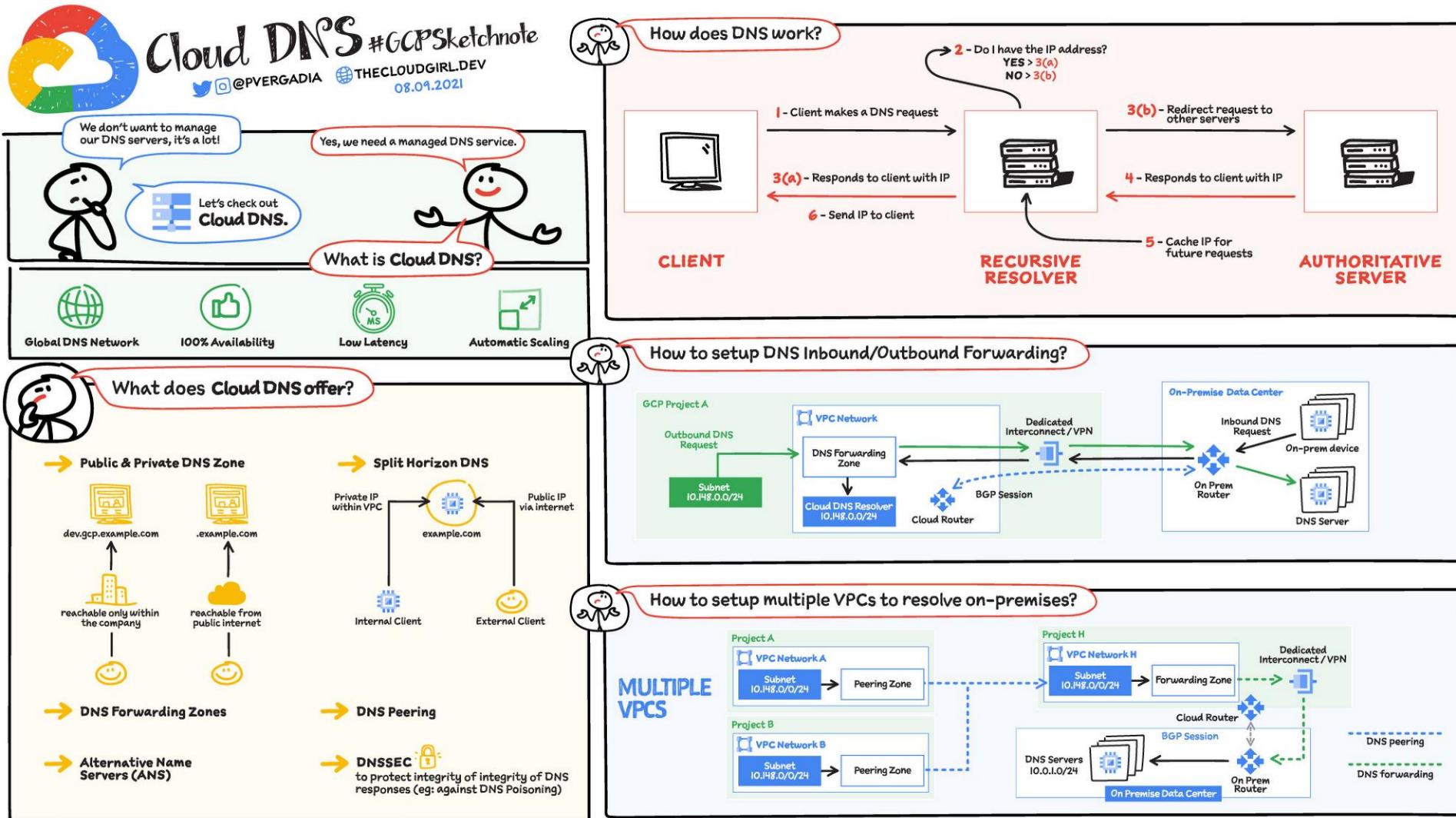
Cloud DNS (Domain Name System)

Cloud DNS is a service that provides a highly scalable and reliable Domain Name System (DNS) for managing your domain names and their associated DNS records.



example.com (Human-readable) → 192.0.2.1 (Computer-readable)





A (address)

1

A (address) - Most commonly used to map a fully qualified domain name (FQDN) to an IPv4 address and acts as a translator by converting domain names to IP addresses.



AAAA (quad A)

2

AAAA (quad A) - Similar to A Records but maps to an IPv6 address (smartphones prefer IPv6, if available).



ANAME

3

ANAME - This record type allows you to point the root of your domain to a hostname or FQDN.



CNAME

4

CNAME (Canonical Name) - An alias that points to another domain or subdomain, but never an IP address. Alias record mapping FQDN to FQDN, multiple hosts to a single location. This record is also good for when you want to change an IP address over time as it allows you to make changes without affecting user bookmarks, etc.



SOA (start of authority)

5

SOA (Start of Authority) - Stores information about domains and is used to direct how a DNS zone propagates to secondary name servers.



NS (name server)

6

NS (name server) - Specifies which name servers are authoritative for a domain or subdomains (these records should not be pointed to a CNAME).



MX (mail exchange)

7

MX (Mail eXchange) - Uses mail servers to map where to deliver email for a domain (should point to a mail server name and not to an IP address).



TXT (text)

8

TXT (text) - Allows administrators to add limited human and machine-readable notes and can be used for things such as email validation, site, and ownership verification, framework policies, etc., doesn't require specific formatting.



SRV (service)

9

SRV (service) - Allows services such as instant messaging or VoIP to be directed to a separate host and port location.



SPF (sender policy framework)

10

SPF (sender policy framework) - Helps prevent email spoofing and limits spammers.



PTR (pointer)

11

PTR (pointer) - A reverse of A and AAAA records, which maps IP addresses to domain names. These records require domain authority and can't exist in the same zone as other DNS record types (put in reverse zones).



QUICK TIP

12

Tip: Always check for typos and mistakes when entering your DNS record information, especially your IPs. The Zone Config File is a good place to check your work and spot any mistyped information.



Introduction to Cloud Load Balancing

Cloud Load Balancing

#GCPSketchnote

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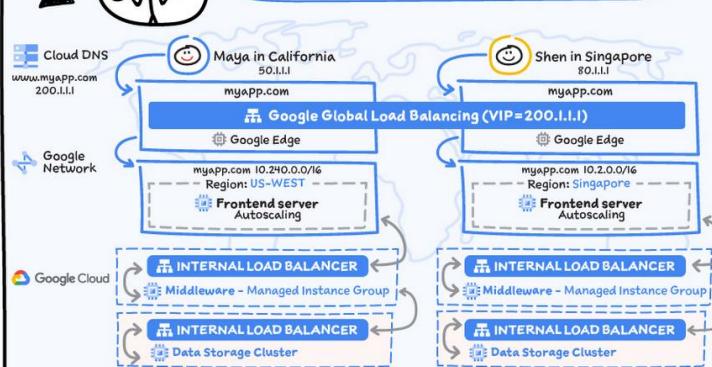
10.5.2020



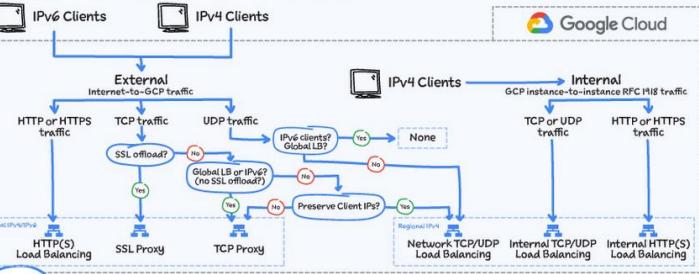
FULLY DISTRIBUTED SOFTWARE DEFINED NETWORKING (SDN)

- ▢ Single Global Anycast VIP (IPv4/IPv6) across region
- ▢ Worldwide Capacity
- ▢ Cross-region failover and fallback
- ▢ Fast autoscaling
- ▢ Single point to apply global policies
- ▢ 1 Million+ QPS

How does Cloud Load Balancing work?

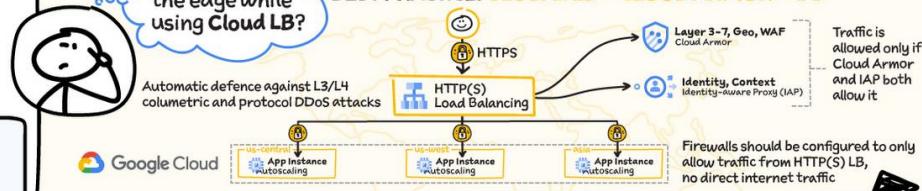


How do I choose the right LB option?



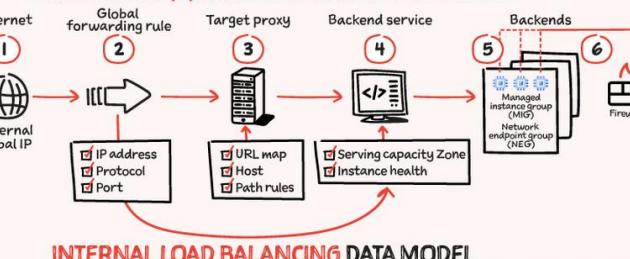
How do I secure the edge while using Cloud LB?

BEST PRACTICE: GLOBAL LB + CLOUD ARMOR + IAP

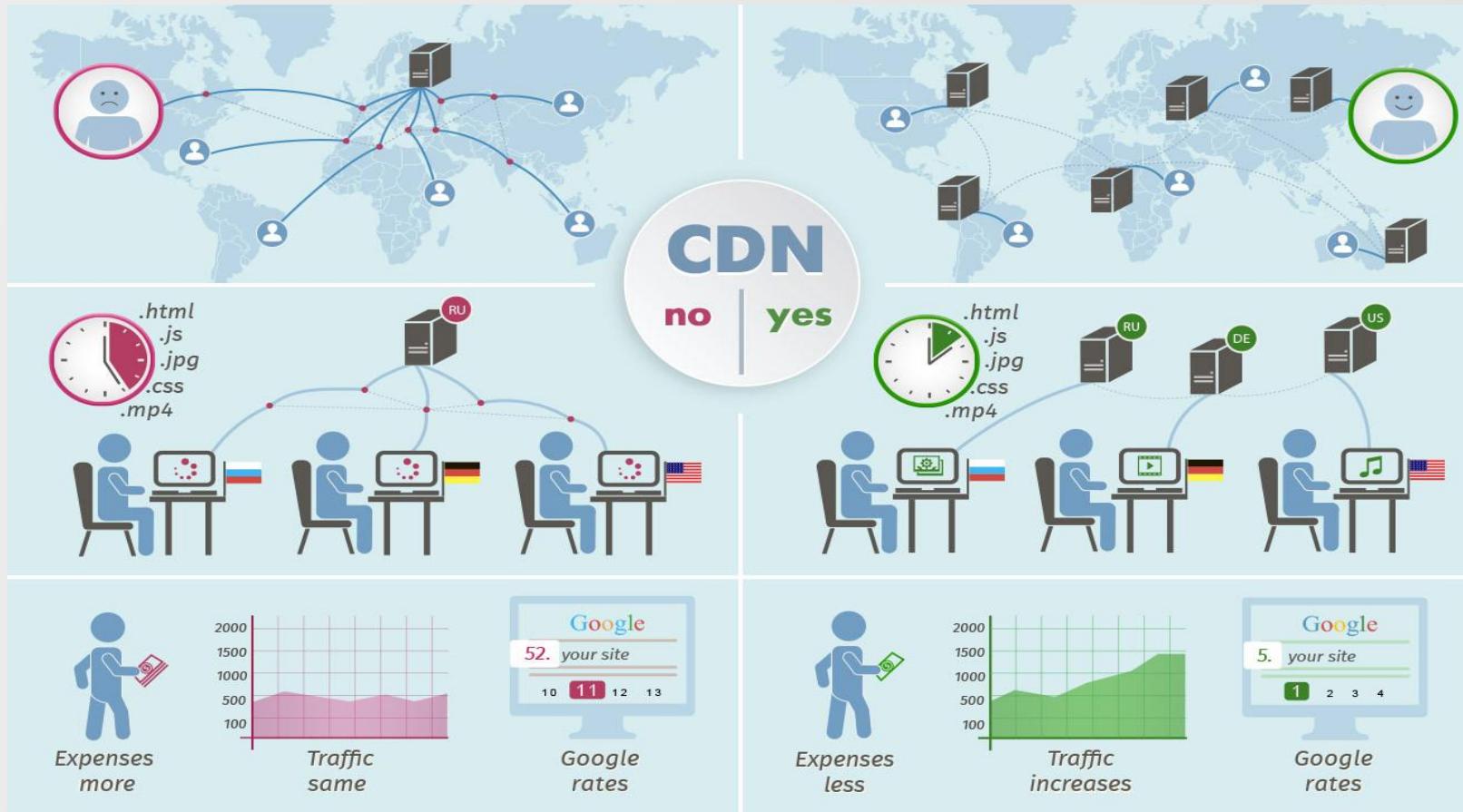


How do you use Global HTTP(S) Load Balancing?

GLOBAL HTTP(S) LOAD BALANCING DATA MODEL



Cloud CDN (Content Delivery Network)

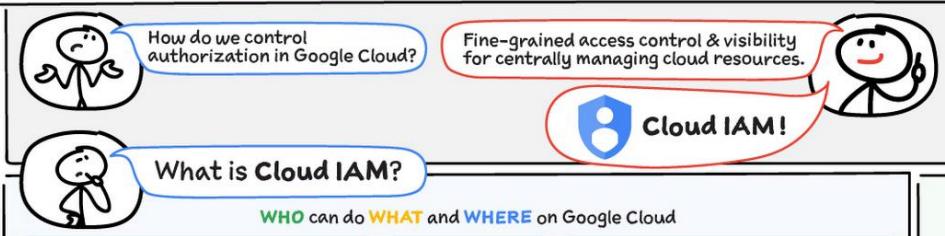


Security Services in GCP

Identity and Access Management (IAM)

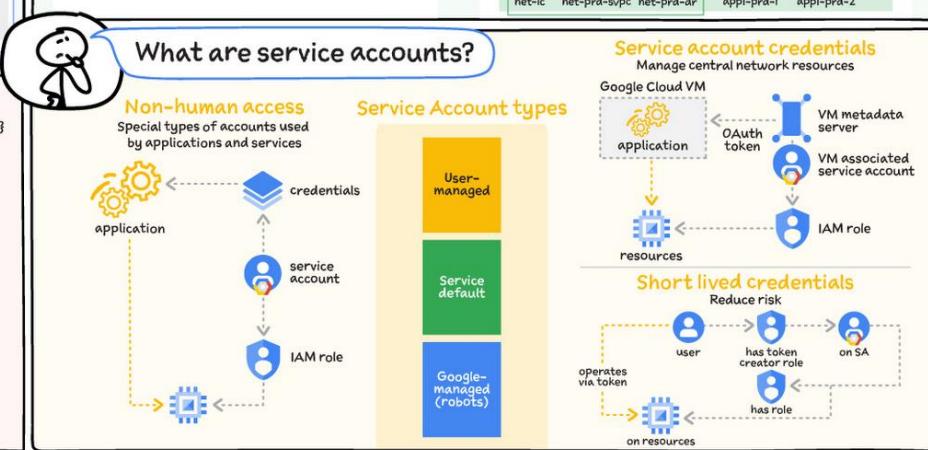
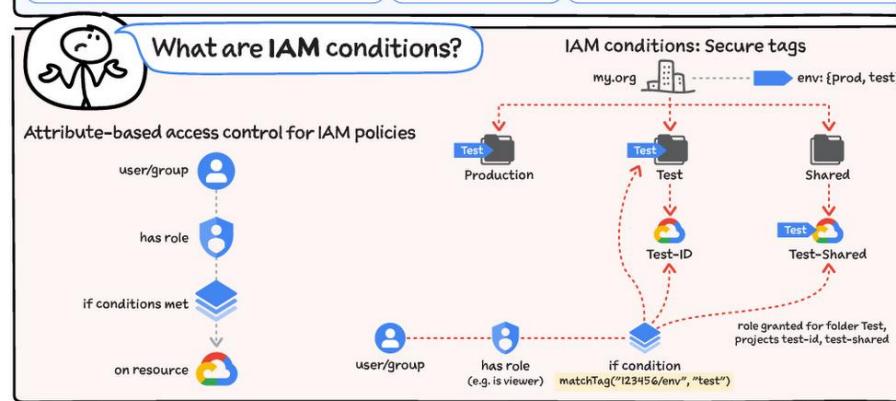
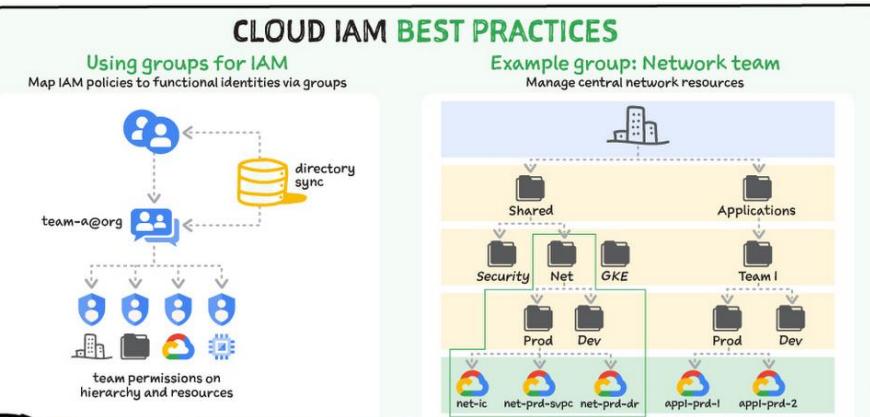
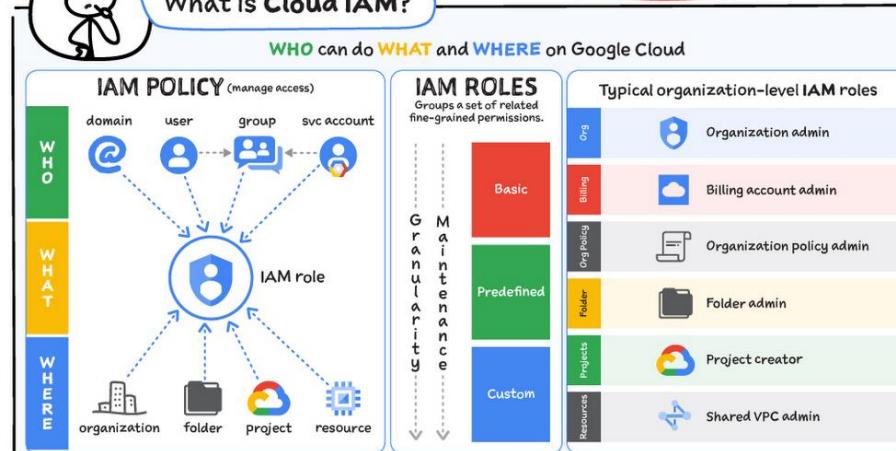
IAM, or Identity and Access Management, is a fundamental security service in GCP that enables you to control who can access your cloud resources and what actions they can perform.





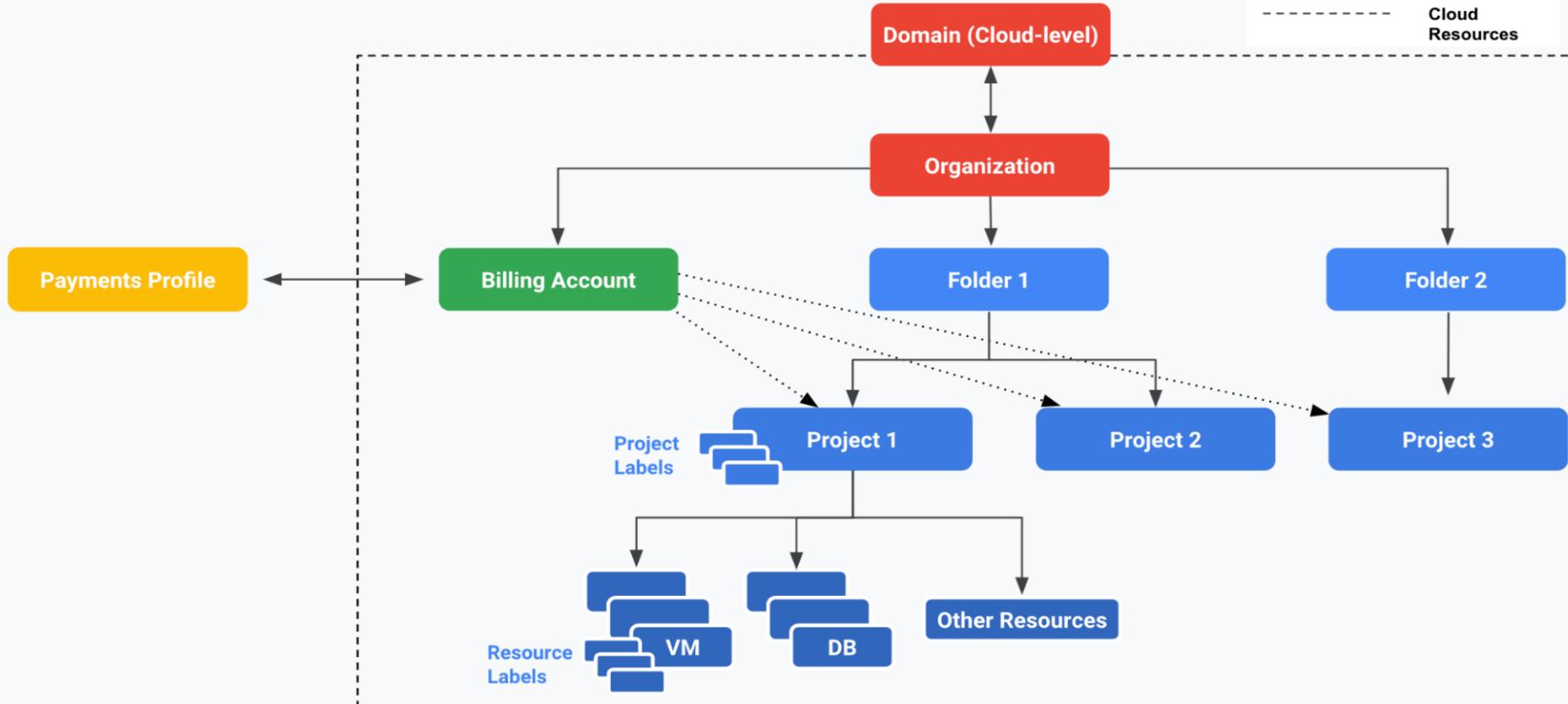
Identity and Access Management (Authorization)

#GCPsketchnote @PVERGADIA THECLOUDGIRL.DEV 11.07.2021

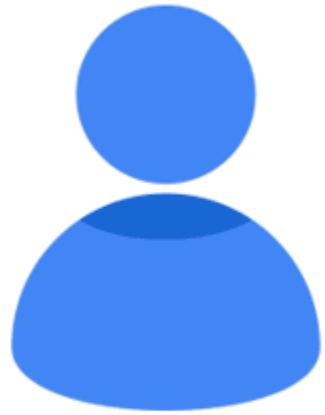


Resource Hierarchy

Key	Owns
.....	Pays for
- - -	Cloud Resources



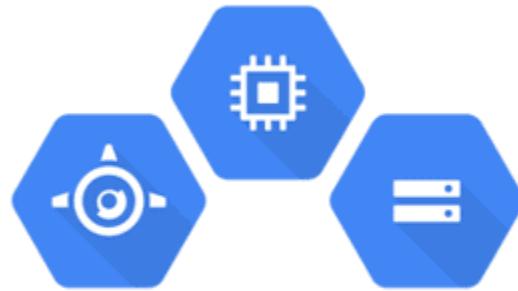
Source: <https://ermetic.com/blog/gcp/introduction-to-iam-in-google-cloud-platform-gcp/>



Who



can do what



on which resource

Cloud Identity and Access Management Best Practices

- 1 Integrate CIAM with Enterprise Security
- 2 Understand Access Controls
- 3 Grant Least Privileges
- 4 Strong Password Policy
- 5 Ensure Multi-factor Authentication
- 6 Monitor Privileged Accounts
- 7 Enable Conditional Access
- 8 Regular Audits
- 9 Active Monitoring



Service Accounts Usage Scenarios:

Google Compute Engine instance to access Cloud Storage.

Enabling applications to interact with BigQuery.

authenticating Kubernetes Engine clusters.

When creating or managing service accounts, it's essential to follow best practices for security:

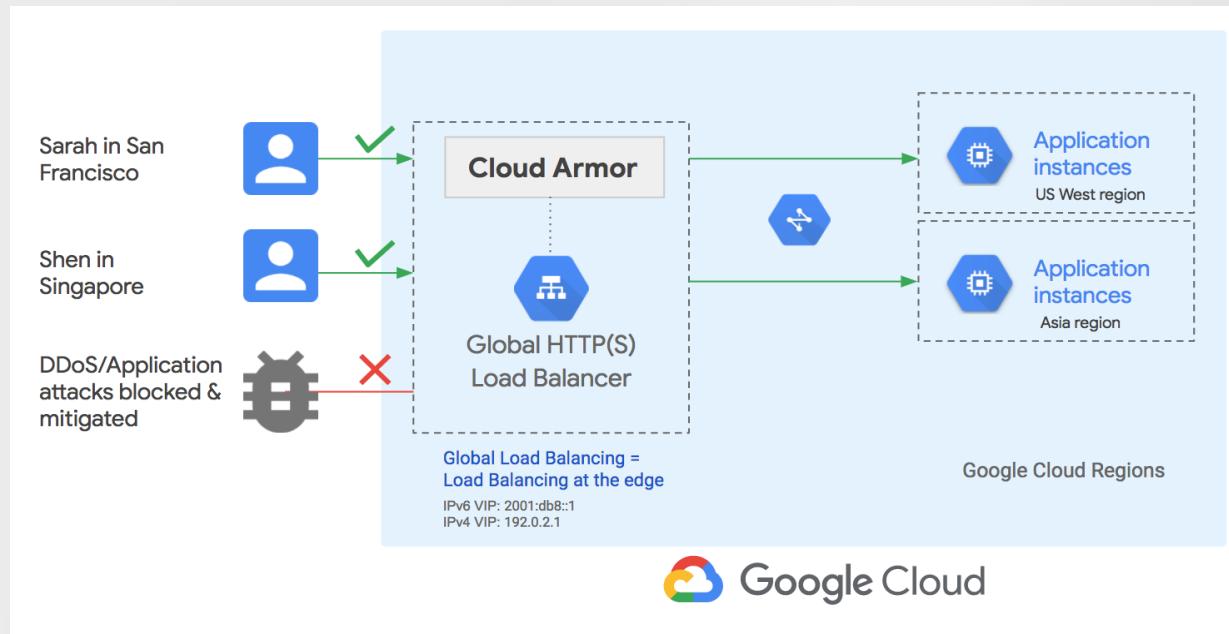
- ✓ Use service accounts only when necessary.
- ✓ Limit permissions to the minimum required for the specific task.
- ✓ Regularly review and audit the permissions associated with service accounts.
- ✓ Rotate service account keys periodically for enhanced security.



Other Network Security Services in GCP

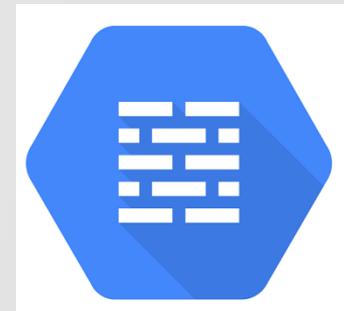
Cloud Armor

Cloud Armor is a Distributed Denial of Service (DDoS) and application defense service. It allows you to define security policies that control access to your applications based on various attributes such as IP address, geographic location, and protocol.



Cloud Firewall

Cloud Firewall is a network-level firewall service that allows you to control and secure traffic to and from your virtual machine instances (VMs) by creating firewall rules.

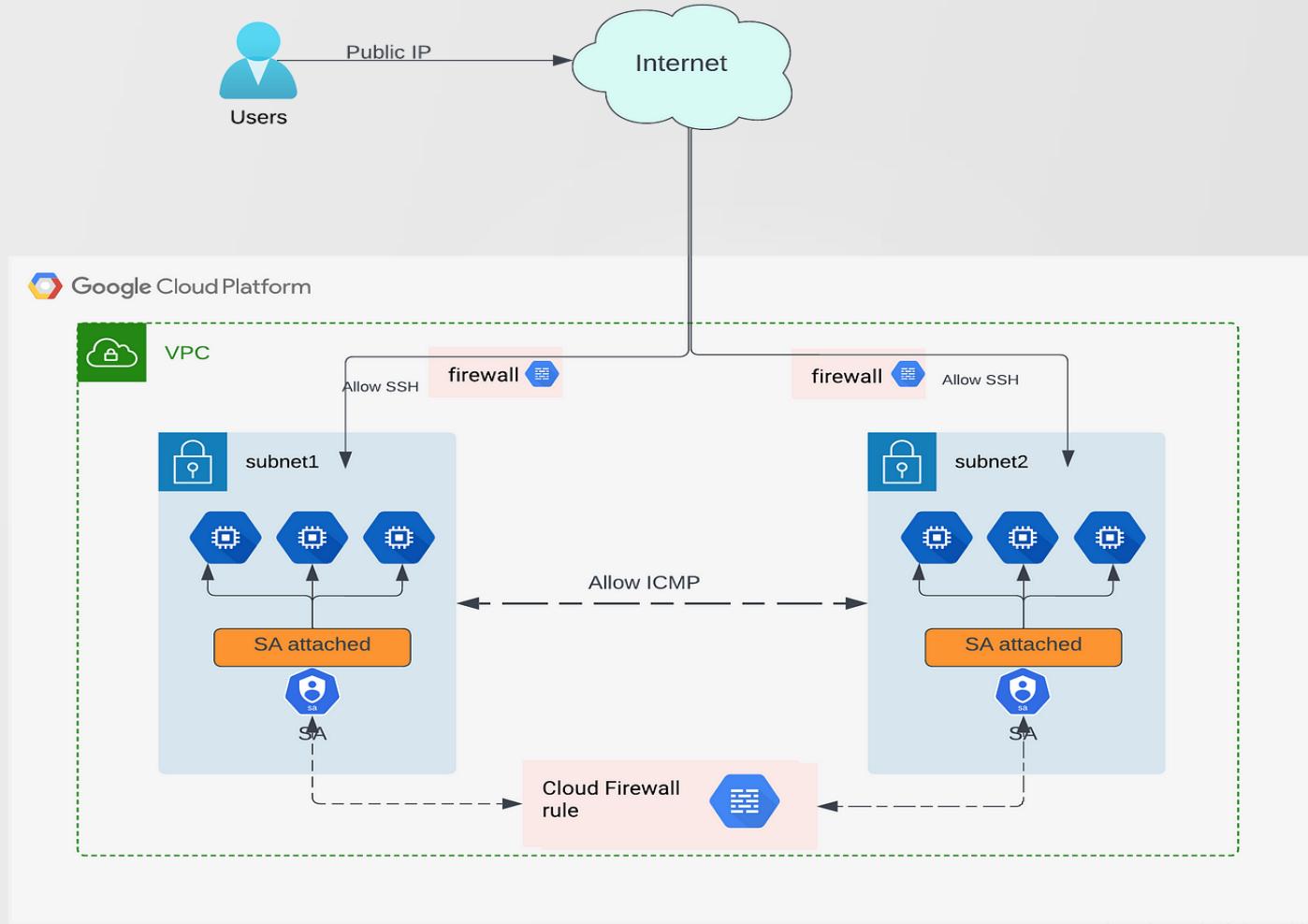


IP addresses

Protocols

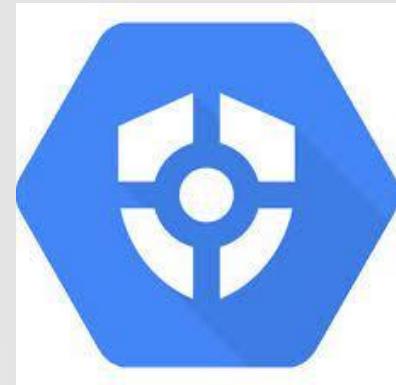
Ports





Google Cloud Security Command Center (SCC)

Google Cloud Security Command Center (SCC) is a centralized security management and data risk assessment platform. It helps organizations gain insights into the security posture of their GCP resources, identify potential vulnerabilities, and manage security risks across their cloud infrastructure.





Source: <https://www.qudrasystems.net/blogs/take-control-of-security-and-risk-management-with-google-cloud>



Data Analytics Services in GCP

Introduction to BigQuery

Introduction to Cloud Composer

Introduction to Dataflow

Introduction to Dataproc

Introduction to Dataprep

Introduction to Data Fusion

Introduction to Pub/Sub

Summary: Choosing the Right Service

Warehouse: BigQuery

Google BigQuery is a fully-managed, serverless data warehouse that enables super-fast SQL queries using the processing power of Google's infrastructure. It allows you to analyze large datasets in real-time by using SQL-like syntax



Google
BigQuery

- **E-Commerce Analytics**
- **Healthcare Analytics**
- **Finance and Banking**

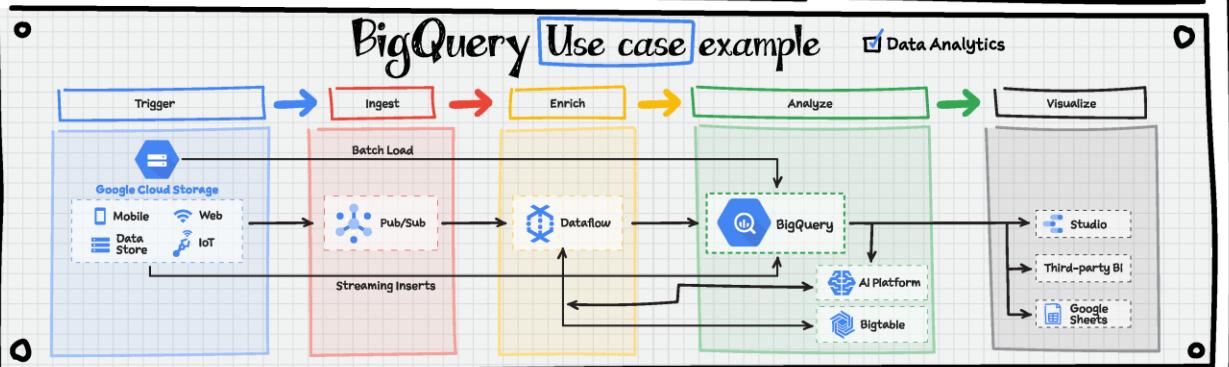
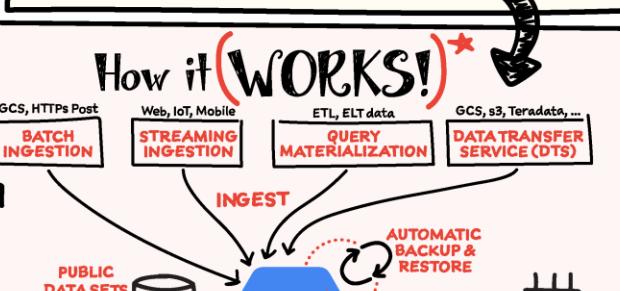
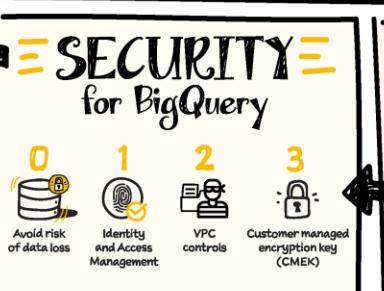
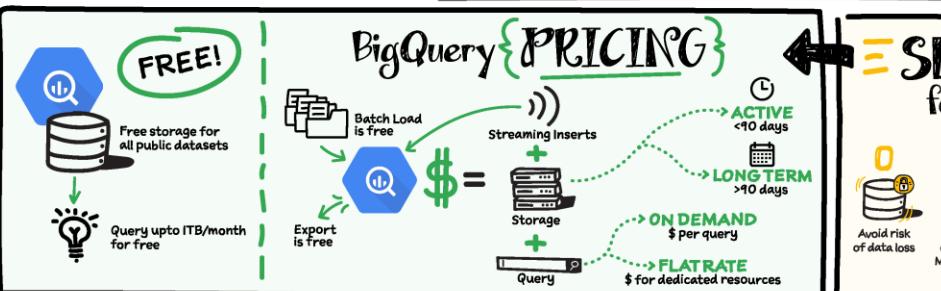
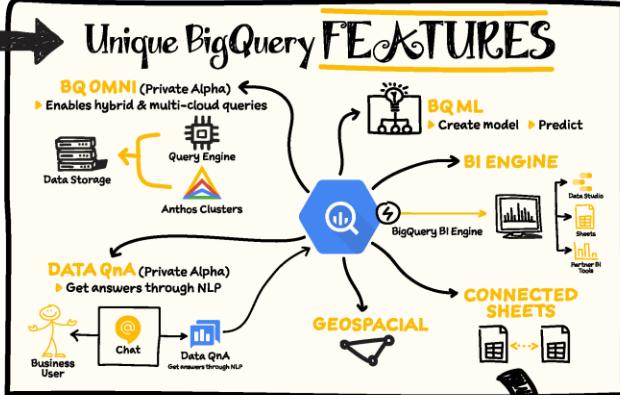
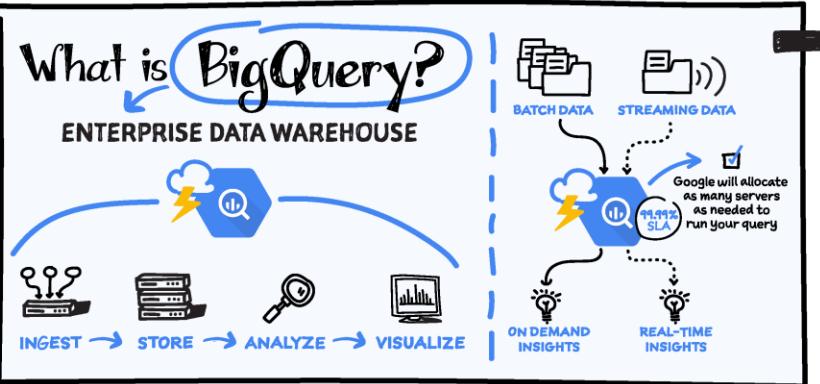




BigQuery

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Introduction to Cloud Composer

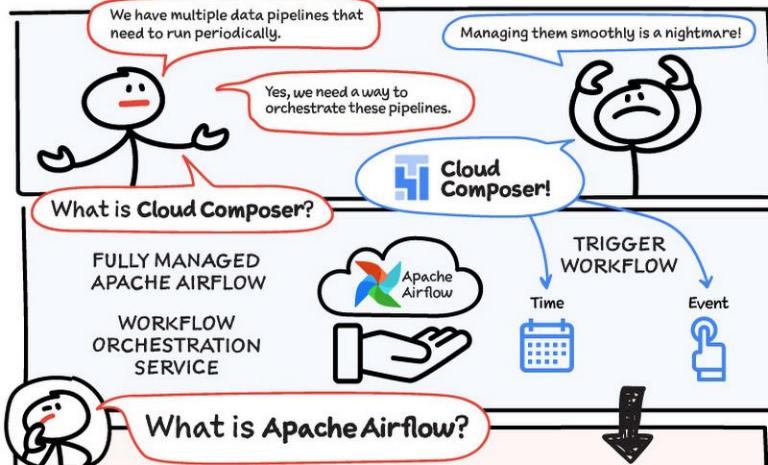
Google Cloud Composer is a fully managed workflow orchestration service that is built on Apache Airflow. It allows you to author, schedule, and monitor workflows by defining them as code. These workflows can include data pipelines, ETL tasks, data processing, and more. Cloud Composer helps you automate and manage complex data workflows, making it easier to coordinate and schedule tasks across different services and resources in Google Cloud.





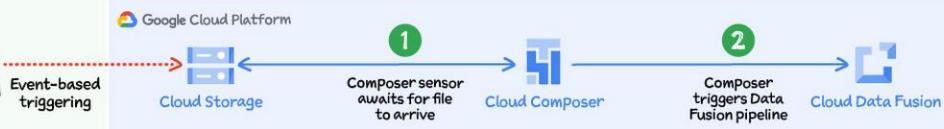
Cloud Composer

#GCPSketchnote
@PVERGADIA THECLOUDGIRL.DEV
07.21.2021

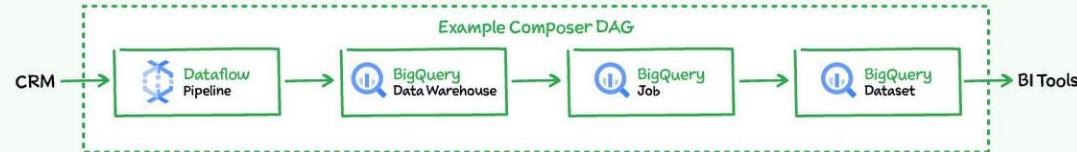


How do I run workflows in Composer?

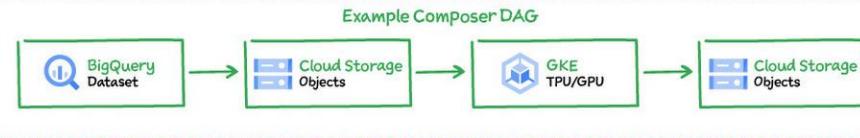
AUTOMATING RUNS OF ETL/ELT PIPELINES



LOADING & ENRICHING DATA FROM A TRANSACTIONAL SYSTEM



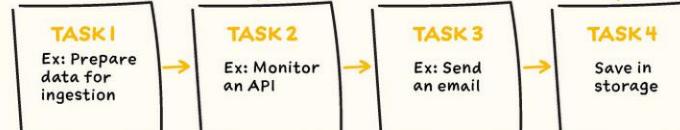
ML TRAINING USING GKE CLUSTER WITH GPU / TPU CORES



What is DAG?

DAG = Workflow

Dependencies/relationships



PURPOSE OF DAG?

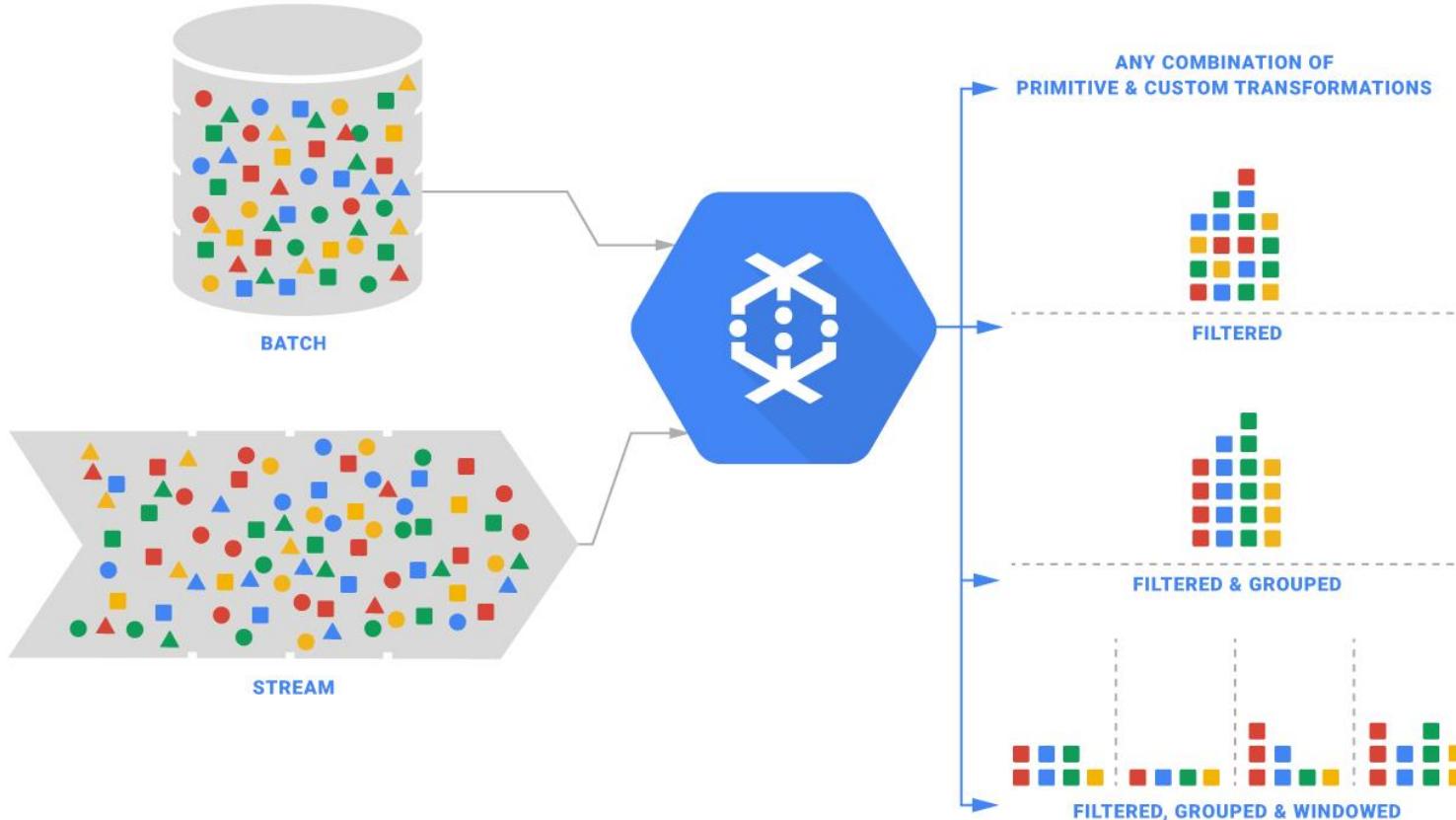
- Executed:
 - ✓ at the right time
 - ✓ in the right order
 - ✓ with the right issue handling

Introduction to Cloud Dataflow

Cloud Dataflow is a fully managed data processing service provided. It allows you to process large amounts of data in a scalable and efficient manner.

Cloud Dataflow is designed to handle both batch and stream processing, making it a versatile tool for various data processing needs.







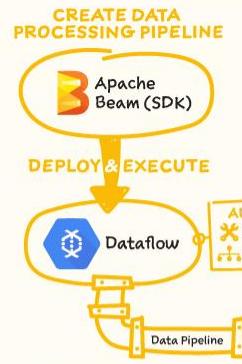
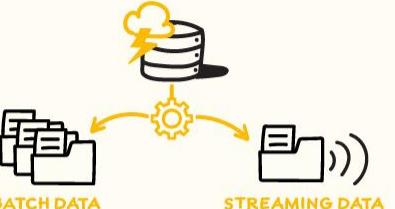
Dataflow

#GCPSketchnote

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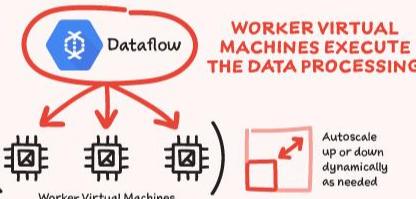
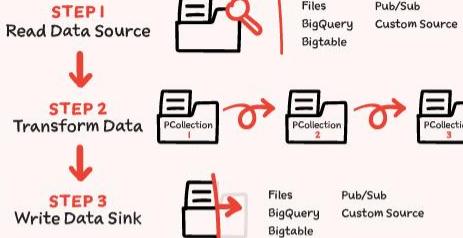
What is Dataflow?

SERVELESS, DATA PROCESSING SERVICE FOR BOTH STREAMING AND BATCH DATA

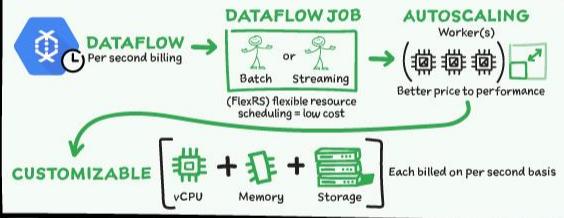


How does it WORK?

DATA PROCESSING PIPELINE



\$\$\$\$ Dataflow PRICING \$\$\$



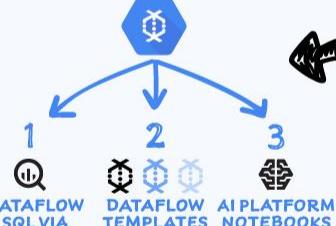
SECURITY

for Dataflow Pipelines

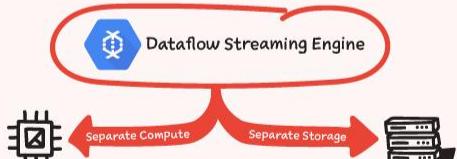
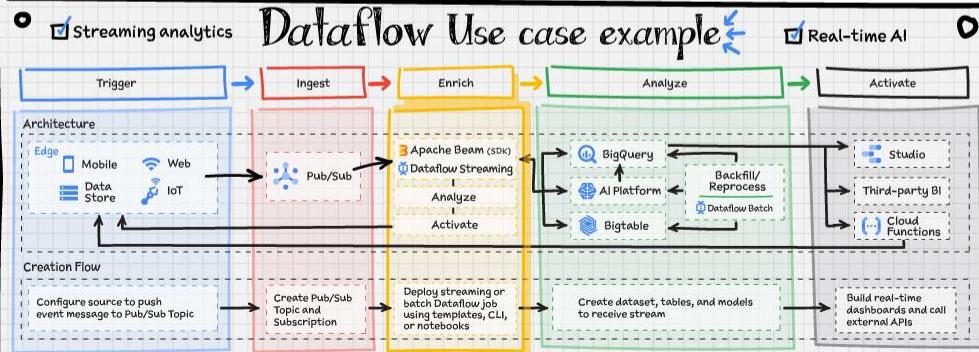
EXACTLY-ONCE PROCESSING

- | 0 | 1 | 2 | 3 |
|---|---|---|---|
|  |  |  |  |
| Avoid risk
of data loss | Turn off
public IPs | VPC
controls | Customer managed
encryption key
(CMK) |

HOW TO USE Dataflow



- | DATAFLOW
TEMPLATES | AI PLATFORM
NOTEBOOKS |
|--|---|
| <ul style="list-style-type: none"> ▶ Share pipeline with teams ▶ Easy & repeatable Pre built templates | <ul style="list-style-type: none"> ▶ Use latest data science and machine learning frameworks |

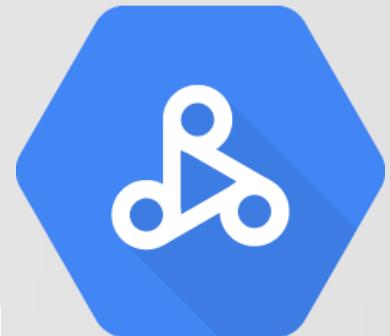
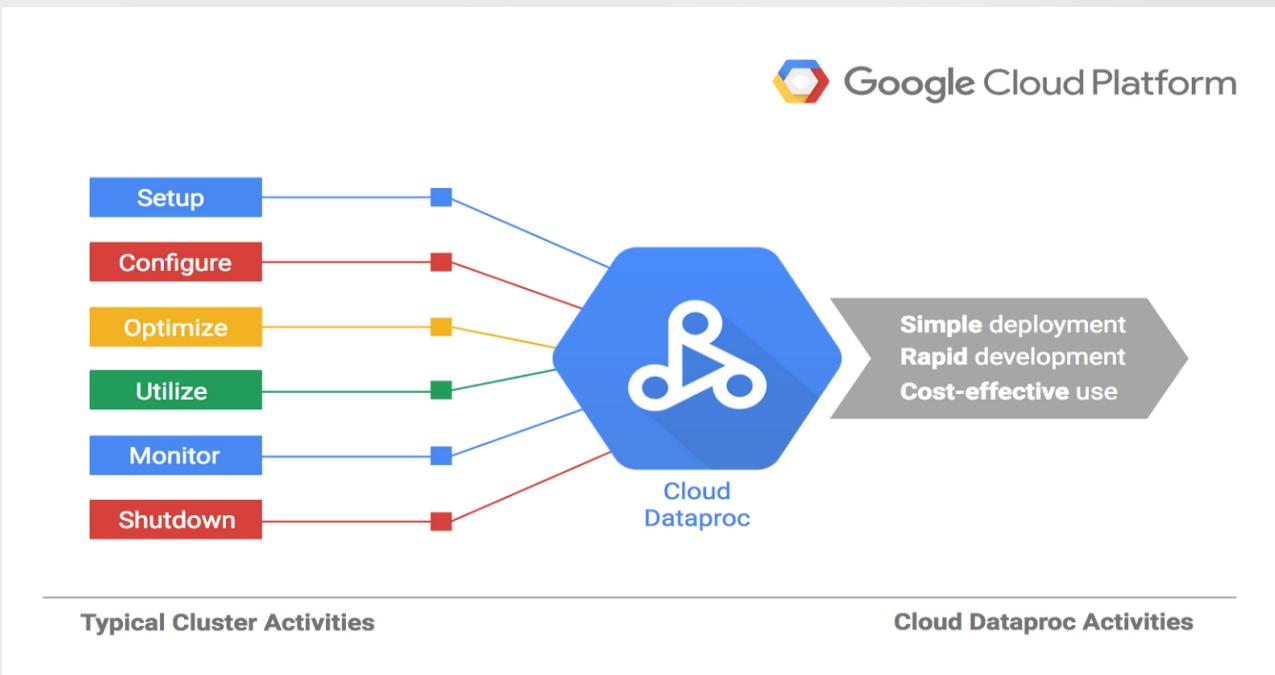


**BATCH PIPELINES SCALE SEAMLESSLY,
WITHOUT ANY TUNING REQUIRED.**



Introduction to Cloud Dataproc

Cloud Dataproc is a managed cloud service that enables you to easily manage and process large-scale data using open-source tools like Apache Hadoop. It's designed to simplify the deployment, configuration, and management of these data processing frameworks, allowing you to focus on your data analysis rather than infrastructure management.



Introduction to Cloud Dataprep

Cloud Dataprep is a data preparation and transformation service that helps users clean, structure, and enrich their data for analysis and downstream processing visually (no coding). It is designed to streamline the often complex and time-consuming process of data preparation, making it easier for users to work with diverse and messy data sources.

A screenshot of the Cloud Dataprep interface. On the left is a spreadsheet view with two columns labeled 'Nominees' and 'Nominees'. The first row contains the names 'thomas Lynley' and 'Thomas Lynley'. The second row contains 'doris lessing' and 'Dian Fossey'. The third row contains 'Chinua achebe' and 'gregor mendel'. The fourth row contains 'Nelson Mandela' and 'margaret atwood'. The fifth row contains 'Octavia butler' and 'barbara havers'. The sixth row contains 'winston Nkata' and 'helen clyde'. The seventh row contains 'Jane goodall' and 'ada Lovelace'. The eighth row contains 'ada Lovelace'. The ninth row contains 'ada Lovelace'. The tenth row contains 'ada Lovelace'. The eleventh row contains 'ada Lovelace'. The twelfth row contains 'ada Lovelace'. The thirteenth row contains 'ada Lovelace'. The fourteenth row contains 'ada Lovelace'. The fifteenth row contains 'ada Lovelace'. The sixteenth row contains 'ada Lovelace'. The seventeenth row contains 'ada Lovelace'. The eighteenth row contains 'ada Lovelace'. The nineteenth row contains 'ada Lovelace'. The twentieth row contains 'ada Lovelace'. The twenty-first row contains 'ada Lovelace'. The twenty-second row contains 'ada Lovelace'. The twenty-third row contains 'ada Lovelace'. The twenty-fourth row contains 'ada Lovelace'. The twenty-fifth row contains 'ada Lovelace'. The twenty-sixth row contains 'ada Lovelace'. The twenty-seventh row contains 'ada Lovelace'. The twenty-eighth row contains 'ada Lovelace'. The twenty-ninth row contains 'ada Lovelace'. The thirtieth row contains 'ada Lovelace'. The thirty-first row contains 'ada Lovelace'. The thirty-second row contains 'ada Lovelace'. The thirty-third row contains 'ada Lovelace'. The thirty-fourth row contains 'ada Lovelace'. The thirty-fifth row contains 'ada Lovelace'. The thirty-sixth row contains 'ada Lovelace'. The thirty-seventh row contains 'ada Lovelace'. The thirty-eighth row contains 'ada Lovelace'. The thirty-ninth row contains 'ada Lovelace'. The forty-th row contains 'ada Lovelace'. The forty-first row contains 'ada Lovelace'. The forty-second row contains 'ada Lovelace'. The forty-third row contains 'ada Lovelace'. The forty-fourth row contains 'ada Lovelace'. The forty-fifth row contains 'ada Lovelace'. The forty-sixth row contains 'ada Lovelace'. The forty-seventh row contains 'ada Lovelace'. The forty-eighth row contains 'ada Lovelace'. The forty-ninth row contains 'ada Lovelace'. The五十th row contains 'ada Lovelace'. The fifty-first row contains 'ada Lovelace'. The fifty-second row contains 'ada Lovelace'. The fifty-third row contains 'ada Lovelace'. The fifty-fourth row contains 'ada Lovelace'. The fifty-fifth row contains 'ada Lovelace'. The fifty-sixth row contains 'ada Lovelace'. The fifty-seventh row contains 'ada Lovelace'. The fifty-eighth row contains 'ada Lovelace'. The fifty-ninth row contains 'ada Lovelace'. The六十th row contains 'ada Lovelace'. The六十-first row contains 'ada Lovelace'. The六十-second row contains 'ada Lovelace'. The六十-third row contains 'ada Lovelace'. The六十-fourth row contains 'ada Lovelace'. The六十-fifth row contains 'ada Lovelace'. The六十-sixth row contains 'ada Lovelace'. The六十-seventh row contains 'ada Lovelace'. The六十-eighth row contains 'ada Lovelace'. The六十-ninth row contains 'ada Lovelace'. The七十th row contains 'ada Lovelace'. The七十-first row contains 'ada Lovelace'. The七十-second row contains 'ada Lovelace'. The七十-third row contains 'ada Lovelace'. The七十-fourth row contains 'ada Lovelace'. The七十-fifth row contains 'ada Lovelace'. The七十-sixth row contains 'ada Lovelace'. The七十-seventh row contains 'ada Lovelace'. The七十-eighth row contains 'ada Lovelace'. The七十-ninth row contains 'ada Lovelace'. The八十th row contains 'ada Lovelace'. The八十-first row contains 'ada Lovelace'. The八十-second row contains 'ada Lovelace'. The八十-third row contains 'ada Lovelace'. The八十-fourth row contains 'ada Lovelace'. The八十-fifth row contains 'ada Lovelace'. The八十-sixth row contains 'ada Lovelace'. The八十-seventh row contains 'ada Lovelace'. The八十-eighth row contains 'ada Lovelace'. The八十-ninth row contains 'ada Lovelace'. The九十th row contains 'ada Lovelace'. The九十-first row contains 'ada Lovelace'. The九十-second row contains 'ada Lovelace'. The九十-third row contains 'ada Lovelace'. The九十-fourth row contains 'ada Lovelace'. The九十-fifth row contains 'ada Lovelace'. The九十-sixth row contains 'ada Lovelace'. The九十-seventh row contains 'ada Lovelace'. The九十-eighth row contains 'ada Lovelace'. The九十-ninth row contains 'ada Lovelace'. The一百th row contains 'ada Lovelace'. The一百-first row contains 'ada Lovelace'. The一百-second row contains 'ada Lovelace'. The一百-third row contains 'ada Lovelace'. The一百-fourth row contains 'ada Lovelace'. The一百-fifth row contains 'ada Lovelace'. The一百-sixth row contains 'ada Lovelace'. The一百-seventh row contains 'ada Lovelace'. The一百-eighth row contains 'ada Lovelace'. The一百-ninth row contains 'ada Lovelace'. The一百零th row contains 'ada Lovelace'.

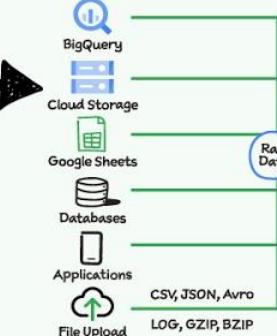
	A	B	C	D
1	Nominees	Nominees		
2	thomas Lynley	Thomas Lynley		
3	doris lessing			
4	Dian Fossey			
5	Chinua achebe			
6	gregor mendel			
7	Nelson Mandela			
8	margaret atwood			
9	Octavia butler			
10	barbara havers			
11	winston Nkata			
12	helen clyde			
13	Jane goodall			
14	ada Lovelace			
15				

A network graph visualization consisting of several black dots (nodes) connected by thin grey lines (edges), forming a complex web of connections. The nodes are scattered across the right side of the screen.

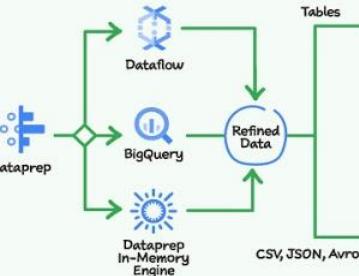


How does it work?

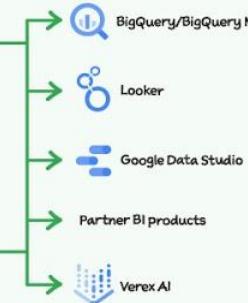
1. INGESTION



2. PREPARATION & STORAGE



3. ANALYSIS & ML



4. GOVERNANCE & AUTOMATION

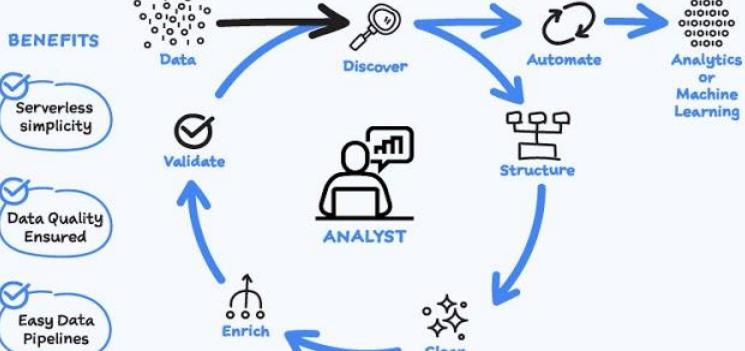
Data Catalog Cloud Functions Cloud Composer



Dataprep

Dataprep simplifies data lifecycle for the Data Analysts

EXPLORE, CLEAN & PREPARE BIG DATA VISUALLY



Some key features!

BUILT-IN DATA QUALITY ASSESSMENT & VALIDATION

- Visually explore and interact with all your data
- Instantly understand data distribution and patterns
- Checks validation - surfaces mismatches
- Get data quality resolution suggestions



AUTOMATED DATA PIPELINES

- Build data engineering pipelines with clicks not code
- Leverage Dataflow & BigQuery to process data at scale
- Rich data connectivity library



VISUALIZE & ACCELERATE DATA TRANSFORMATION

- Get ML-guided transformation suggestions automatically
- Standardize, structure
- Join datasets easily with a guided approach
- One-click feature engineering & calculation

Powerful & easy processing with Dataflow & BigQuery under the hood

Introduction to Cloud Data Fusion

Data fusion, also known as data integration, is the process of combining and transforming data from different sources into a unified format, making it easier to analyze and extract insights.

Data Fusion is a managed service that helps organizations perform data integration tasks without the need for extensive coding or manual processes. It offers a graphical interface for designing, deploying, and managing ETL (Extract, Transform, Load) pipelines, allowing users to efficiently move and transform data across various GCP services.



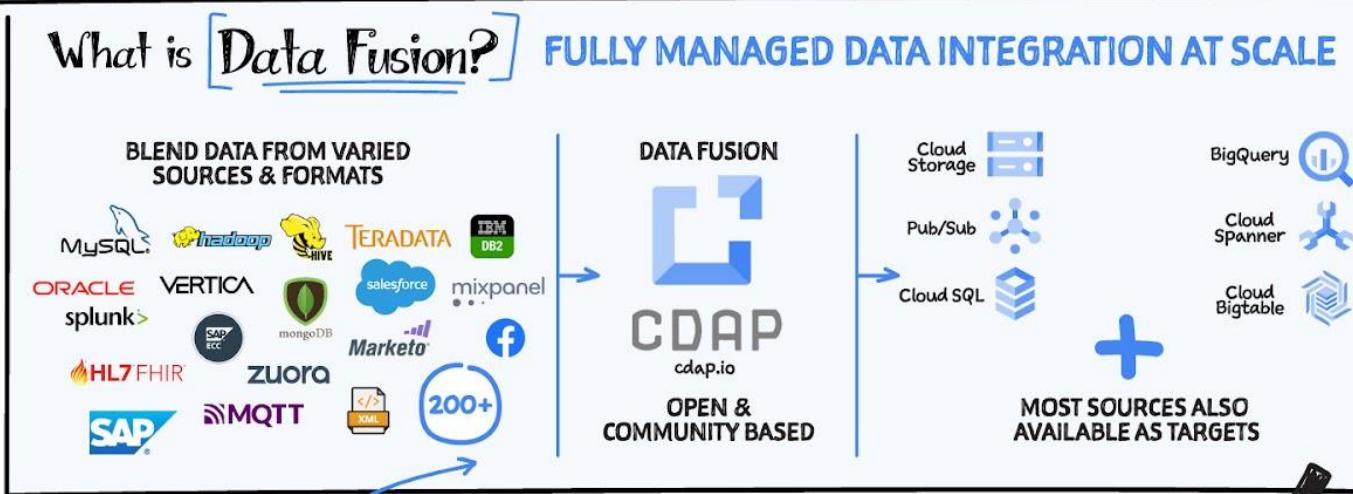


Data Fusion

#GCPSketchnote

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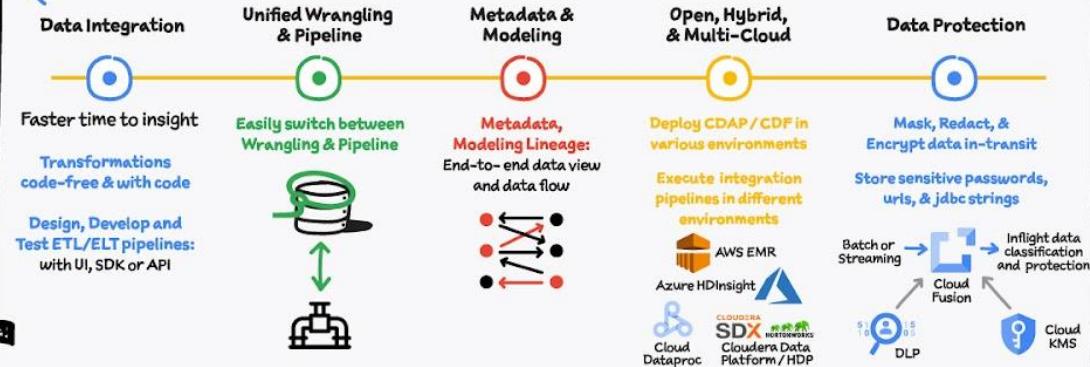
6.28.2021



PERSONA BASED FUNCTIONALITY

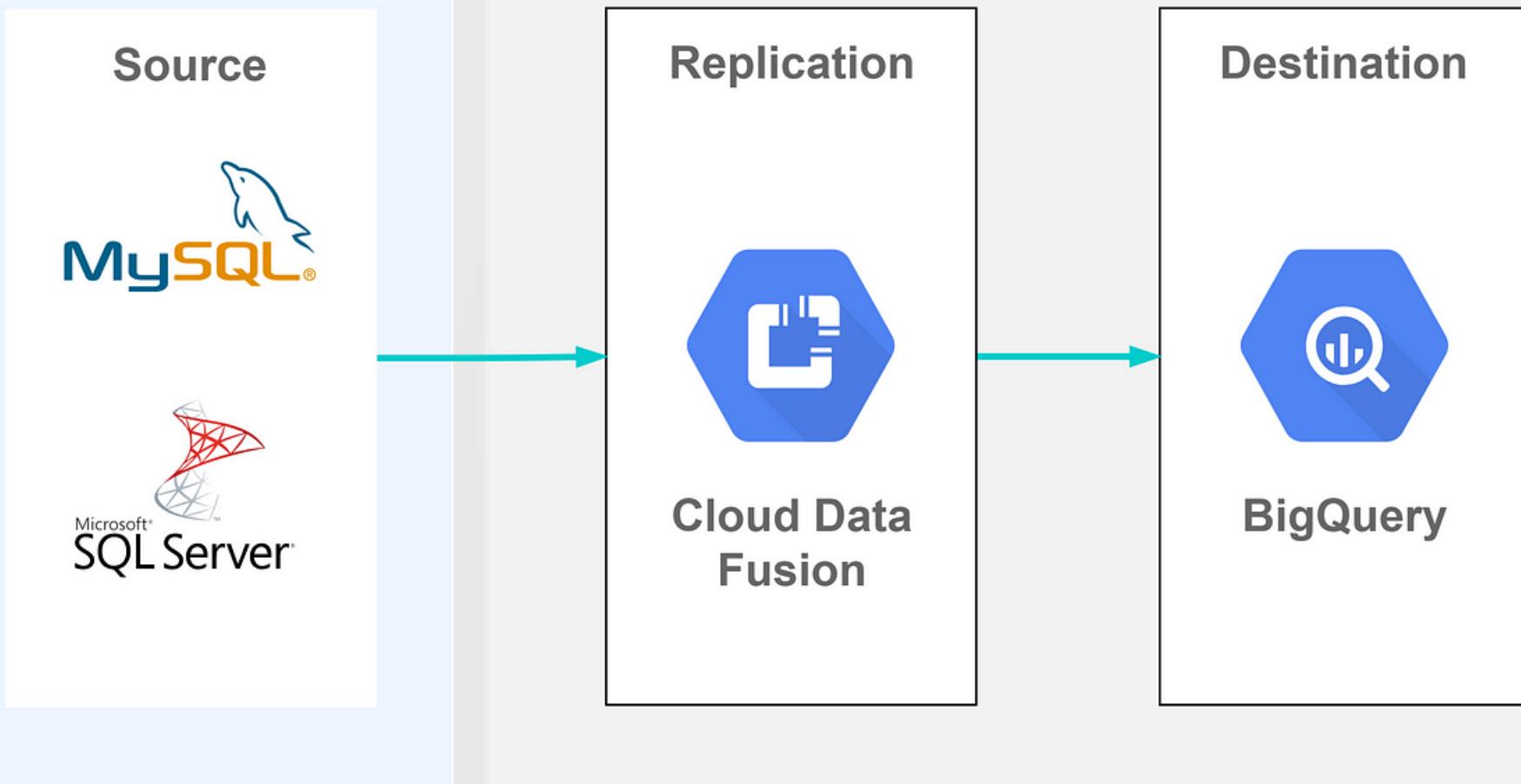
USE CASES	Data Marts & Data Warehouses	Data Lakes	Operational Reporting
CAPABILITIES	Pipelines with ETL & ETL capabilities	Bulk Data Ingestion & Data Wrangling	Replication capabilities with real-time CDC
PERSONAS	ETL Developers Data Engineers	Data Engineers Data Analysts	ETL Developers Data Engineers

What are its Data Integration capabilities?





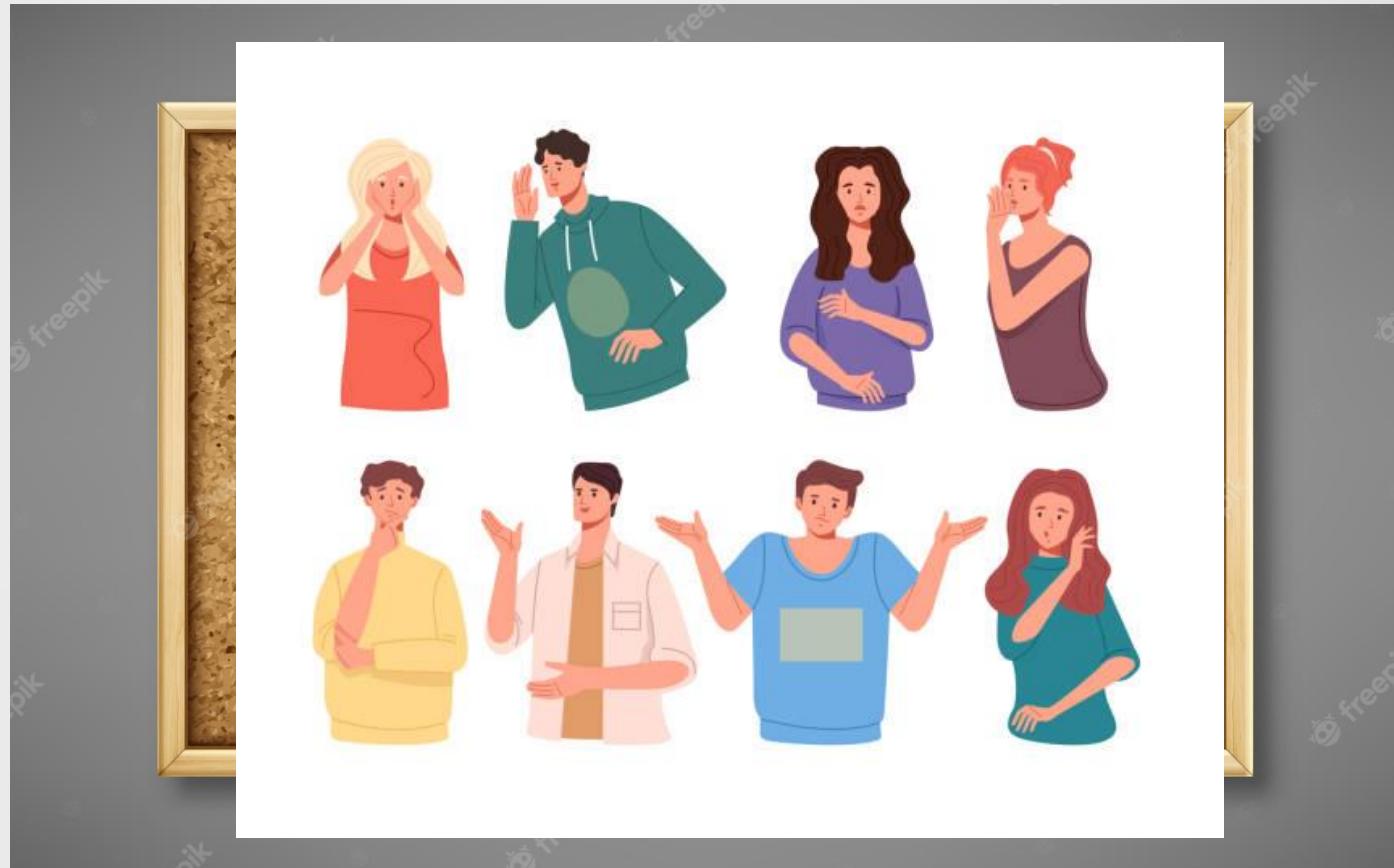
Google Cloud Platform



Introduction to Cloud Pub/Sub

Pub/Sub, short for "Publish/Subscribe," is a messaging service that enables asynchronous communication between different components of an application or between different services. It allows decoupled and scalable communication by using a publisher-subscriber model. In this model, publishers send messages to a topic, and subscribers receive messages from the topic they are interested in.

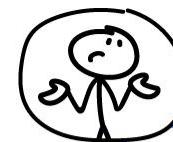
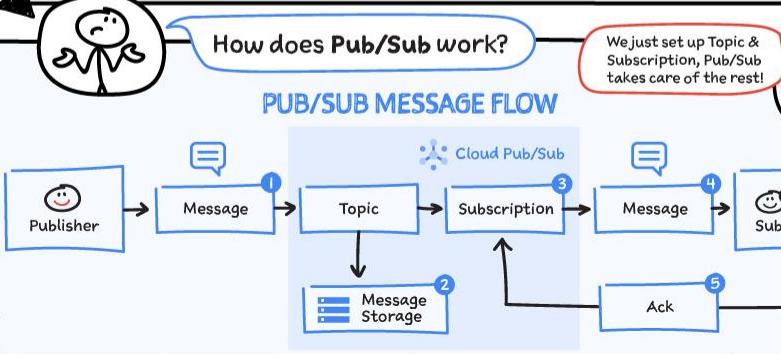
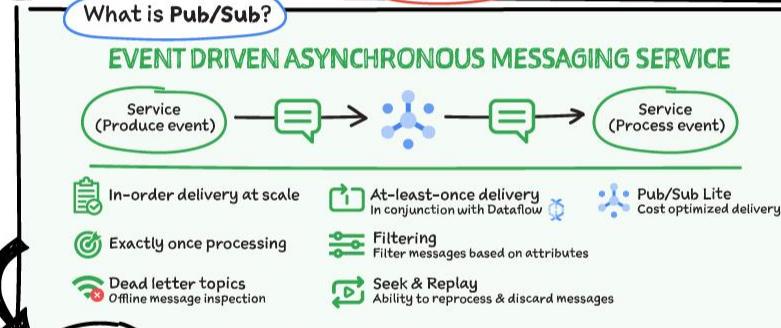
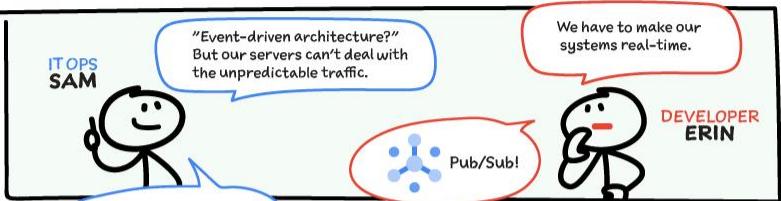




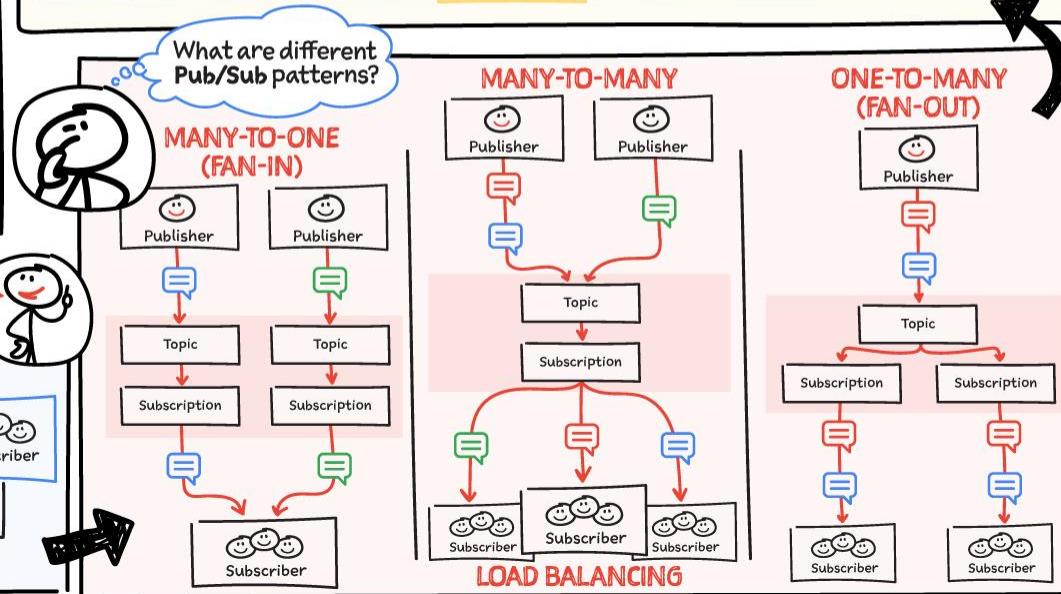
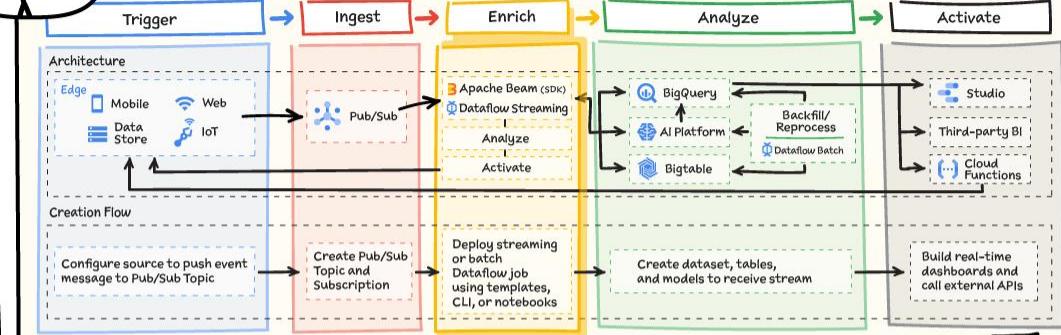


Cloud Pub/Sub

#GCPsketchnote
@PVERGADIA THECLOUDGIRL.DEV 10.1.2020



How does Pub/Sub help with Stream Analytics?



Summary: Choosing Between Data Analytics Services

BigQuery:

You need a fully managed and serverless data warehouse for running SQL-like queries on large datasets.

Fast query performance, scalability, ease of use, separation of storage and compute, built-in machine learning capabilities.

Cloud Composer:

You need to orchestrate, schedule, and monitor complex workflows and data pipelines.

Based on Apache Airflow, supports Python scripting, DAG (Directed Acyclic Graph) definition, integration with various GCP services.

Dataflow:

You want to build real-time or batch data processing pipelines using Apache Beam SDK.

Autoscaling, serverless execution, supports both batch and stream processing, integration with GCP services.

An abstract graphic in the bottom right corner featuring a network of gray lines connecting numerous small black dots, forming a complex web-like structure.

Dataproc:

You need to run Apache Spark or Apache Hadoop clusters for big data processing.

Managed cluster provisioning, auto-scaling, cost optimization, supports popular big data frameworks.

Data Fusion:

You need to build and manage ETL (Extract, Transform, Load) pipelines without extensive coding.

Simplified ETL design, visual interface, supports a variety of data sources and sinks, scalable and managed.

Dataprep:

You need to clean, transform, and prepare data for analysis without extensive coding.

Visual data preparation, interactive data wrangling, data profiling, integration with other GCP services.

Pub/Sub:

You need to build real-time event-driven applications and systems.

Scalable messaging service, durable and reliable message delivery, integration with other GCP services.



Data Volume and Scale

Complexity

Querying and Analytics

Coding Proficiency

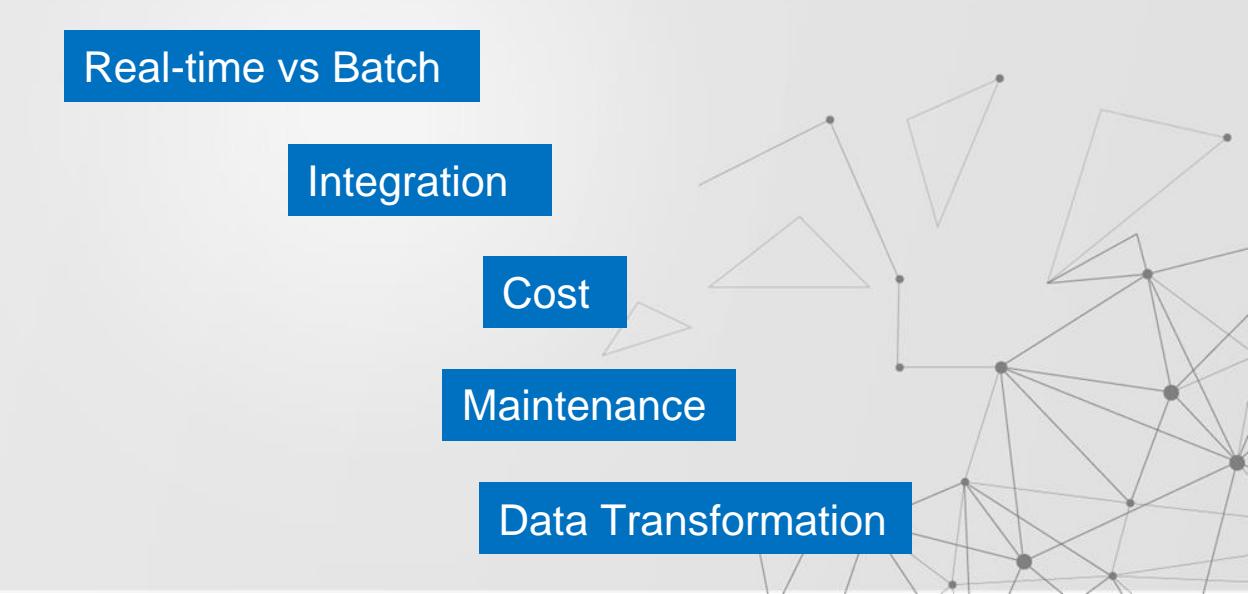
Real-time vs Batch

Integration

Cost

Maintenance

Data Transformation





AI and ML Services in GCP

[Introduction to Vertex AI](#)

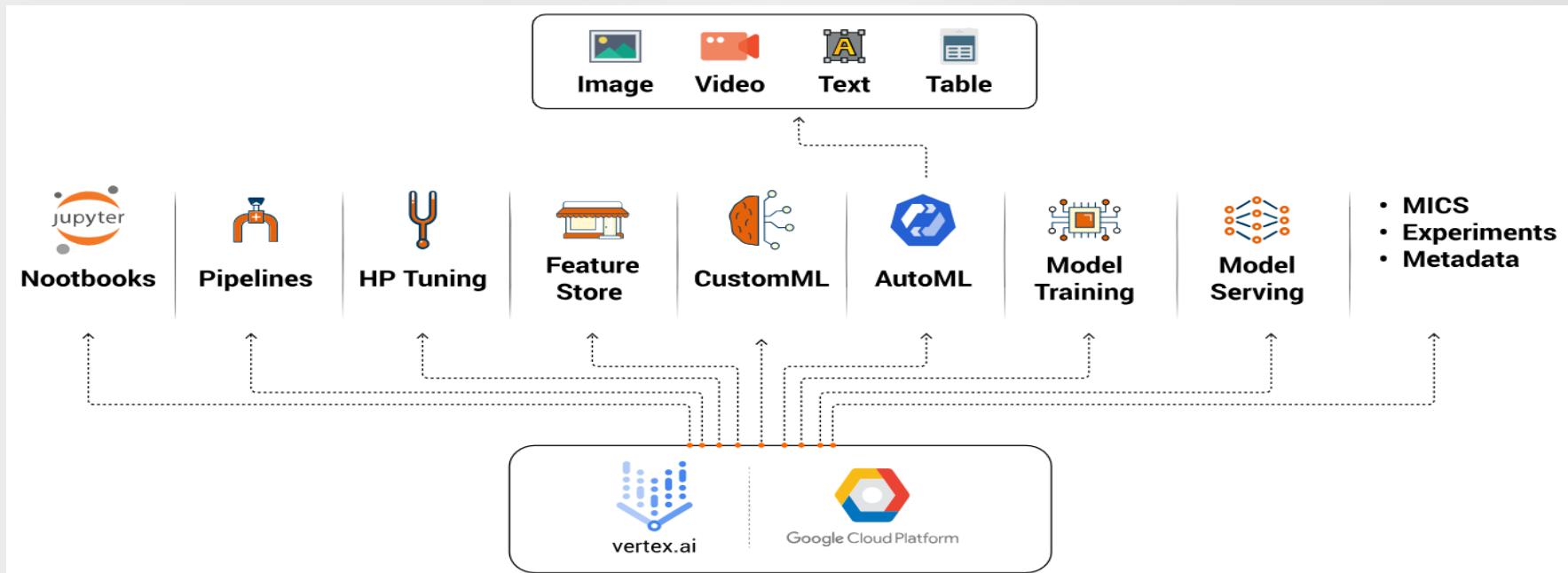
[Introduction to Vertex AI Vision](#)

[Introduction to Gen App Builder](#)

[Introduction to Speech-to-Text AI](#)

Introduction to Vertex AI

GCP Vertex AI is a managed machine learning (ML) platform that lets developers, data scientists, and analysts build, train, and deploy machine learning models at scale. It's essentially the evolution and unification of various AI and ML products like AI Platform Training, AI Platform Predictions, and AutoML.



AutoML

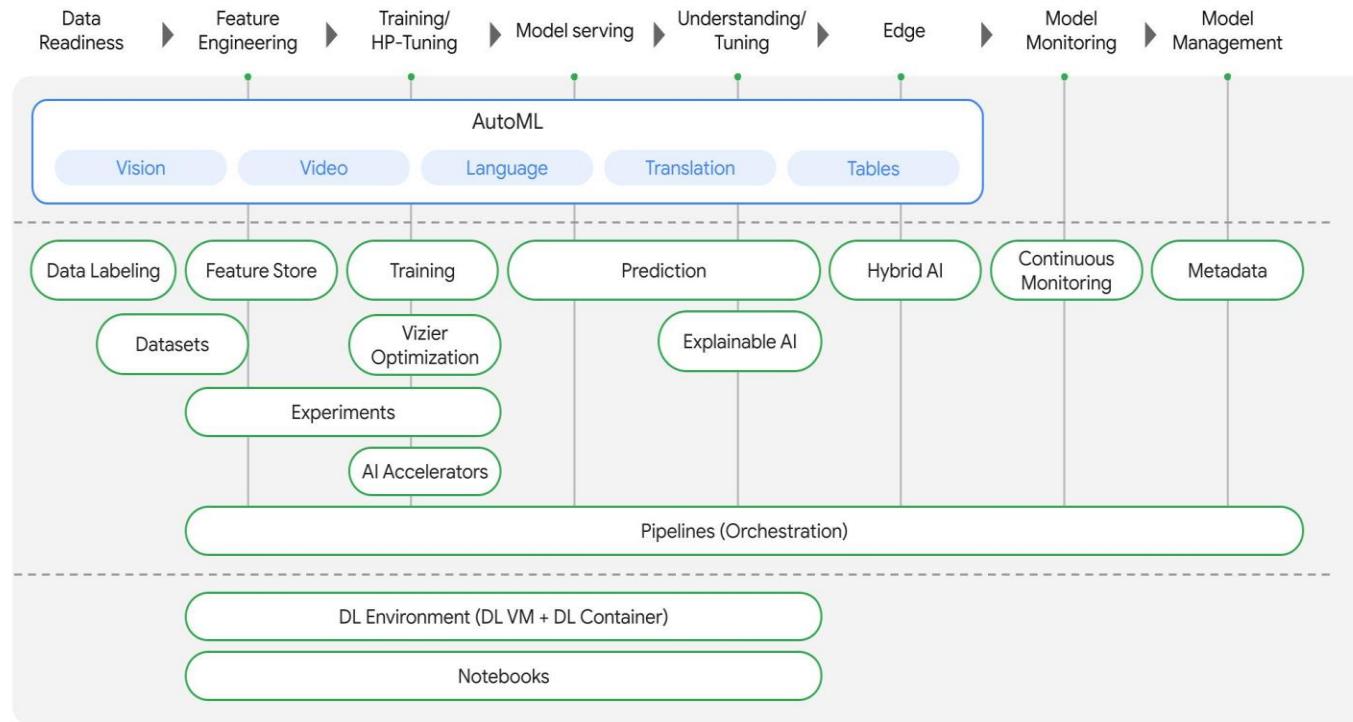
AutoML allows users to train high-quality custom machine learning models with minimal effort and machine learning expertise. You simply provide labeled data, and Google's algorithms automatically train the best model for you.

Custom Training

Custom Training gives more control to the users. It lets users bring their custom ML code and run it at scale using GCP's infrastructure.



What's included in Vertex AI?



Generative AI

Generative AI refers to algorithms that can generate data. On Vertex AI, this would primarily involve techniques like Generative Adversarial Networks (GANs), Variational Autoencoders (VAEs), and more.

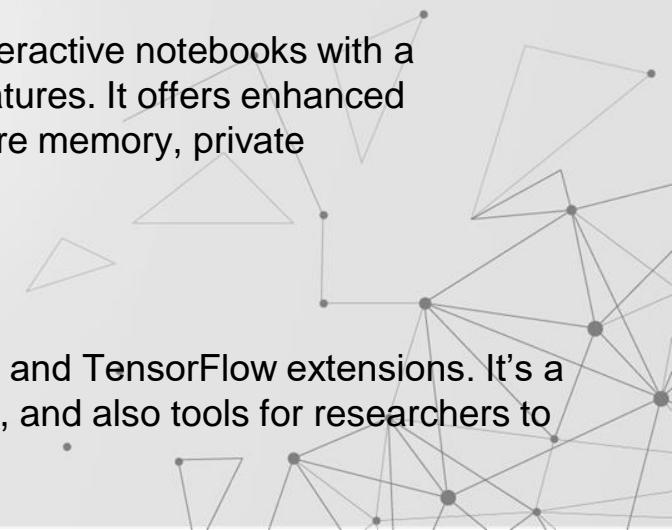
Colab Enterprise

While standard Google Colab provides a Jupyter notebook environment with free access to GPUs and TPUs.

Colab Enterprise enables businesses to create, run, and share interactive notebooks with a similar experience as the free Colab, but with enterprise-grade features. It offers enhanced capabilities tailored for businesses, ensuring faster resources, more memory, private workspaces, SLA guarantees, and enterprise-level support.

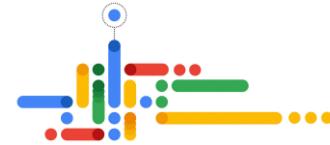
Model Garden

TensorFlow Model Garden is a collection of pre-trained models and TensorFlow extensions. It's a resource for ready-to-use TensorFlow 2.x models and modules, and also tools for researchers to push the state-of-the-art.



Introduction to Gen App Builder

Gen App Builder is a powerful tool that helps developers with no machine learning experience create enterprise-grade generative AI apps. This tool offers a no-code approach, enabling developers to build high-quality experiences in minutes or hours.



No Coding Required

Integrations With Other Google Cloud Services

Customizable Templates

Real-Time Collaboration

Scalability

Security

Generative AI refers to a type of artificial intelligence that can produce new, previously unseen content or data based on patterns it learned during its training. This content can be in various forms, such as text, images, music, or even complex data structures.



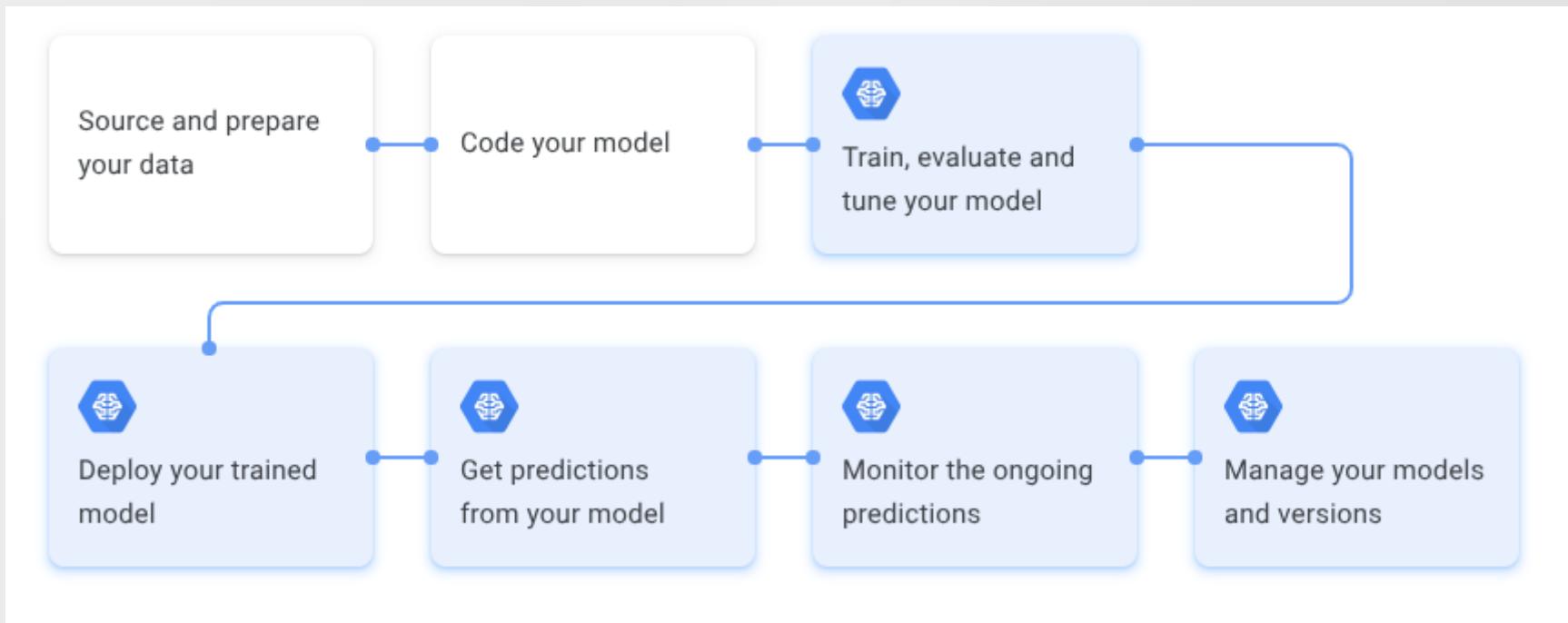
BASE10 TREND MAP: GENERATIVE AI

Companies are grouped based on medium produced and segmented by use case within each medium. Companies that offer products across segments are grouped in the segment of the core product offering.



Introduction to AI Platform

AI Platform provides tools and services for machine learning (ML) practitioners, from data engineers and data scientists to ML researchers.



Introduction to Speech-to-Text

Cloud Speech-to-Text allows developers to convert audio to text and vice versa by applying powerful neural network models.



Variety of Models

Real-time Streaming or Batch Processing

Noise Robustness

Automatic Punctuation

Language Variety

Speaker Diarization

Customization

Word-level Confidence

- ✓ Generating Speech from Text/ Text from Speech: No coding required
- ✓ Integration: Coding is required

Introduction to Vertex AI Vision

Vertex AI Vision is a machine learning service specifically tailored for image/video streams analysis tasks. It's designed to make it easier for developers to incorporate image recognition capabilities into their applications without the need for deep machine learning expertise.

