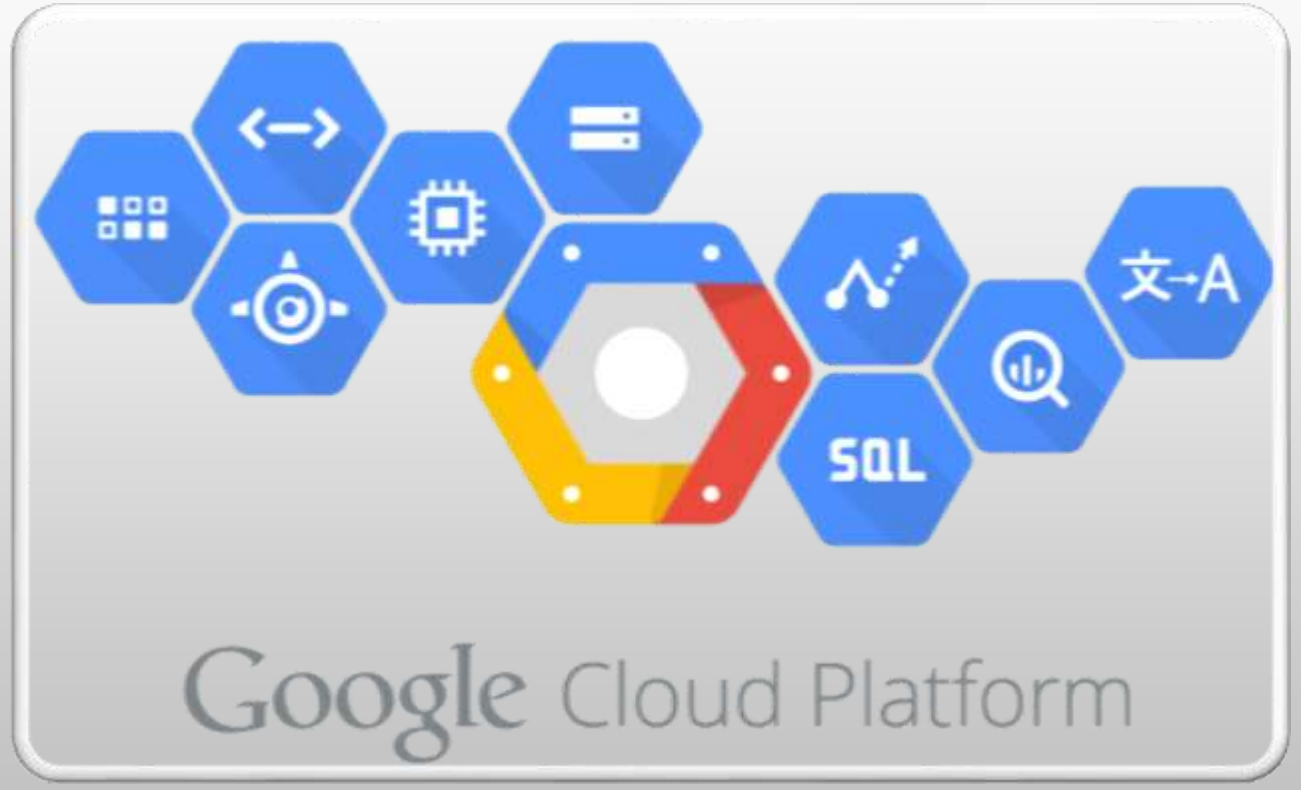
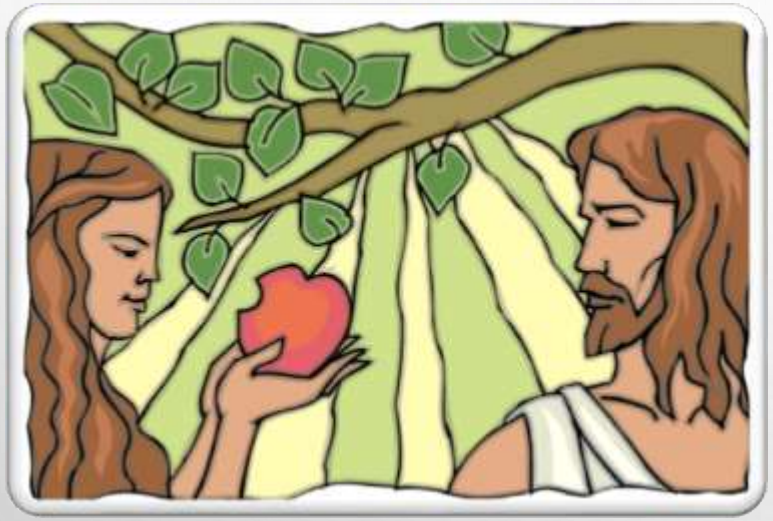


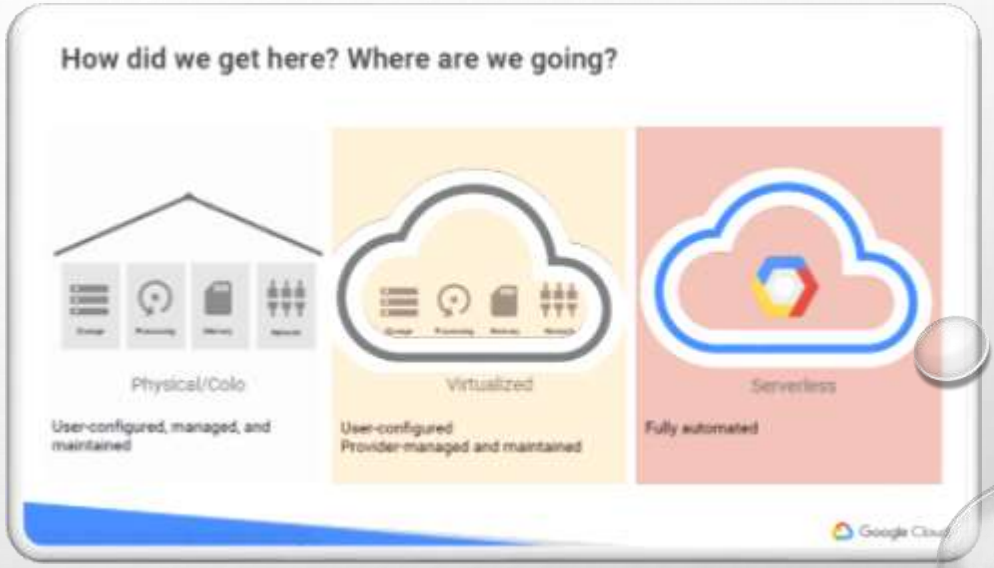
PRESENTED BY

CHETAN SHARMA

MANAS MOHAPATRA

WHAT IS CLOUD COMPUTING?





HOW DID WE GET HERE?

NOW YOU CAN ASK “WHAT IS CLOUD COMPUTING?”

“Simply put, cloud computing is the delivery of computing services—servers, storage, databases, networking, software, analytics, intelligence and more—over the Internet (“the cloud”) to offer faster innovation, flexible resources, and economies of scale. You typically pay only for cloud services you use, helping lower your operating costs, run your infrastructure more efficiently, and scale as your business needs change”

TYPES OF CLOUD COMPUTING

Public Cloud

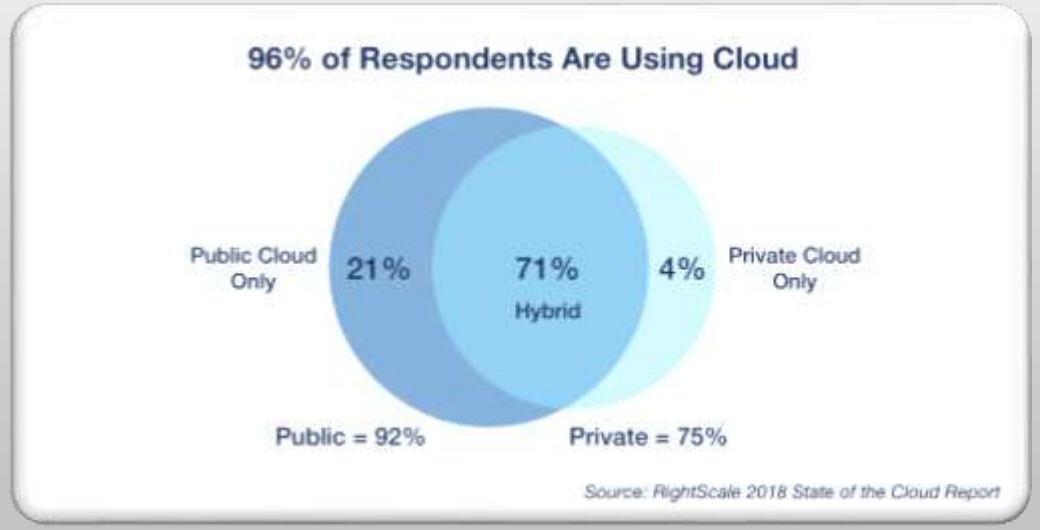
- Public clouds are owned and operated by a third-party cloud service providers
- Like GCP, Microsoft Azure, AWS, IBM Cloud

Private Cloud

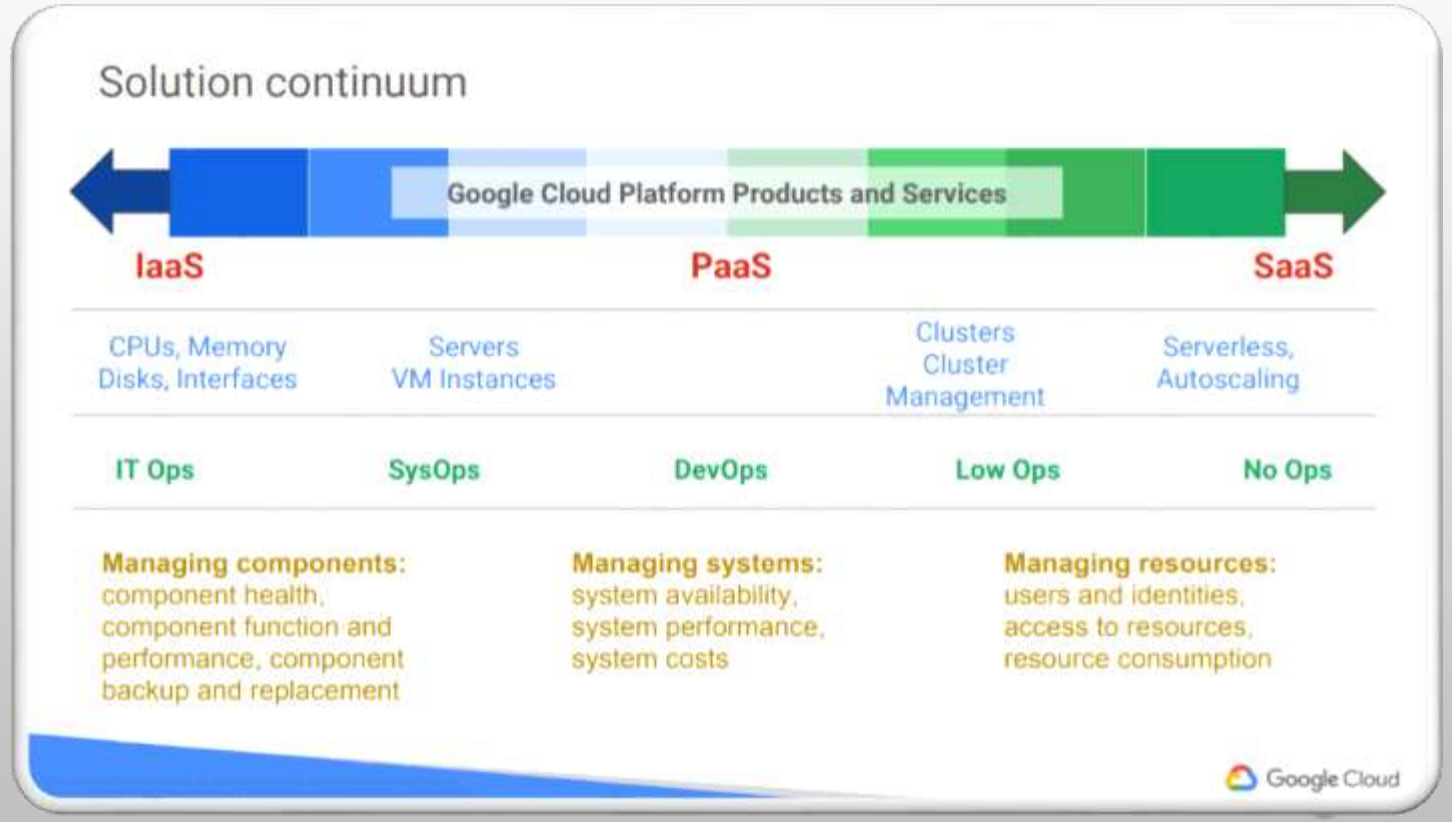
- A private cloud refers to cloud computing resources used exclusively by a single business or organization
- Individual Corporation, Third party, Oracle

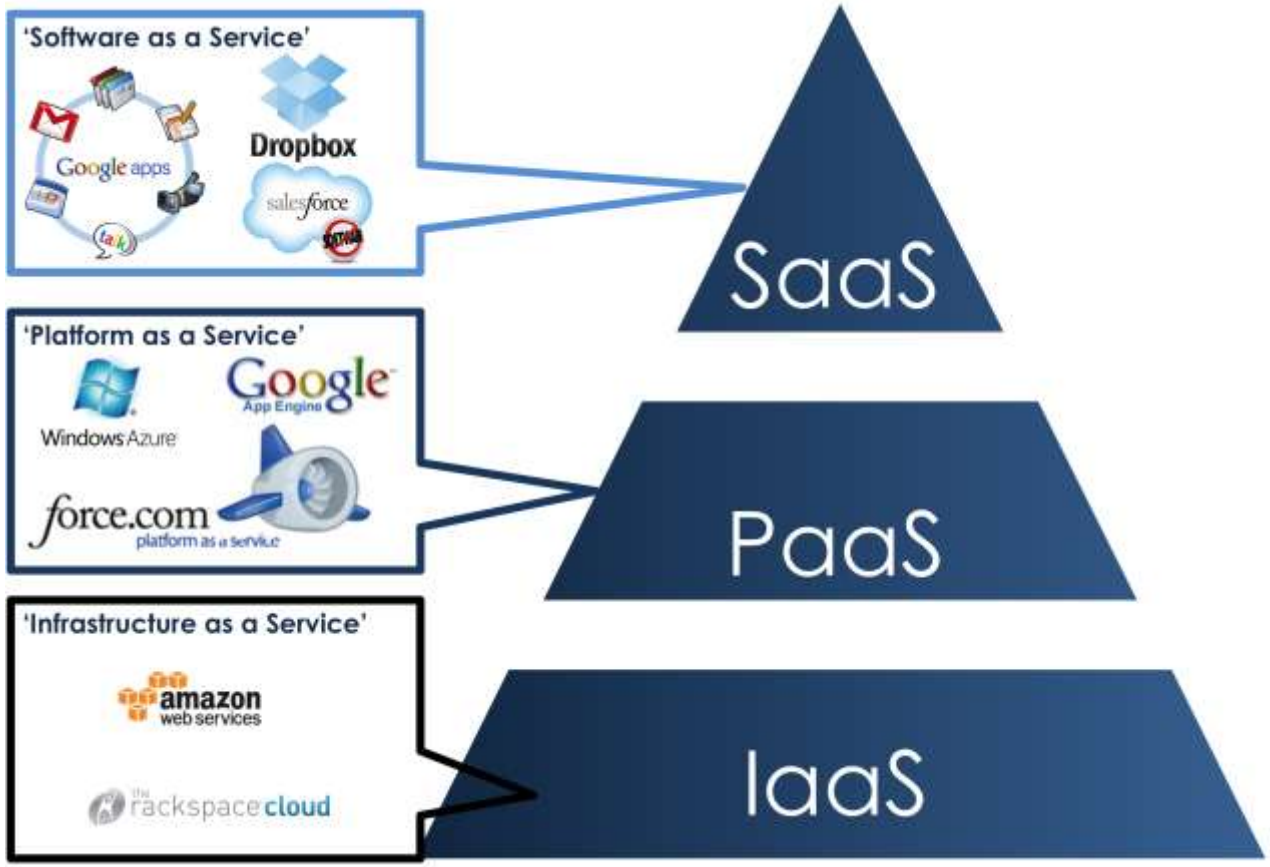
Hybrid Cloud

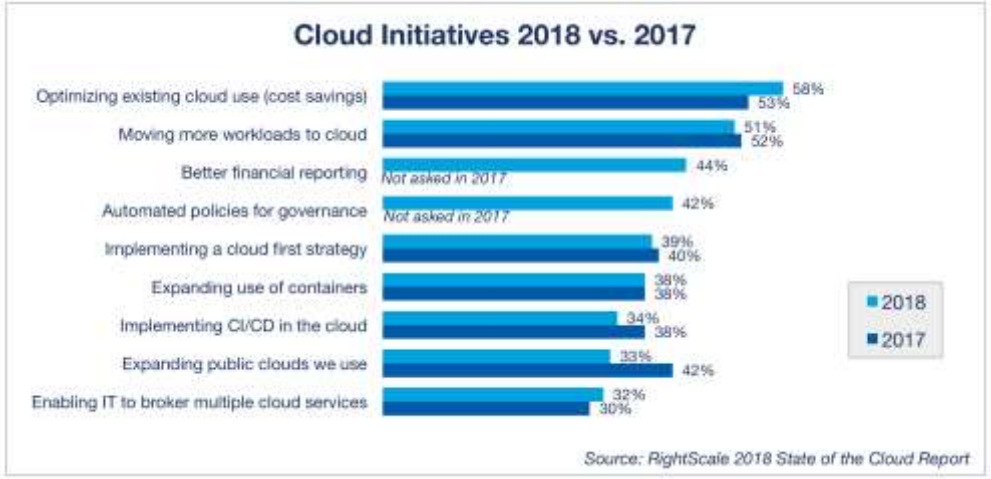
- Hybrid clouds combine public and private clouds, bound together by technology that allows data and applications to be shared between them.
- On-premise with any public cloud

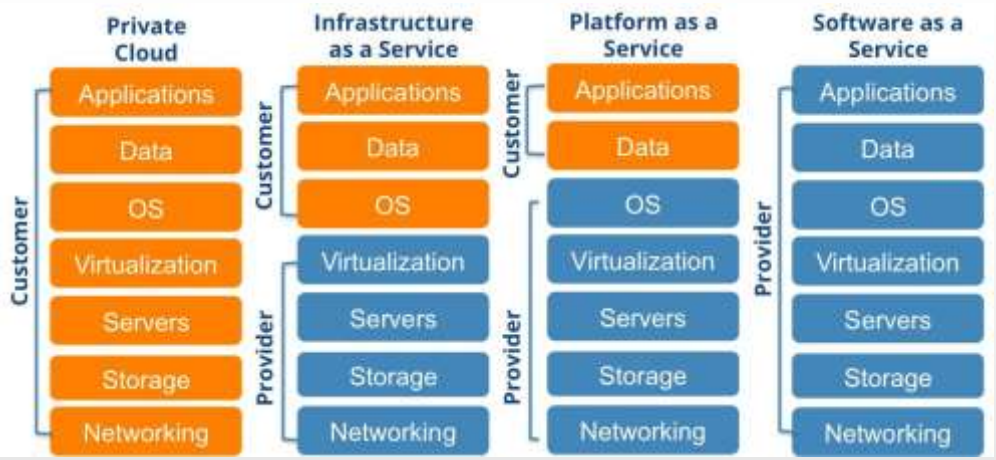


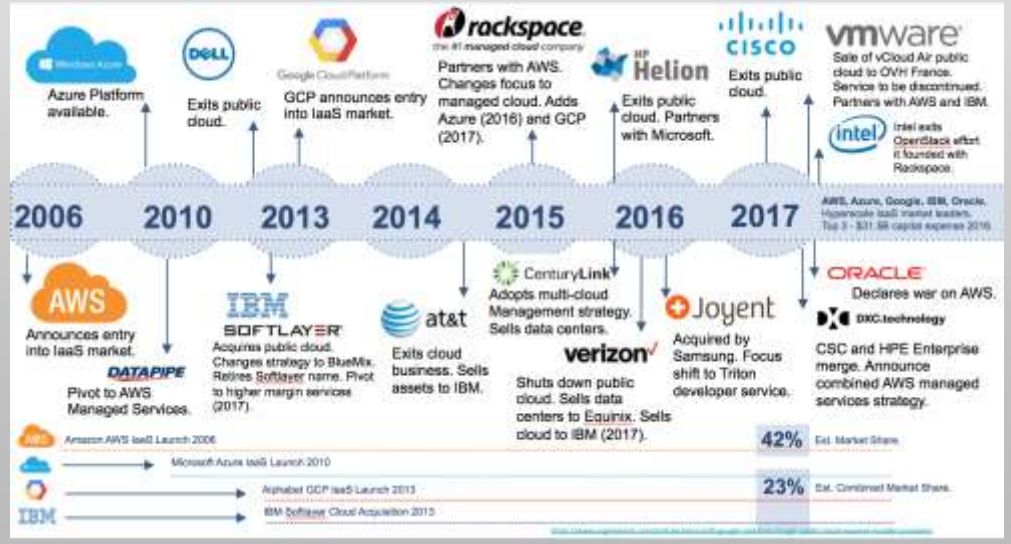
SERVICES CLOUD OFFERS



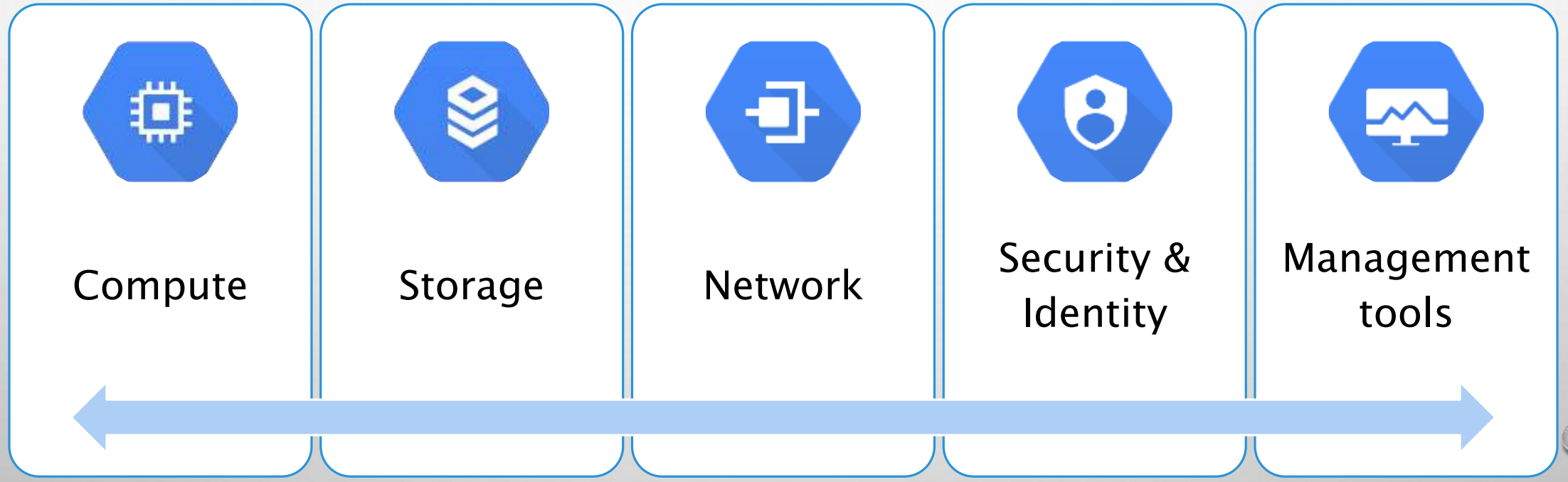

'Software as a Service'
Google apps
Dropbox
salesforce
'Platform as a Service'
Google
App Engine
Windows Azure
force.com
'Infrastructure as a Service'
amazon
web services
rackspace cloud
SaaS
PaaS
IaaS


Cloud Initiatives 2018 vs. 2017
Optimizing existing cloud use (cost savings)
58%
53%
Moving more workloads to cloud
51%
52%
Better financial reporting
44%
Not asked in 2017
Automated policies for governance
42%
Not asked in 2017
Implementing a cloud first strategy
39%
40%
Expanding use of containers
38%
38%
Implementing CI/CD in the cloud
34%
38%
Expanding public clouds we use
33%
42%
Enabling IT to broker multiple cloud services
32%
30%
2018
2017
Source: RightScale 2018 State of the Cloud Report


Private Cloud
Infrastructure as a Service
Platform as a Service
Software as a Service
Customer
Provider
Applications
Data
OS
Virtualization
Servers
Storage
Networking


2006
2010
2013
2014
2015
2016
2017
Azure Platform available.
Exits public cloud.
GCP announces entry into IaaS market.
Partners with AWS. Changes focus to managed cloud. Adds Azure (2016) and GCP (2017).
Exits public cloud. Partners with Microsoft.
Exits public cloud.
Sale of vCloud Air public cloud to OVH France. Service to be discontinued. Partners with AWS and IBM.
Announces entry into IaaS market.
Pivot to AWS Managed Services.
Acquires public cloud. Changes strategy to BlueMix. Retires Softlayer name. Pivot to higher margin services (2017)
Exits cloud business. Sells assets to IBM.
Adopts multi-cloud Management strategy. Sells data centers.
Shuts down public cloud. Sells data centers to Equinix. Sells cloud to IBM (2017).
Acquired by Samsung. Focus shift to Triton developer service.
Declares war on AWS.
CSC and HPE Enterprise merge. Announce combined AWS managed services strategy.
42%
23%

GOOGLE CLOUD PLATFORM AKA “GCP”



Product and services

Compute

Identity & Security

Each Google Cloud Platform product and service have a unique Blue hexagonal icon.

Networking

Big Data

Storage and Databases

Machine Learning

Product and services……

Management Tools

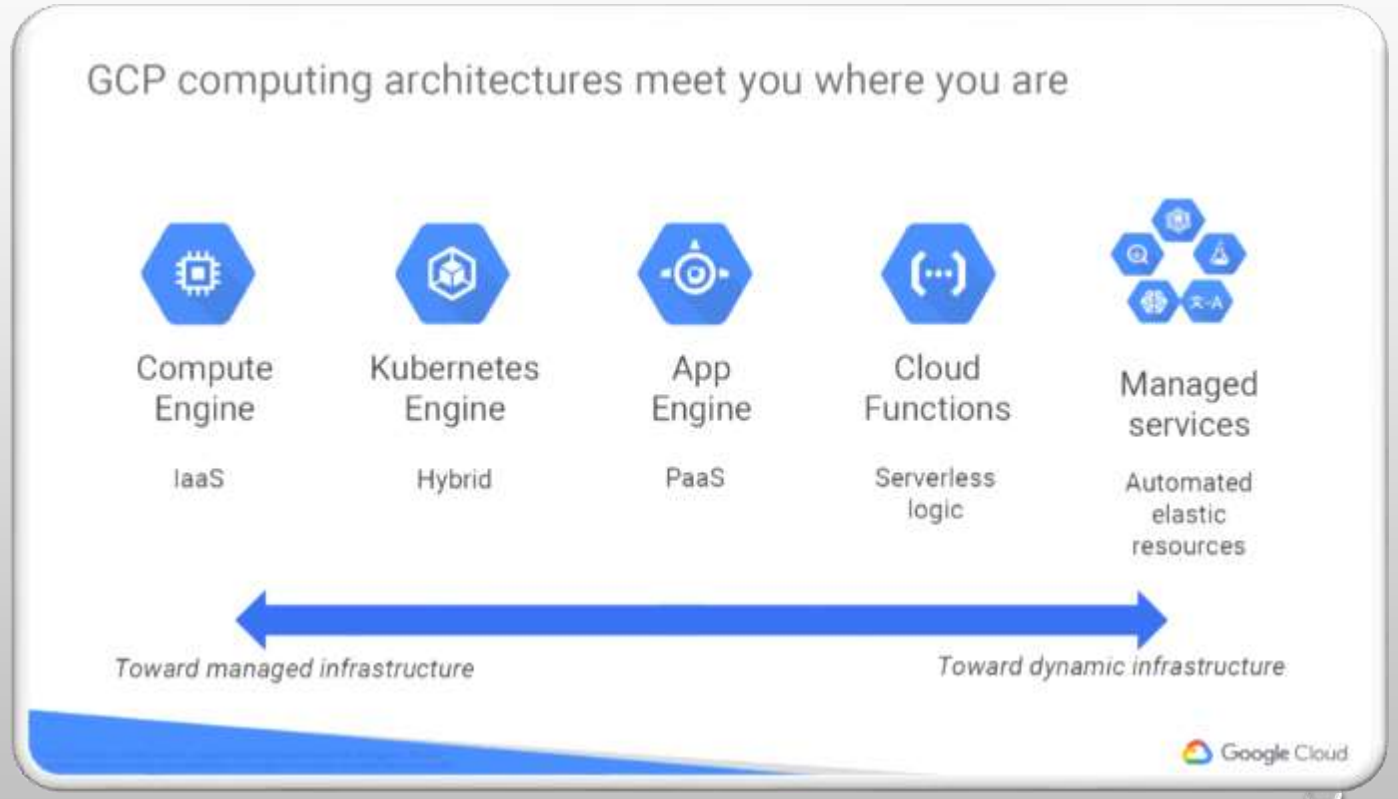
- Stackdriver
- Monitoring
- Logging
- Error Reporting
- Trace
- Debugger
- Deployment Manager
- Cloud Endpoints
- Cloud Console
- Cloud Shell
- Cloud Mobile App
- Billing App
- Cloud APIs

GCP products and services WITHOUT A UNIQUE icon utilize a generic HEXAGONAL ICON.

Developer Tools

- Cloud SDK
- Deployment Manager
- Cloud Source Repositories
- Cloud Tools for Android Studio
- Cloud Tools for IntelliJ
- Cloud Tools for PowerShell
- Cloud Tools for Visual Studio
- Google Plug-in for Eclipse
- Cloud Test Lab

COMPUTING IN GCP



COMPUTE…

Compute Engine offers customer friendly pricing

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

Compute Engine offers managed virtual machines

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

Compute Engine features

- Instance metadata
- Startup scripts

Machine right-sizing
- Recommendation engine for optimum machine size
- Stackdriver statistics
- New recommendation 24 hrs after VM create or resize

Global load balancing
- Multiple regions for availability

Availability policies
- Live migrate
- Auto restart

- Per-second billing
- Sustained use discounts

Preemptible
- Up to 80% discount
- No SLA

Google Cloud

Creating custom machine types

- Number of vCPUs per instance
  - Only 1 vCPU or an even number of vCPUs
- Memory
  - 0.9 GB to 6.5 GB per vCPU
- When to select custom:
  - Requirements fit between the predefined types
  - Need more memory or more CPU
  - Need GPUs
- Customize the amount of memory and CPU for your machine
- Get recommendations for a predefined match
  - Custom VM will generally be more expensive than an identical predefined VM

Google Cloud

GCP compute and processing options

	Compute Engine	Kubernetes Engine	App Engine Standard	App Engine Flexible	Cloud Functions
Language support	Any	Any	Python Java PHP Go	Python Java Node.js Go Ruby PHP .NET Custom Runtimes	Node.js
Usage model	IaaS	IaaS PaaS	PaaS	PaaS	Microservices Architecture
Scaling	Server Autoscaling	Cluster	Autoscaling managed servers		Serverless
Primary use case	General Workloads	Container Workloads	Scalable web applications Mobile backend applications		Lightweight Event Actions

Google Cloud

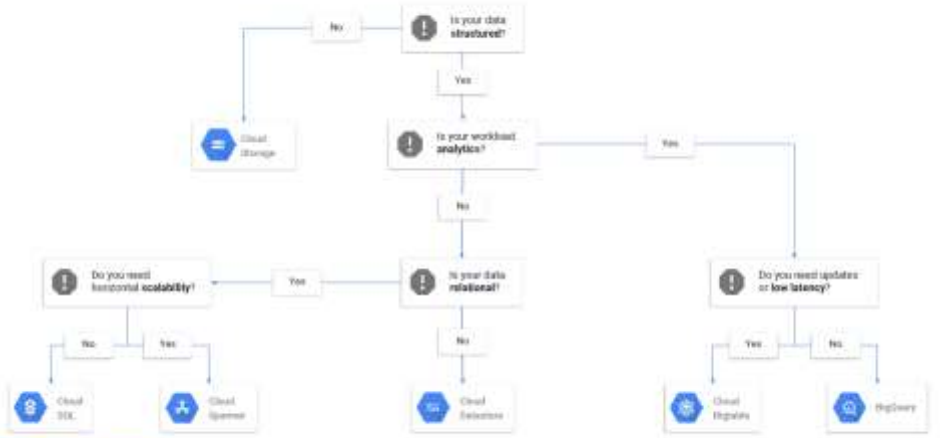
Data storage services

Data Processing Services

	Cloud Storage	Cloud SQL	Cloud Spanner	Cloud Datastore	Cloud Bigtable	BigQuery
Capacity	Petabytes +	Terabytes	Petabytes	Terabytes	Petabytes	Petabytes
Access metaphor	Like files in a file system	Relational database	Globally scalable RDBMS	Persistent Hashmap	Key-values, HBase API	Relational
Read	Have to copy to local disk	SELECT rows	transactional reads and writes	filter objects on property	scan rows	SELECT rows
Write	One file	INSERT row		put object	put row	Batch/stream
Update granularity	An object (a "file")	Field	SQL, Schemas ACID transactions Strong consistency High availability	Attribute	Row	Field
Usage	Store blobs	No-ops SQL database on the cloud		Structured data from App Engine apps	No-ops, high throughput, scalable, flattened data	Interactive SQL* querying fully managed warehouse

Google Cloud

Storage and database decision chart



Google Cloud

STORAGE IN GCP

STORAGE OPTIONS

Cloud SQL is a managed RDBMS

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

Cloud Datastore is a horizontally scalable NoSQL DB

- NoSQL designed for application backends
- Fully managed
  - Uses a distributed architecture to automatically manage scaling
- Built-in redundancy
- Supports ACID transactions

Why choose Cloud Bigtable?

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

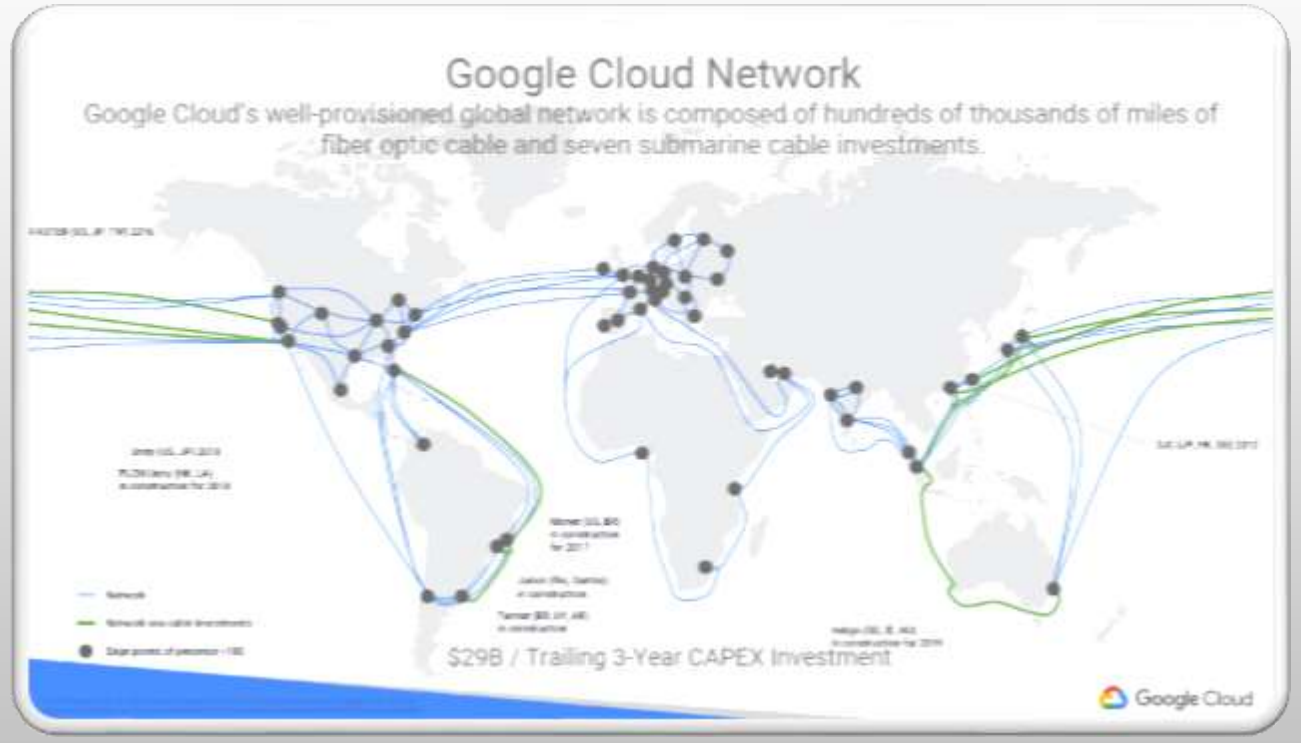
Cloud Storage is binary large-object storage

- High performance, internet-scale
- Simple administration
  - Does not require capacity management
- Data encryption at rest
- Data encryption in transit by default from Google to endpoint
- Online and offline import services are available

Choosing among Cloud Storage classes

	Multi-regional	Regional	Nearline	Coldline
	Most frequently accessed	Accessed frequently within a region	Accessed less than once a month	Accessed less than once a year
	99.95%	99.90%	99.00%	99.00%
	Consistent APIs			
	Millisecond access			
	Content storage and delivery	In-region analytics, transcoding	Long tail content, backups	Archiving, disaster recovery

NETWORKIN G IN GCP

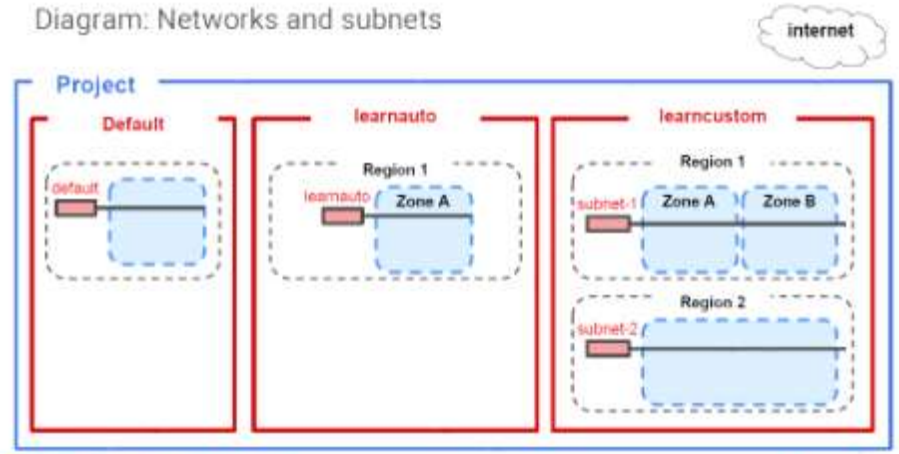


As of 2017 GCP operates
14 Regions and 39 Zones

Google Cloud Platform Virtual Private Cloud (VPC) Objects

- Projects
- Networks
  - Default, auto mode, custom mode
- Subnetworks
- Regions
- Zones
- IP addresses
  - Internal, external, range
- Virtual machines (VMs)
- Routes
- Firewall rules

Diagram: Networks and subnets



Projects and networks

A project:

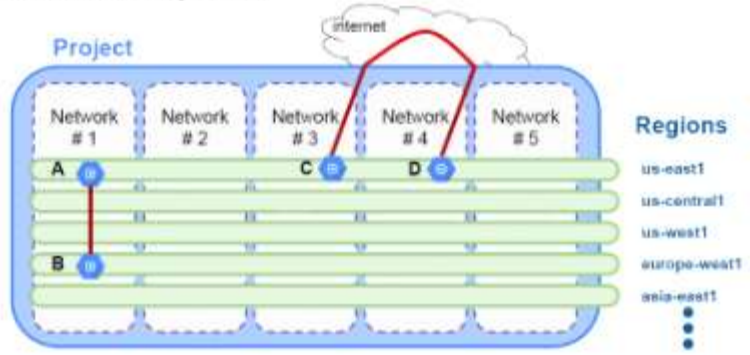
- Associates objects and services with billing.
- Contains networks (quota max 5).

A network:

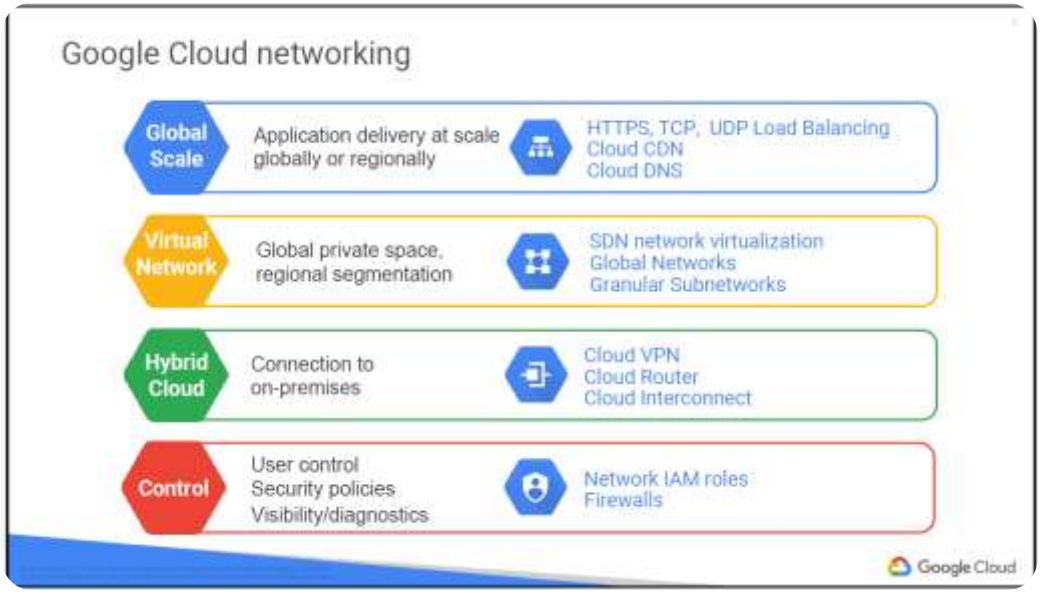
- Has no IP address range.
- Is global and spans all available regions.
- Contains subnetworks.
- Can be of type default, auto mode, or custom mode*.

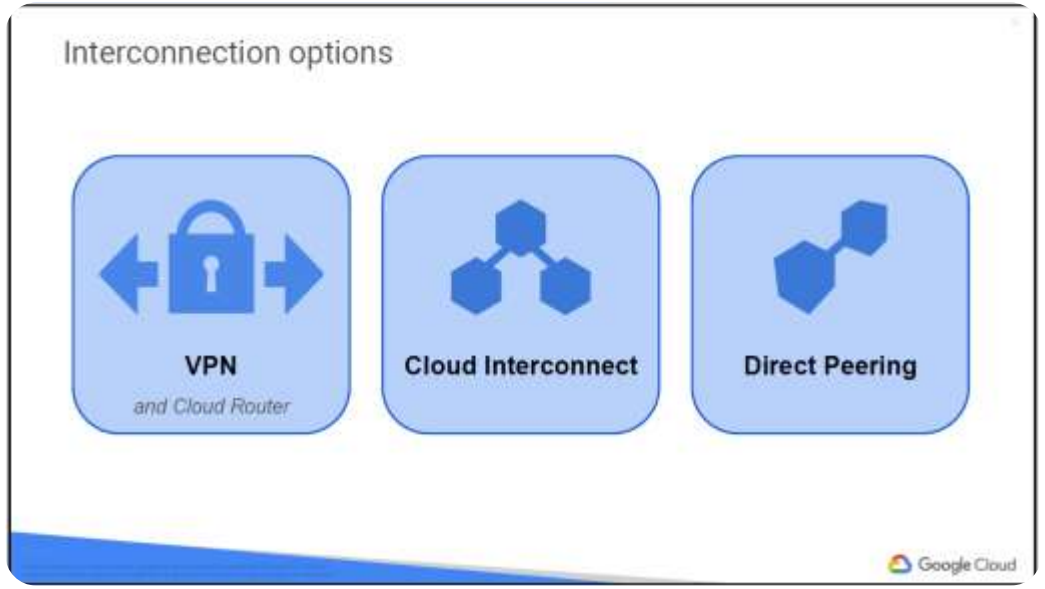
*An auto mode network can be converted to custom mode network, but *"once custom, always custom."*

Networks isolate systems



- A and B can communicate over internal IPs *even though they are in different regions.*
- C and D must communicate over external IPs *even though they are in the same region.*





NETWORKING OPTIONS IN GCP

Cloud Interconnect

- Enterprise-grade connection to GCP
- Provides access to private (e.g., RFC1918) network addresses
- Enables easy hybrid cloud deployment
- Does not require the use of and management of hardware VPN devices

Cloud Interconnect

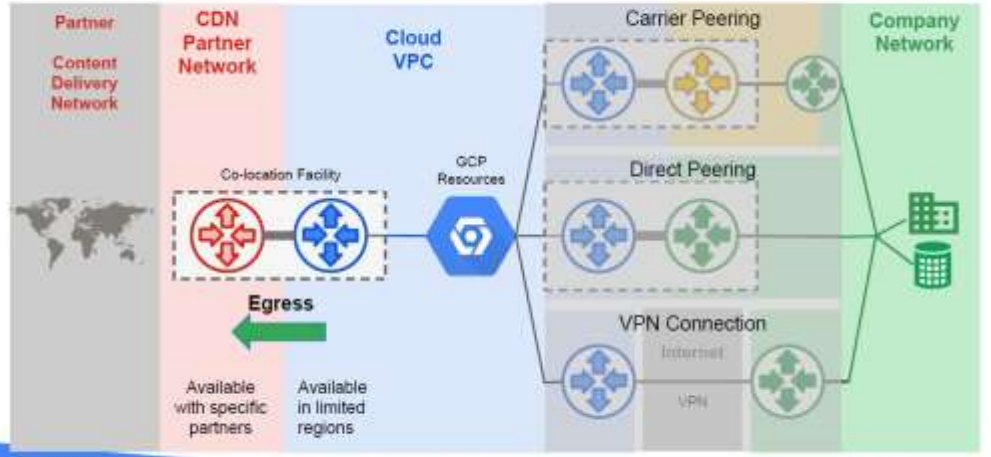
- Connect through a service providers network
- Provides dedicated bandwidth (50Mbps – 10Gbps)

Direct Peering

- Connect to Google Cloud through Google POPs
- Provides N X 10G transport circuits for private cloud traffic

Google Cloud

Content Delivery Network Interconnect



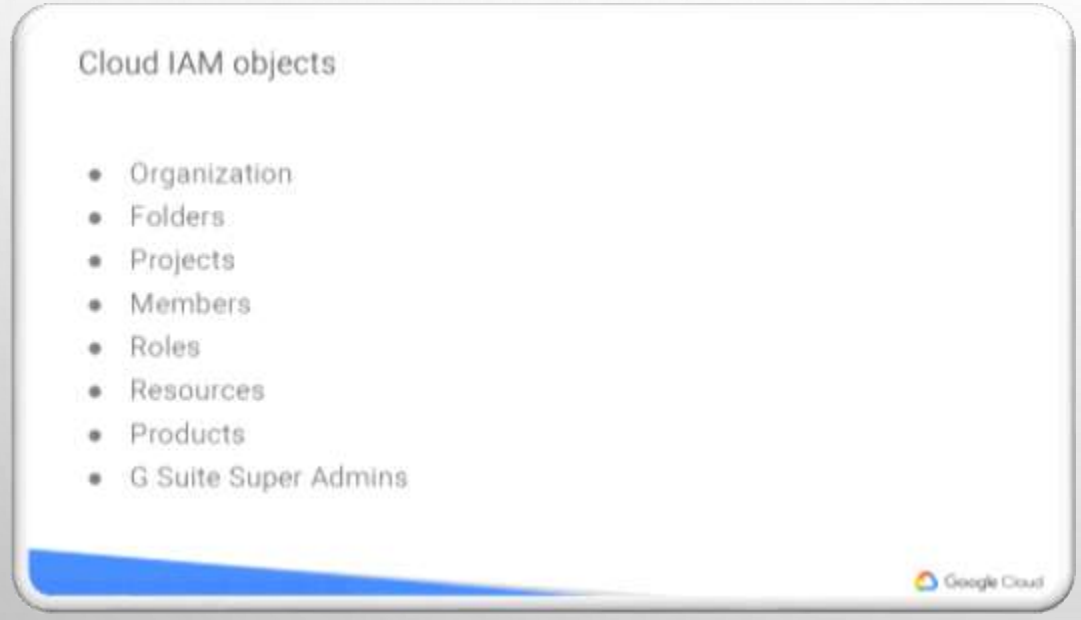
Google Cloud

Comparing load-balancing options

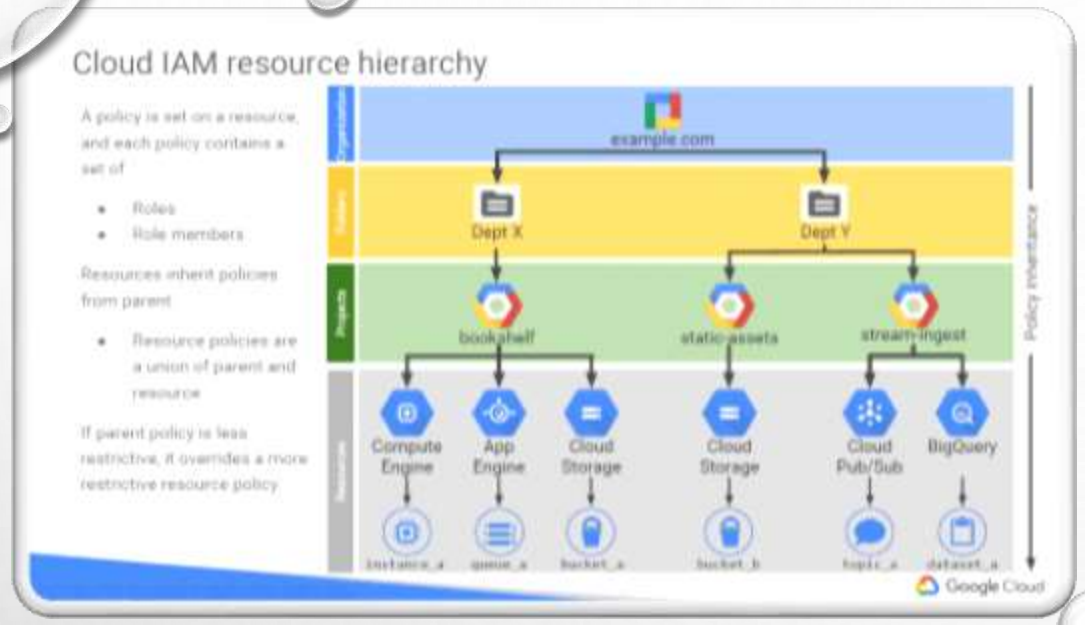
Global HTTP(S)	Global SSL Proxy	Global TCP Proxy	Regional	Regional internal
Layer 7 load balancing based on load	Layer 4 load balancing of non-HTTPS SSL traffic based on load	Layer 4 load balancing of non-SSL TCP traffic	Load balancing of any traffic (TCP, UDP)	Load balancing of traffic inside a VPC
Can route different URLs to different back ends	Supported on specific port numbers	Supported on specific port numbers	Supported on any port number	Use for the internal tiers of multi-tier applications

Google Cloud

CLOUD IAM: IDENTIFY & ACCESS MANAGEMENT



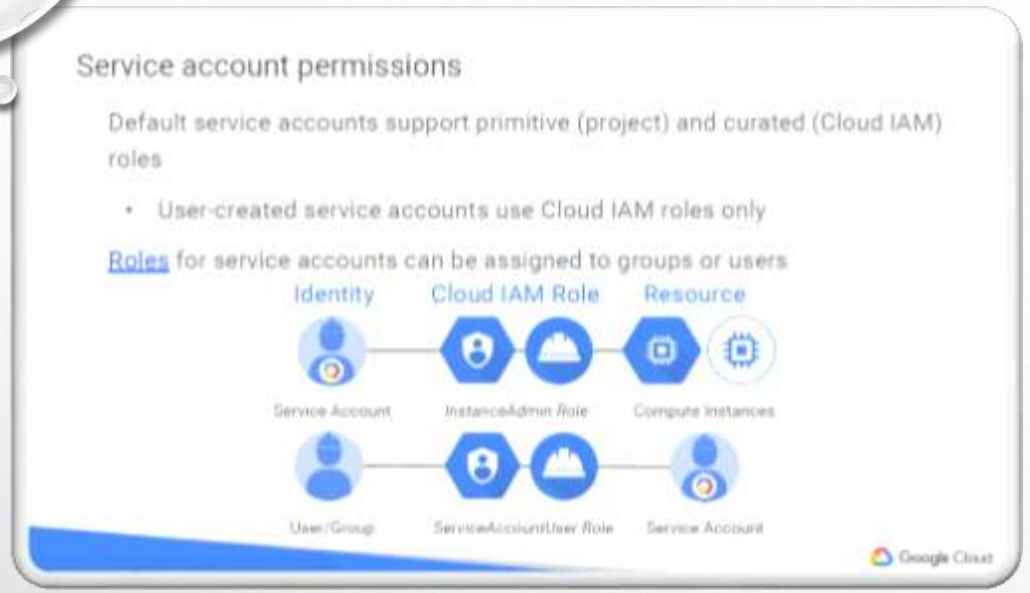
RESOURCE HIERARCHY



Organization

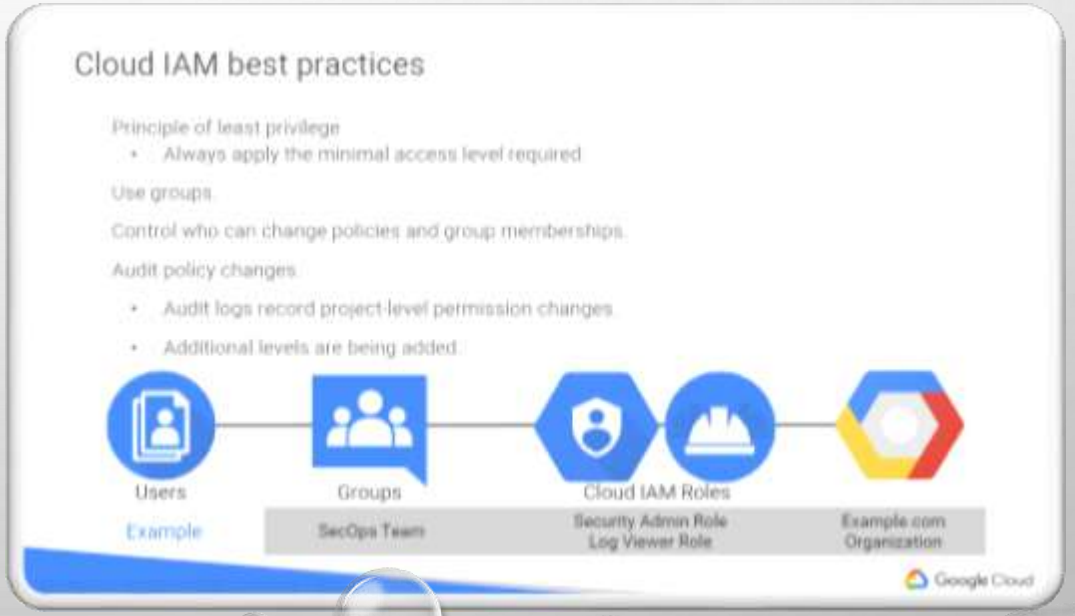
- Organization is created by Google Sales
- Organization Owners are established at creation
  - **G Suite** Super Admins are *the only* **Organization Owners**
- **Organization Owner**
  - Assigns the Organization Administrator role from the **G Suite** *Admin Console—(**Admin** is a separate product)*
    - Organization Administrators manage GCP from the Cloud Console
- Always have more than one organization owner, for security purposes

Google Cloud



TYPE OF ROLES

- Primitive roles –viewer, editor, owner
- Curated roles
- Product specific roles – vm creator, editor
- Essential roles– At hierarchy
- Project role– viewer, owner, editor



Deployment Manager

- An infrastructure automation tool
  - Creates GCP resources
  - Not limited to 1 VM like an Instance Template
- Create the Deployment Template in a Cloud API-enabled environment such as Cloud Shell
  - View results and manage deployment in console

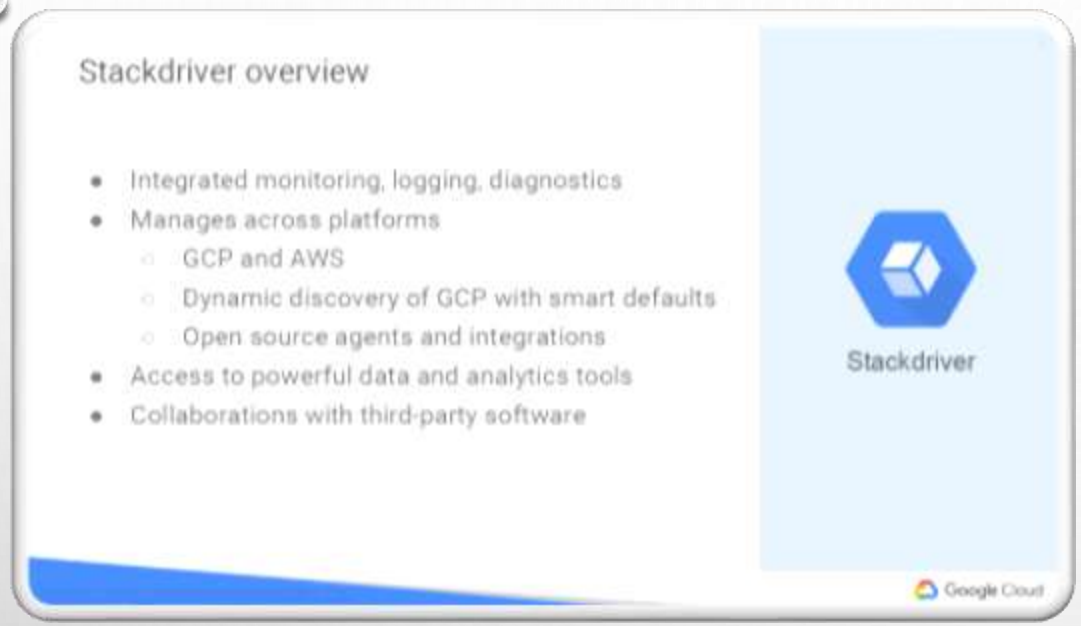
Google Cloud

Comparing orchestration tools

	Deployment Manager	Puppet	Chef	Terraform	Cloud Formation
Imperative vs Declarative	Declarative	Declarative	Imperative	Declarative	Declarative
Hosted	Yes	No	No	No	Yes
Driven by Discovery/Swagger	Yes	No	No	No	No
Multi-Platform	No	Yes	Yes	Yes	No
Integrated with a Platform (IAM, UI, ...)	Yes	No	No	No	Yes

Google Cloud

MANAGEMENT TOOLS



STACKDRIVER

Logging

- Platform, system, and application logs
  - API to write to logs
  - 30-day retention + option to transfer to Cloud Storage
- Log search/view/filter
- Log-based metrics
- Monitoring alerts can be set on log events
- Data can be exported to BigQuery

Logging

Google Cloud

Error Reporting

Aggregate and display errors for running cloud services

- Error notifications
- Error dashboard
- Java, Python, JavaScript, Ruby, C#, PHP, and Go

Error Reporting

Google Cloud

Monitoring

- Dynamic config and intelligent defaults
- Platform, system, and application metrics
  - Ingests data: Metrics, events, metadata
  - Generates insights through dashboards, charts, alerts
- Uptime/health checks
- Dashboards
- Alerts

Monitoring

Google Cloud

Tracing

Tracing system

- Displays data in near real time
- Latency reporting
- Per-URL latency sampling

Collects latency data

- App Engine
- Google HTTPS load balancers
- Applications instrumented with the Stackdriver Trace SDKs

Tracing

Google Cloud

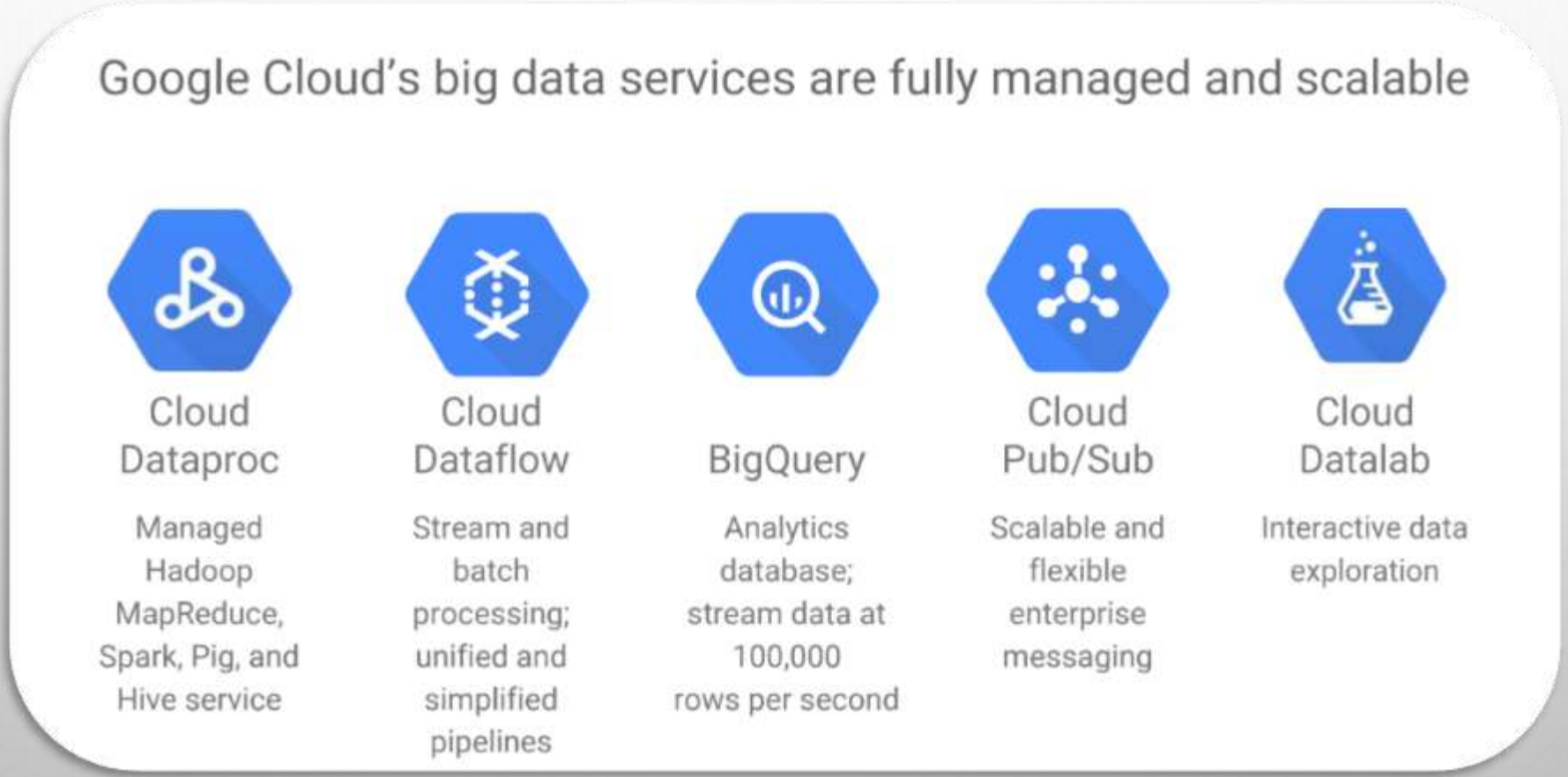
Debugging

- Inspect an application without stopping it or slowing it down significantly
- App Engine Standard or Flexible and Compute Engine
- Java, Python, or Go
- Debug snapshots
  - Capture call stack and local variables of a running application
- Debug logpoints
  - Inject logging into a service without stopping it

Debugging

Google Cloud

BIG DATA AND MACHINE LEARNING IN GCP



GCP DATA-TOOLS AND FUNCTIONALITIES

BigQuery is a fully managed data warehouse

- Provides near real-time interactive analysis of massive datasets (hundreds of TBs)
- Query using SQL syntax (SQL 2011)
- No cluster maintenance is required.

Google Cloud

Cloud Dataflow offers managed data pipelines

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

Google Cloud

Cloud Datalab offers interactive data exploration

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

Google Cloud

Cloud Dataproc is managed Hadoop

- Fast, easy, managed way to run Hadoop and Spark/Hive/Pig on GCP
- Create clusters in 90 seconds or less on average.
- Scale clusters up and down even when jobs are running.

Google Cloud

Cloud Machine Learning Platform

Open source tool to build and run neural network models

- Wide platform support: CPU or GPU; mobile, server, or cloud

Cloud ML

Fully managed machine learning service

- Familiar notebook-based developer experience
- Optimized for Google infrastructure; integrates with BigQuery and Cloud Storage

Machine Learning APIs

Pre-trained machine learning models built by Google

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

Google Cloud

WHY ITS BETTER?

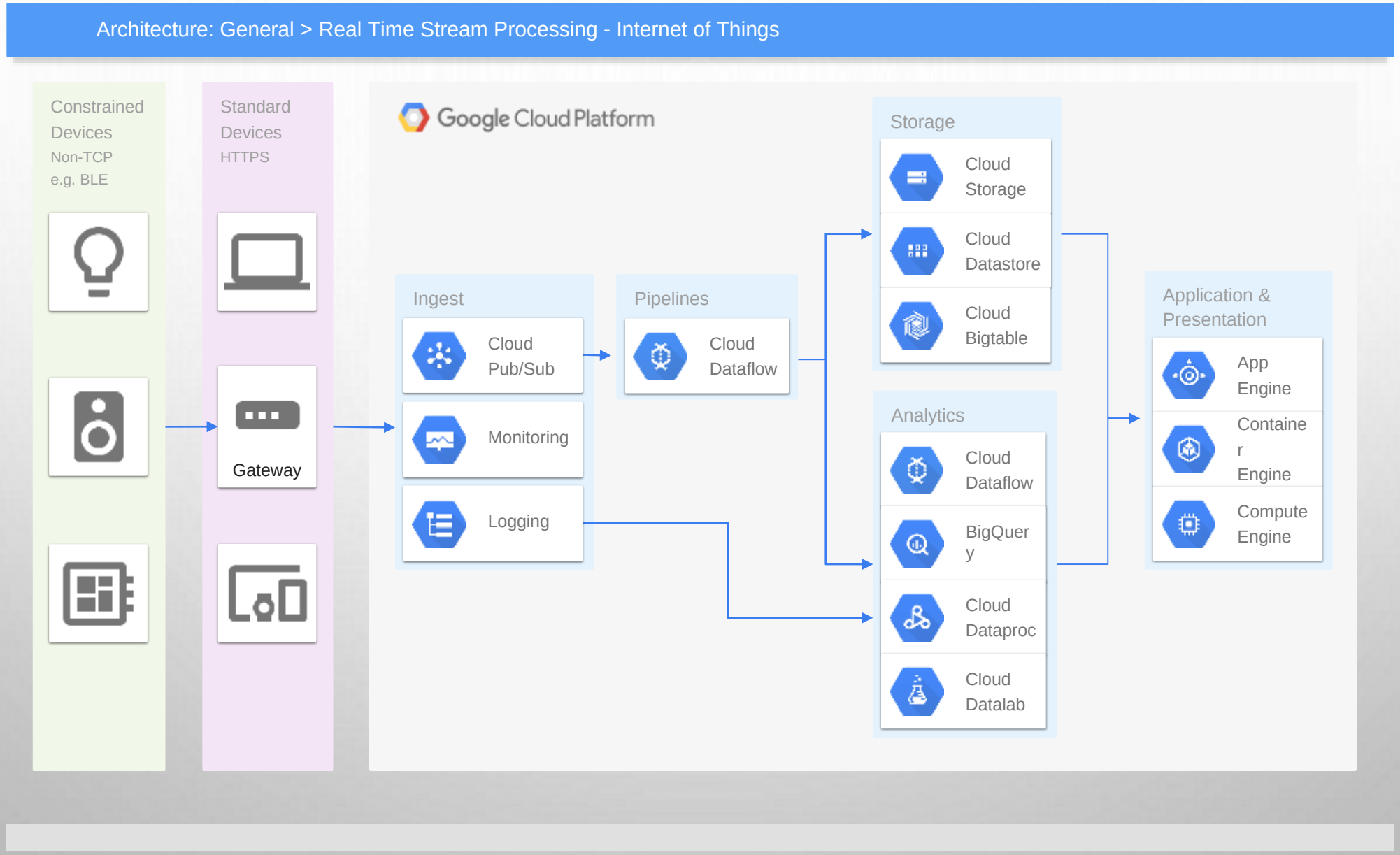
- Flexible billing on the cloud. ex: no charges on creation of a resource viz compute engine, sql db or storage bucket
- Scaling is fast and entry at any level is unrestrictive.
- Google has a huge network of datacenters spread across 18 geographical regions across the world.
- Google provides Peta-byte (which is 1000 tb) level OLAP data scaling in its clusters which virtually means your prototype can be scaled to planet-level production in no time.

SHORTCOMINGS

- Remote login through SSH tunnel could only be made using a google id in the pub-key.
- Navigation bar option had a search button.
- You can setup a cloud SQL proxy instead of a static IP address and connect to it.
- Support team in japan
- Gcloudshell connection is lost intermittently
- Static IP to the instance is changed automatically.

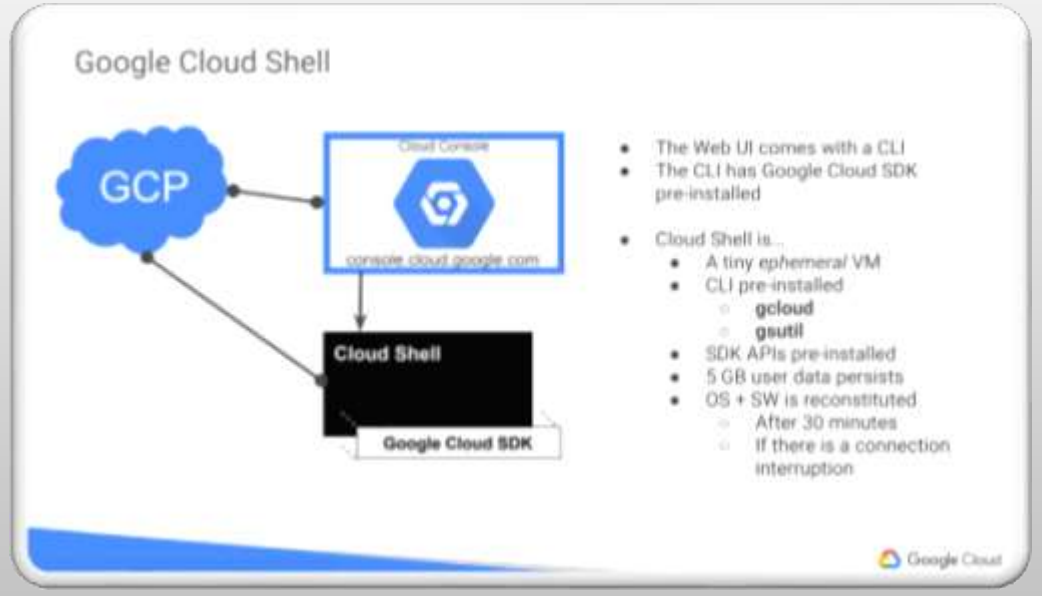
TRANSFER DATA INTO CLOUD

An Example of end to end Cloud solution

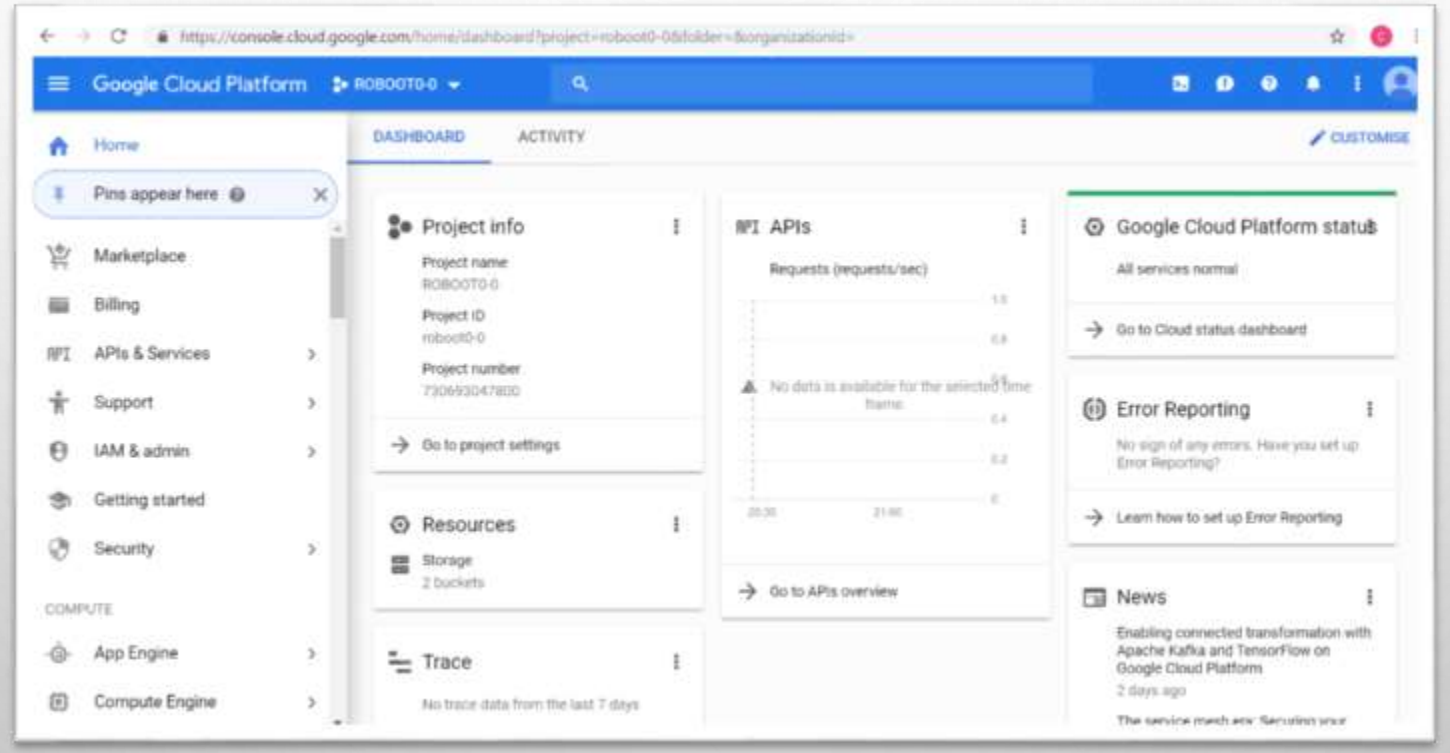


GETTING STARTED WITH GCP

- Create a GCP account with your Gsuite/Gmail/LDAP/SSO by contacting sales
- Create a project with unique name for billing and managing resources
- Start building unlimited possibilities



GCP CONSOLE HOME



REFERENCES

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- HTTPS://WWW.COURSERA.ORG/PROGRAMS/GCP-PROGRAM-GTM-OCT18-NXSGM

THANK YOU