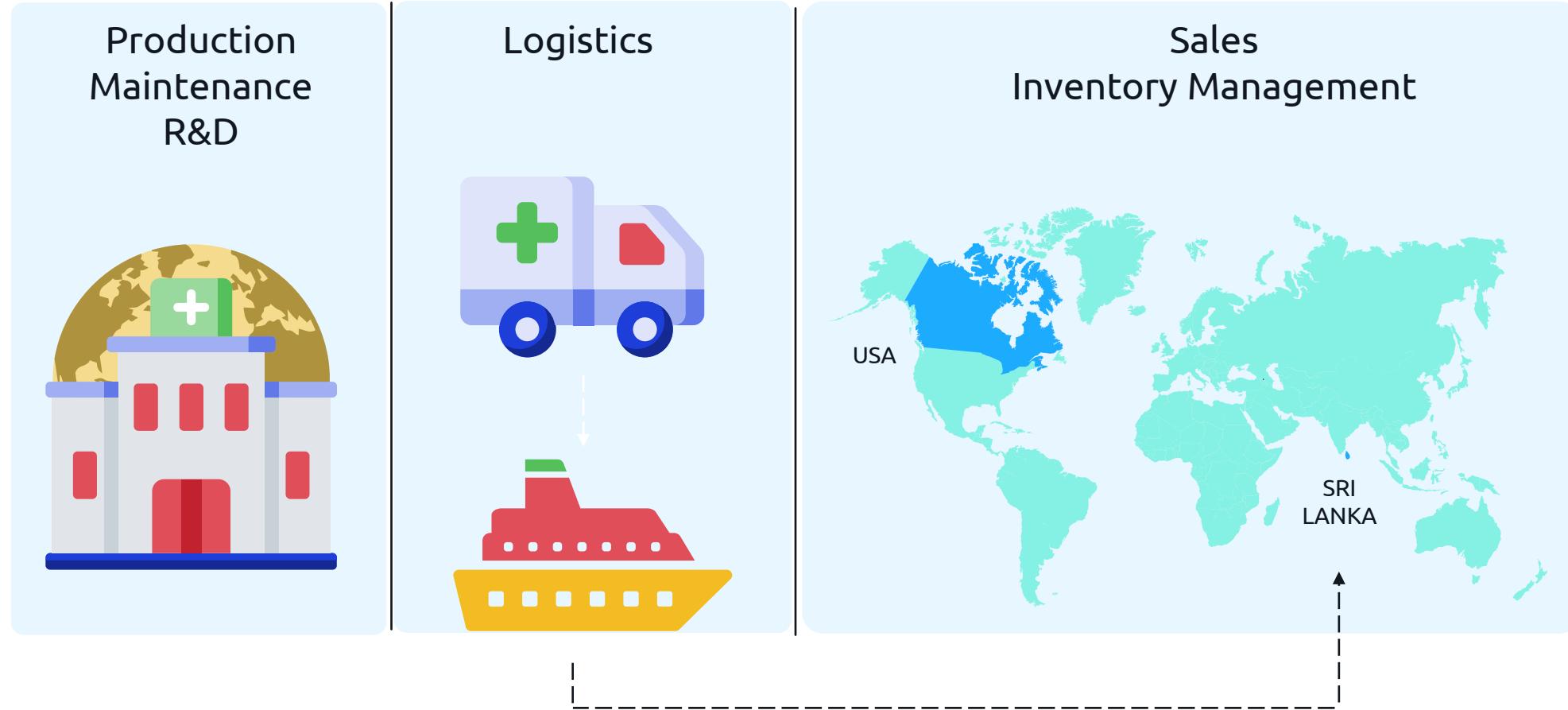




# KodeKloud

# Let's understand a Use-Case



Software Applications are built that can be accessed via

---



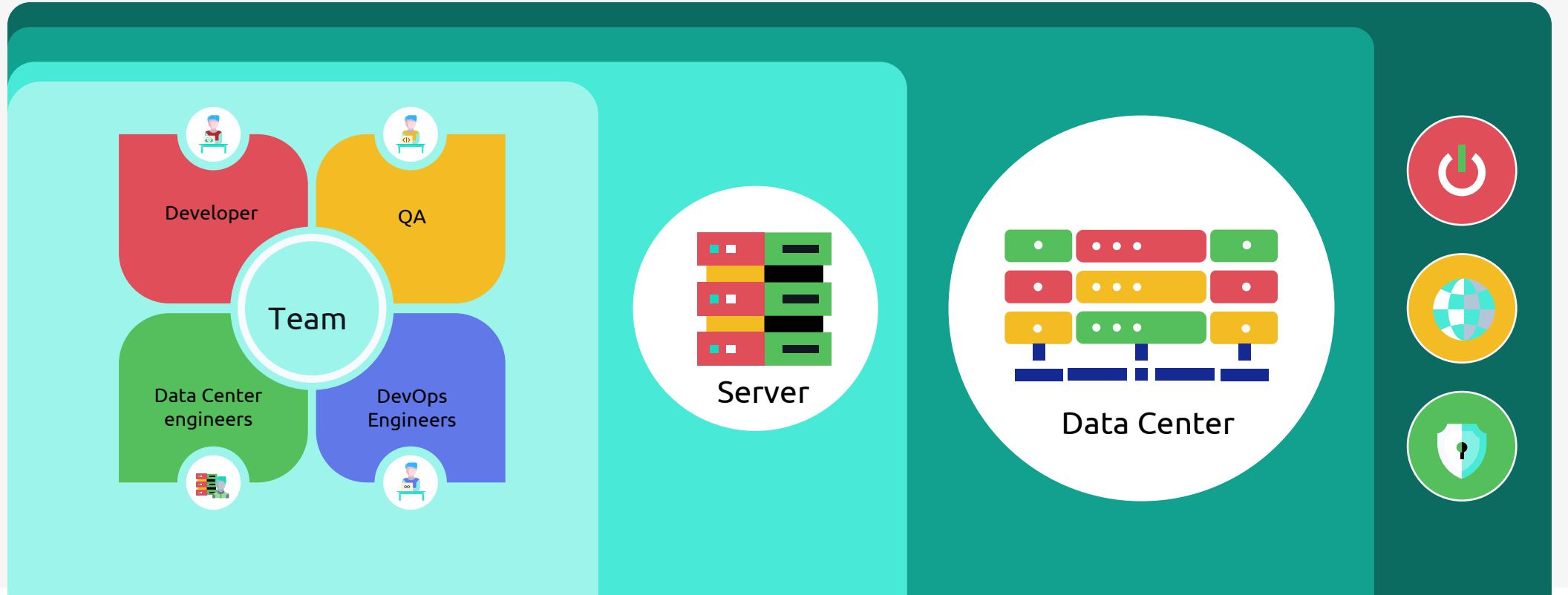
Mobile



Desktop



| How are these **applications** and **software** built?



How can we achieve  
this using GCP Cloud?



Using GCP Cloud



What services in GCP can replace our existing software and hardware services?



Understand AI, Data, and machine learning services in GCP which we can leverage.



# KodeKloud

# Why is it critical for businesses to adopt new technology?



| Why do brands **fail?**



**Yahoo**

Once a leading player in the online advertising market.



**Sony Walkman**

Didn't adapt to technological innovations such as digitalization, the shift towards software, and the growth of illegally downloadable music online.



| Why do few brands **sustain longer?**



### Equifax

The consumer credit reporting giant Equifax was founded in 1899. Still growing and adapting itself to the latest technology stacks.



### Walmart

Founded in 1962, Adapted the latest technologies and is currently competing with giants like amazon in the grocery delivery sector.

# Key requirements for an organization to keep growing

---



Self evaluate the products/service offered



Adapt to new technology



Reorganize if necessary



Innovate within

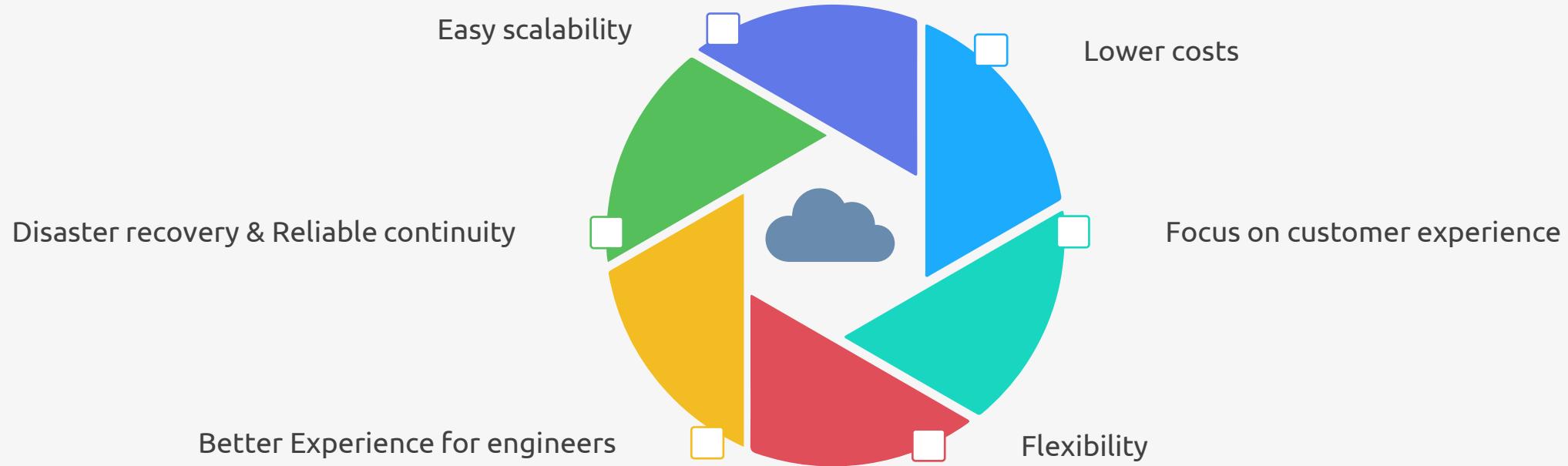


# KodeKloud

# How is cloud technology revolutionizing the business?



| What does Cloud technology offer?





| How cloud technology achieves this?



Taking the responsibility of providing and maintaining the infrastructure needs of the organization.



This allows the organization to focus entirely on customer needs and user experience.



Customer experience has a direct correlation to the growth of business



How can our pharma company benefit from cloud?

Production  
Maintenance  
R&D



Logistics



Sales  
Inventory Management



Infrastructure & Application Modernization in  
Cloud



Innovating with Data in Google Cloud



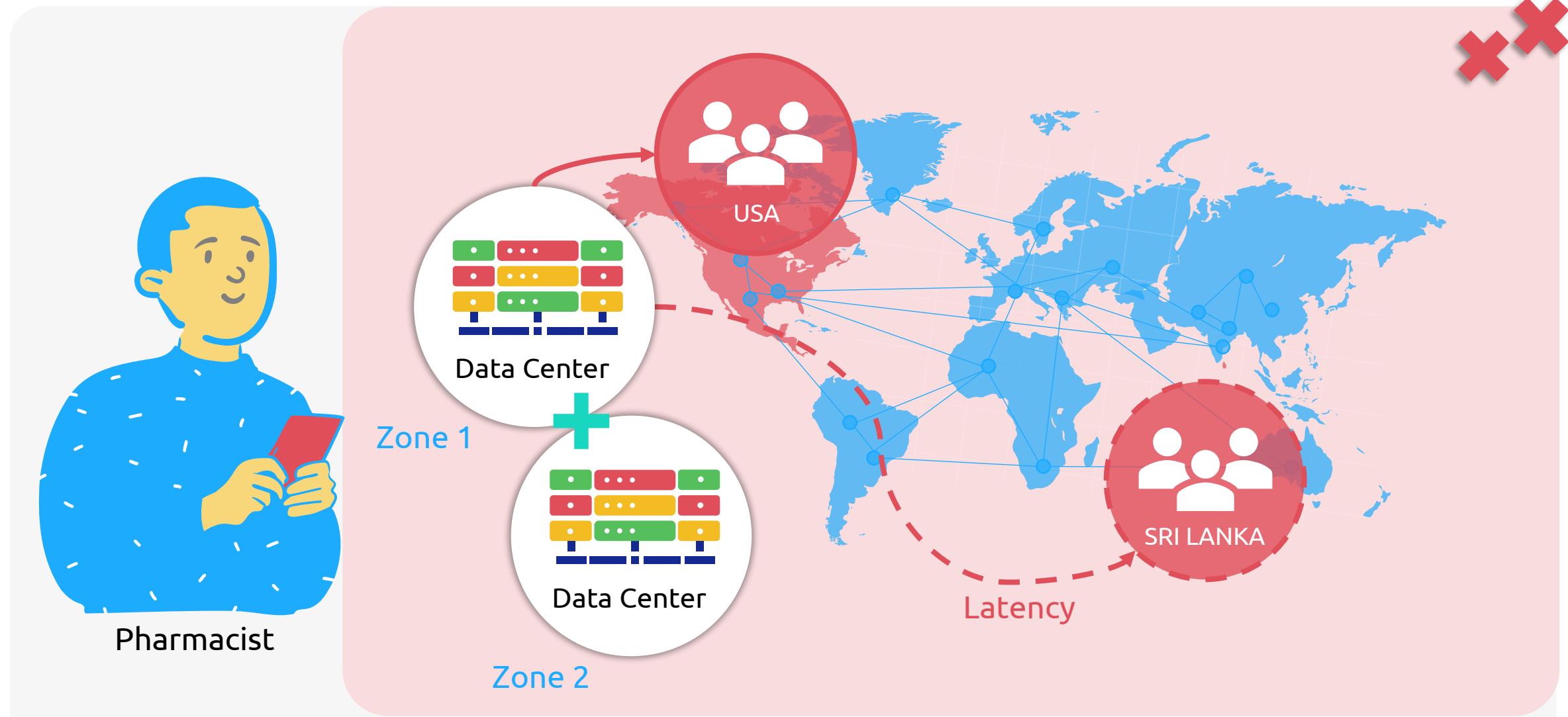
Understanding google cloud security and  
operations to maintain the existing standards

Certification focused topics



# KodeKloud

# What is GCP Global Infrastructure?





| How do solve this issue?

We have a few options to consider



Deploy the application in a different region closer to the customer

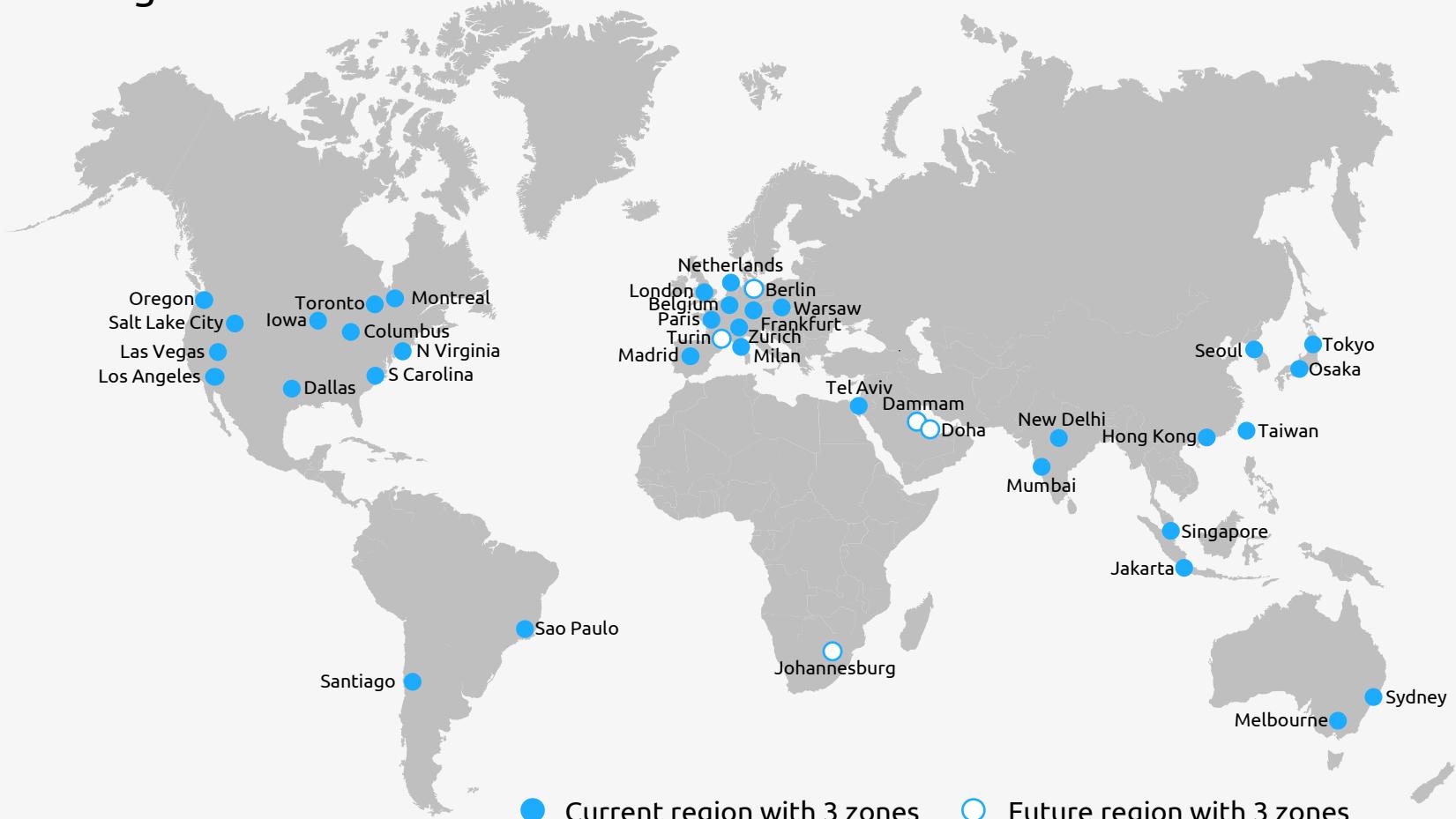


Add additional zones within a region to achieve high availability



But what does GCP have to provide here for us?

## Regions



GCP currently has 34 regions (expanding)



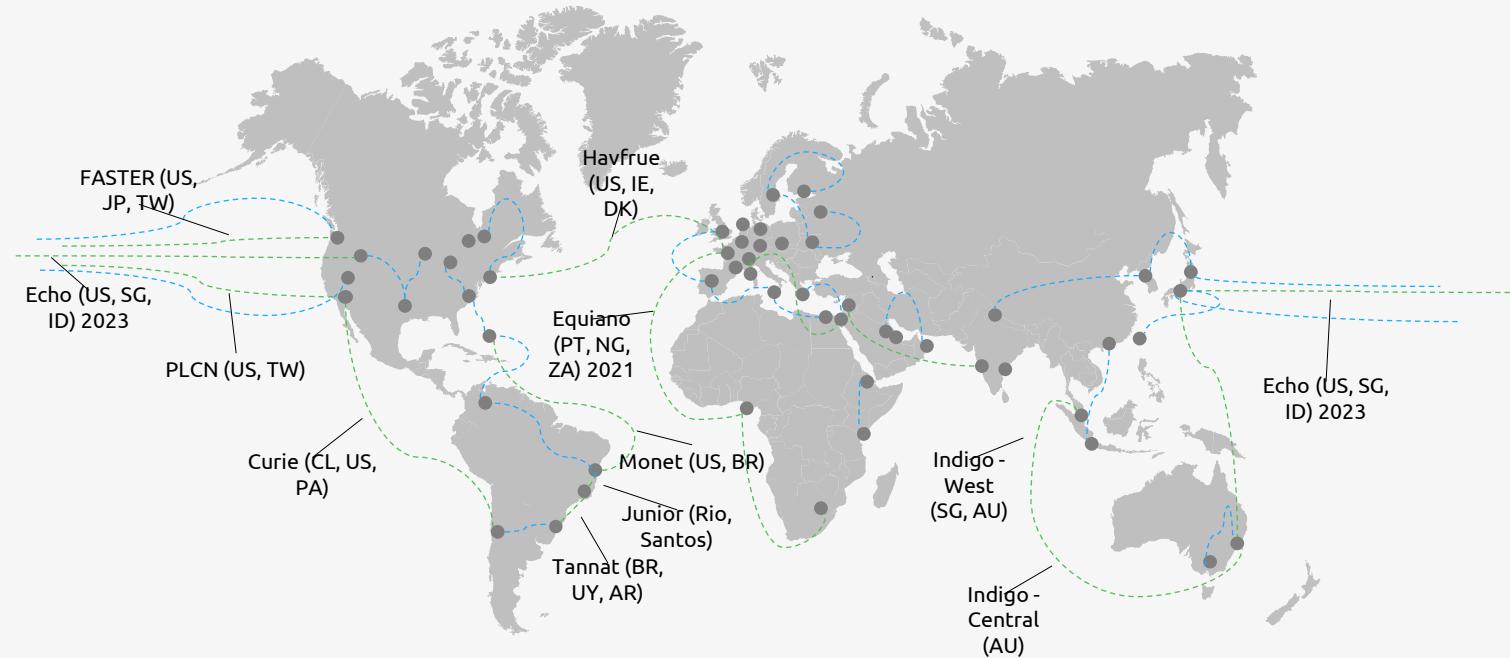
Available in 200+ countries



24/7/365 support

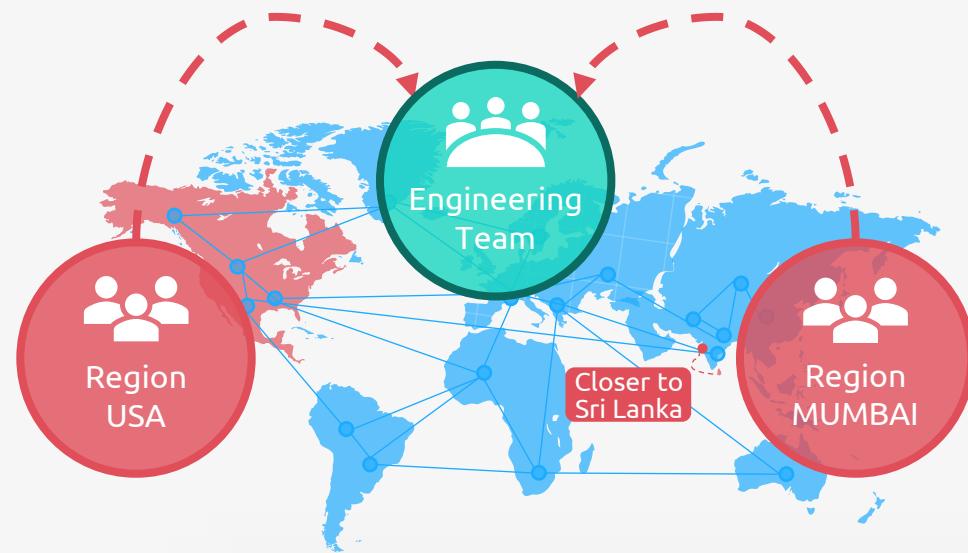
\*Exception: region has 4 zones.

## Network



Fault-tolerant network

Q | How do solve this issue?



We have a few options to consider

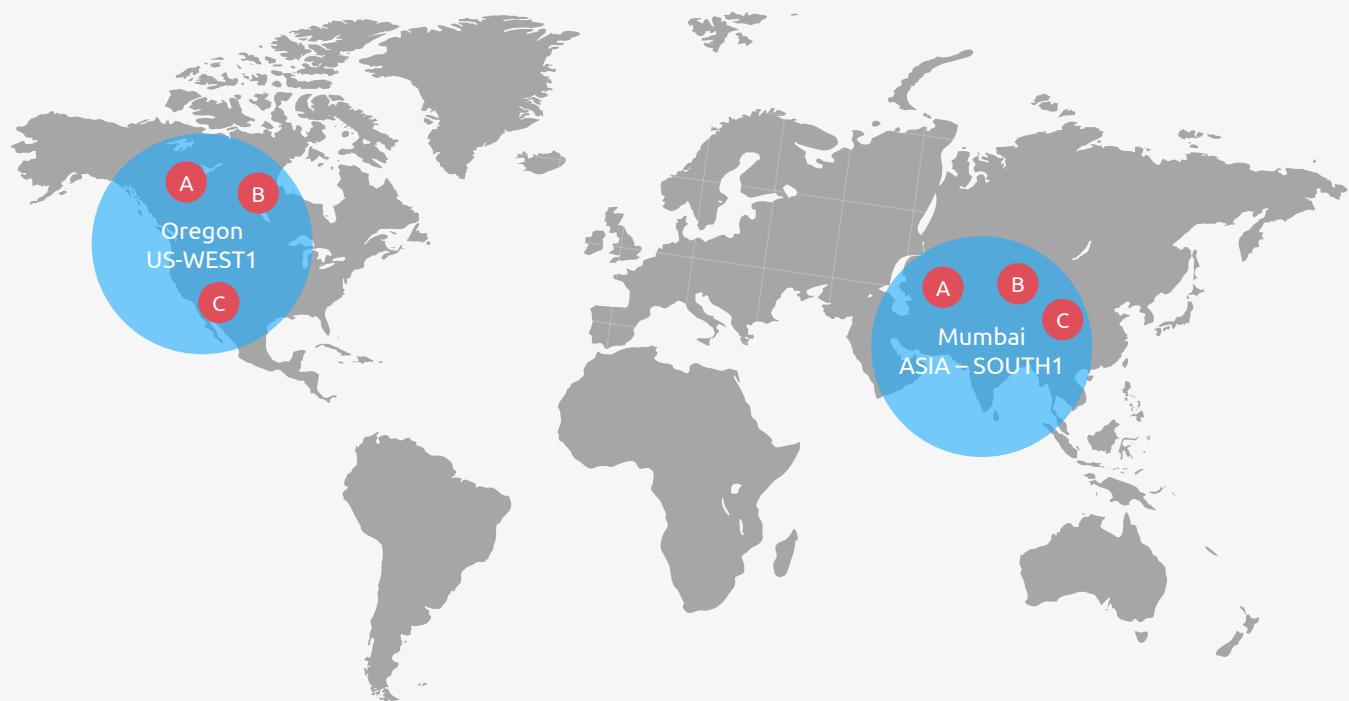


Deploy the application in a different region closer to the customer



Add additional zones within a region to achieve high availability

# Regions and Zones



- **Region** is a geographical location where GCP is hosting multiple zones
- **Zone** are discrete data centers connected with low latency network
- A **region** usually consists of 3 or more **zones**



# KodeKloud

# How to select a region?



## How to select a region?

### Optimize for

leaf Lower carbon footprint ?

Not important  Important

dollar sign Lower price ?

Not important  Important

clock Lower Latency ?

Not important  Important

### Where is your traffic coming from?

Your current location

Afghanistan

Albania

Algeria



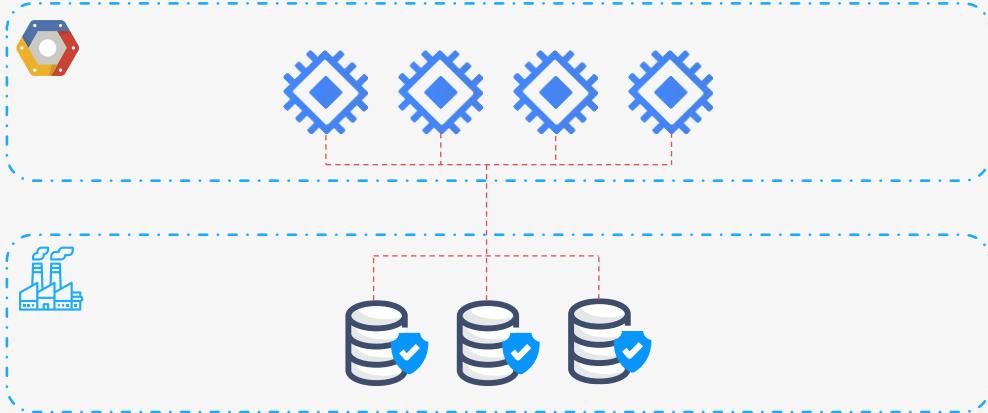
The [Google Region Picker tool](#) helps you pick a Google Cloud region considering carbon footprint, price, and latency. [Select your preferences.](#)



# KodeKloud

# Hybrid and multi-cloud infrastructures

# Hybrid and Multi-cloud



## Hybrid Cloud

A setup where we utilize a private cloud or own data center with a public cloud (like GCP)



## Multi-cloud

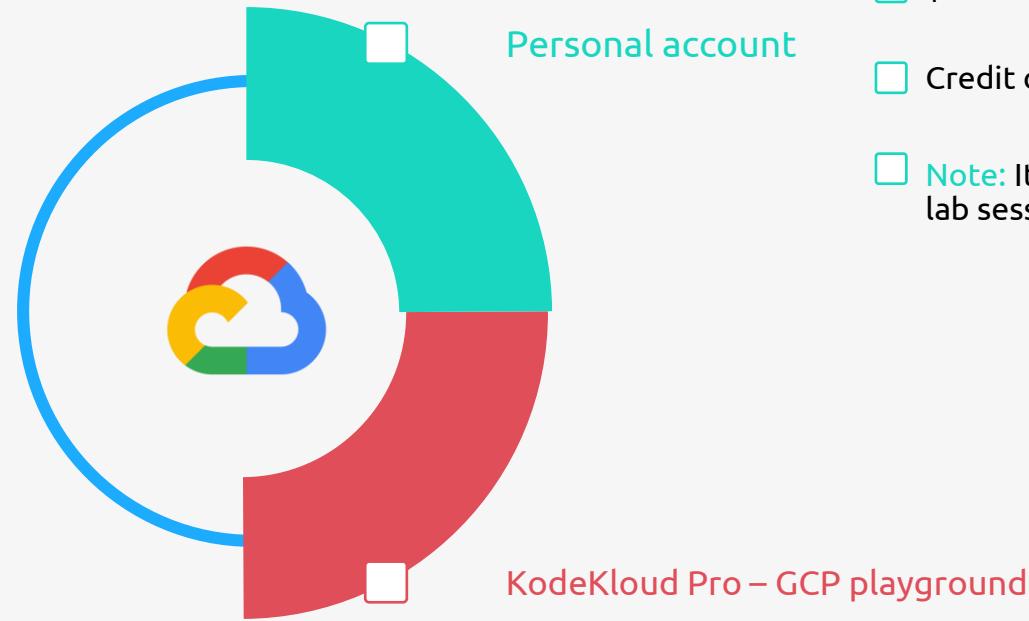
A setup where we utilize more than 1 public cloud, Like hosting a few services in GCP and others in Azure or AWS



# KodeKloud

# Creating of GCP account

# GCP Account Creation

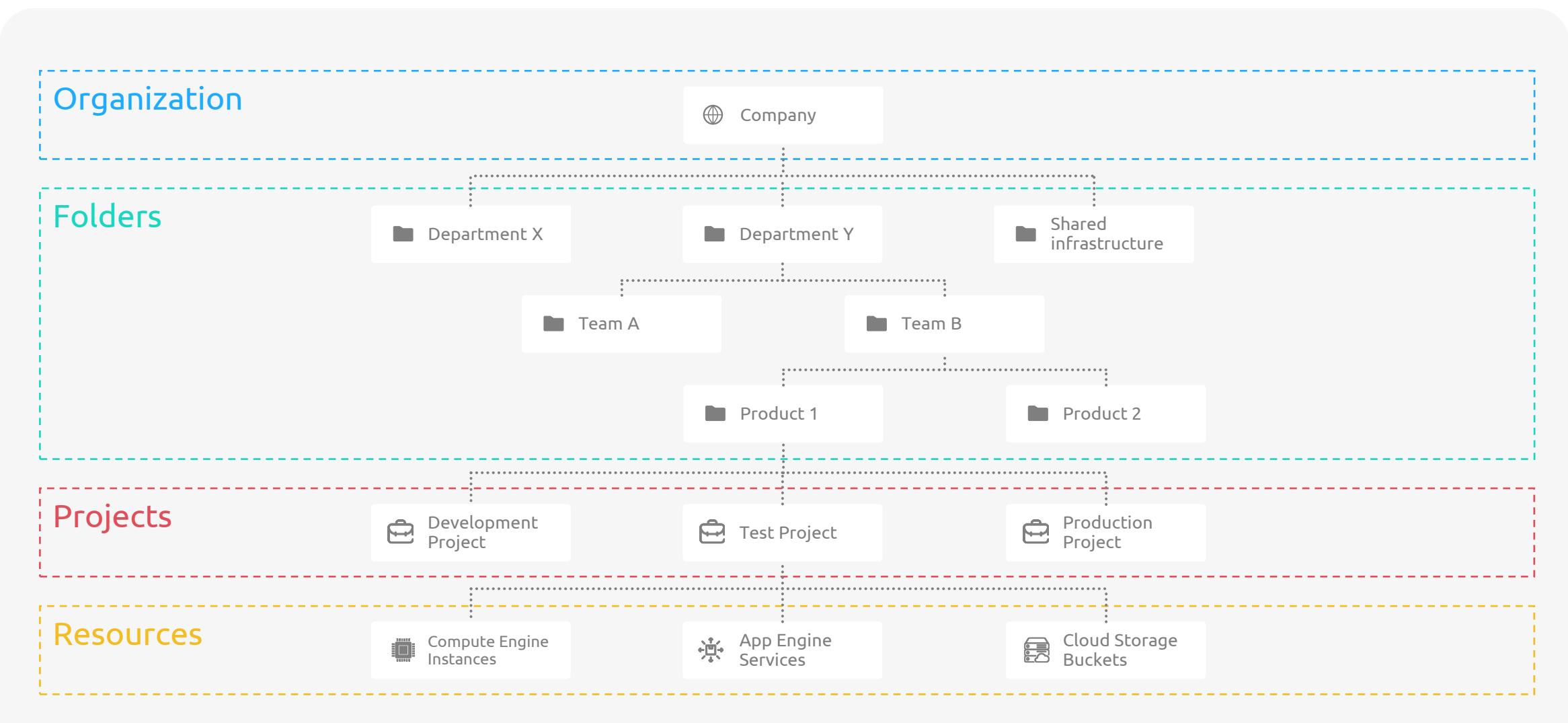


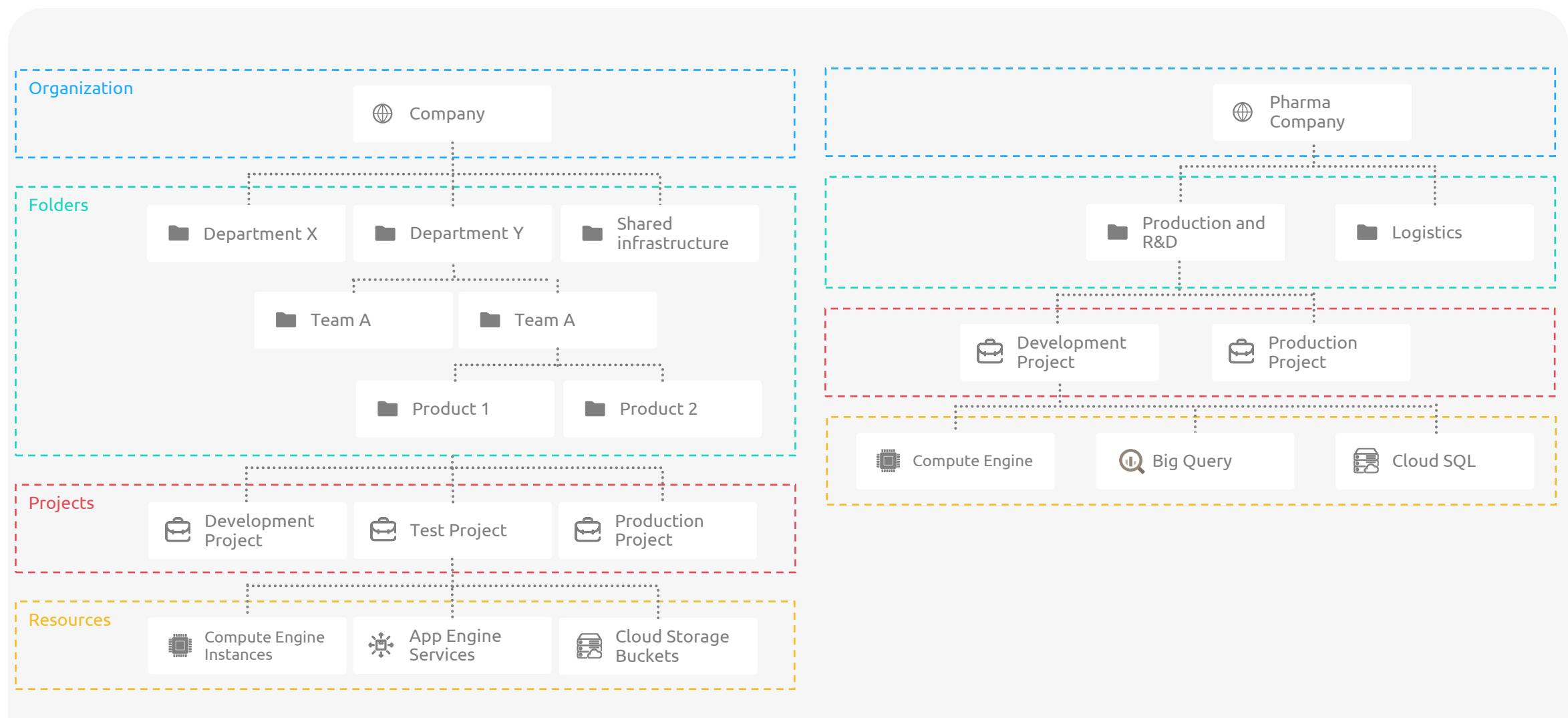
- 20+ free products
- \$300 in free credits for 90-day
- Credit card might be required based on certain regions
- Note:** It is always better to delete everything after practicing lab sessions in a personal account



# KodeKloud

# Resource hierarchy





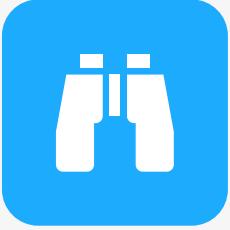


# KodeKloud

Demo

# Understanding Billing in GCP

# Understanding Billing in GCP



GCP allows us to see granular details of our GCP usage



GCP allows provides discounts when the organization that is in contract with GCP





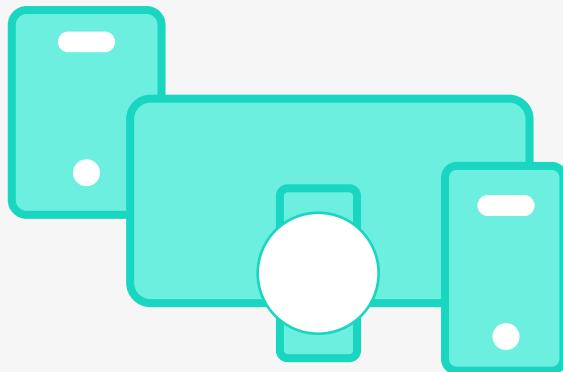
# KodeKloud

# Understanding compute, Persistent disk, and firewall

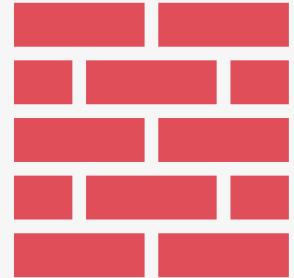
# Whiteboard Architecture

Understanding different compute engine terminologies

Region: US-Central-1



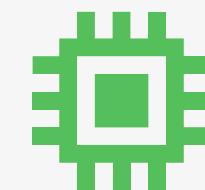
Mobile Devices



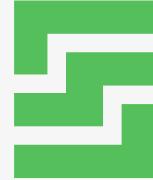
Cloud  
VPC Firewall Rules

Allow  
HTTP and HTTPS traffic

US-Central-1a



Compute Engine



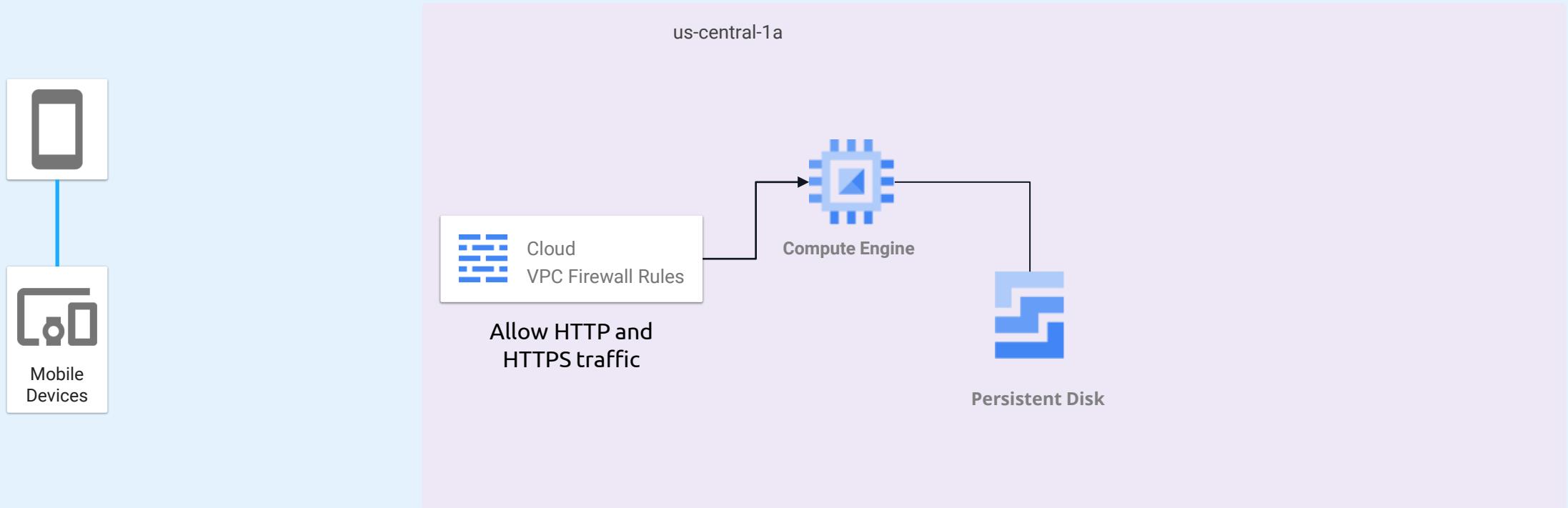
Persistent Disk

# Whiteboard Architecture

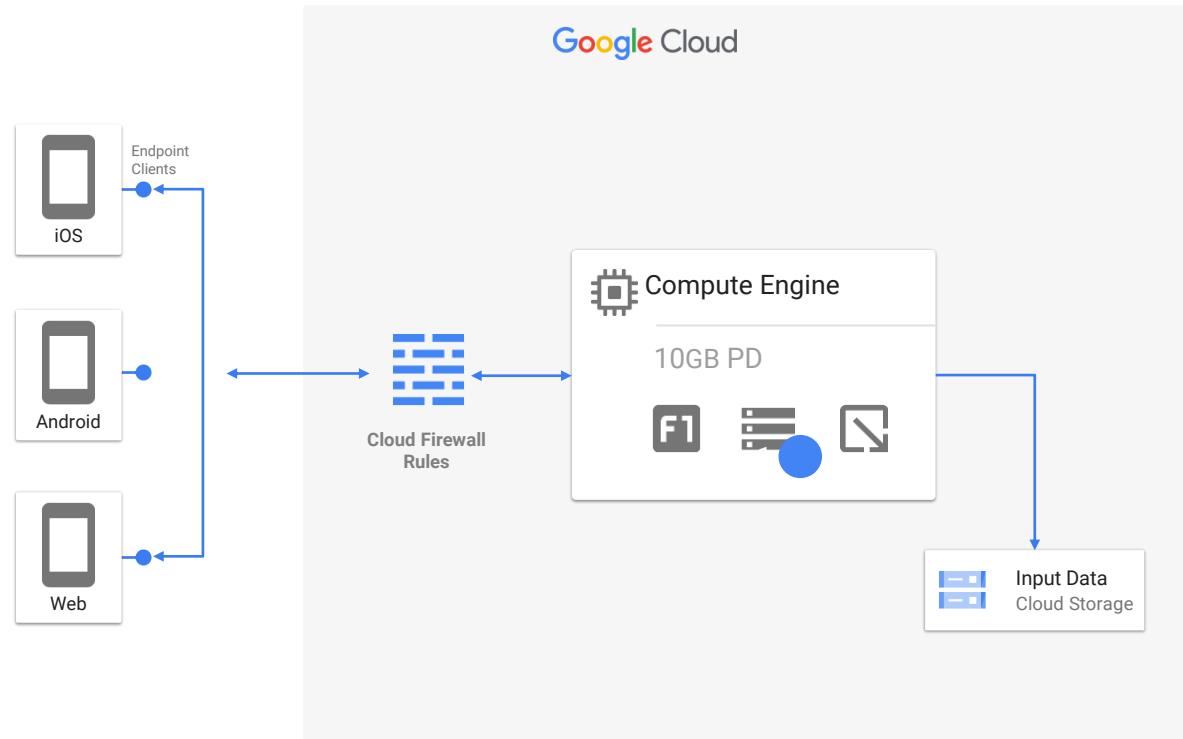
## Understanding different compute engine terminologies

Google Cloud

Region: us-central-1



# Understanding different compute engine terminologies





# KodeKloud

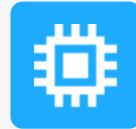


# KodeKloud

## Summary

Understanding compute,  
Persistent disk, and firewall

## Compute Engine



### Different machine types



Scale-out workloads (T2D)



General purpose workloads (E2, N2, N2D, N1)



Ultra-high memory (M2, M1)



Compute-intensive workloads (C2, C2D)



Most demanding applications and workloads (A2)



Pricing for Compute Engine is based on **per-second usage** of the machine types.



We can run different OS: Windows, Debian, Ubuntu, and Centos. (These are called **public images**)

## Persistent Disk



Persistent disks are durable network storage devices that your instances can access like physical disks in a desktop or a server.



The data on each persistent disk is distributed across several physical disks

## VPC Firewall Rules

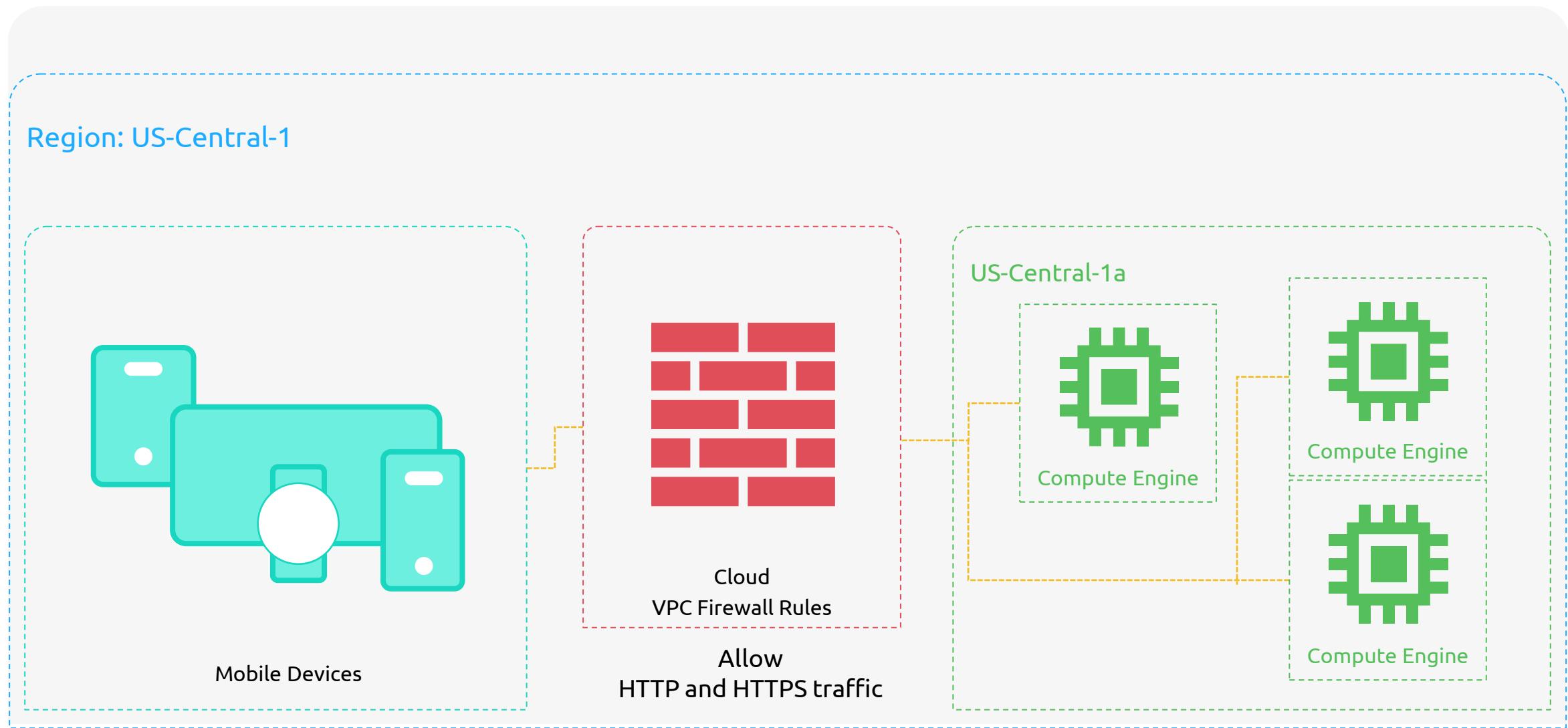


VPC firewall rules let you allow or deny connections to or from your virtual machine (VM) instances based on a configuration



# KodeKloud

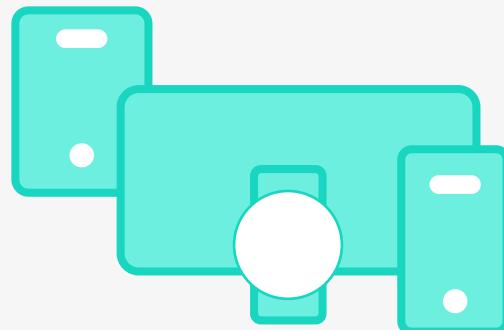
# Scaling compute instance



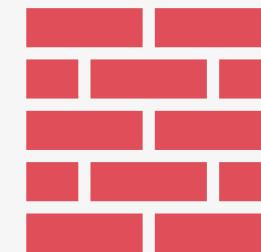


How do we scale our computing?

Region: US-Central-1



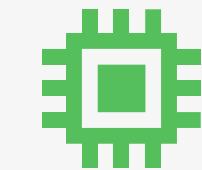
Mobile Devices



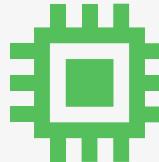
Cloud  
VPC Firewall Rules

Allow  
HTTP and HTTPS traffic

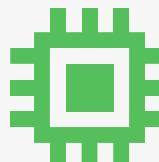
US-Central-1a



Compute Engine



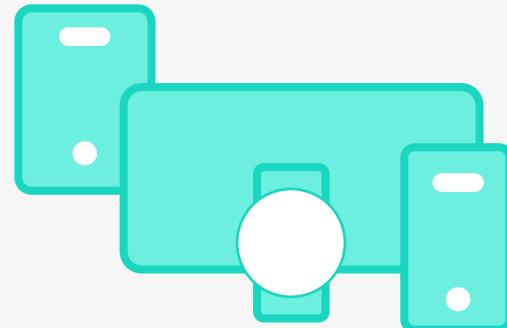
Compute Engine



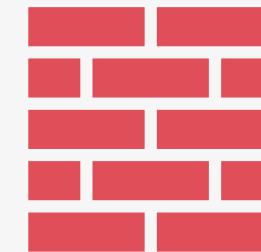
Compute Engine

How do we balance incoming traffic to our application when it's scaled up?

Region: US-Central-1

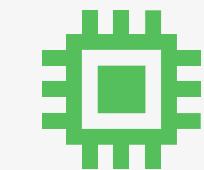


Mobile Devices

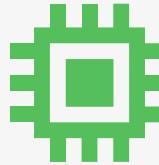


Cloud  
VPC Firewall Rules  
Allow  
HTTP and HTTPS traffic

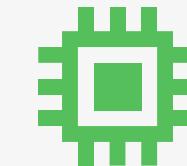
US-Central-1a



Compute Engine



Compute Engine



Compute Engine



# KodeKloud

# Exploring Instance groups

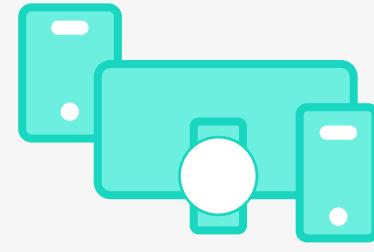


How do we scale our computing?

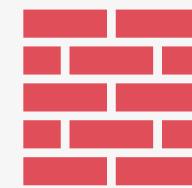


How do we balance incoming traffic to our application when it's scaled up?

Region: US-Central-1



Mobile Devices



Cloud  
VPC Firewall Rules  
Allow  
HTTP and HTTPS traffic

US-Central-1a



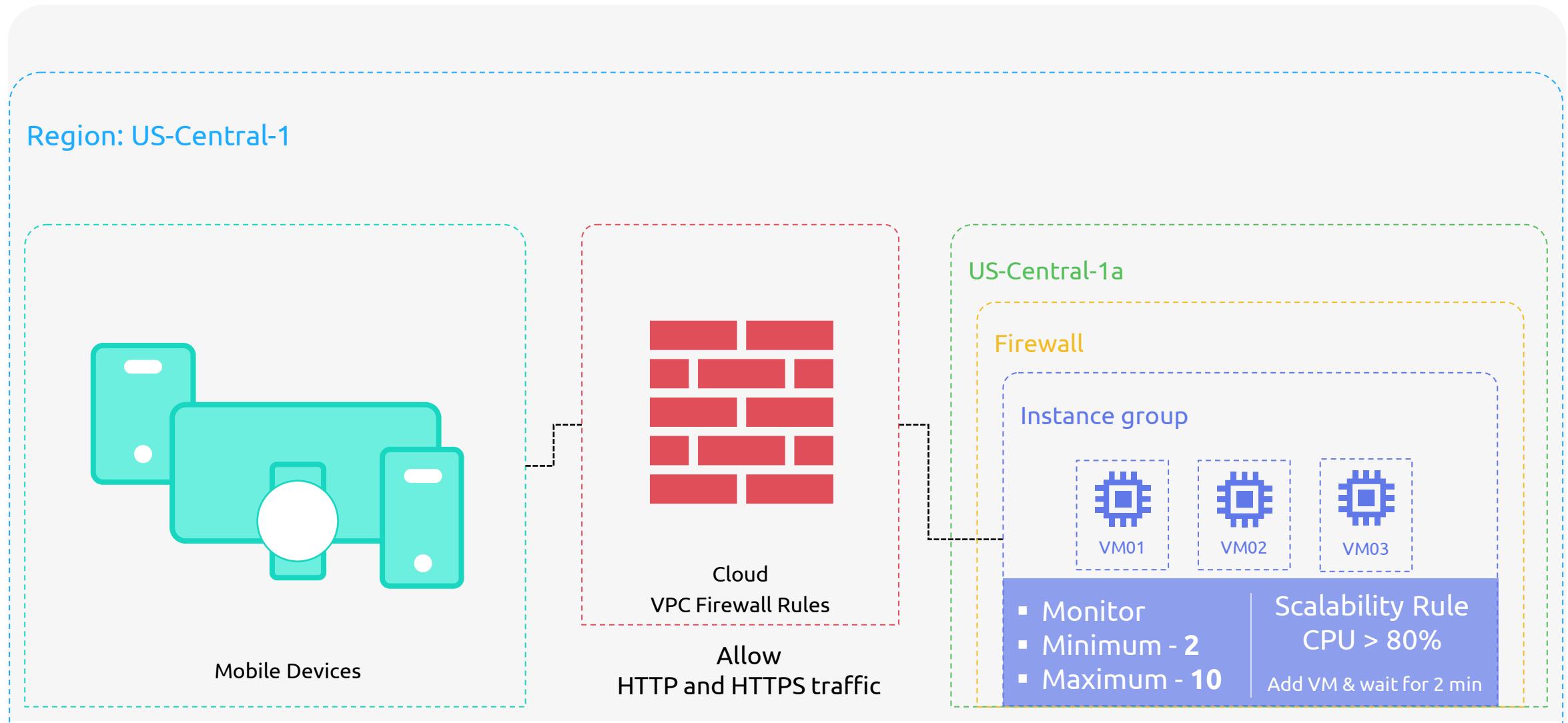
Compute Engine

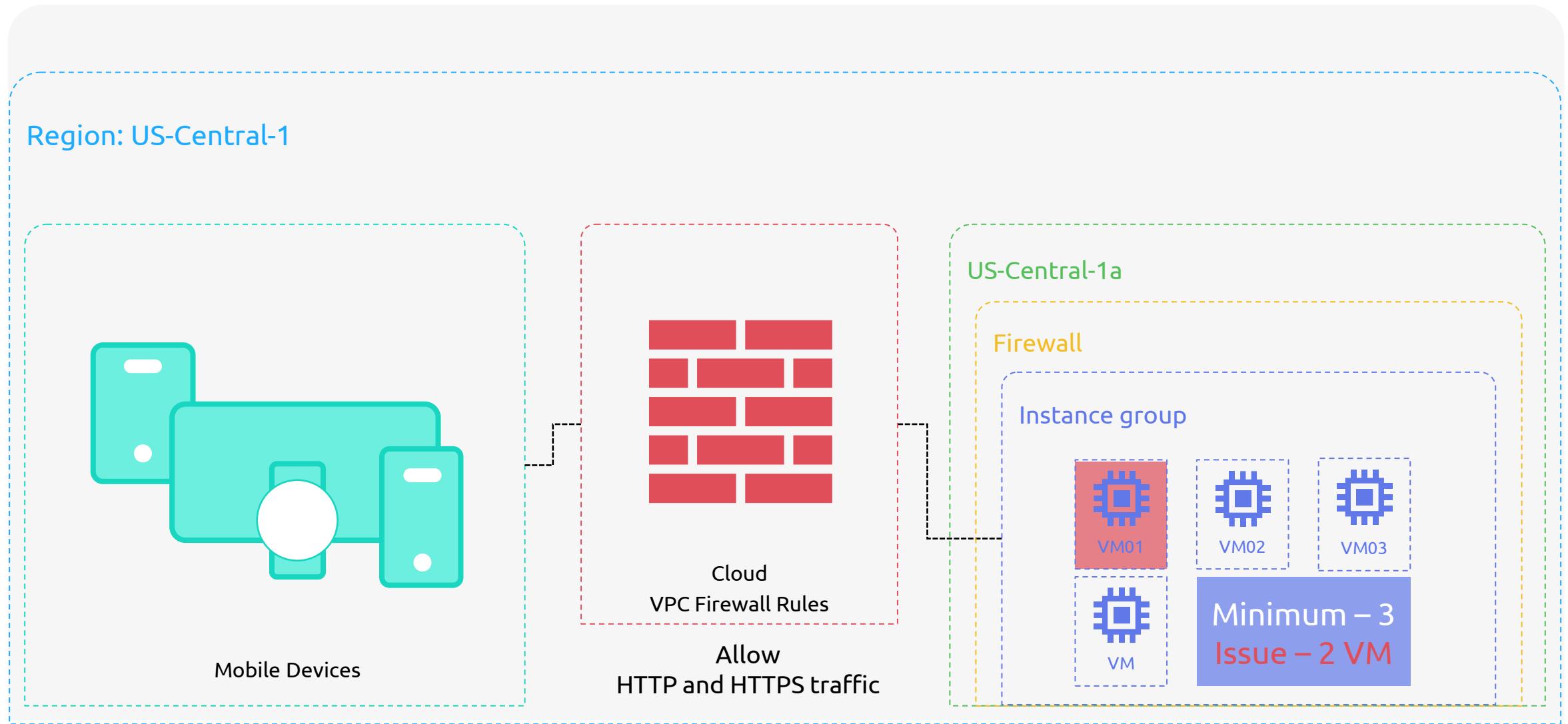


Compute Engine



Compute Engine

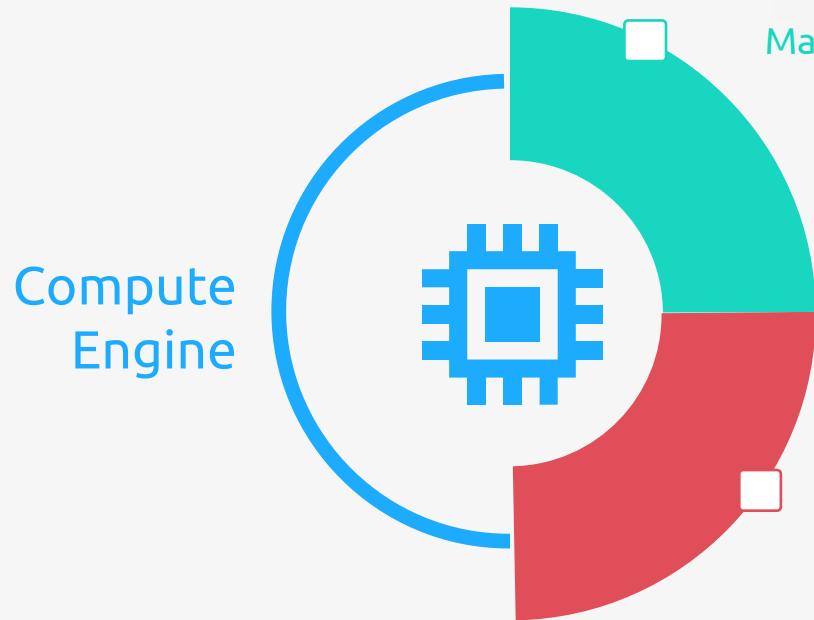




## Instance group



Collection of virtual machine (VM) instances that you can manage as a single entity.



### Managed instance groups (MIGs)

- It let you operate apps on multiple **identical VMs**.
- You can make your workloads scalable and highly available by taking advantage of automated MIG services, including:
  - autoscaling,
  - auto-healing,
  - regional (multiple zones) deployment, and
  - automatic updating.



High availability



Scalability



Automated updates

### Unmanaged instance groups

- It let you load balance across a fleet of VMs that you manage yourself.



| How do we manage incoming traffic?



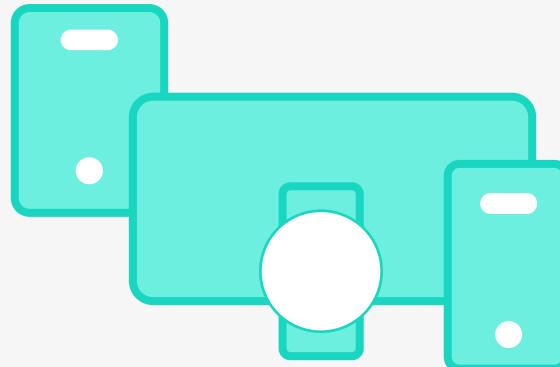
# KodeKloud

# Load Balancer

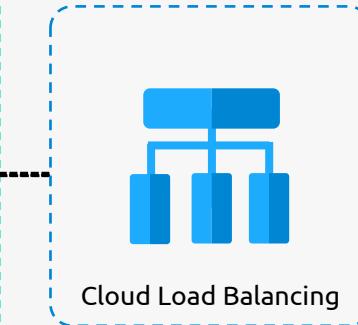


Why route the traffic between instance groups?

Region: US-Central-1



Mobile Devices



Cloud Load Balancing

US-Central-1a

Firewall

Software Version 01

Instance group 01



Instance group 02



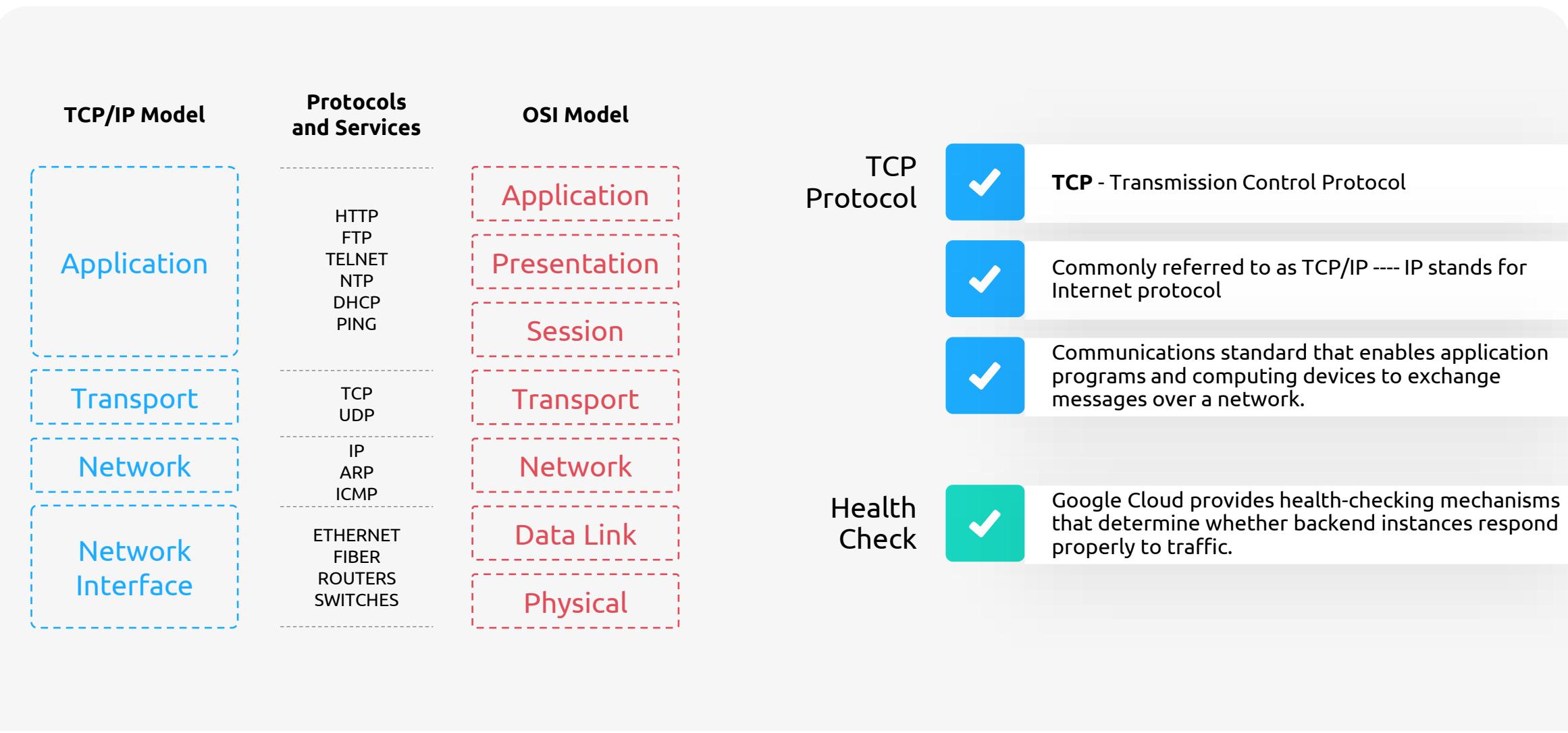
Software Version 02

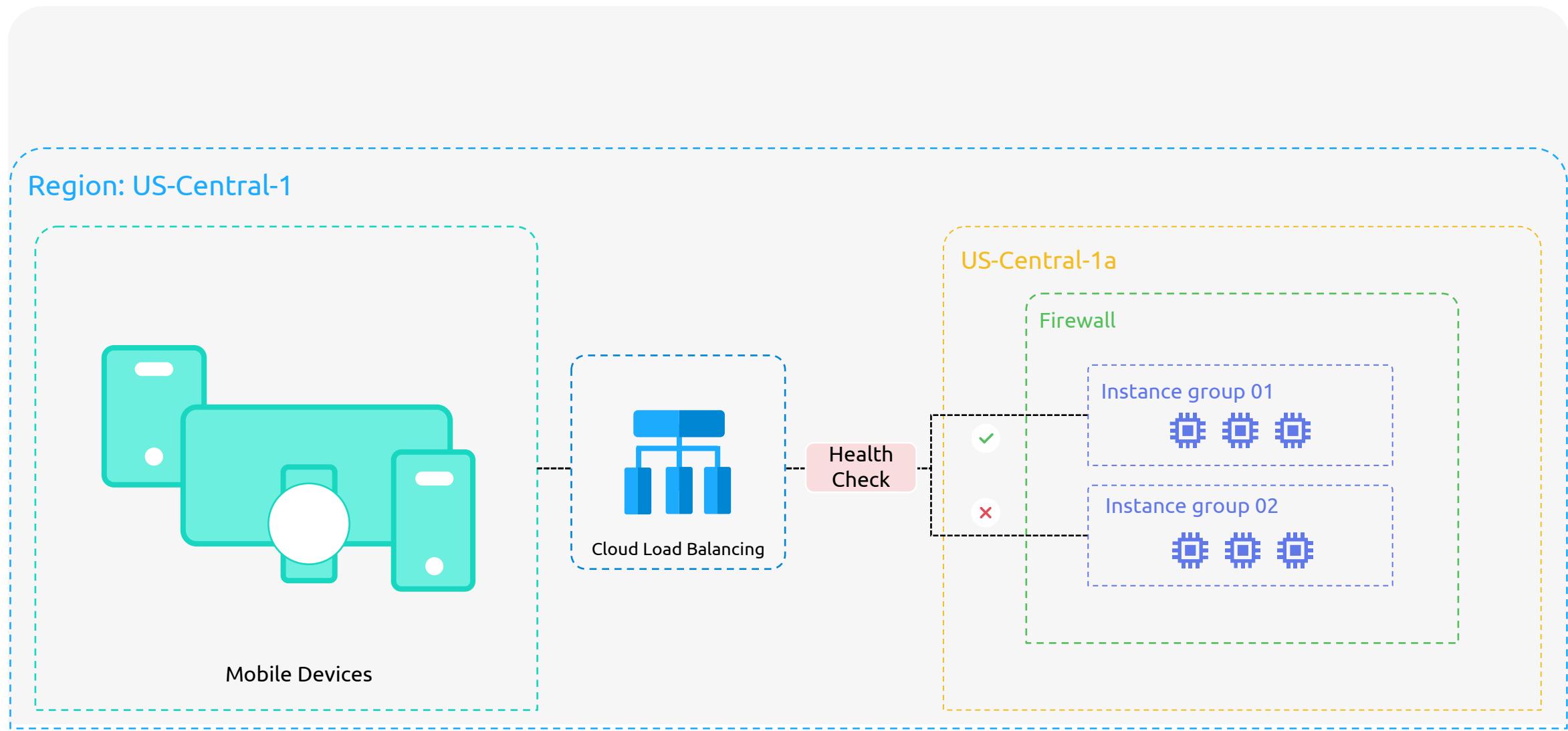


# KodeKloud

# Summary of Load Balancer

# Terminologies used in Load Balancing







A load balancer distributes user traffic across multiple instances of your applications.



By spreading the load, load balancing reduces the risk that your applications experience performance issues.



Layer 4 and Layer 7 load balancing.



Internal and Internet-facing load balancer.



Health checks offer a primary check on our application if it's up and running in our instance group.



# KodeKloud

# Simple application deployment

## 01

## Previously



Auto scaling instance group



About load balancer



Achieve high availability



Achieve easy deployment

## Use Case



Let us deploy a simple Application on GCP with minimum best practices

## Minimum Requirements



Scalable



High Availability



Easy Deployment

## Question?



How shall we setup our application inside the instance group during the VM creation time ?



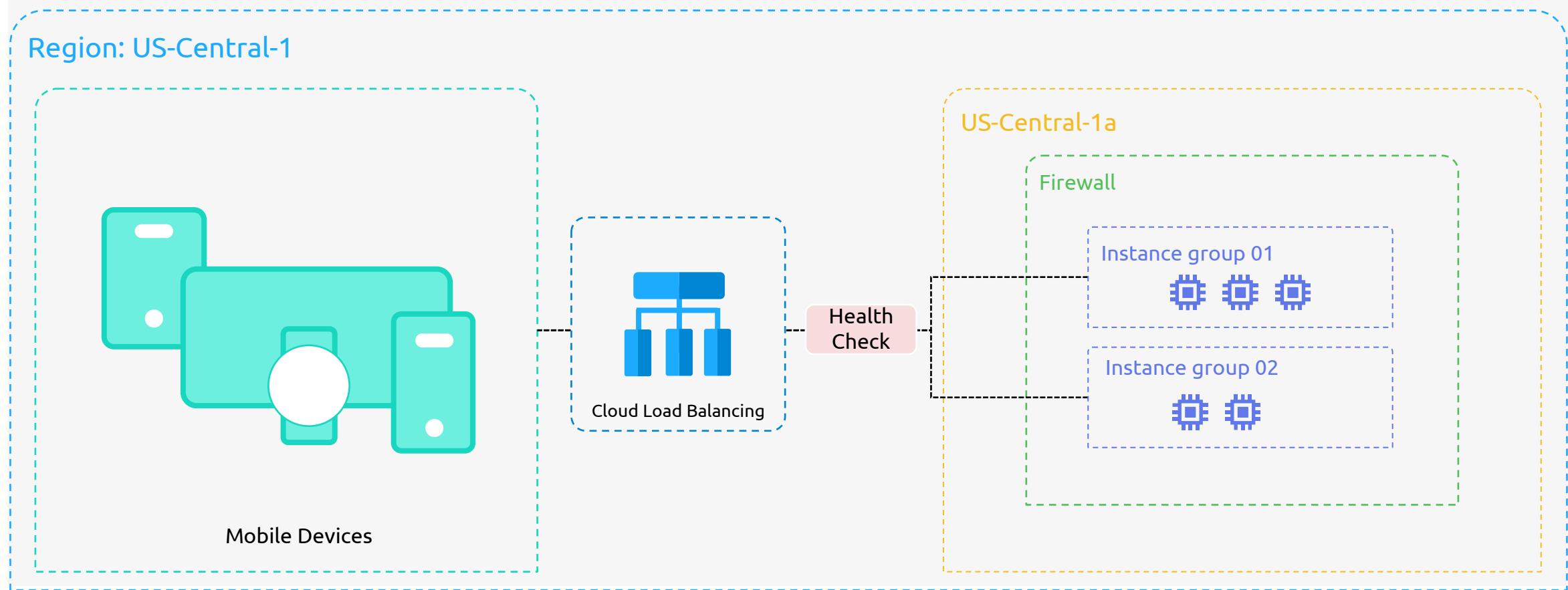
Do we have an automation for it ?

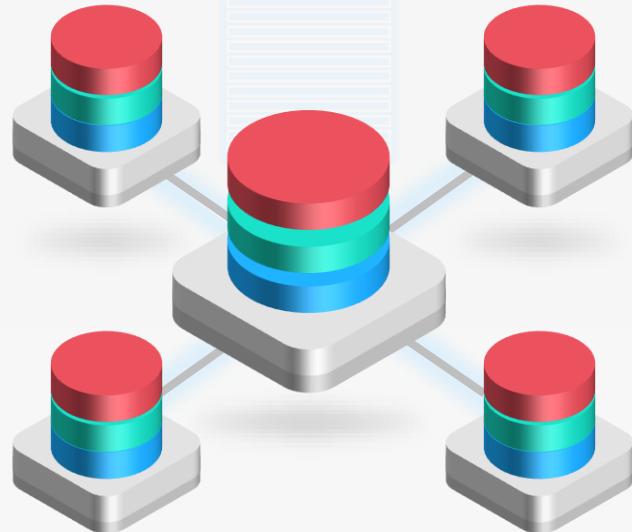


# KodeKloud

# Why do we need databases?

## Q | What happens to storage?





Databases support good data access: Large volumes of data can be stored in one place.



Multiple users can read and modify the data at the same time



Databases are searchable and sortable, so the data you need can be found quickly and easily.



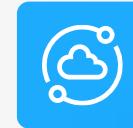
Databases further can be used to get business insights



# KodeKloud

# Databases in GCP

## Q | Why use databases in GCP?



GCP provides wide range of databases , Which can be used as pay as you go model



This is a game changer because usually database licenses and maintenance usually have a high cost.



Maintenance, Scalability, Disaster recovery all of this can be handled by GCP for you in a cost-effective manner.

# Wide options of Databases in GCP

## Cloud SQL



Fully managed MySQL, PostgreSQL, and SQL Server.

## Cloud Spanner



Cloud-native with unlimited scale, global consistency, and up to 99.999% availability.



Processes more than 2 billion requests per second at peak.



Suitable for users using databases such as Oracle or DynamoDB.

## Alloy DB for PostgreSQL



Fully managed, PostgreSQL-compatible database

## Cloud Bigtable



Highly performant, fully managed NoSQL database



Like HBase or Cassandra.



# KodeKloud

# SQL and NoSQL

## Relational databases (SQL)

Information is stored in tables, rows, and columns,  
typically works best for structured data



They are used for applications in which the  
structure of the data does not change often.



They are having ACID features  
(Atomic, Consistent, Isolated, Durable)



Cloud SQL, Cloud Spanner



## Non-relational databases (NoSQL)



It stores complex, unstructured data in a non-tabular  
form such as documents.



Unlike relational databases, they perform faster



Why ? Because data is stored in a Key, Value format



Cloud Bigtable, Memorystore, Firestore



Which database should I use?

Relational			Non – Relational (NoSQL)		In Memory
 <b>Cloud SQL</b> Managed MySQL, PostgreSQL, SQL Server	 <b>Cloud Spanner</b> Cloud-native with large, consistent, 99.999% availability	 <b>Bare Metal</b> Lift and shift Oracle workloads to Google Cloud	 <b>Fire Store</b> Cloud Native, serverless, NoSQL document database, backend-as-a-service, global strong consistency, 99.999% SLA	 <b>Cloud BigTable</b> Cloud-native NoSQL wide-column store for large-scale, low-latency workloads	 <b>Memory Store</b> Fully managed Redis and Memcached for sub-millisecond data access
<b>Good for</b>					
General purpose SQL DB	RDBMS+ scale, HA, HTAP	RDBMS+ scale, HA, HTAP	Large-scale, complex hierarchical data	Heavy read + write, events	In-memory and key-value store
<b>Use Case</b>					
 Web Frameworks  ERP  CRM  Ecommerce And web  SaaS application	 Gaming  Global financial ledger 	 Legacy applications 	 Mobile/web/IOT applications  Real-time sync  Offline sync 	 Personalization  Adtech  Fraud detection 	 Caching  Session store  Gaming  Personalization  Social chat or news feed  Adtech 

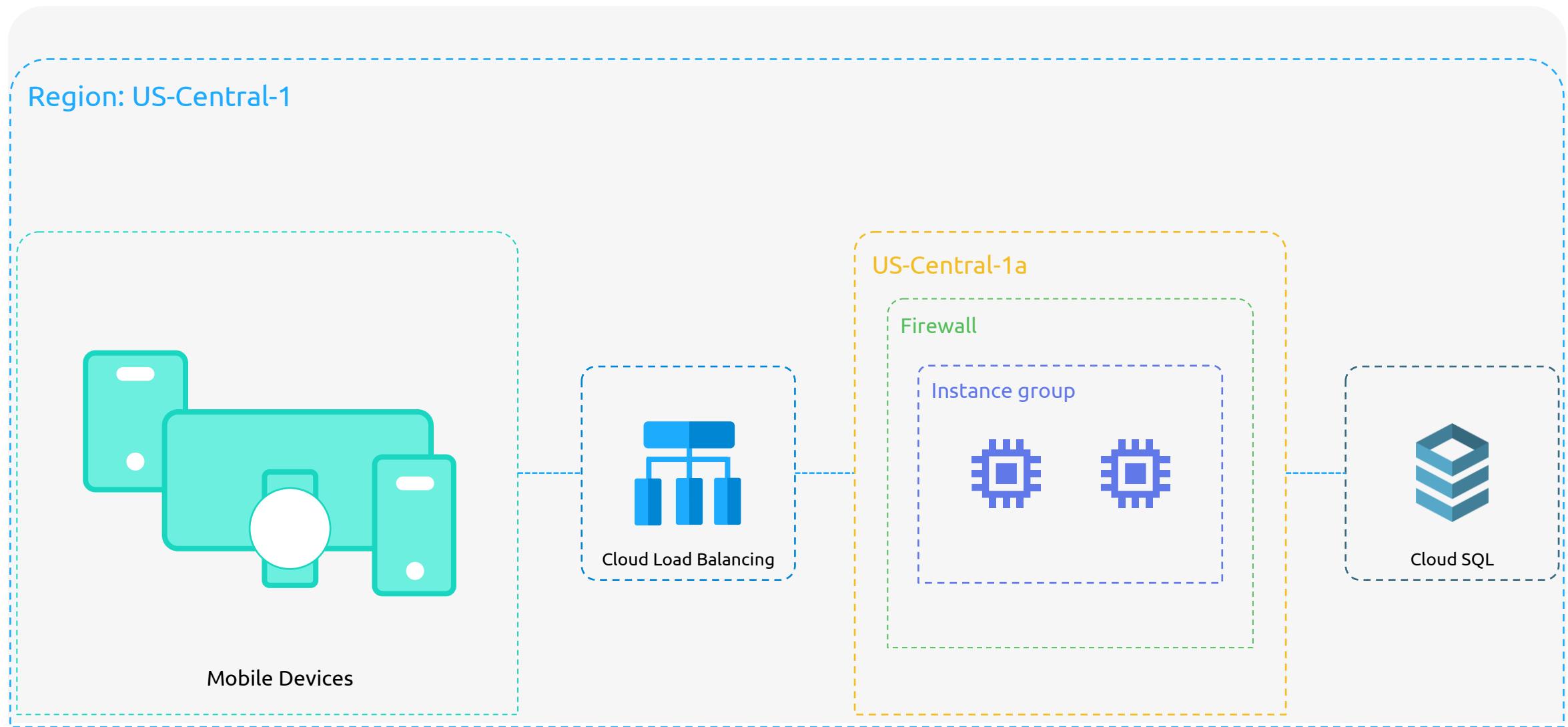


# KodeKloud

# Demo

# Database

```
gcloud sql connect my-db --user=root --quiet
```





# KodeKloud

# What is an object storage?

## Storage in GCP



Upload receipt

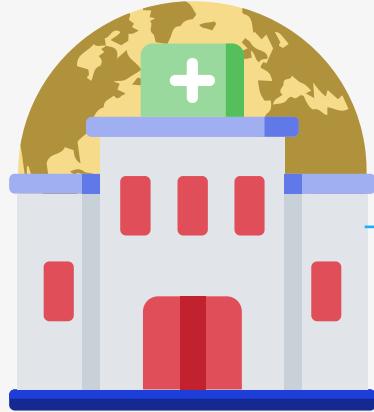


We can't store in volume.



We can't store these in databases.

# Object Storage in GCP



Upload receipt



What is an object storage?



What is a Cloud Storage?



How can we use it?



What are the features of Cloud Storage?

Storing such huge amounts of data in their own data centers can be expensive for large organizations, Moving these to the cloud can help reduce cost and operational burden.



# KodeKloud

# Object storage and GCP Storage bucket

# Object Storage in GCP



Object storage is a computer data storage architecture designed to handle large amounts of unstructured data.



It is a storage pool.



Object storage works best for static storage, especially for unstructured data, where you write data once but may need to read it many times.

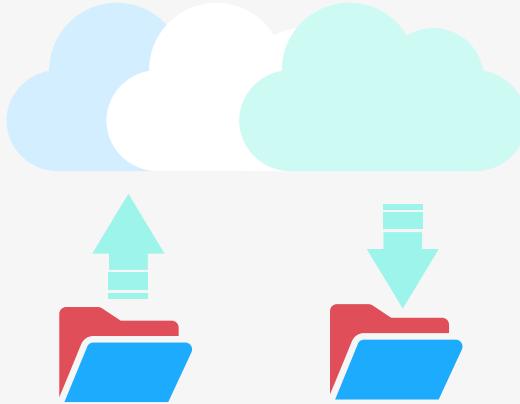


Object storage doesn't really have a folder structure or hierarchical structure.



Cloud storage is the object storage option in GCP, This is also something referred to as buckets.

# Object Storage in GCP



We can store any kind of data with different sizes



Store any amount of data.(Upper limit is too high)



Retrieve it as often as you'd like.



**Turbo Replication** : Replicate 100% of your data between regions in 15 mins or less



Durability 99.99999999%

## Use Case



Rich media storage  
and delivery



Big data  
analytics



Internet of  
Things



Backup and  
archiving



# KodeKloud

# Different storage class GCP Storage



Why do we need different storage classes?



Upload receipt



We are billed for storage used.



What will happen after 1 year when these files are not accessed anymore?



Can we really delete it because it's needed for an audit?

## Available storage classes

The following table summarizes the primary storage classes offered by Cloud Storage.

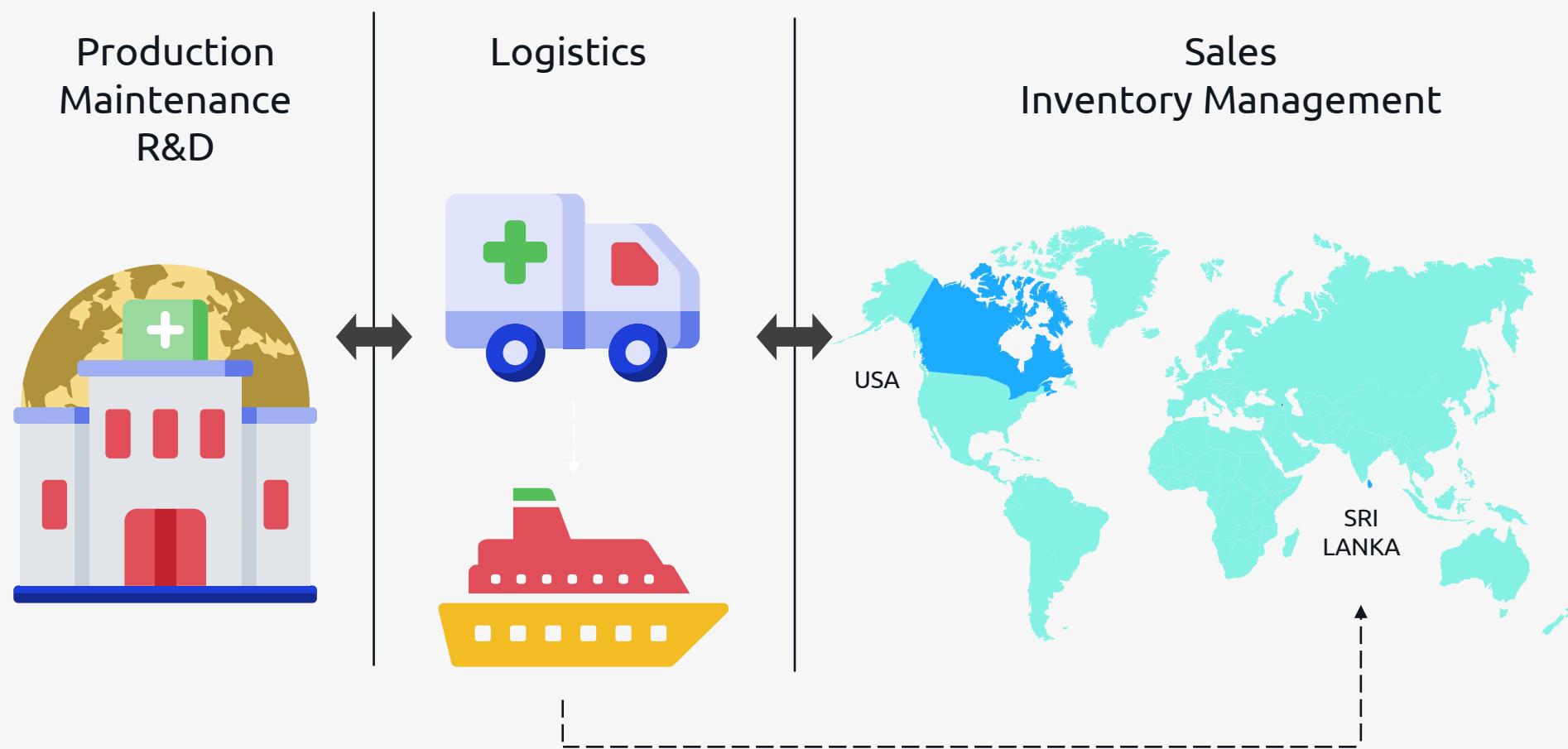
Storage Class	Name for APIs and CLIs	Minimum storage duration	Typical monthly availability	\$
Standard Storage	STANDARD	None	<ul style="list-style-type: none"> <li>▪ &gt;99.99% in multi-regions and dual-regions</li> <li>▪ 99.99% in regions</li> </ul>	
Nearline Storage	NEARLINE	30 days	<ul style="list-style-type: none"> <li>▪ 99.95% in multi-regions and dual-regions</li> <li>▪ 99.9% in regions</li> </ul>	
Coldline Storage	COLDLINE	90 days	<ul style="list-style-type: none"> <li>▪ 99.95% in multi-regions and dual-regions</li> <li>▪ 99.9% in regions</li> </ul>	
Archive Storage	ARCHIVE	365 days	<ul style="list-style-type: none"> <li>▪ 99.95% in multi-regions and dual-regions</li> <li>▪ 99.9% in regions</li> </ul>	





# KodeKloud

# How can APIs modernize legacy systems?



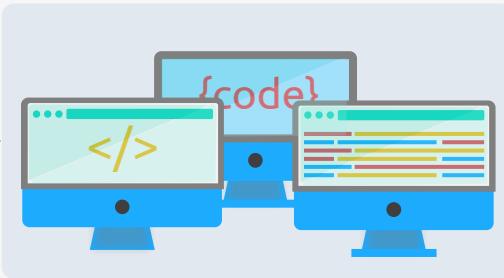


How do applications between different internal teams communicate?

Production  
Maintenance  
R&D



Logistics



Sales  
Inventory Management

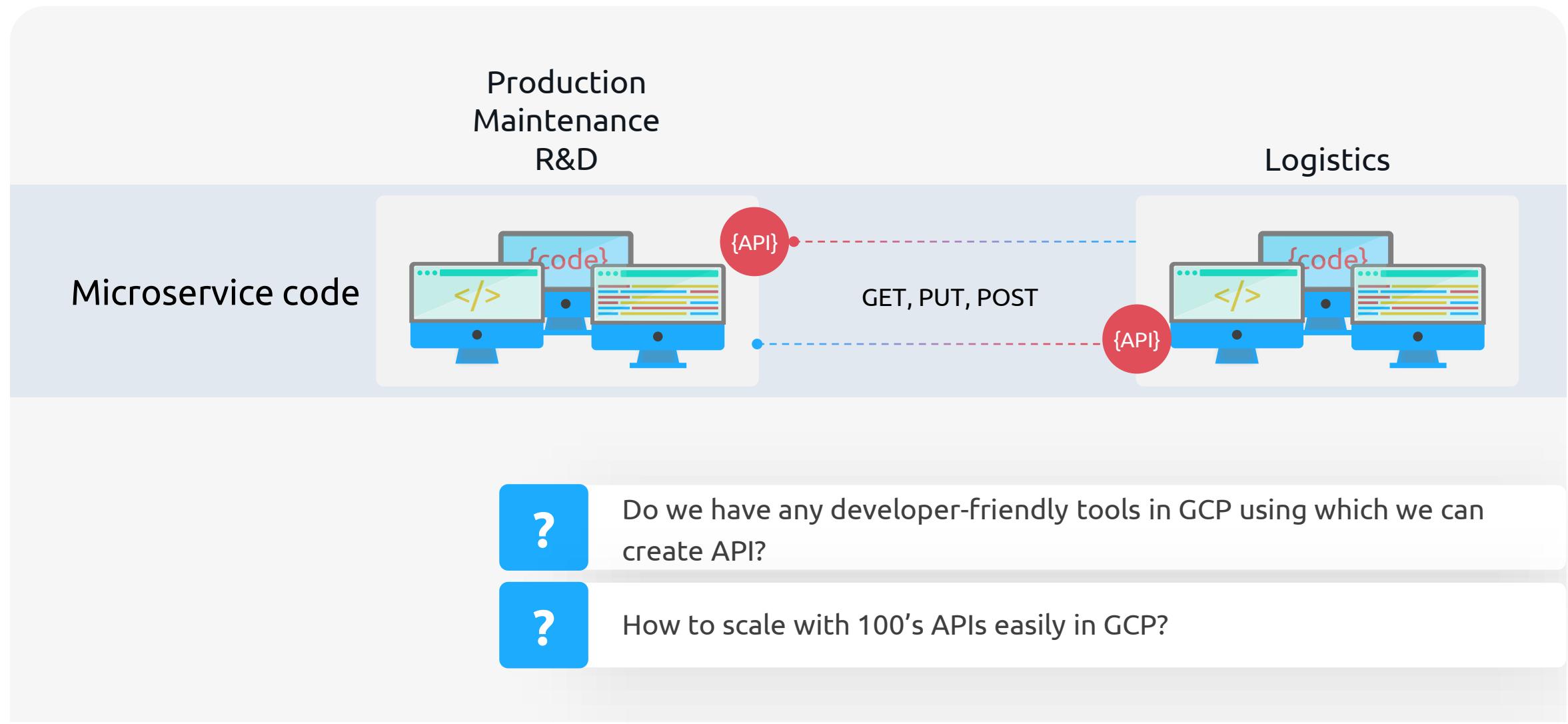




# KodeKloud

# Understanding API

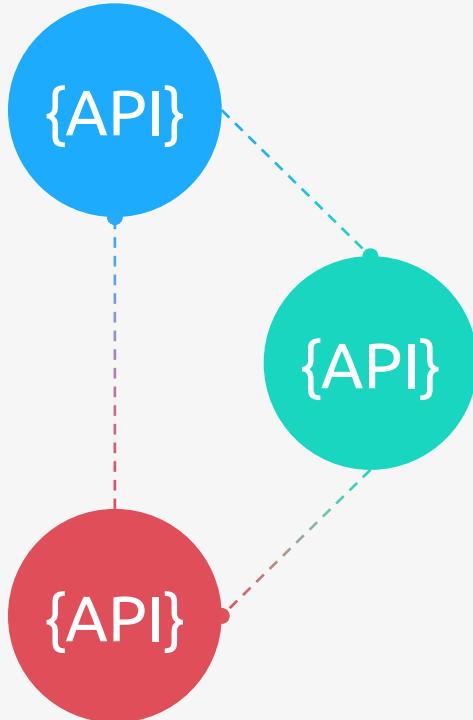
# API – Application User Interface





# KodeKloud

# Apigee in GCP



With Apigee hybrid, you have the power to choose where to host your APIs—on-premises, Google Cloud, or hybrid.



AI-powered API monitoring

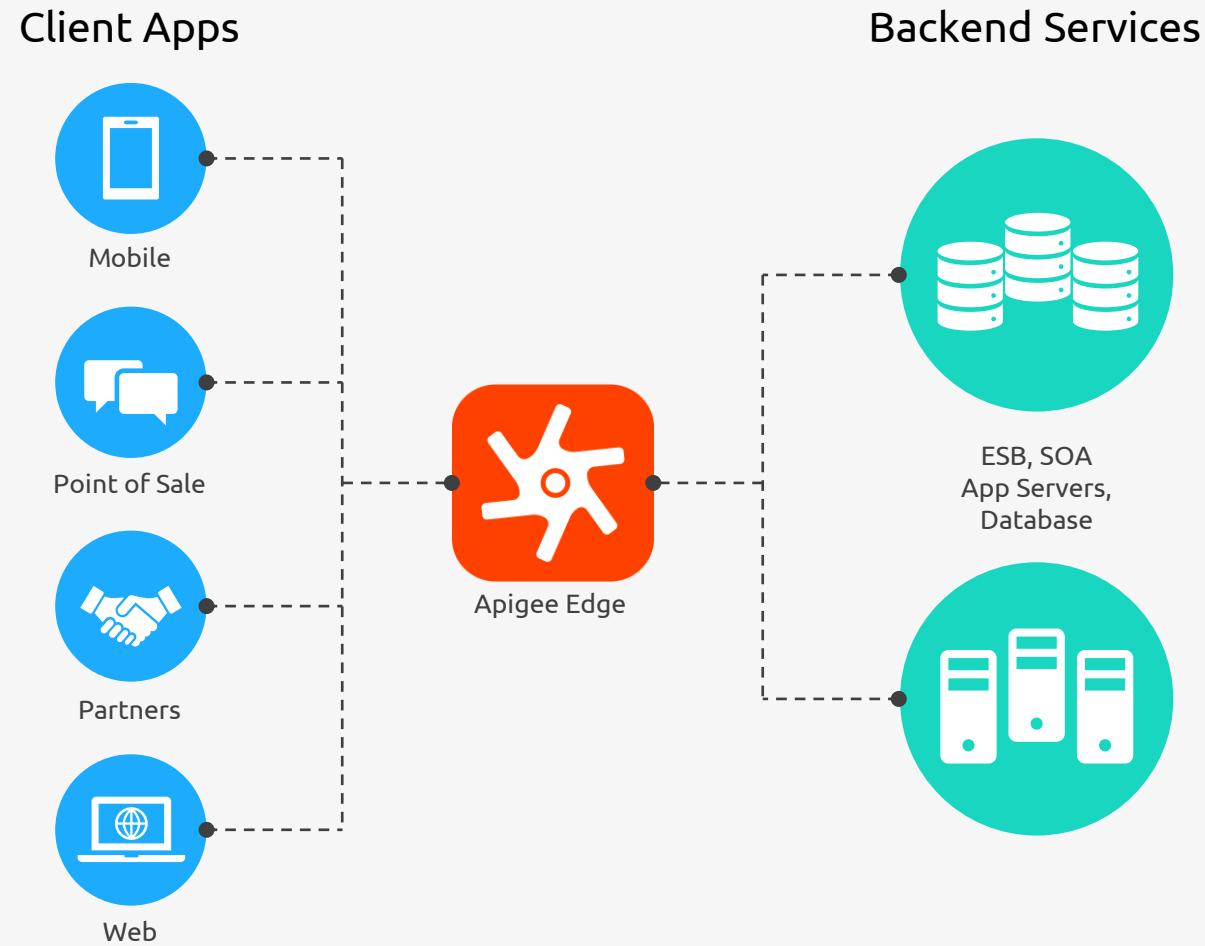


Expand and move to micro service architecture

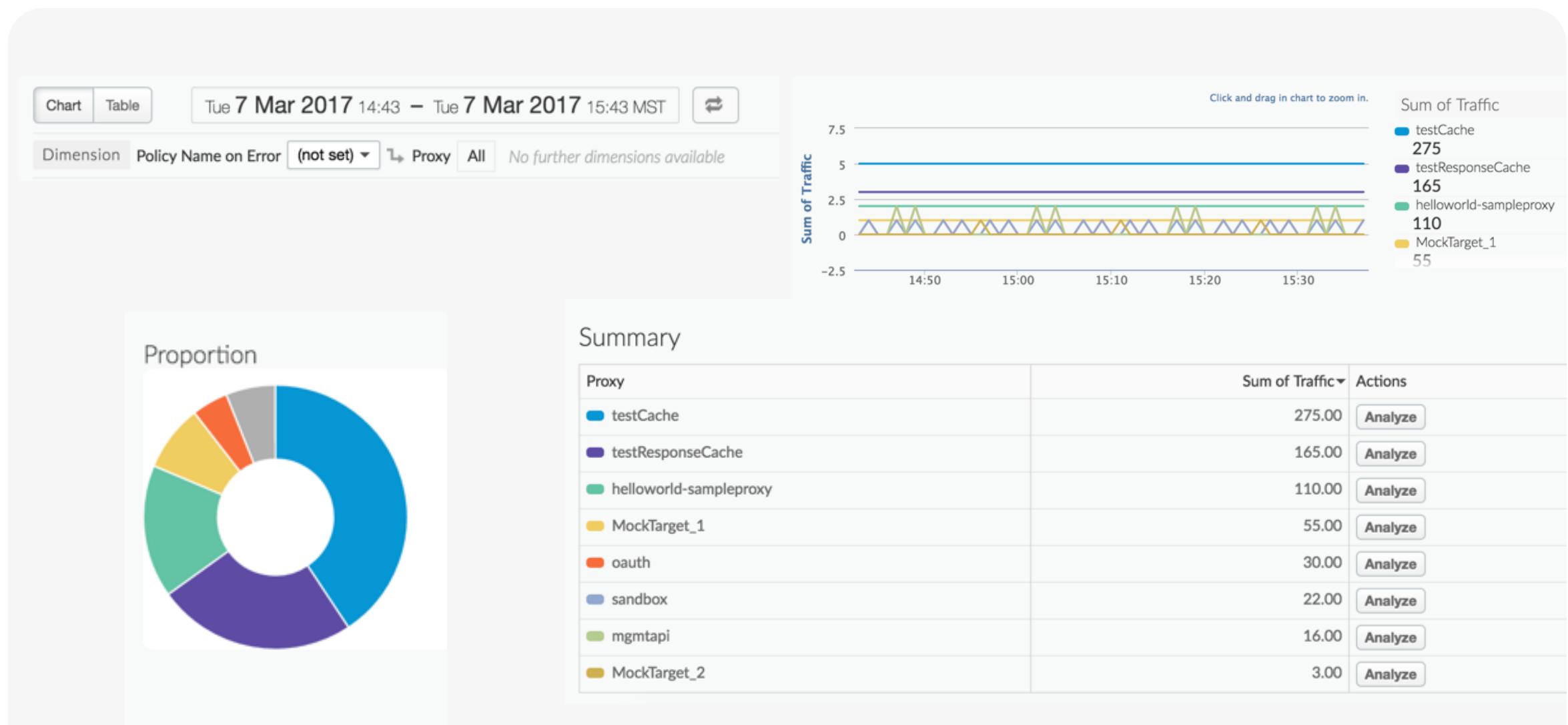


Developer-friendly tools to build and deploy APIs

# Apigee Management System



# Apigee Management System



# Apigee Management System

Deployment to Trace Environment test, Revision 1 ▾ Stop Trace Session Remaining Time: 08:26 Download Trace Session Node.js Logs

Transactions

	Status	Method	URI	Elapsed
5	200	GET	/testresponsecache?apikey=sTlODDxLcA...	9 ms
4	200	GET	/testresponsecache... apikey=sTlODDxLcA...	6 ms
3	200	GET	/testresponsecache... apikey=sTlODDxLcA...	5 ms
2	200	GET	/testresponsecache... apikey=sTlODDxLcA...	5 ms
1	401	GET	/testresponsecache? apikey=sTlODDxLcA...	8 ms

Send Requests

Method URL Status

GET http://apigeedocs-test.apigee.net/testresponsecache?apikey=sTlODDxLcA... Send Or Send with the API Console

Transaction Map

Phase Details

Request Received from Client  
GET /testresponsecache?  
apikey=sTlODDxLcA4zbYzAh9wKQi596qdxERrU

Response Sent to Client  
200 OK

View Options

Transaction Map

- Show Disabled Policies (none)
- Show Skipped Phases (1)
- Show All FlowInfos (6)

Phase Details

- Automatically Compare Selected Phase

Request Headers

Accept	*/*
Accept-Encoding	gzip,deflate
Host	apigeedocs-test.apigee.net
User-Agent	AHC/1.0

Response Headers

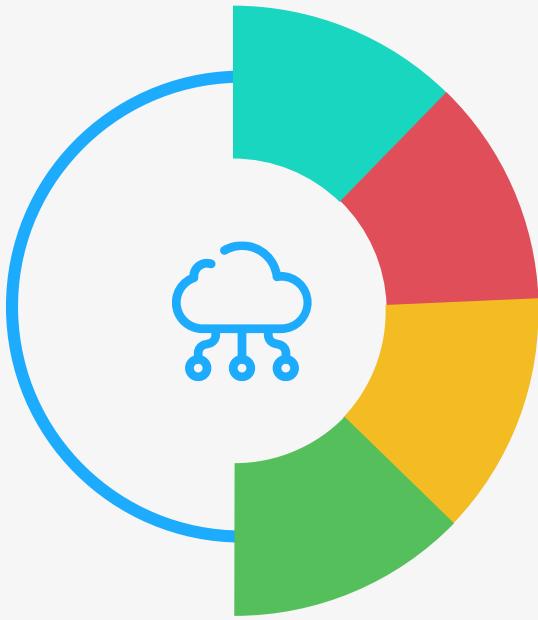
Access-Control-Allow-Origin	*
Connection	keep-alive
Content-Length	68
Content-Type	application/json



# KodeKloud

# 4V's of BigData

## 4 v's of Big Data



- Volume**  
Today, every single minute we create the same amount of data that was created from the beginning of time until the year 2000
- Velocity**  
It is all about the speed new data is generated and moves around.
- Variety**  
Data is generally one of three types: unstructured, semi-structured, and structured
- Veracity**  
The veracity of big data denotes the trustworthiness of the data. Is the data accurate and high-quality?



# KodeKloud

# 4 steps of handling big data in GCP

# Big Data and AI with GCP



1

Collection of  
Data



2

Processing  
the Data



3

Analytics on  
Data



4

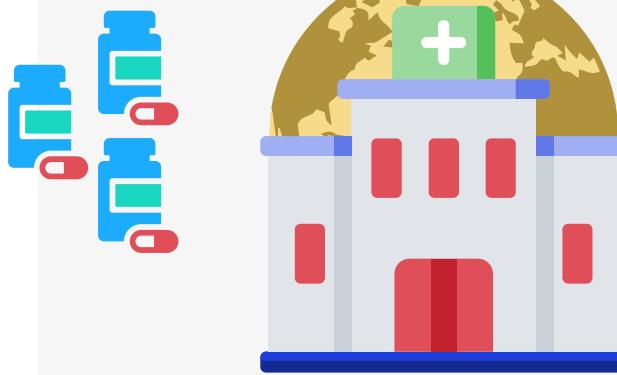
AI and Machine  
learning



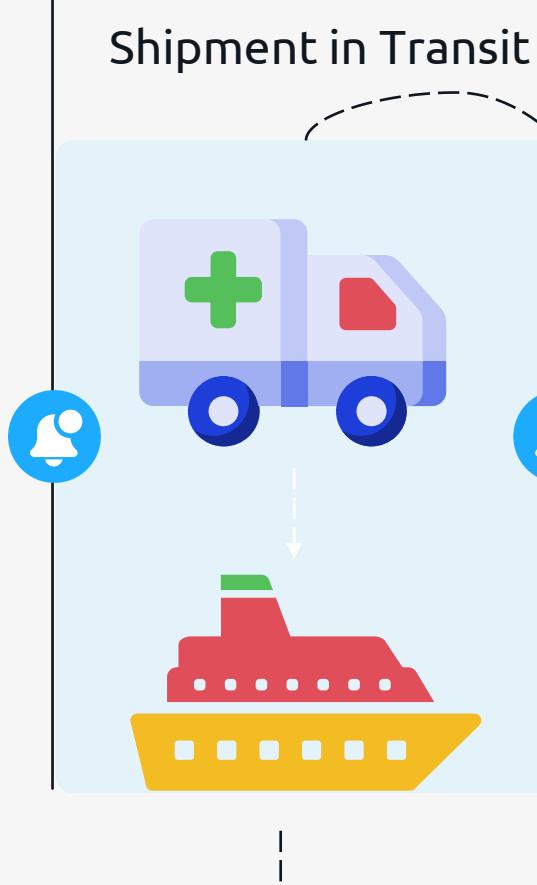
# KodeKloud

# Use case for Big Data

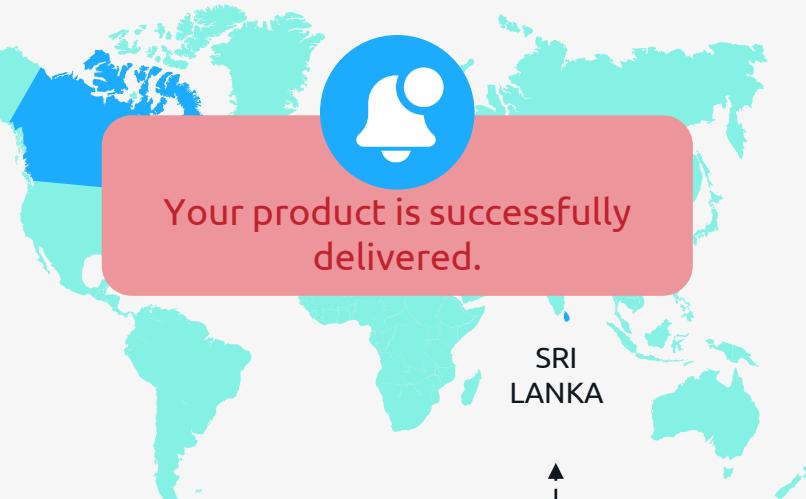
### Shipment Sent

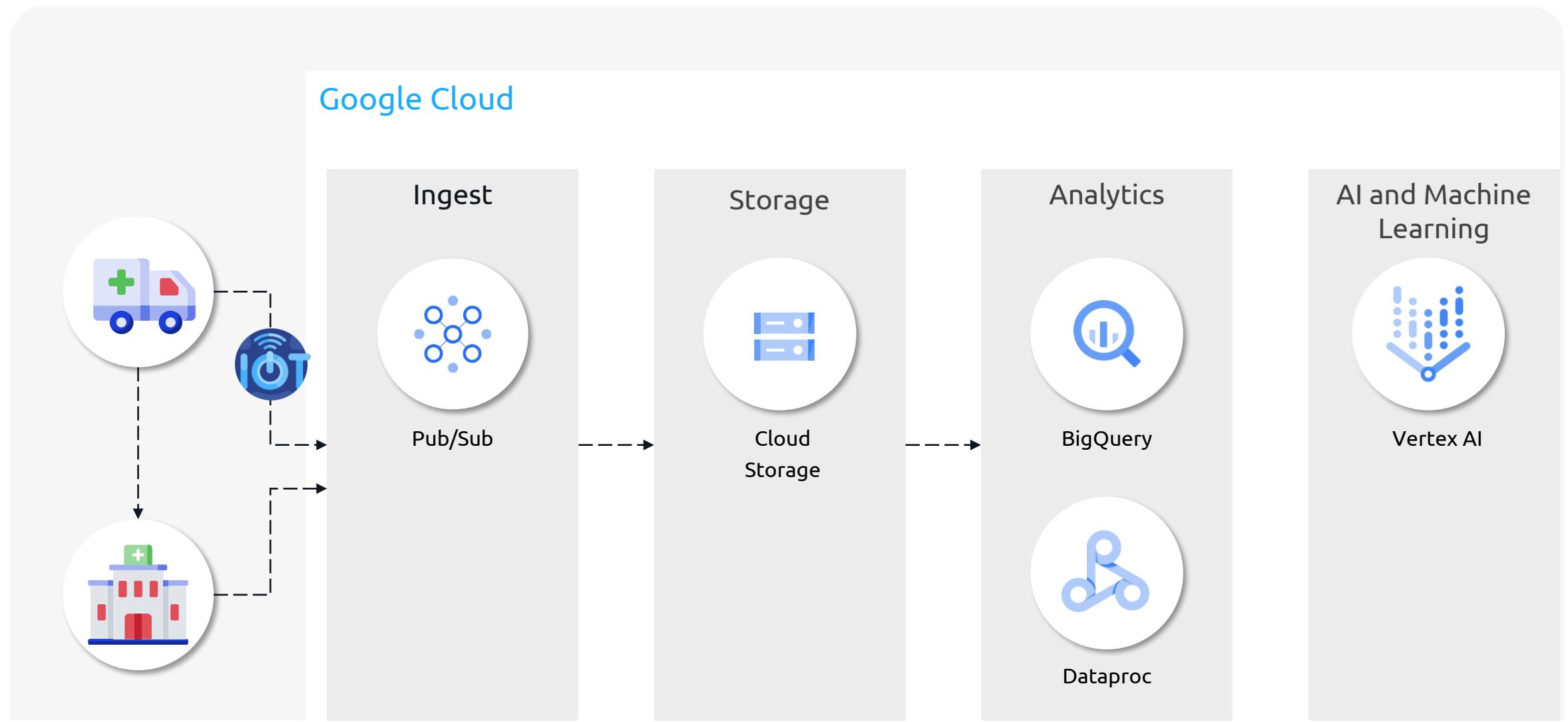


### Shipment in Transit



### Shipment Received





**Streaming Data**  
Pub/Sub

Stream data in real-time.



Ingest events for streaming into Big Query, data lakes, or operational databases.

**Storage**  
Cloud Storage

Lower-cost storage option



Can act as Data warehouse



Connect further to Big Query, DataProc

## Data Processing

DataProc



Fully managed and highly scalable service for running Apache Spark, 30+ open-source tools and frameworks.



Used for data lake modernization, ETL



Pay as you go model



No License to use any service

## AI and Machine learning

Vertex AI



Build and run AI models



Use GPU instance for Deep learning machine learning models



End to End machine learning model deployment

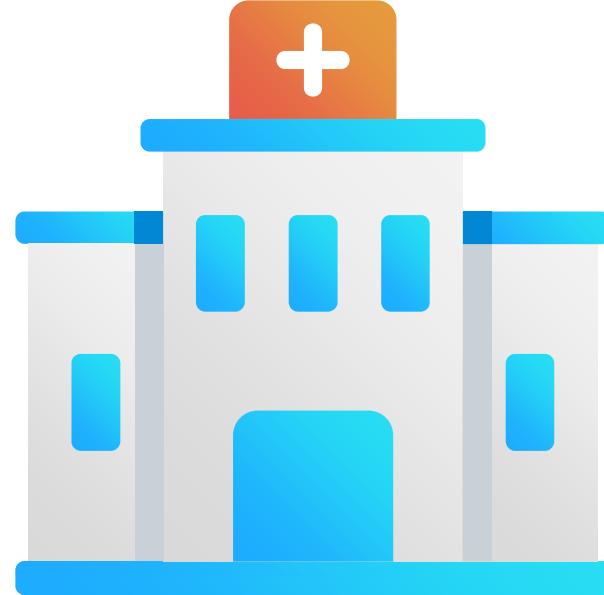


Options to use Tensorflow, Scikit ML libraries   [Machine learning library](#)

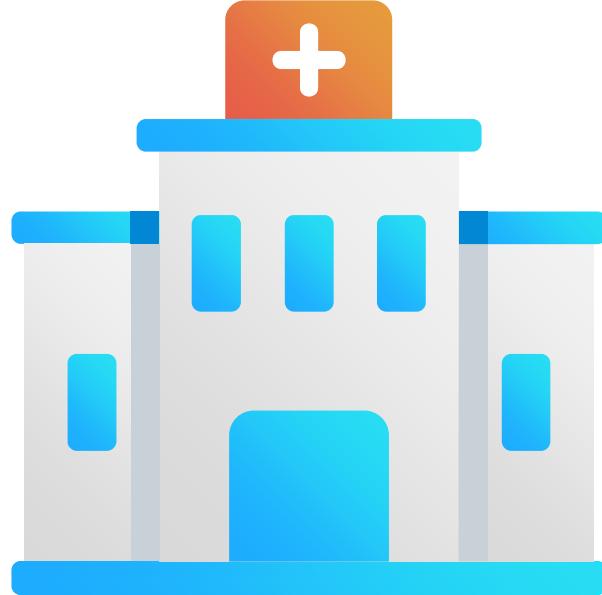


# KodeKloud

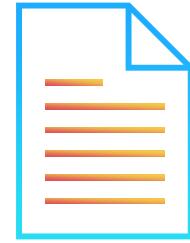
# Document AI



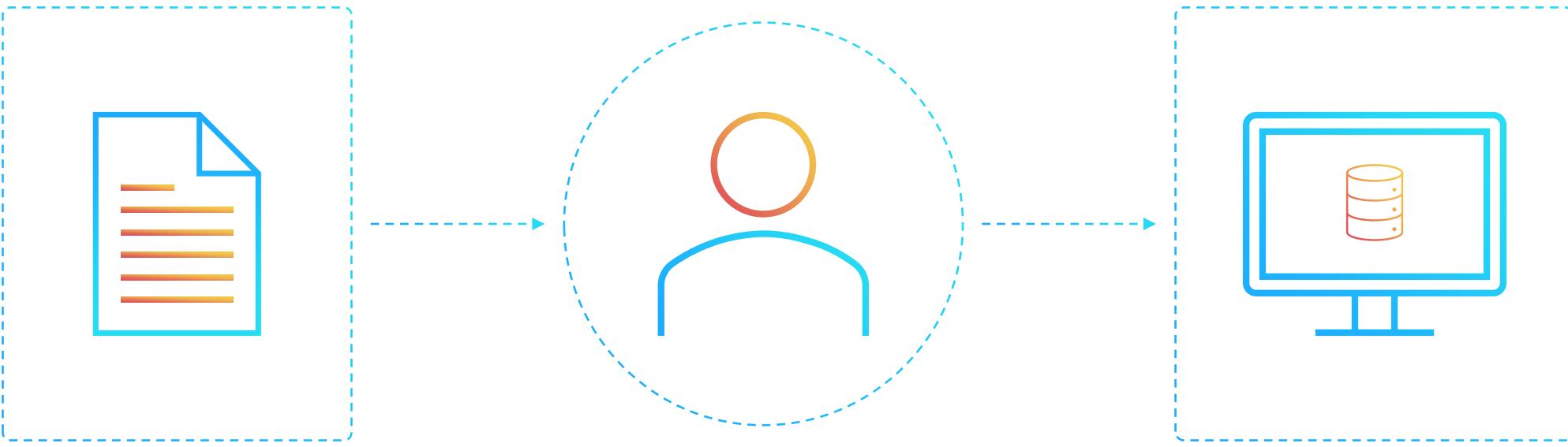
Pharmaceutical company



Pharmaceutical company



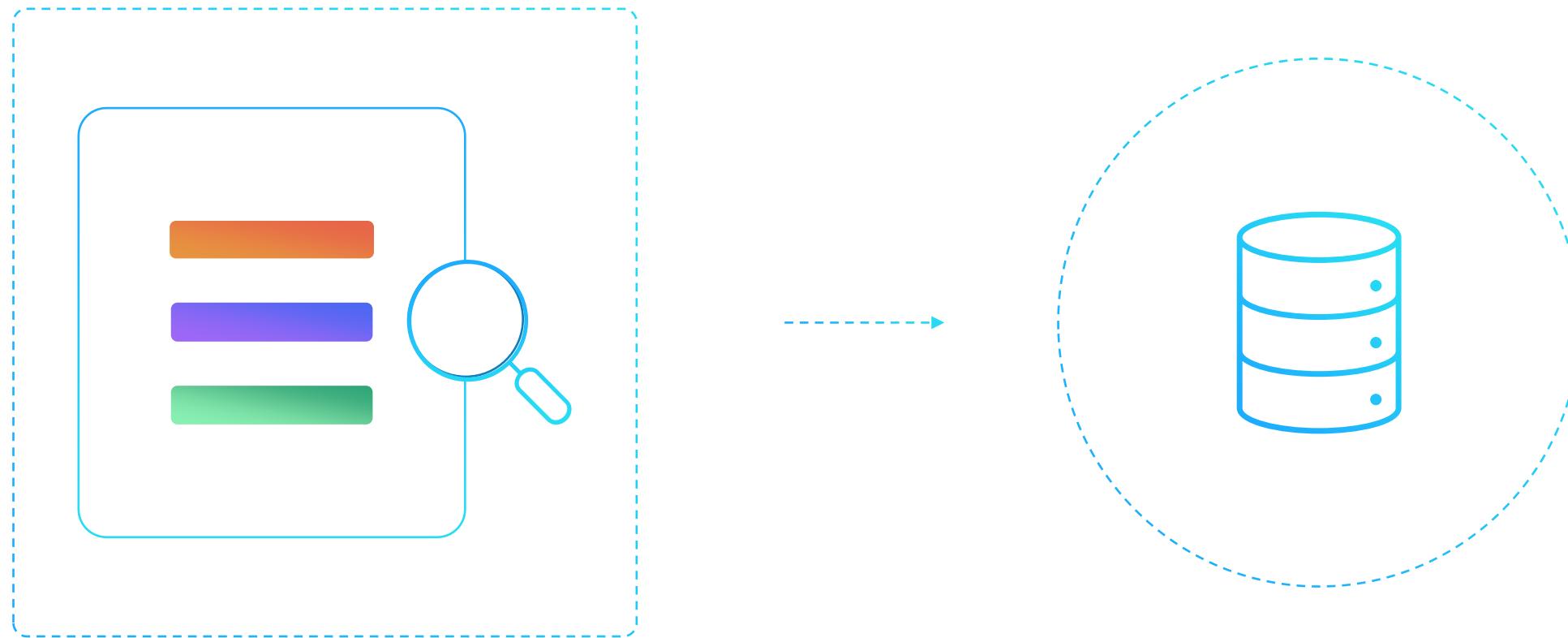








# GCP Document AI

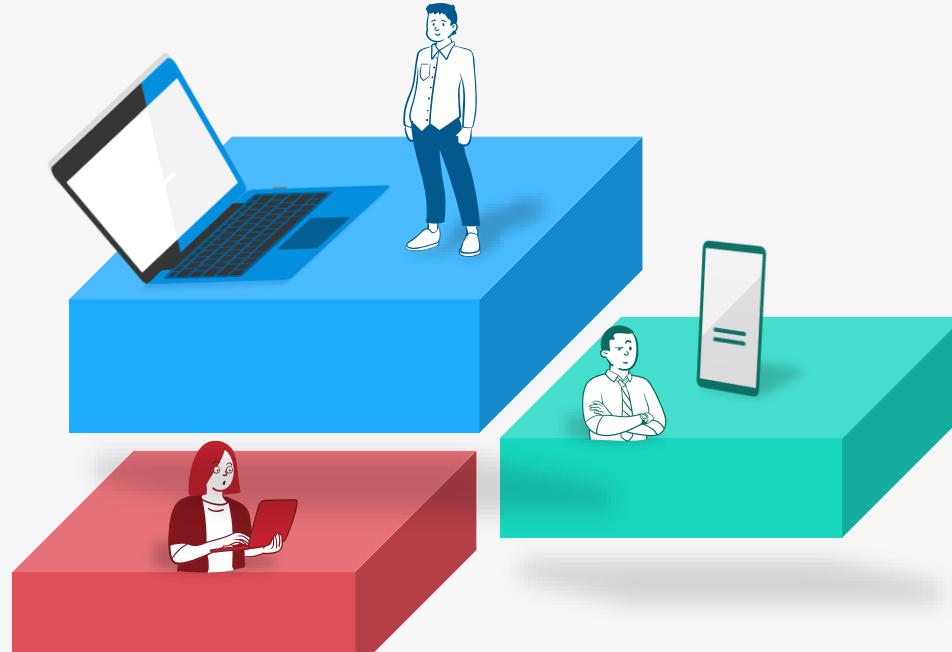


Extract structured data from documents **analyse**, **search** and **store** this data.



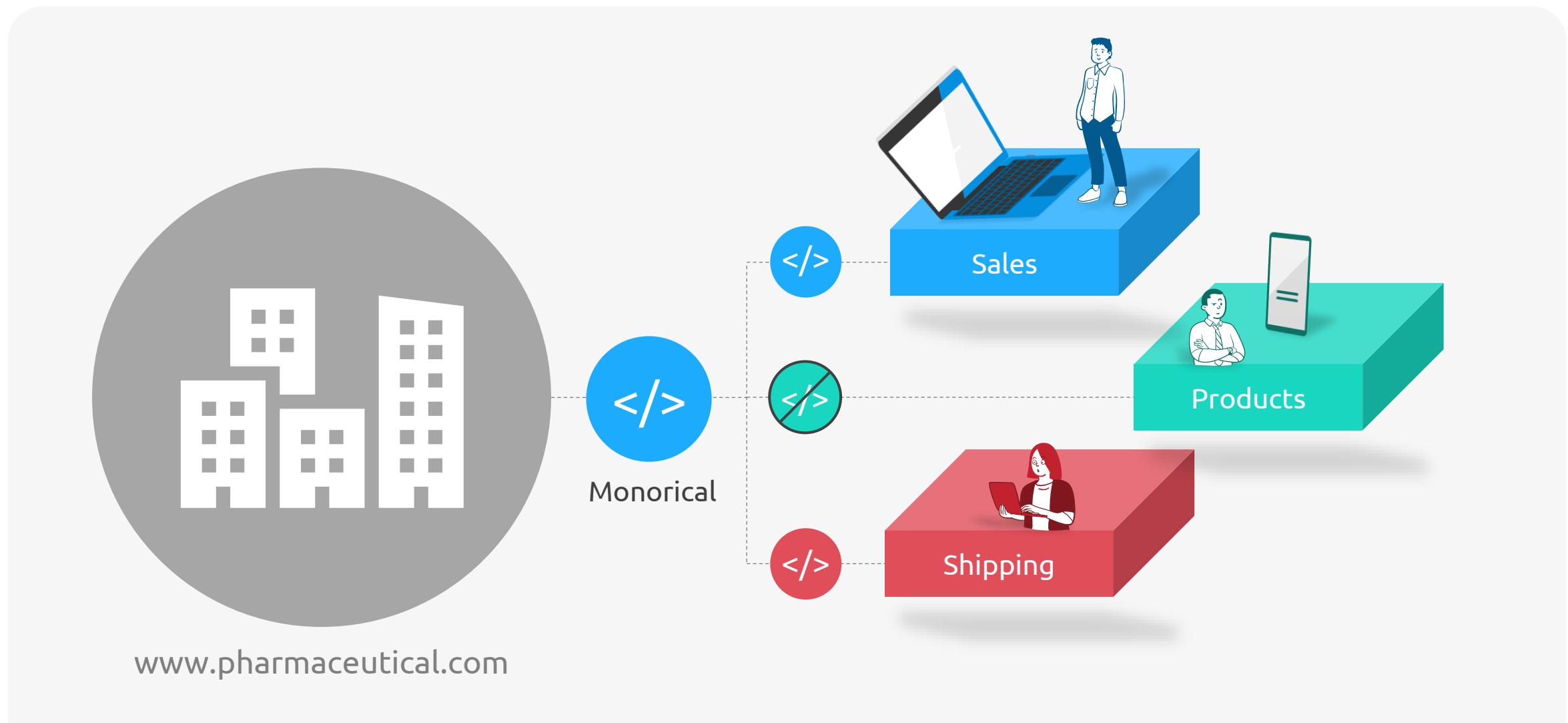
# KodeKloud

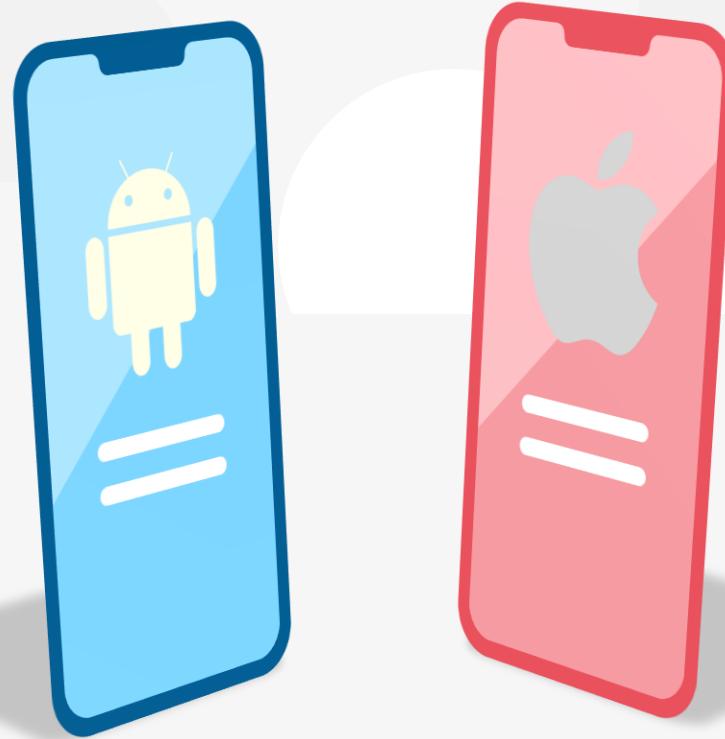
# Container Orchestration in GCP



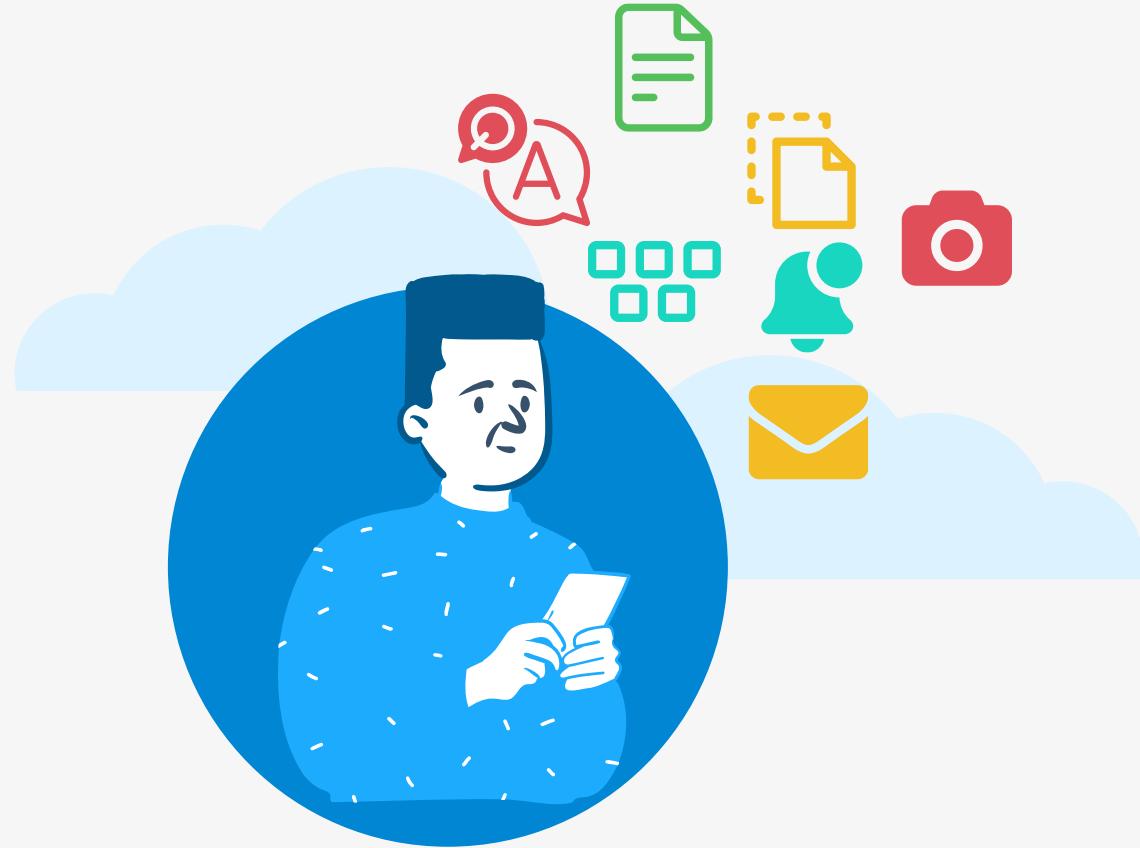
Q | Why do we need containerization?

Q | What are the tools and services?





# Why containers are required?

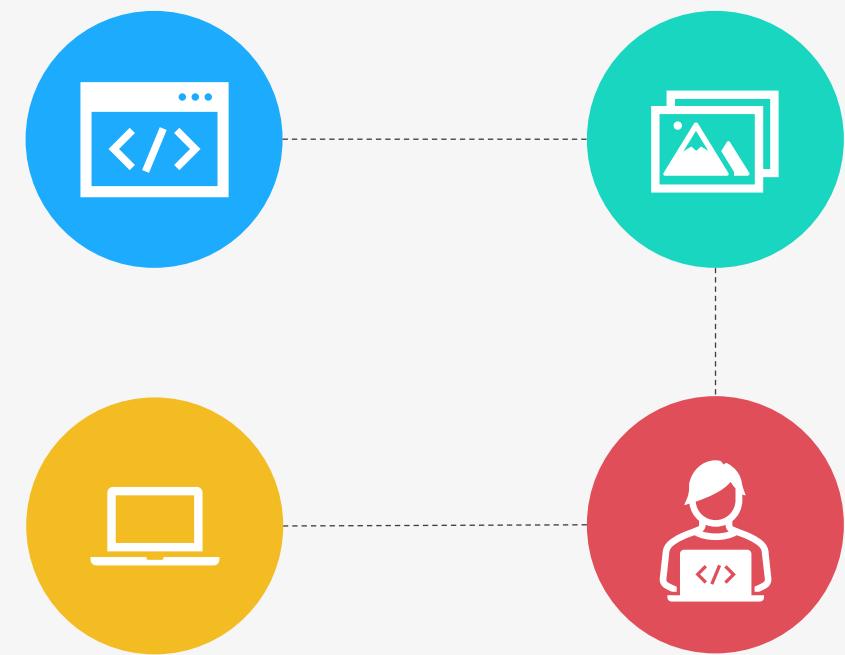
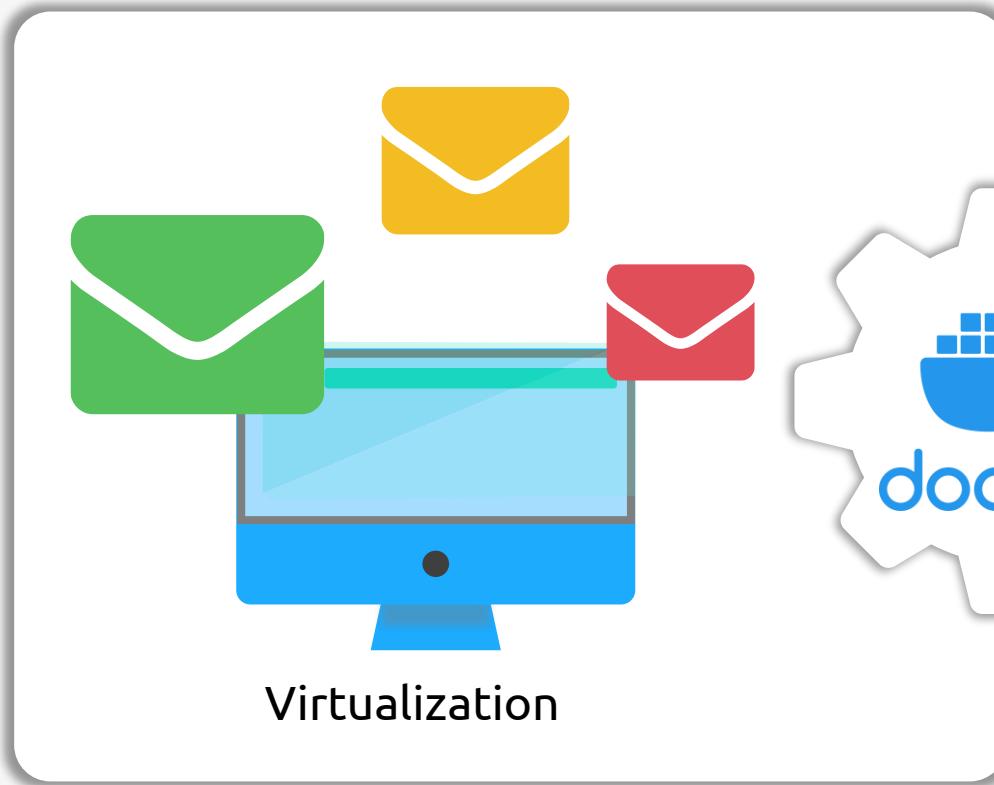


Streamlines the development lifecycle by allowing developers to work in standardized environments



Shipping code to clients is easy

Q | What is the software required?





# KodeKloud

GKE



Kubernetes

The open-source container  
orchestration system



Automating



Software deployment



Scaling

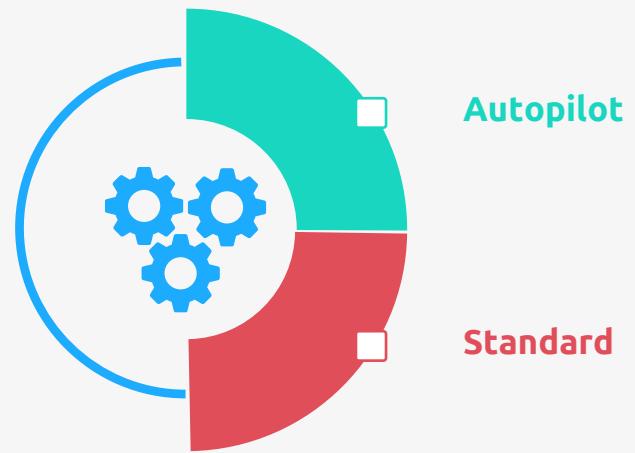


Management



## GKE

The most automated and scalable managed Kubernetes platform

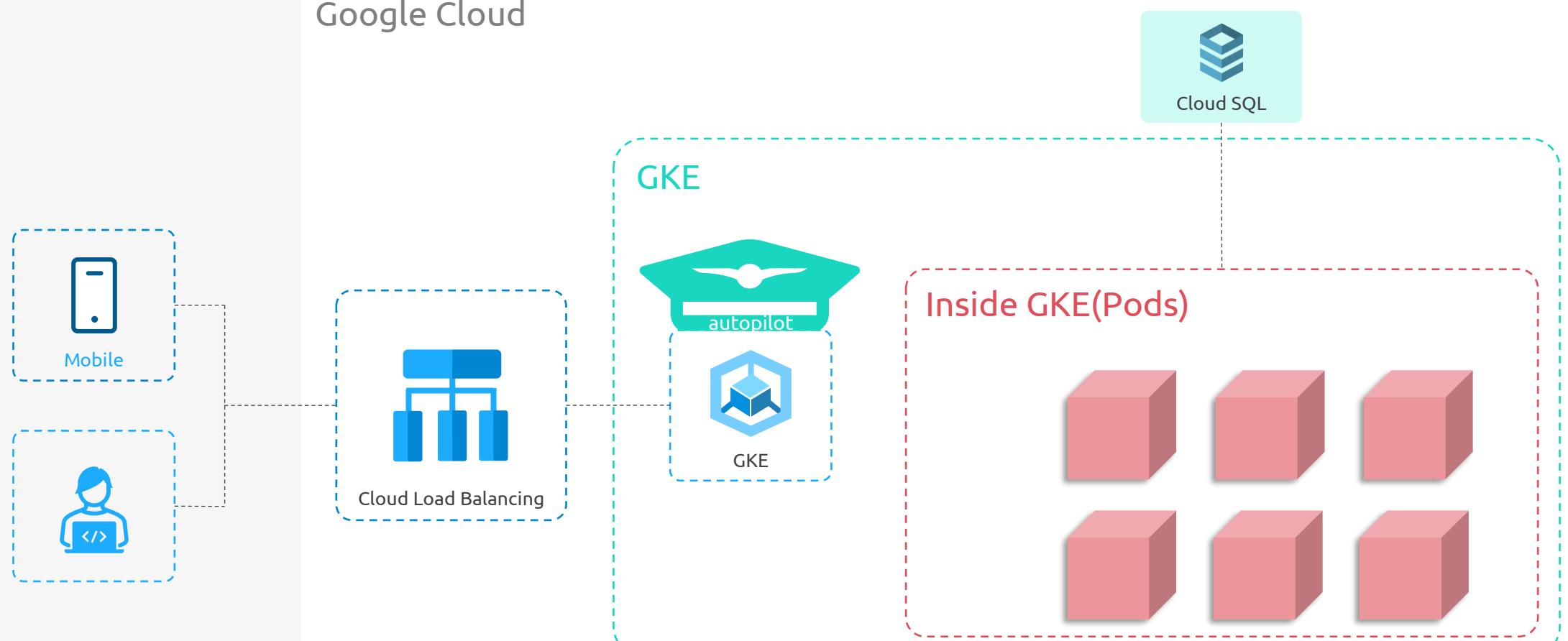


Easy integration with Load Balancers and other services to expose our application APIs



GKE is the developer favorite tool while building modern data applications

Exam Tip : GKE is used for container orchestration





# KodeKloud

# Cloud Run



We only have a container image; We want to quickly test this without going to the GKE setup.



GCP Cloud Run



Build and deploy scalable containerized apps written in any language (including [Go](#), [Python](#), [Java](#), [Node.js](#), [.NET](#), and [Ruby](#)) in less than 10mins.



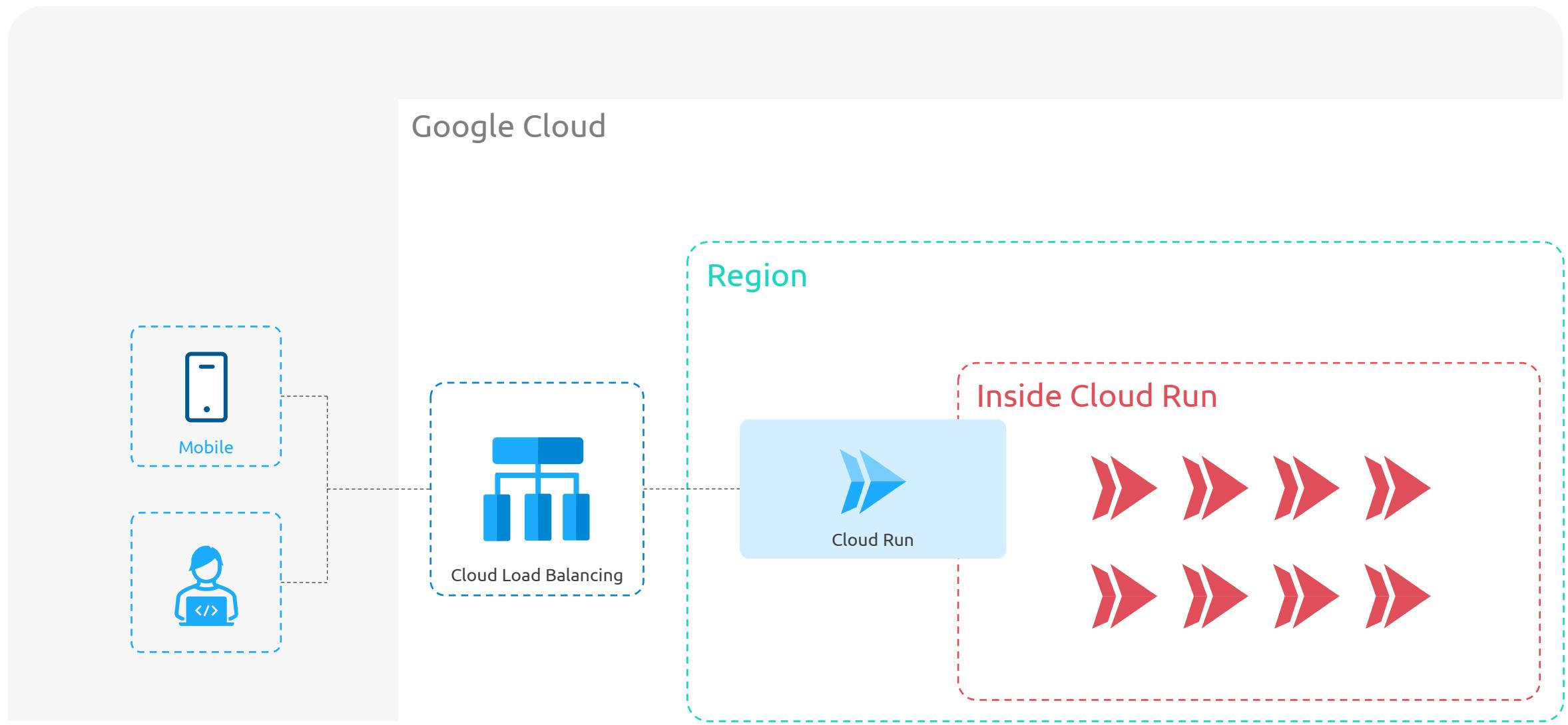
Pay per use



Only pay when your code is running, billed to the nearest 100 milliseconds.



Cloud Run integrations --- Load Balancer, Logging

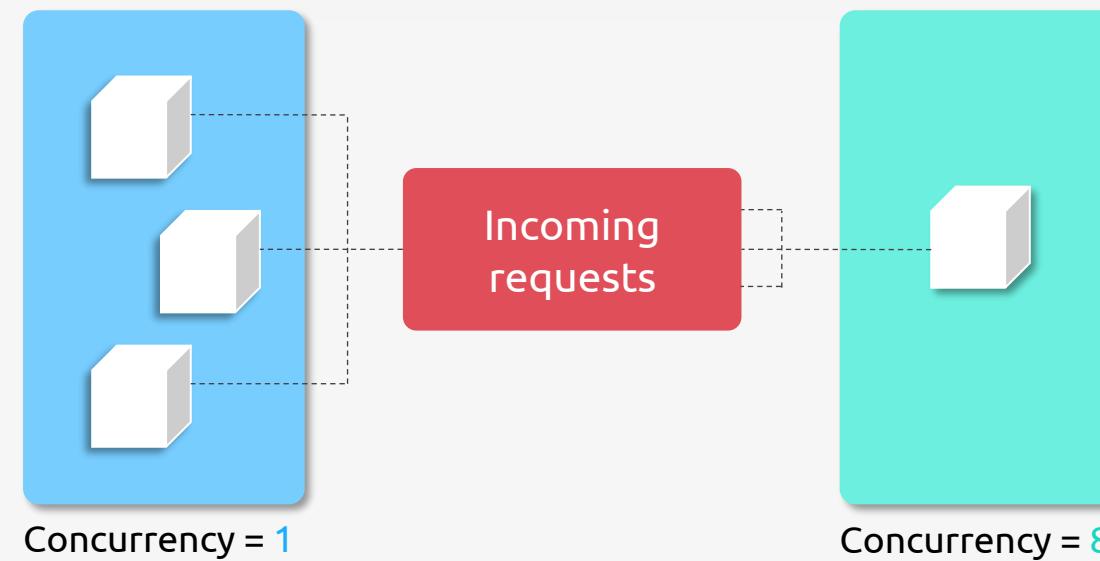




Cloud Run is a scalable solution to be chosen to test and deploy a simple containerized application



Each cloud-run container can receive default 80 requests at the same time; you can increase this to a maximum of 1000





# KodeKloud

# GCP Security, Privacy, and Cloud Compliance

GCP Security, Privacy, and Cloud Compliance



- 1 Detect, investigate, and respond to threats faster
- 2 Protect business-critical apps from fraud and web attacks
- 3 Digital sovereignty
- 4 Provide secure access to systems, data, and resources





# KodeKloud

# GCP services for securing our cloud setup



### Data Replication

Data Replication and Disaster recovery



### Single Sign On

Integrate with the existing single sign-on system



### IAM

Use IAM to provide the least required access



### Cloud Armor

Enable Cloud Armor protection



### Threat Detection

Setup rules to alert on misconfiguration



# KodeKloud

# Shared responsibility model

## Security inside the cloud

Responsibel Organization

Data Security inside the cloud ■

Application configuration according to best practice ■

Taking proactive measures in solving security threats. ■

## Security of the cloud

Responsibel GCP

Physical security of Data centers ■

Global network ■

Cyber Security of Data centers ■

Upgrade and patches accordingly ■



# Overview & Sample-Arch-1

# Architecture: Connection On-Premises to GCP

