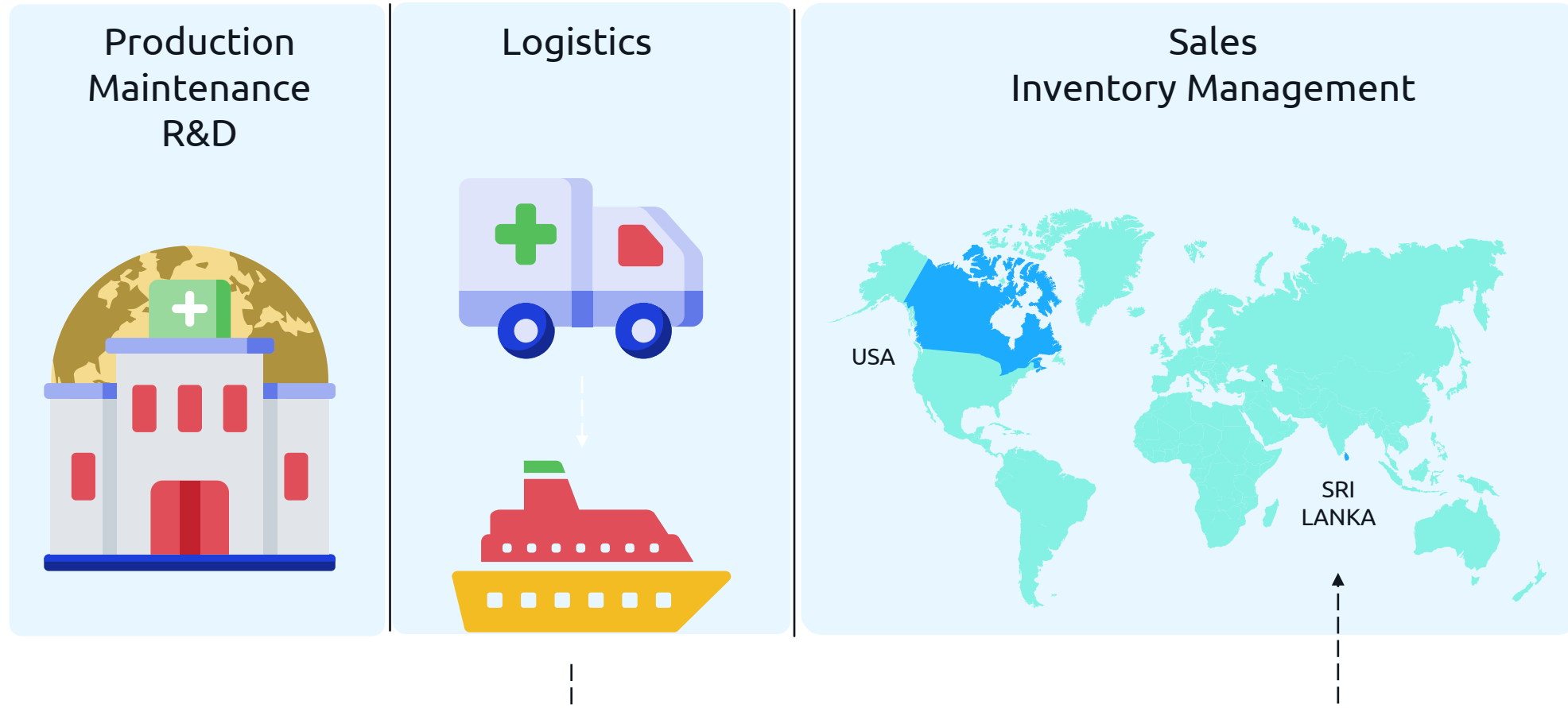


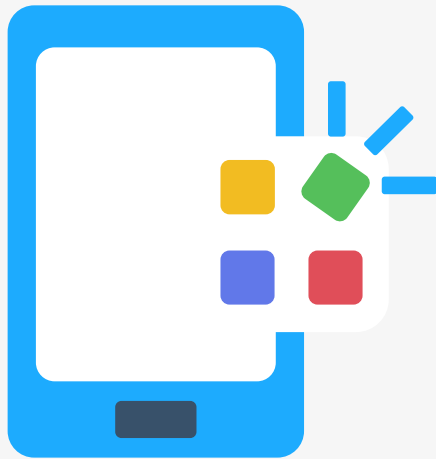


KodeCloud

Let's understand a Use-Case



Software Applications are built that can be accessed via



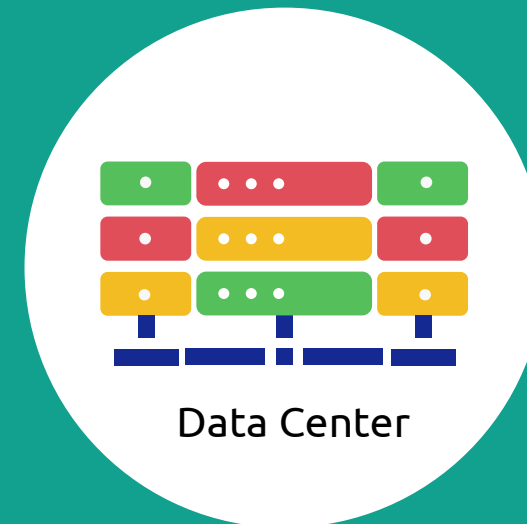
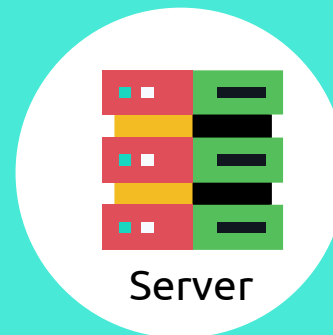
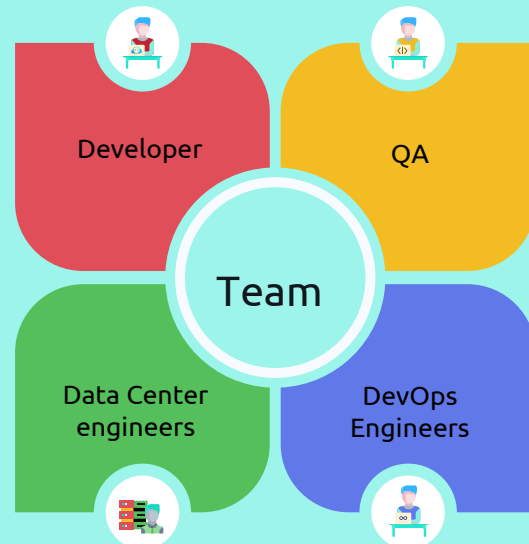
Mobile



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.



KodeCloud

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.

Q | 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

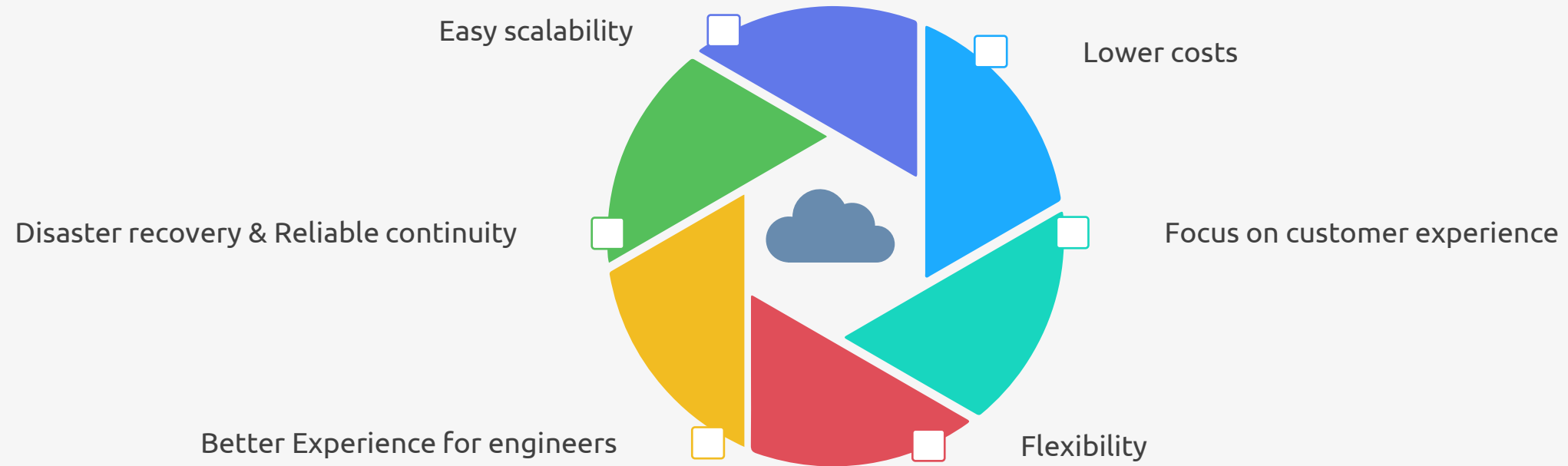


KodeCloud

How is cloud technology
revolutionizing the business?



| What does Cloud technology offer?



Q | 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

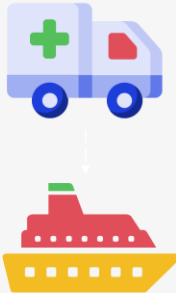


How can our pharma company benefit from cloud?

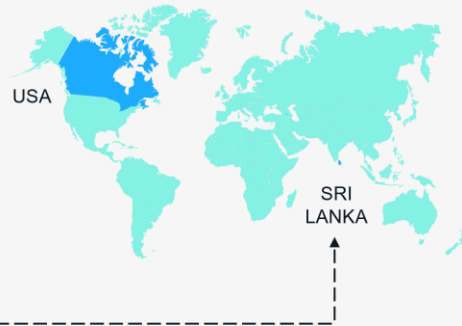
Production
Maintenance
R&D



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

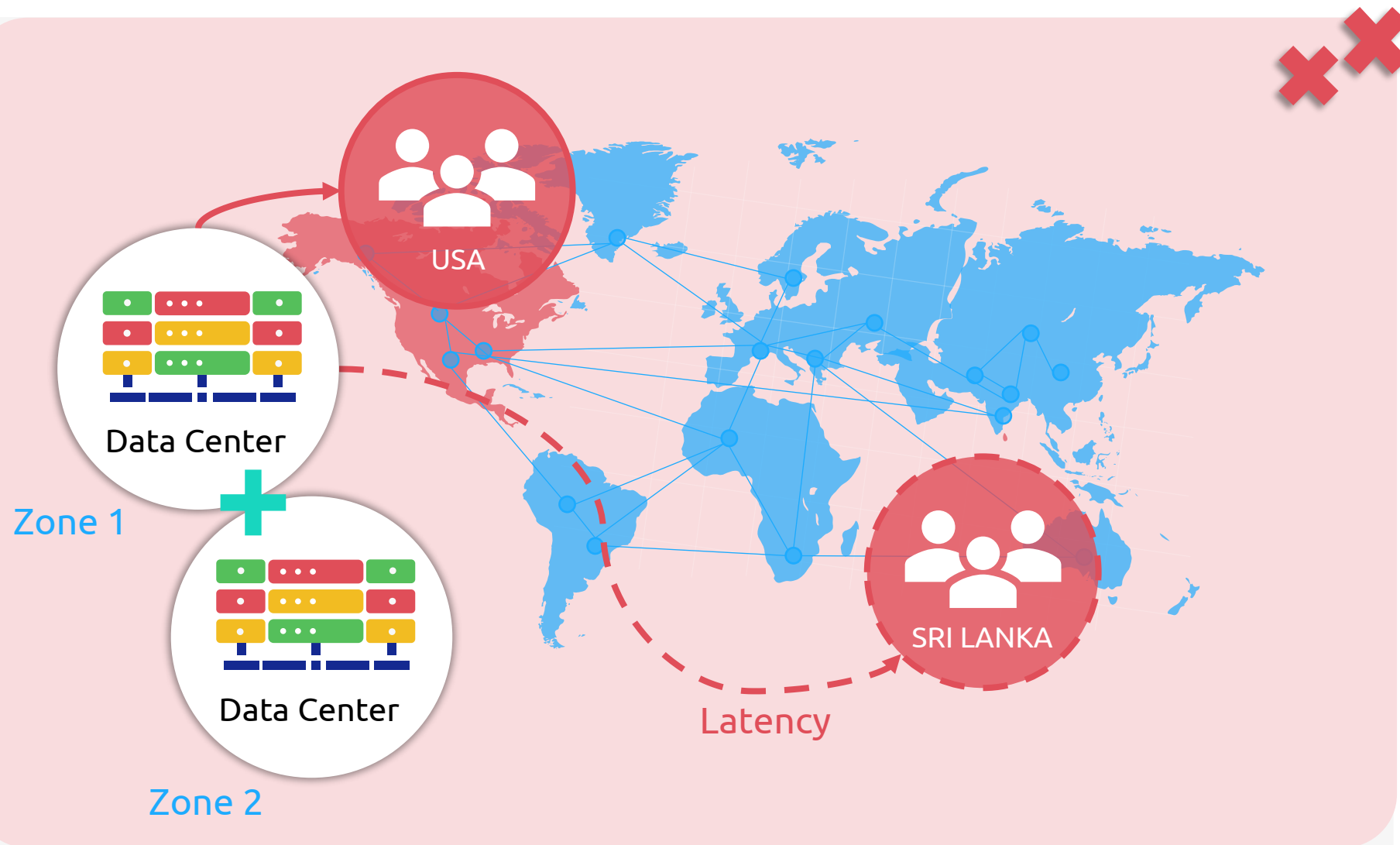


KodeCloud

What is GCP Global Infrastructure?



Pharmacist



🔍 | How do solve this issue?

We have a few options to consider



Deploy the application in a different region closer to the customer

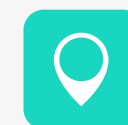
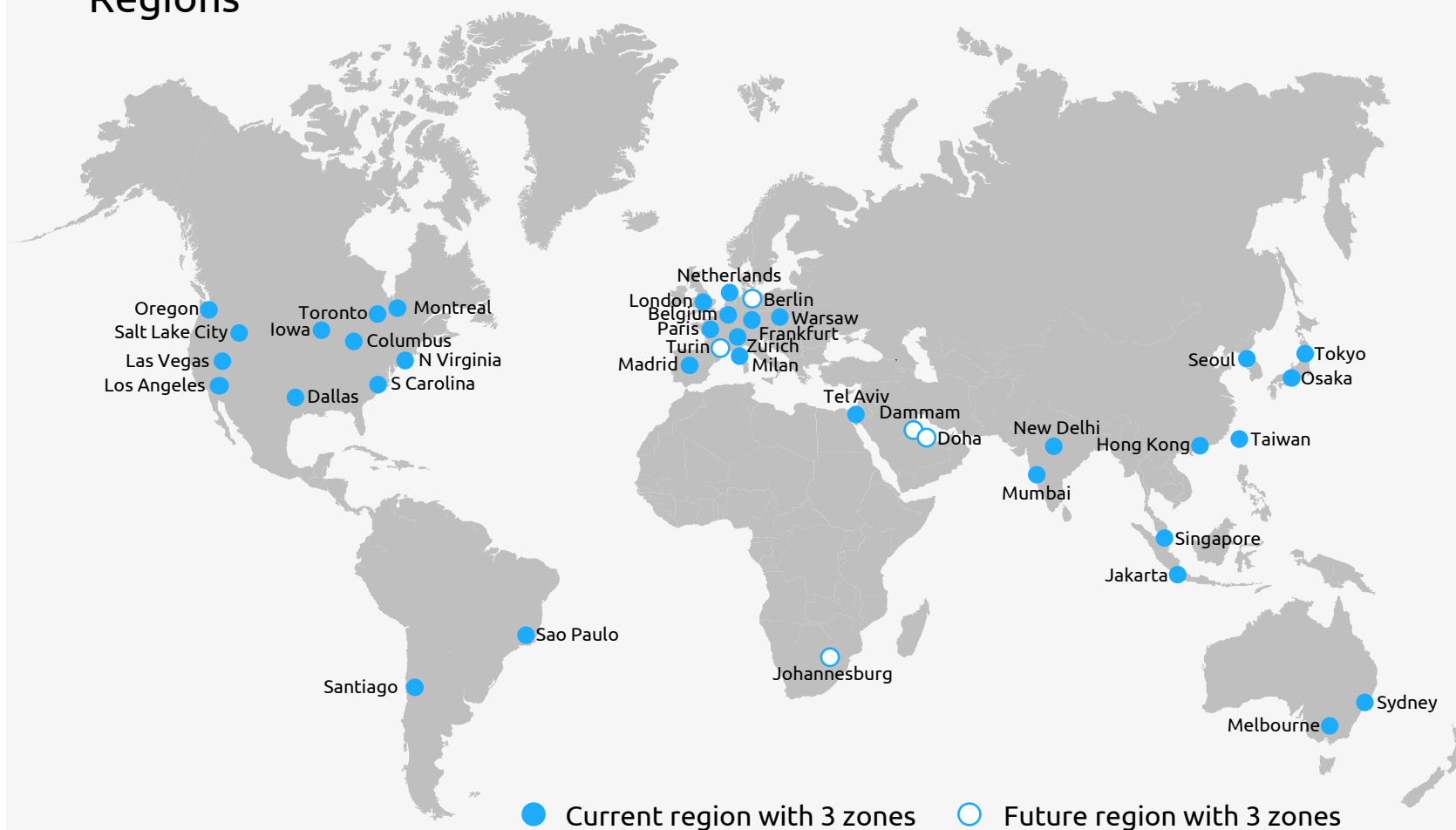


Add additional zones within a region to achieve high availability



But what does GCP have to provide here for us?

Regions



GCP currently has 34 regions (expanding)



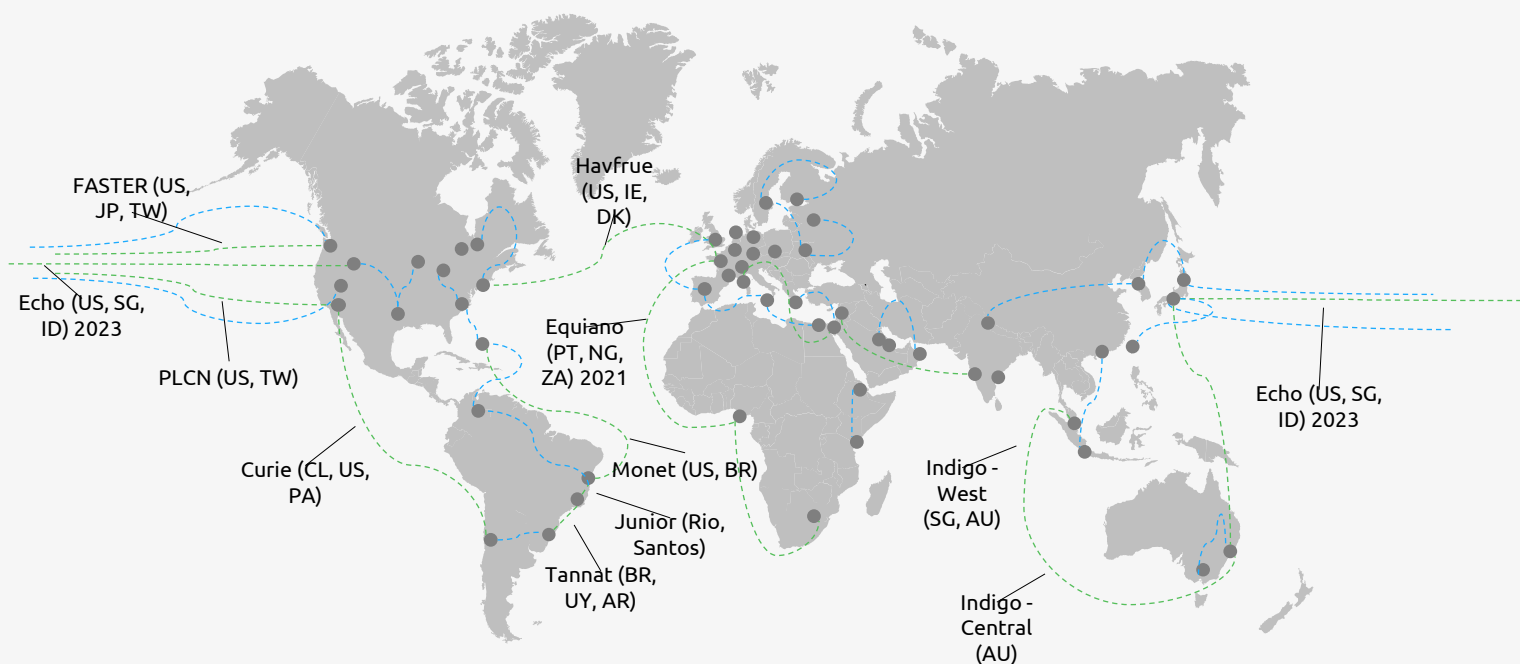
Available in 200+ countries



24/7/365 support

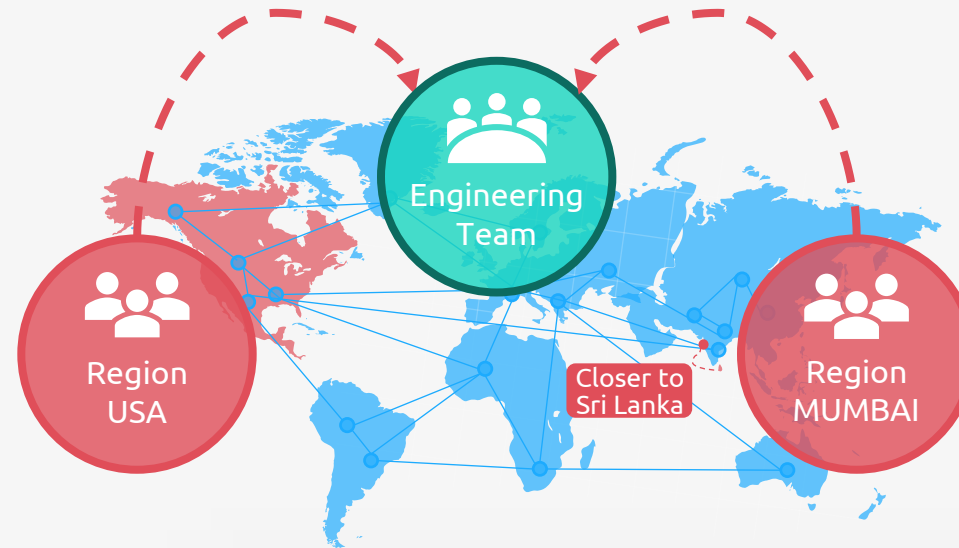
*Exception: region has 4 zones.

Network



Fault-tolerant network

🔍 | How do solve this issue?



We have a few options to consider

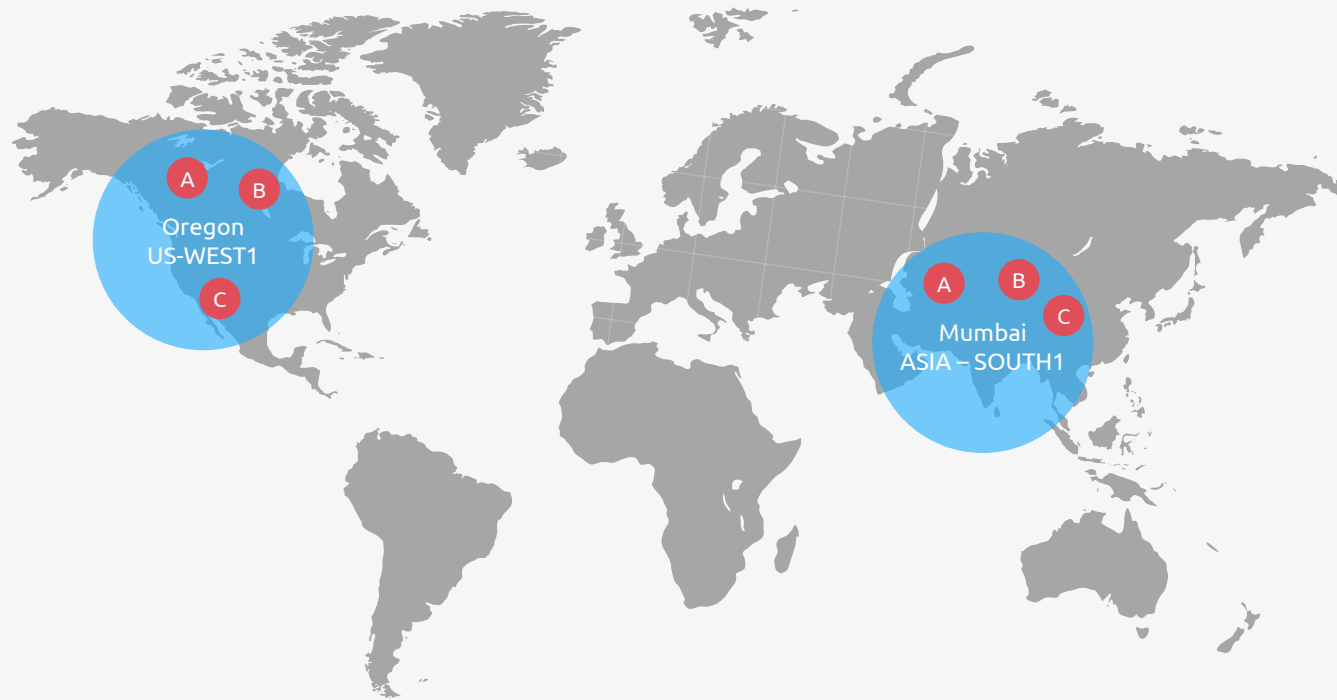


Deploy the application in a different region closer to the customer



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**






KodeCloud

How to select a region?



How to select a region?

Optimize for

-  Lower carbon footprint[?]
Not important Important
-  Lower price[?]
Not important Important
-  Lower Latency[?]
Not important Important

Where is your traffic coming from?

Your current location

Afghanistan

Albania

Algeria



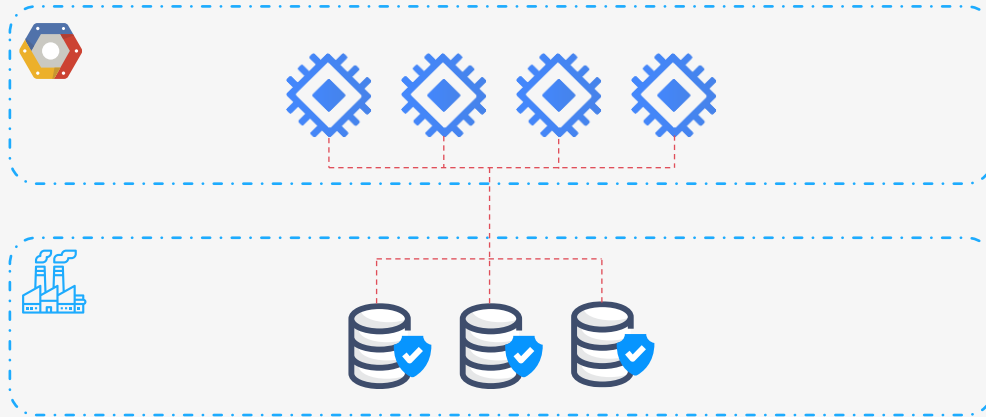
The [Google Region Picker tool](#) helps you pick a Google Cloud region considering carbon footprint, price, and latency. [Select your preferences.](#)



KodeCloud

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

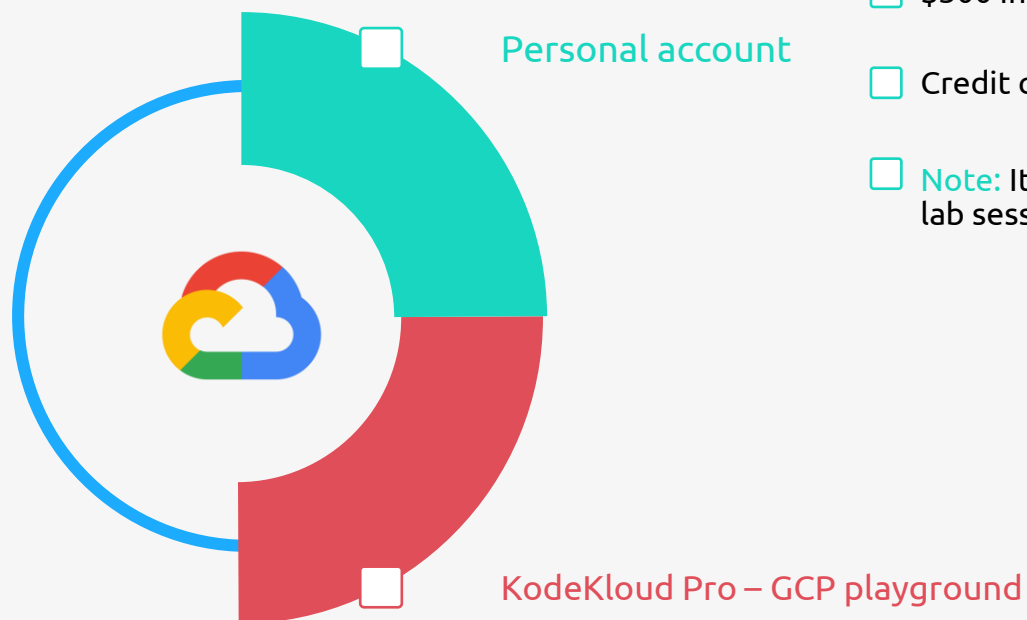
A setup where we utilize more than 1 public cloud, Like hosting a few services in GCP and others in Azure or AWS



KodeCloud

Creating of GCP account

GCP Account Creation

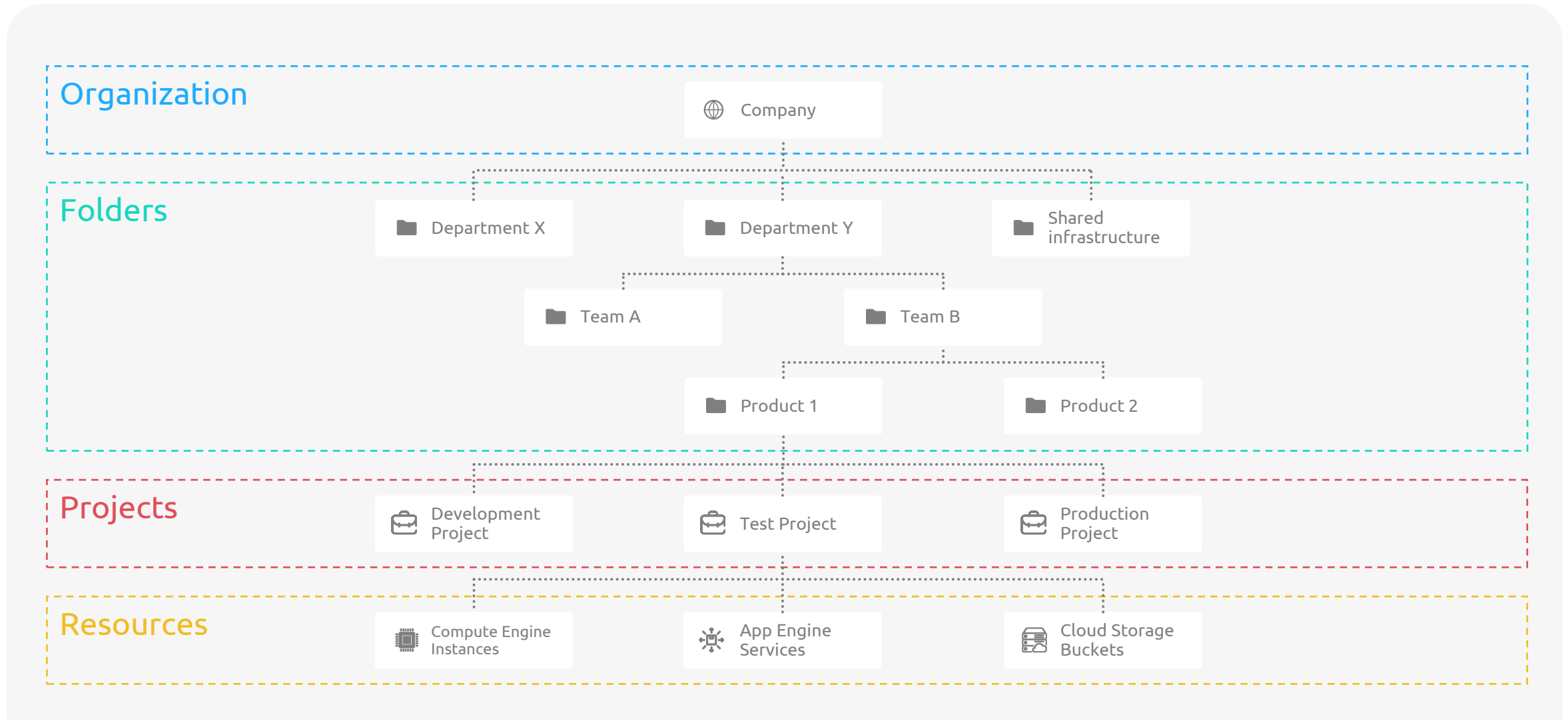


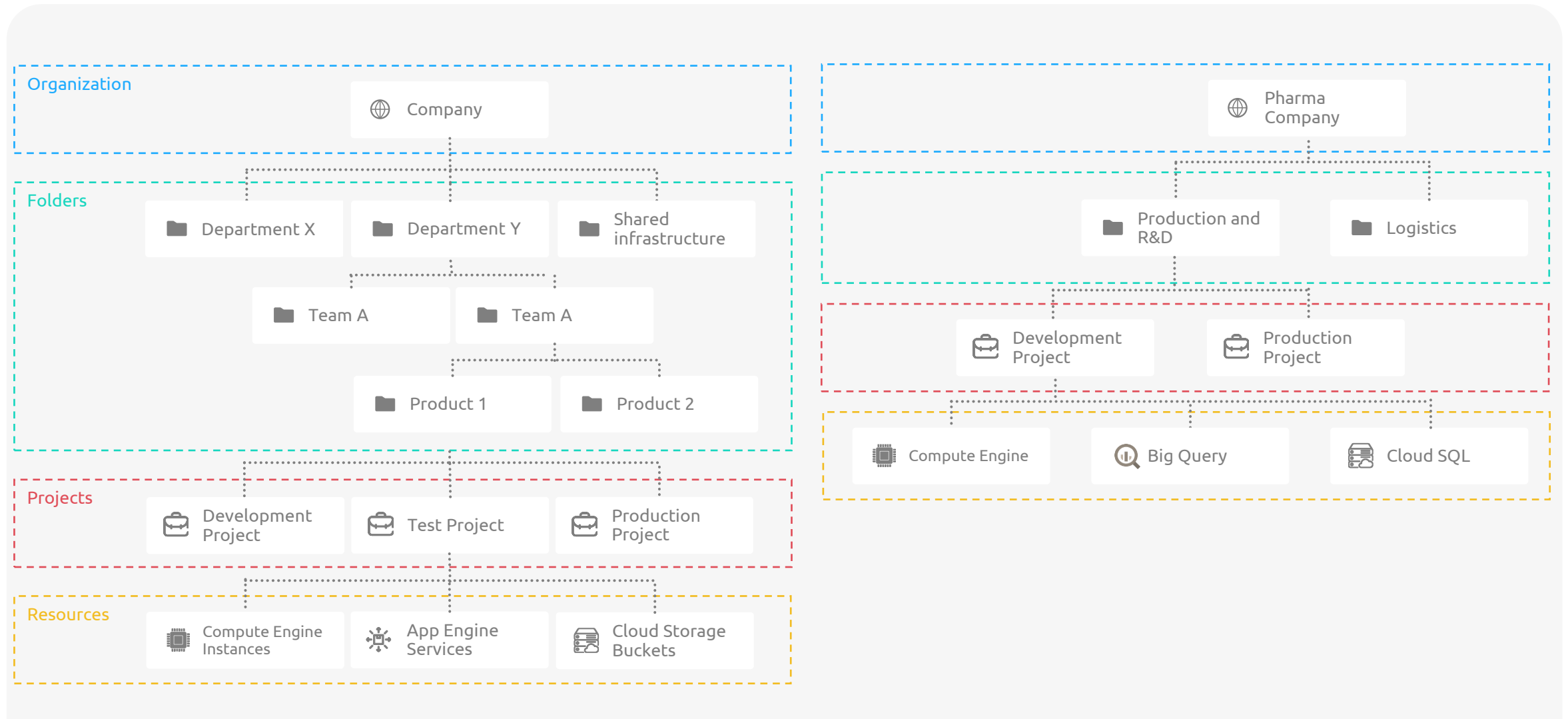
- ☐ 20+ free products
- ☐ \$300 in free credits for 90-day
- ☐ Credit card might be required based on certain regions
- ☐ **Note:** It is always better to delete everything after practicing lab sessions in a personal account



KodeCloud

Resource hierarchy







KodeCloud

Demo

Understanding Billing in GCP

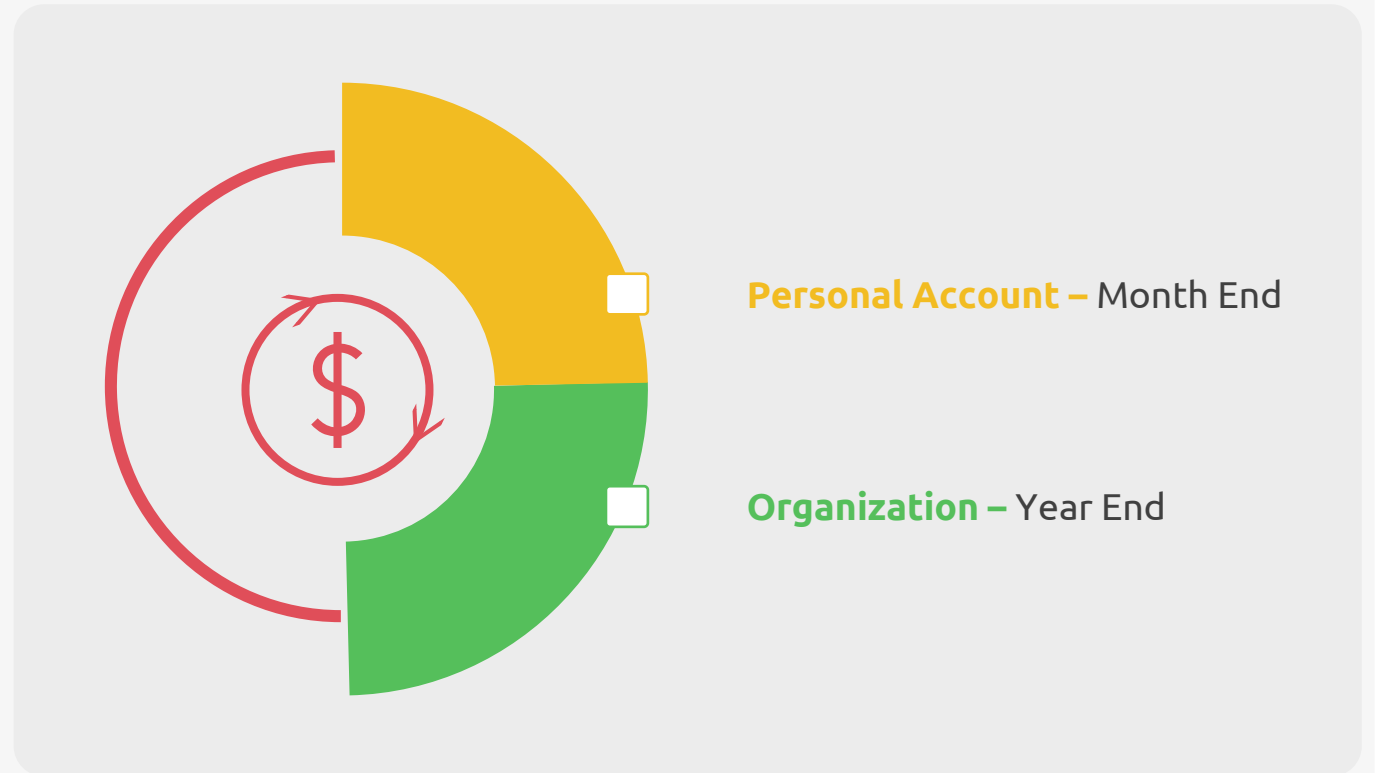
Understanding Billing in GCP



GCP allows us to see granular details of our GCP usage



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



Billing cycle



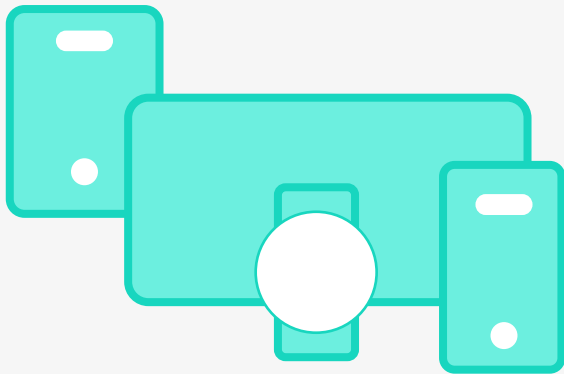
KodeKloud

Understanding compute, Persistent disk, and firewall

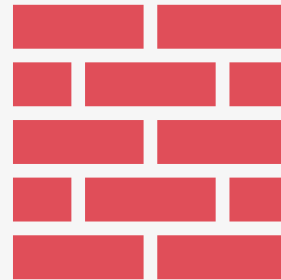
Whiteboard Architecture

Understanding different compute engine terminologies

Region: US-Central-1



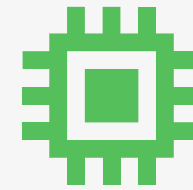
Mobile Devices



Cloud
VPC Firewall Rules

Allow
HTTP and HTTPS traffic

US-Central-1a



Compute Engine



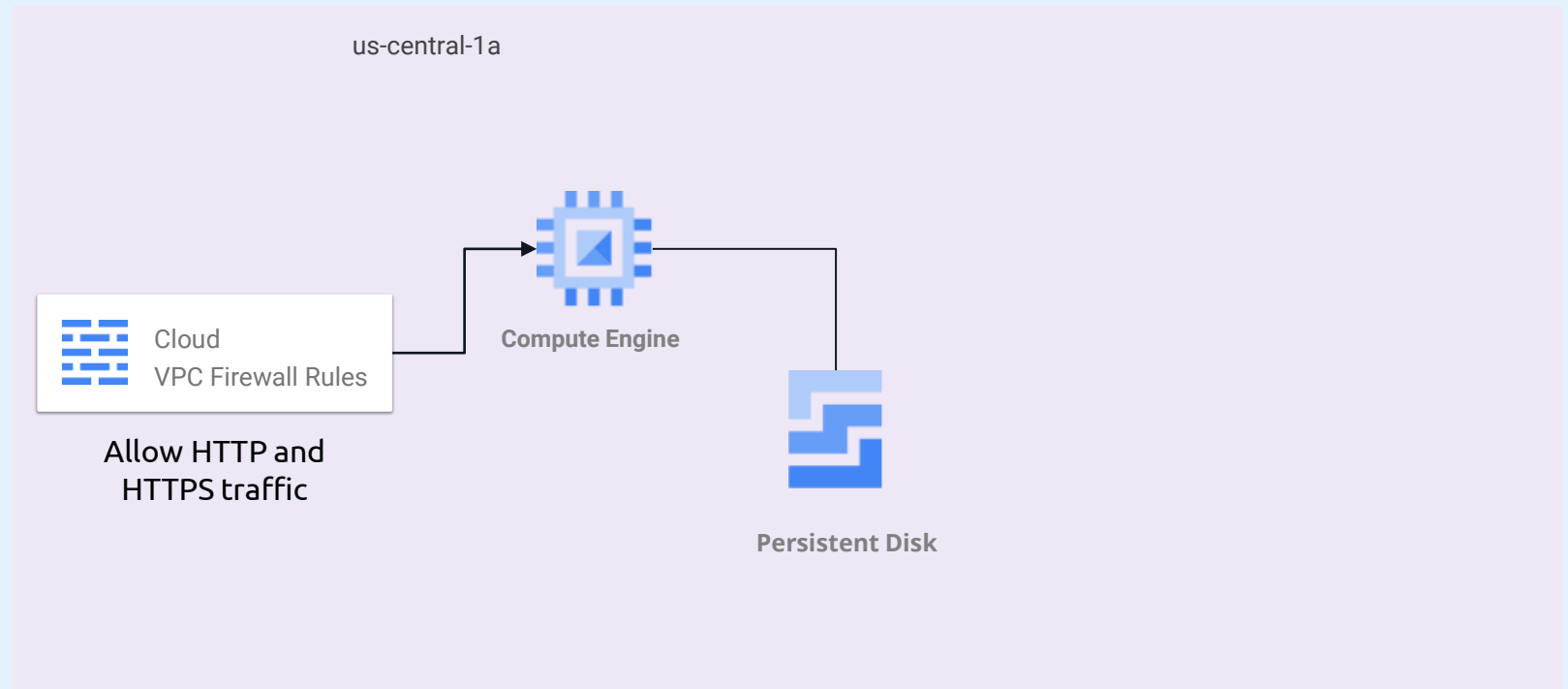
Persistent Disk

Whiteboard Architecture

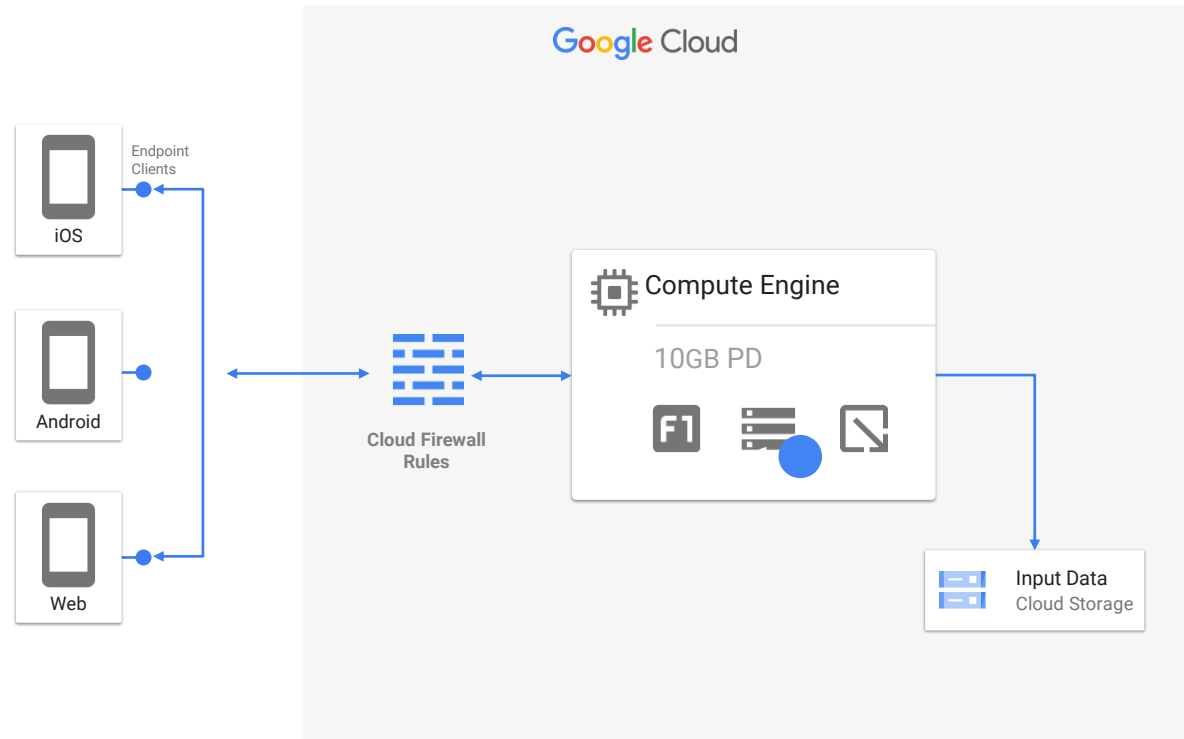
Understanding different compute engine terminologies

Google Cloud

Region: us-central-1



Understanding different compute engine terminologies





KodeCloud



KodeCloud

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

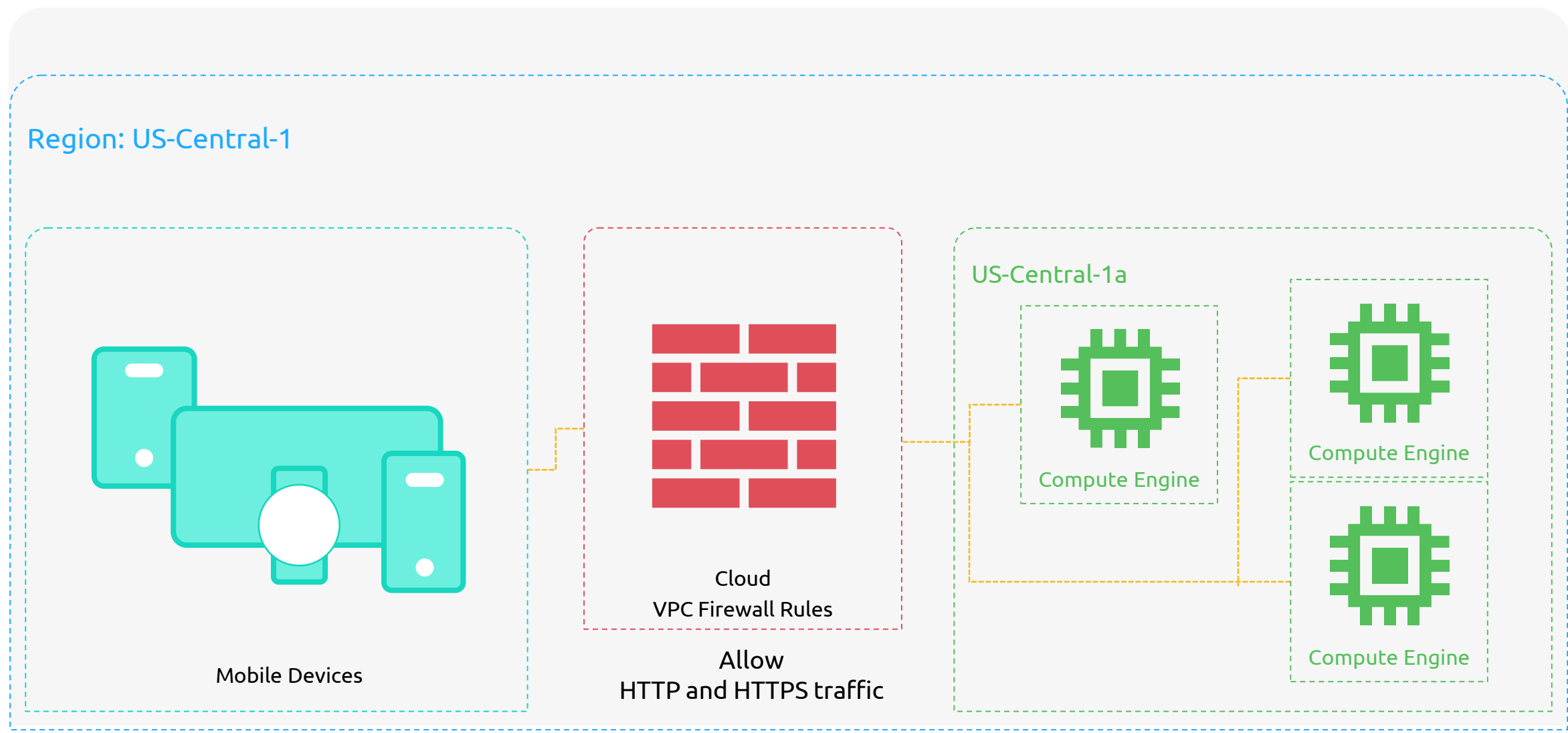


VPC firewall rules let you allow or deny connections to or from your virtual machine (VM) instances based on a configuration



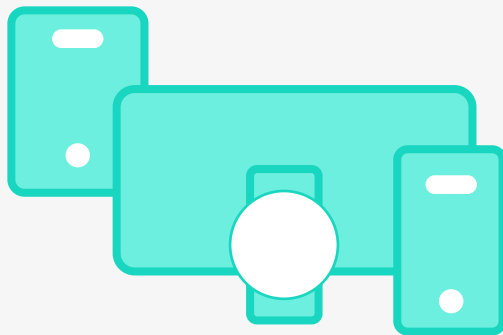
KodeKloud

Scaling compute instance

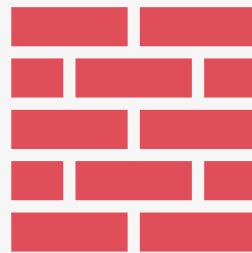


How do we scale our computing?

Region: US-Central-1



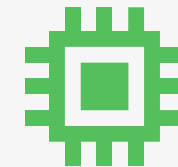
Mobile Devices



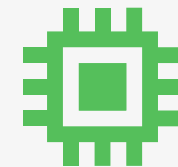
Cloud
VPC Firewall Rules

Allow
HTTP and HTTPS traffic

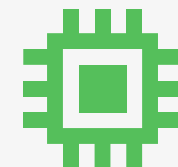
US-Central-1a



Compute Engine



Compute Engine

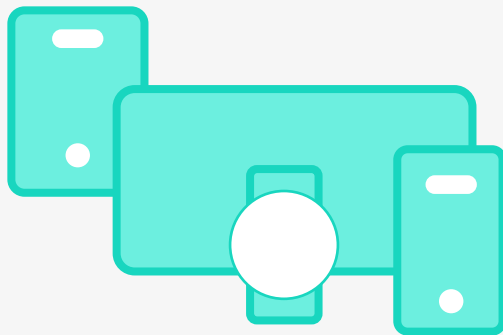


Compute Engine

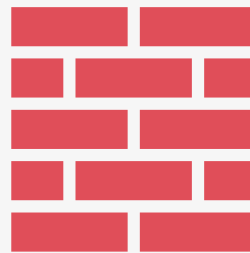


How do we balance incoming traffic to our application when it's scaled up?

Region: US-Central-1



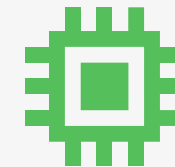
Mobile Devices



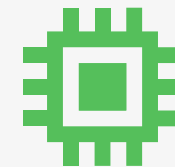
Cloud
VPC Firewall Rules

Allow
HTTP and HTTPS traffic

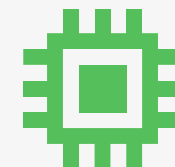
US-Central-1a



Compute Engine



Compute Engine



Compute Engine



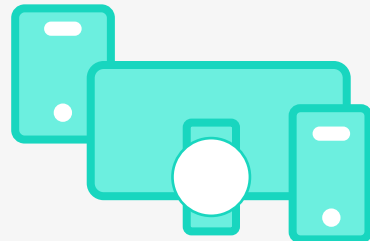
KodeCloud

Exploring Instance groups

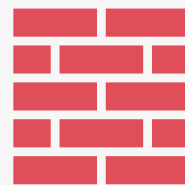
🔍 | How do we scale our computing?

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

Region: US-Central-1



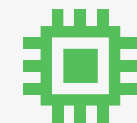
Mobile Devices



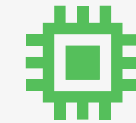
Cloud
VPC Firewall Rules

Allow
HTTP and HTTPS traffic

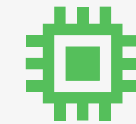
US-Central-1a



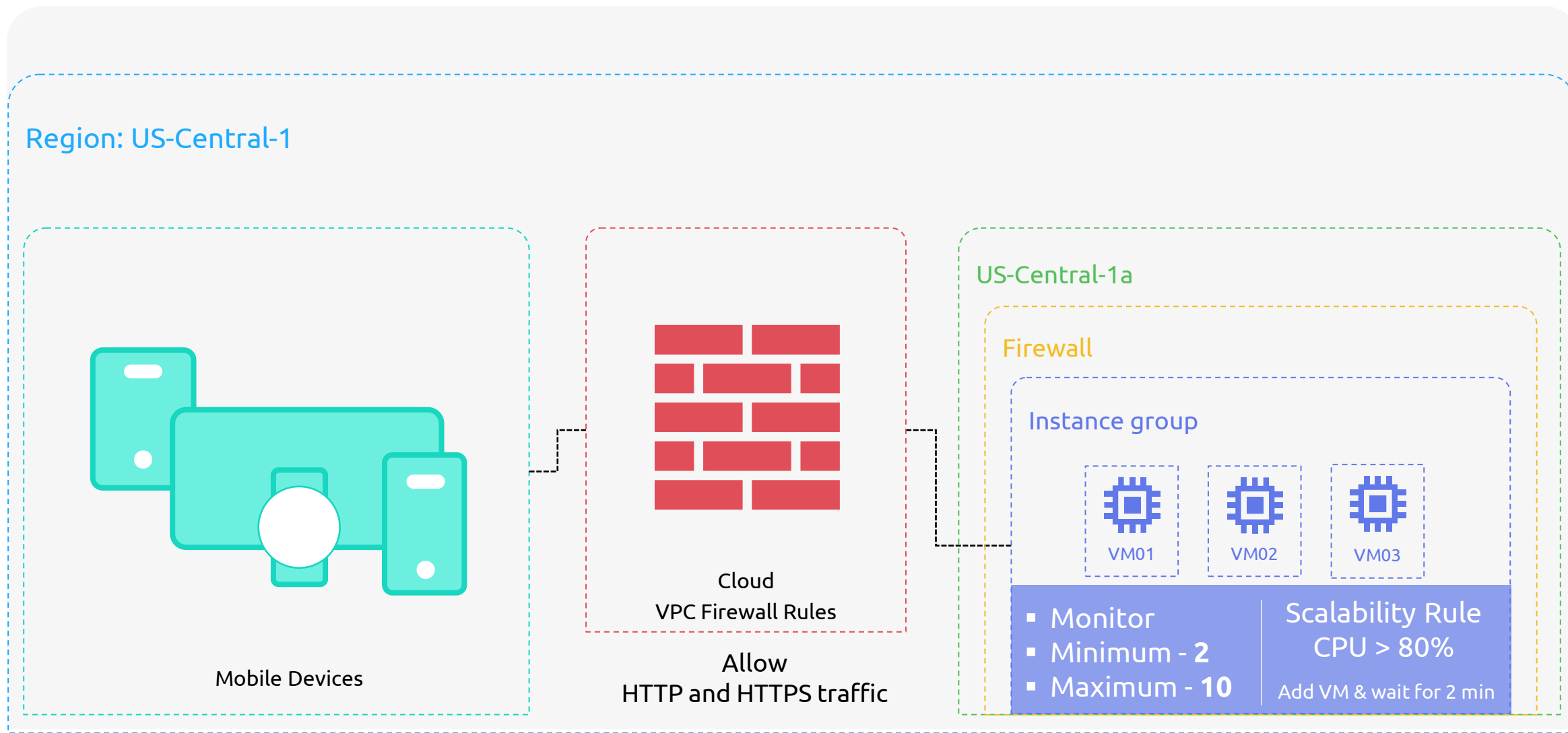
Compute Engine

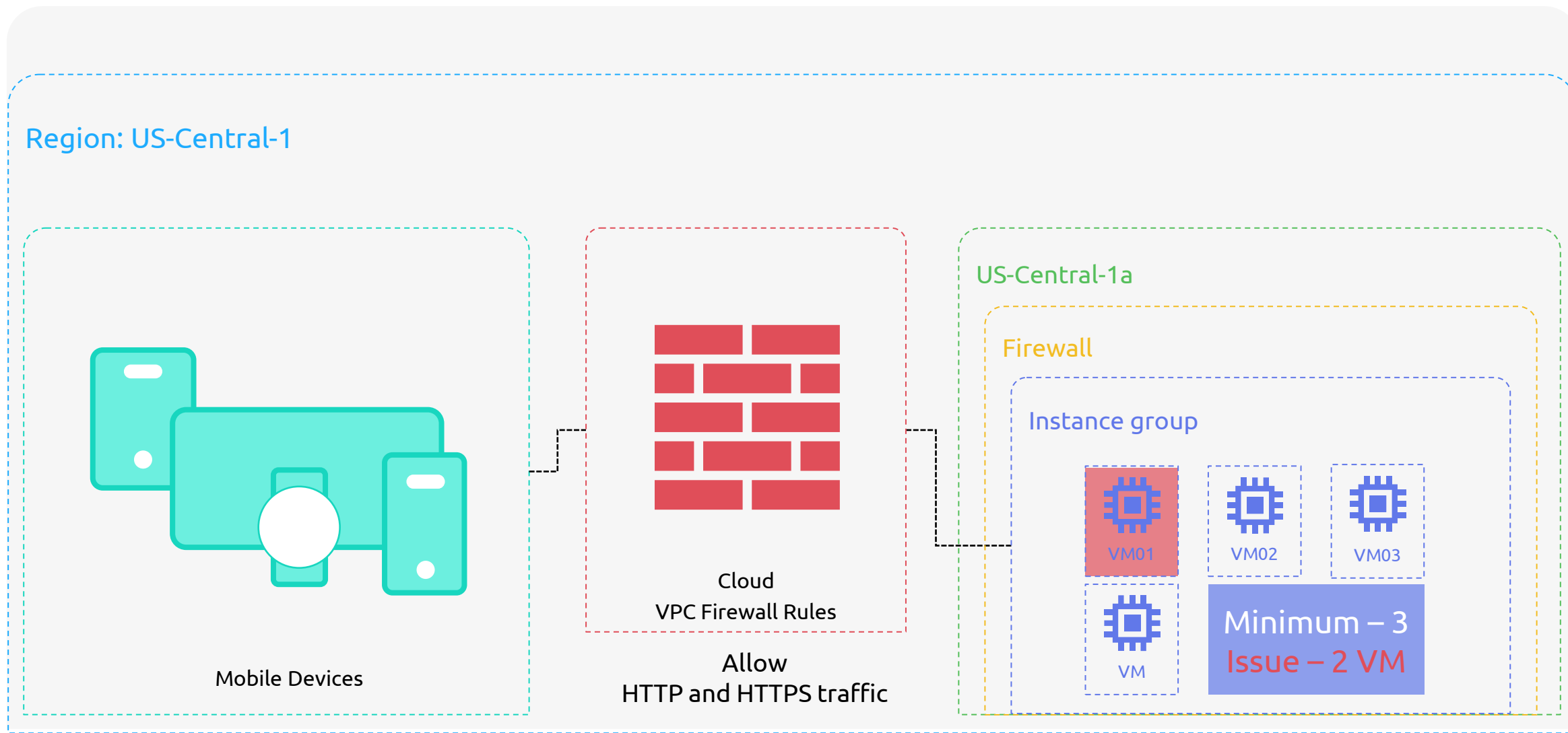


Compute Engine



Compute Engine

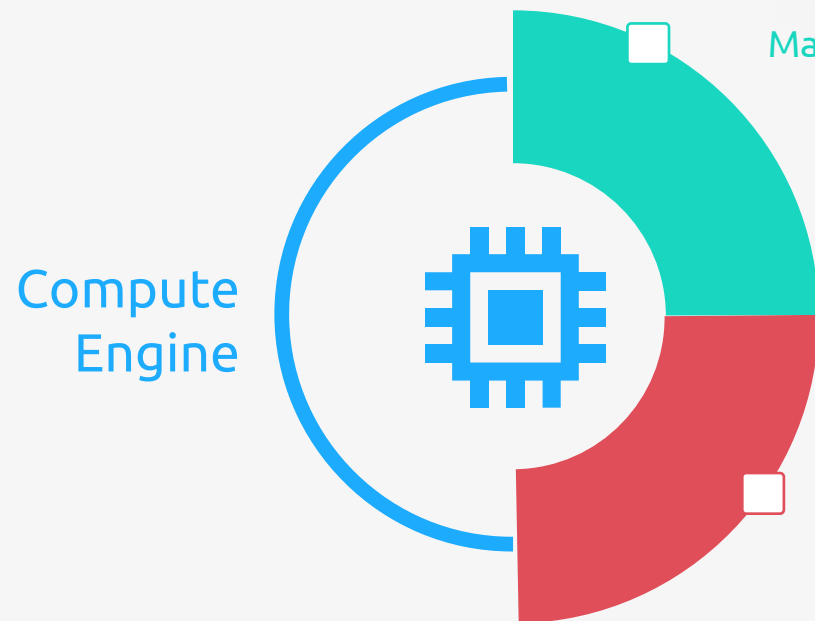




Instance group



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?

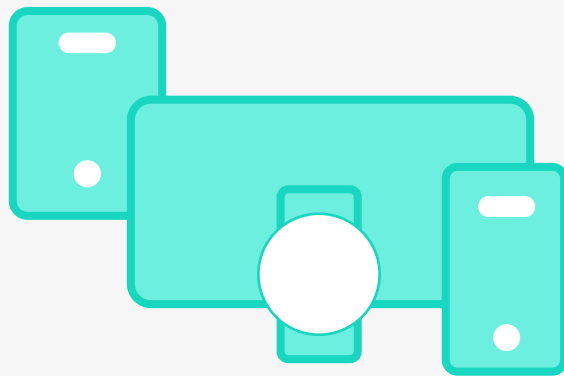


KodeKloud

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



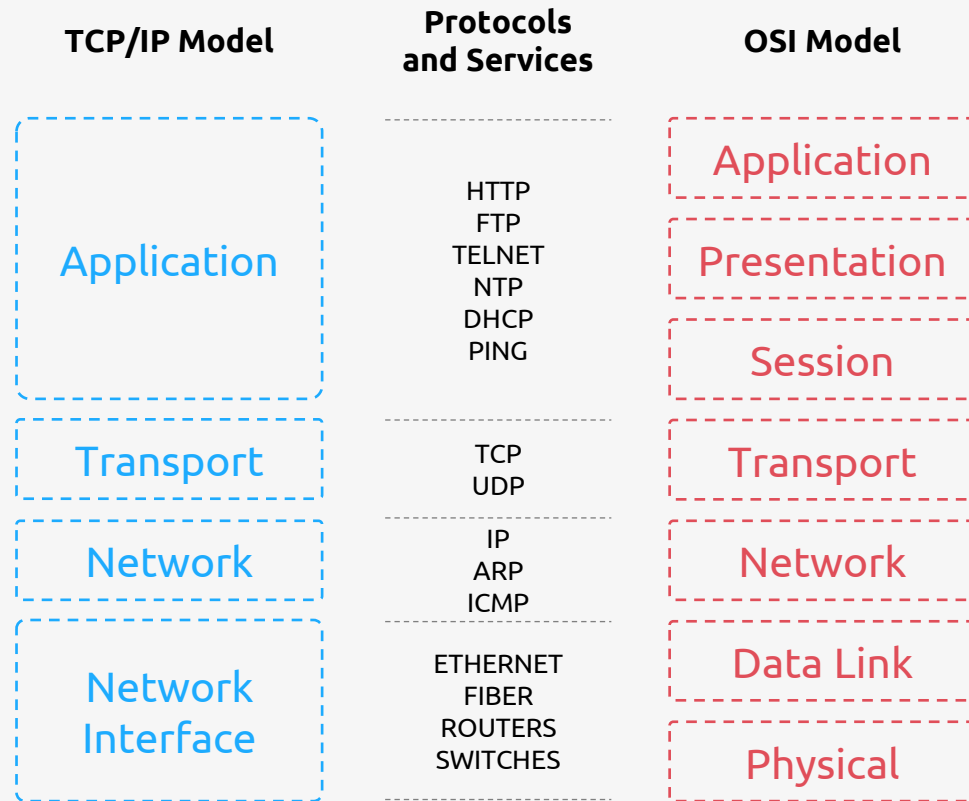
Software
Version 02



KodeCloud

Summary of Load Balancer

Terminologies used in Load Balancing



TCP Protocol



TCP - Transmission Control Protocol



Commonly referred to as TCP/IP ---- IP stands for Internet protocol

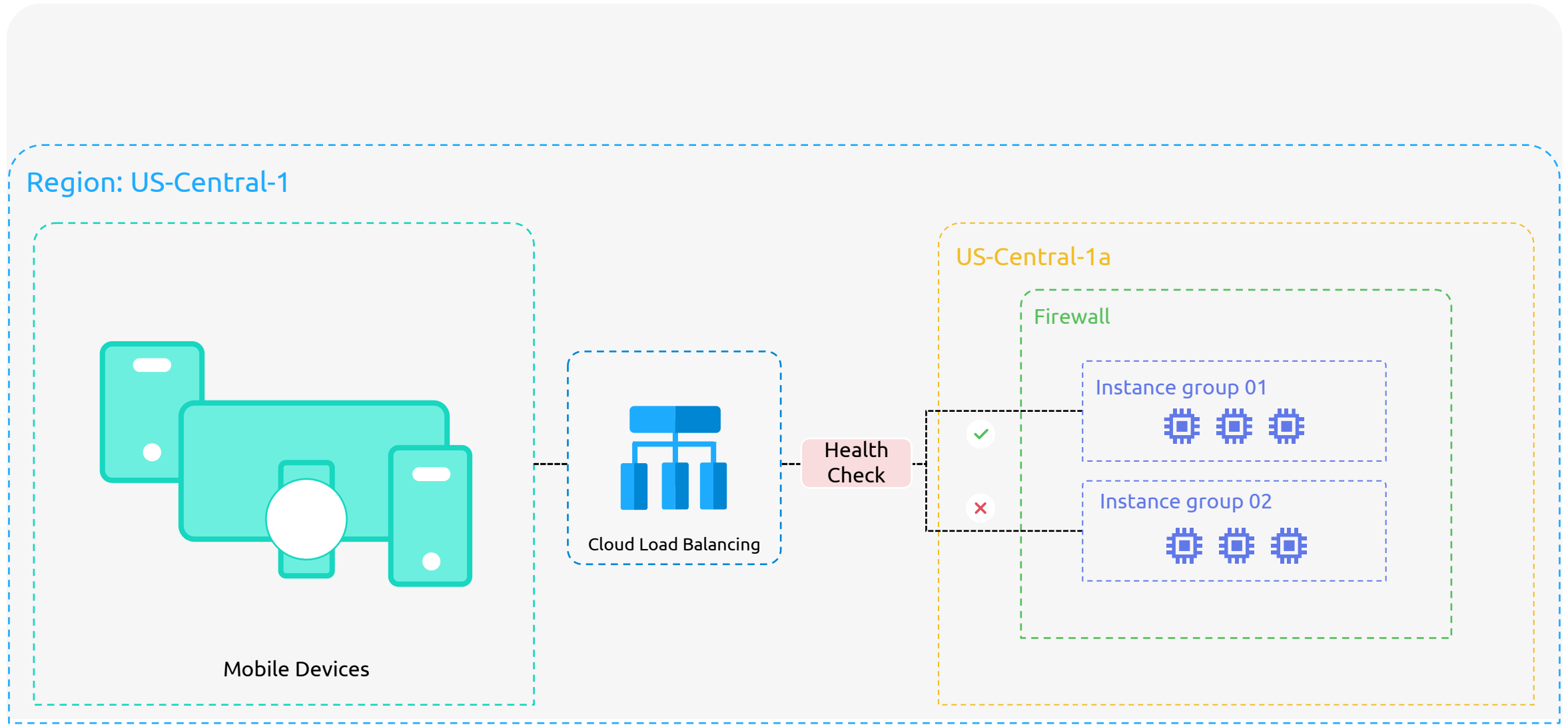



Communications standard that enables application programs and computing devices to exchange messages over a network.


Health Check





Google Cloud provides health-checking mechanisms that determine whether backend instances respond properly to traffic.




- 

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 ?

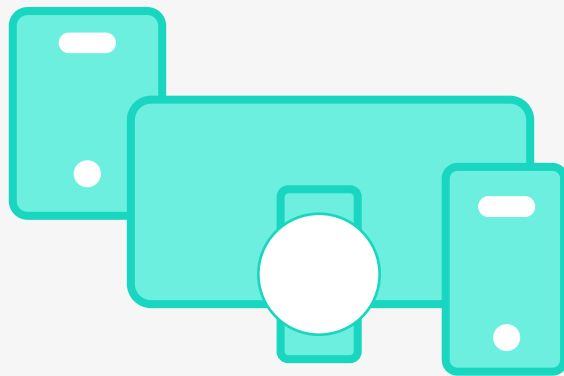


KodeCloud

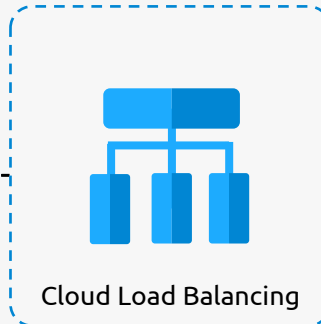
Why do we need databases?

What happens to storage?

Region: US-Central-1



Mobile Devices



Health Check

US-Central-1a

Firewall

Instance group 01



Instance group 02





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.



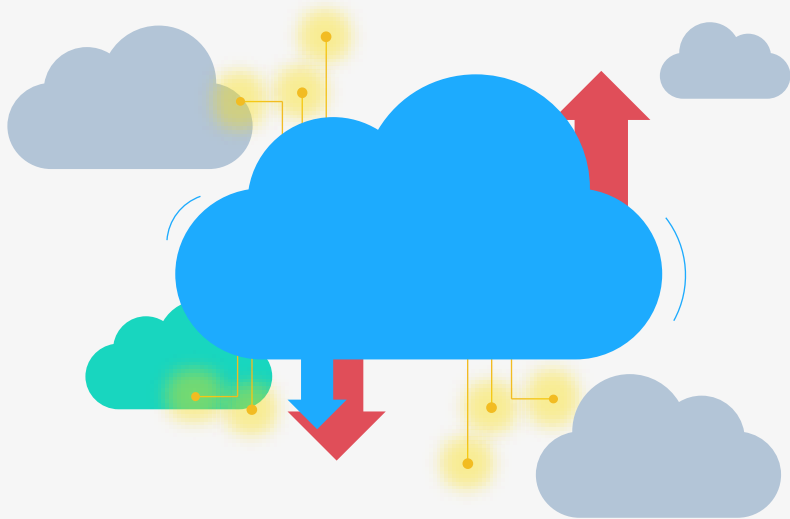
Databases further can be used to get business insights



KodeCloud

Databases in GCP

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.



KodeCloud

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**Cloud SQL**

Managed MySQL,
PostgreSQL,
SQL Server

**Cloud Spanner**

Cloud-native with
large, consistent,
99.999%
availability

**Bare Metal**

Lift and shift
Oracle workloads
to Google Cloud

Non – Relational (NoSQL)**Fire Store**

Cloud Native, serverless, NoSQL
document database, backend-
as-a-service, global strong
consistency, 99.999% SLA

**Cloud BigTable**

Cloud-native NoSQL wide-
column store for large-scale,
low-latency workloads

In Memory**Memory Store**

Fully managed Redis and Memcached
for sub-millisecond data access

Good for

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

Use Case

Web
Frameworks

Gaming

Legacy
applications

Mobile/web/IOT
applications

Personalization

Caching

Session store

ERP

Global financial
ledger

Data center
retirement

Real-time sync

Adtech

Gaming

Personalization

CRM

Ecommerce
And web

Supply chain/
inventory
management

Offline sync

Fraud detection

Social chat or news
feed

Adtech

SaaS
application

Personalized apps

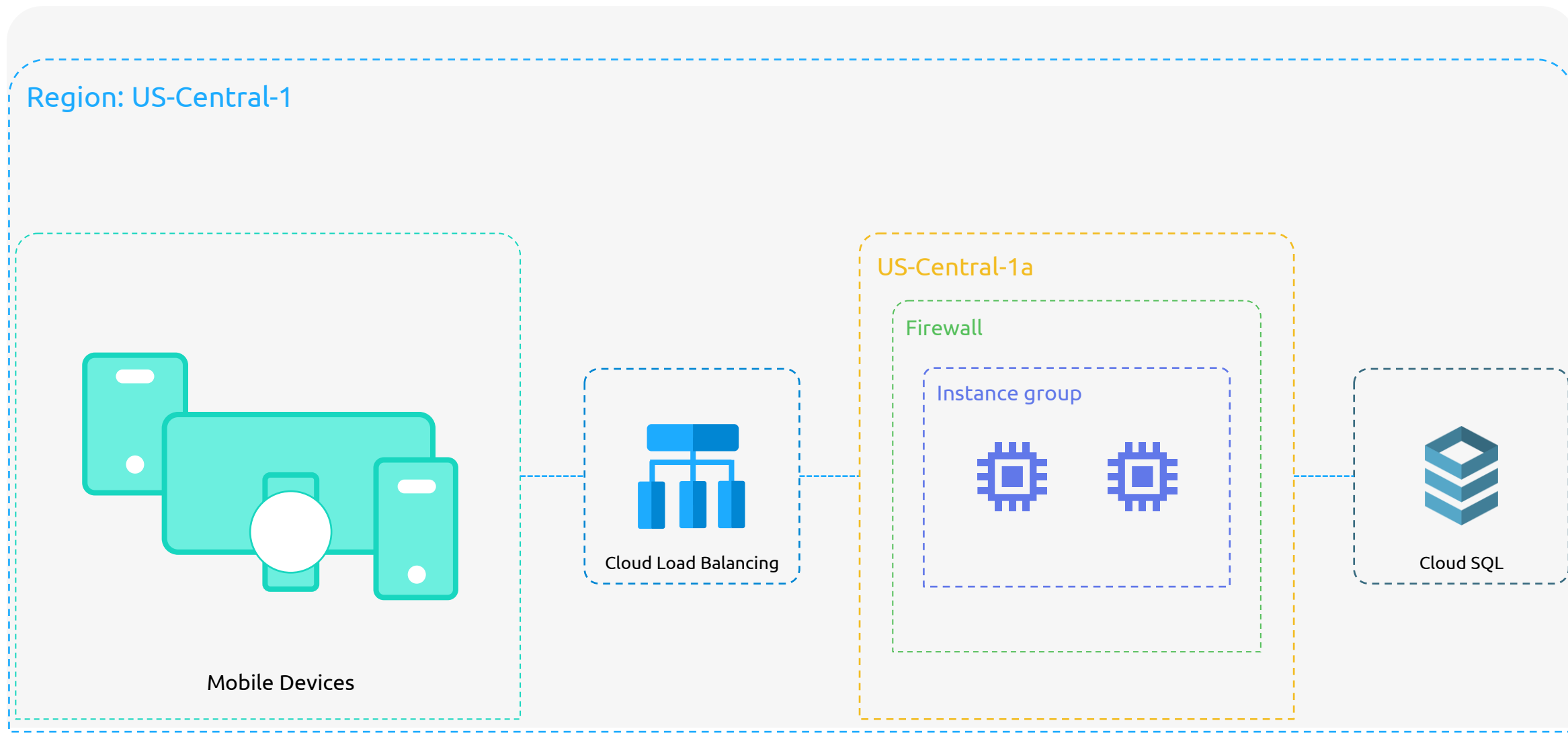
Recommendation
engines

Leaderboard



KodeCloud

Demo Database

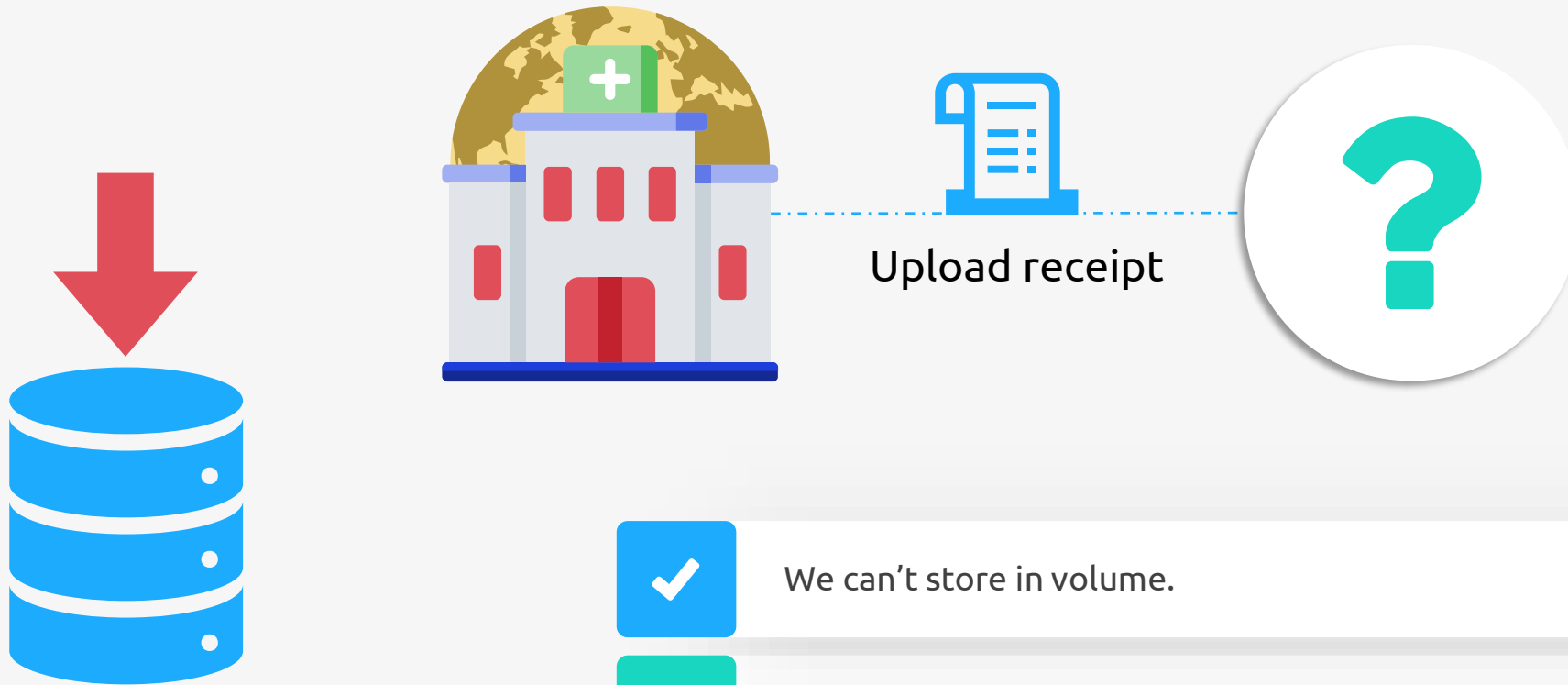




KodeCloud

What is an object storage?

Storage in GCP

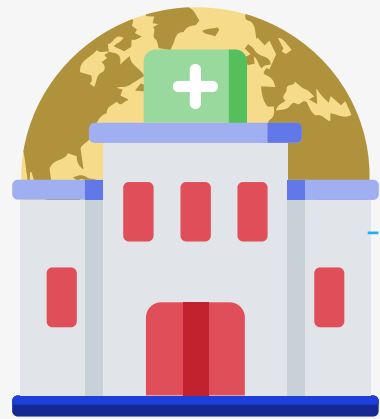


We can't store in volume.



We can't store these in databases.

Object Storage in GCP



Upload receipt



Cloud Storage



What is an object storage?



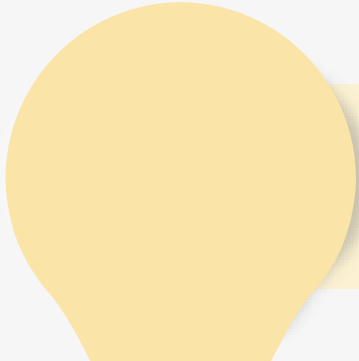
What is a Cloud Storage?



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.

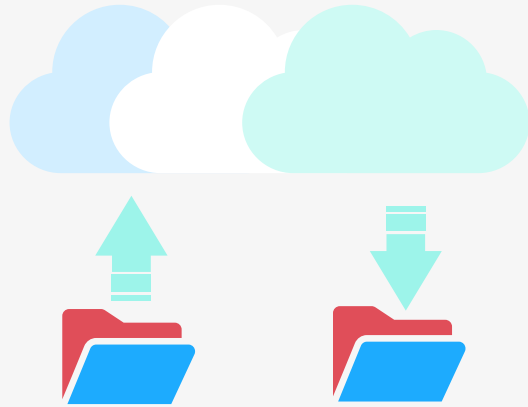


Object storage doesn't really have a folder structure or hierarchical structure.



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 99.999999999%

Use Case



Rich media storage
and delivery



Big data
analytics



Internet of
Things



Backup and
archiving

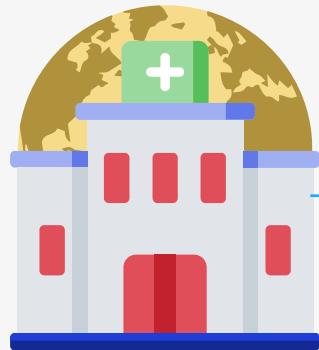


KodeCloud

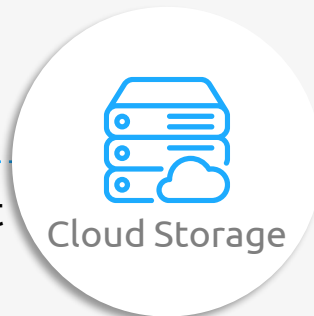
Different storage class

GCP Storage

Q | 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">>99.99% in multi-regions and dual-regions99.99% in regions
Nearline Storage	NEARLINE	30 days	<ul style="list-style-type: none">99.95% in multi-regions and dual-regions99.9% in regions
Coldline Storage	COLDLINE	90 days	<ul style="list-style-type: none">99.95% in multi-regions and dual-regions99.9% in regions
Archive Storage	ARCHIVE	365 days	<ul style="list-style-type: none">99.95% in multi-regions and dual-regions99.9% in regions

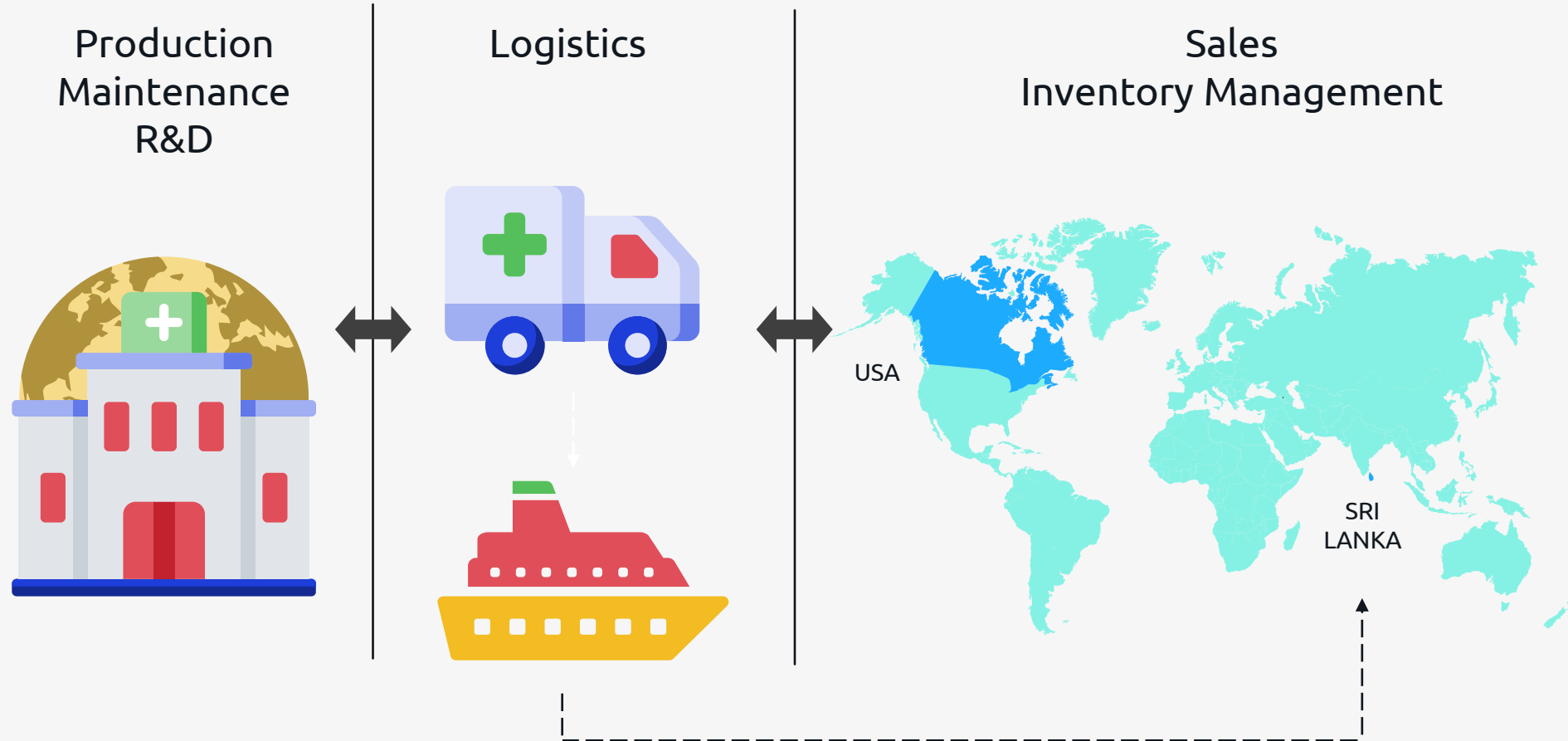
\$

Cost



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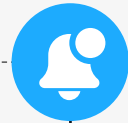
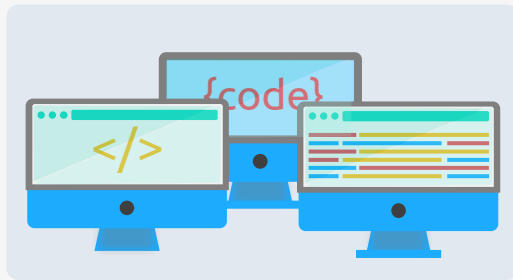
How can APIs modernize legacy systems?



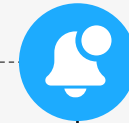
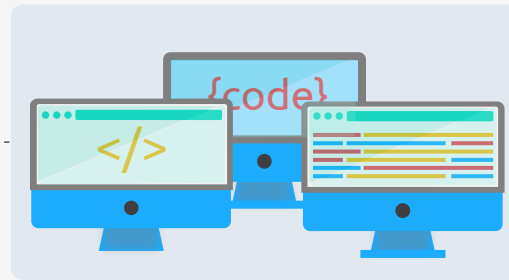


How do applications between different internal teams communicate?

Production
Maintenance
R&D



Logistics



Sales
Inventory Management

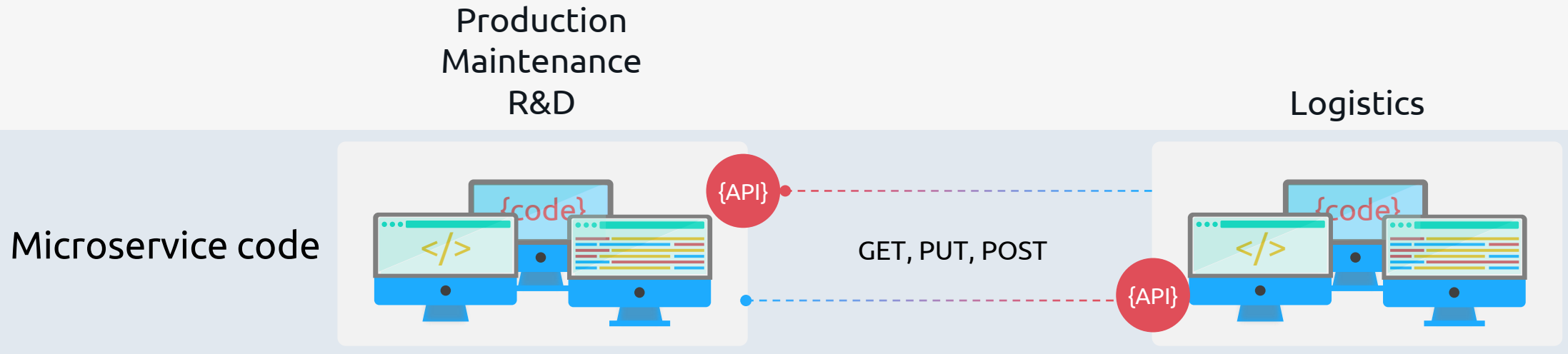




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Understanding API

API – Application User Interface



?

Do we have any developer-friendly tools in GCP using which we can create API?

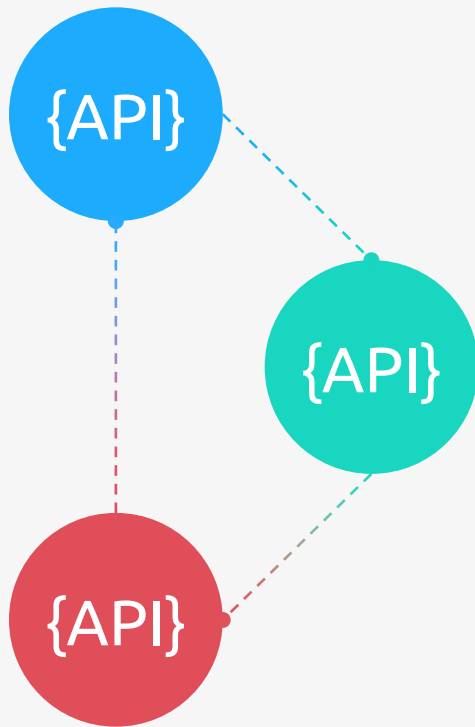
?

How to scale with 100's APIs easily in GCP?



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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

Client Apps



Mobile



Point of Sale



Partners



Web



Apigee Edge

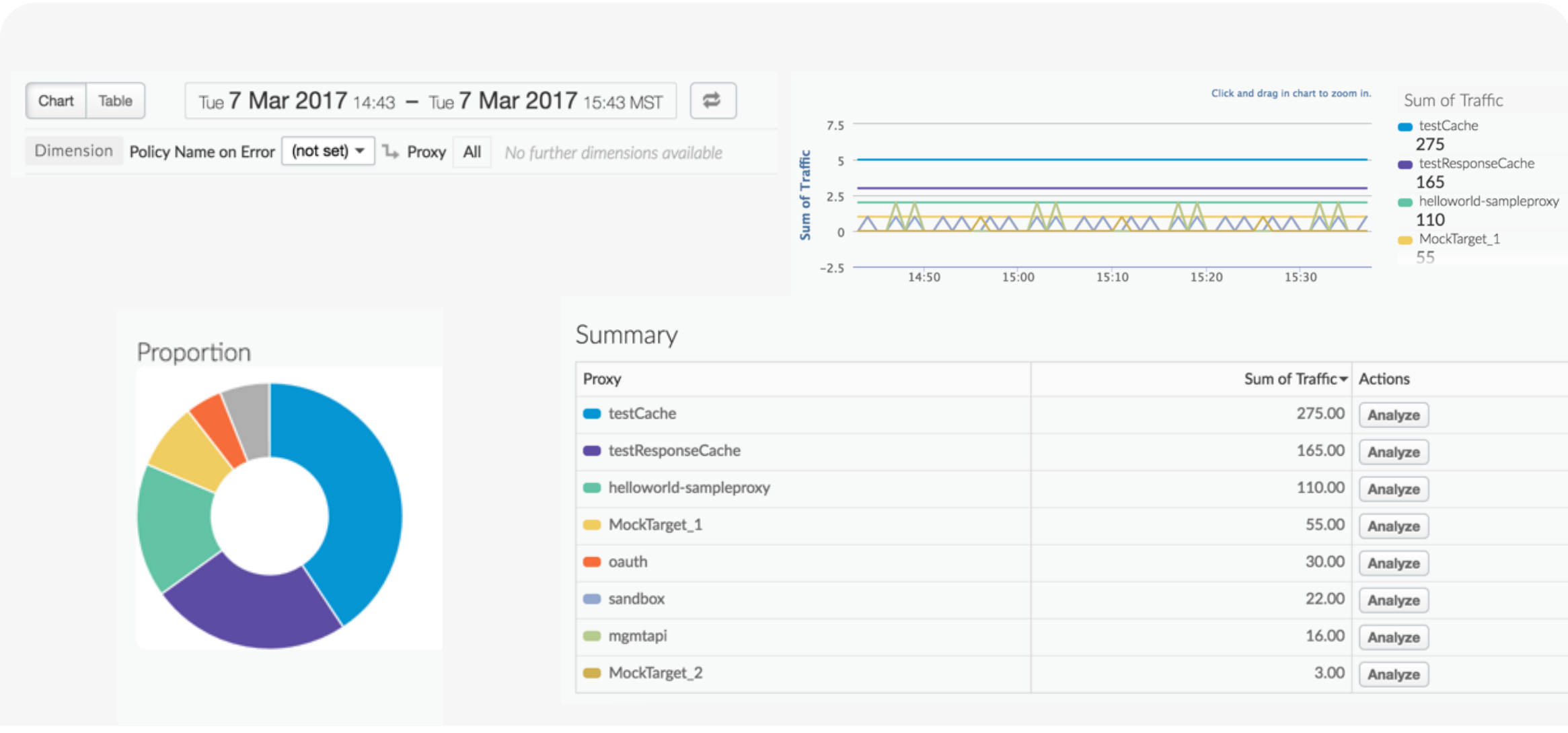
Backend Services



ESB, SOA
App Servers,
Database



Apigee Management System



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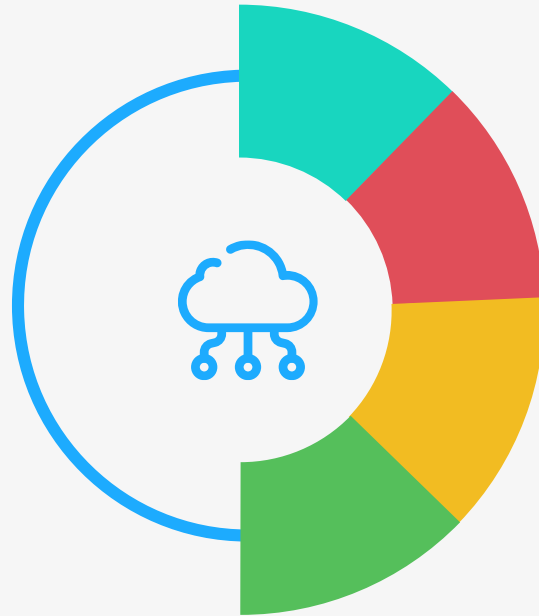


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4V's of BigData

Big Data and AI with GCP

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?



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4 steps of handling big data in GCP

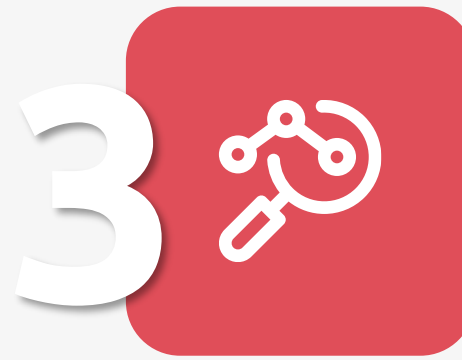
Big Data and AI with GCP



Collection of
Data



Processing
the Data



Analytics on
Data

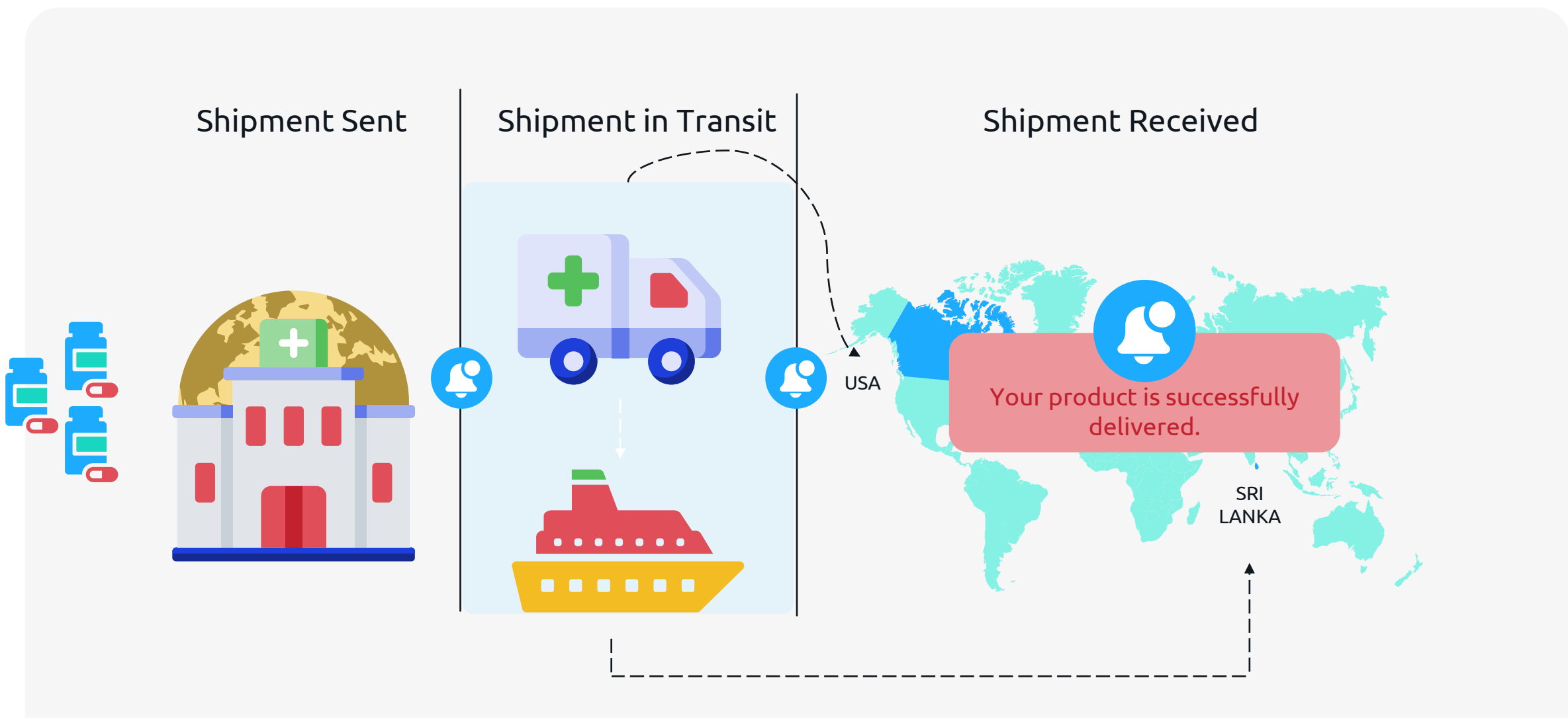


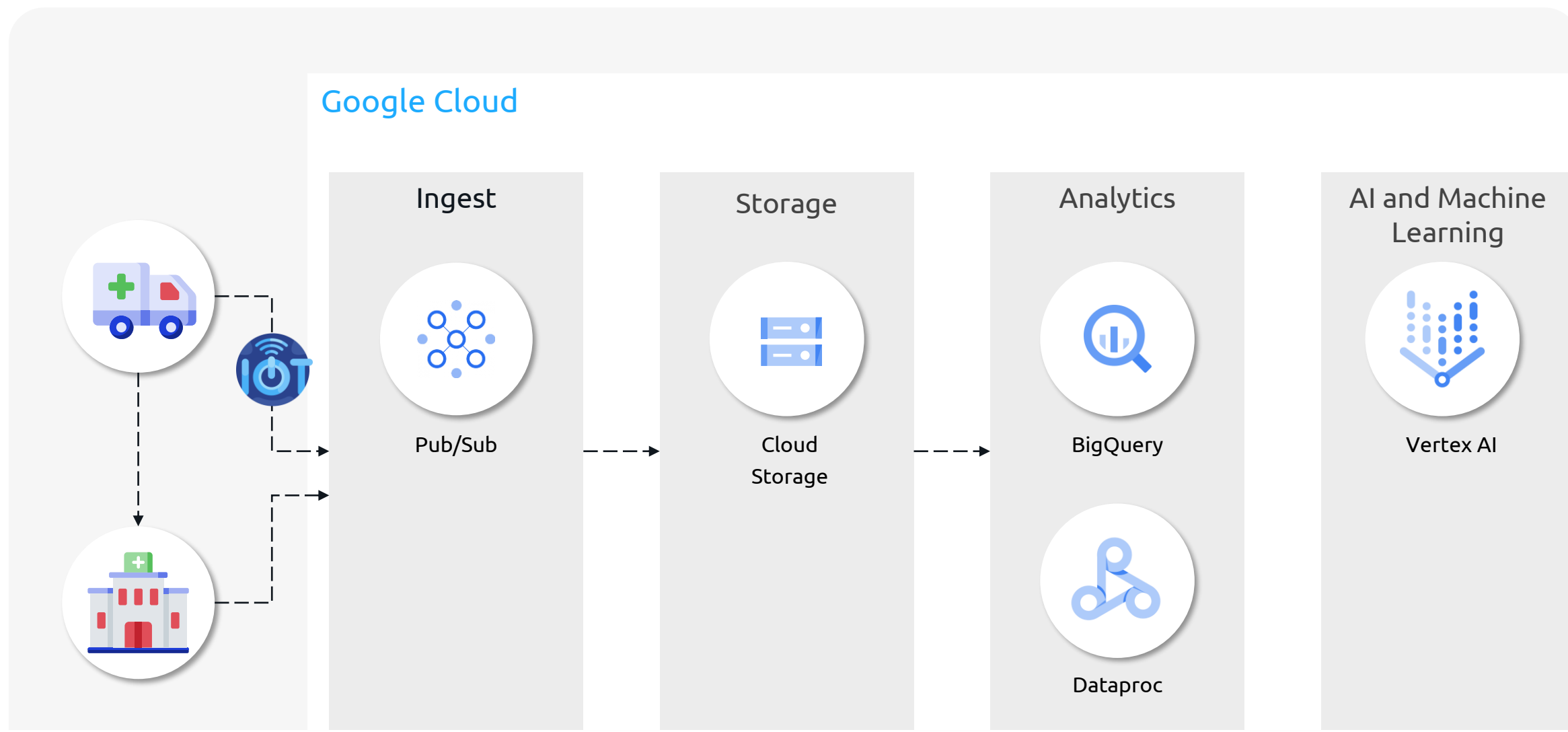
AI and Machine
learning



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Use case for Big Data





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

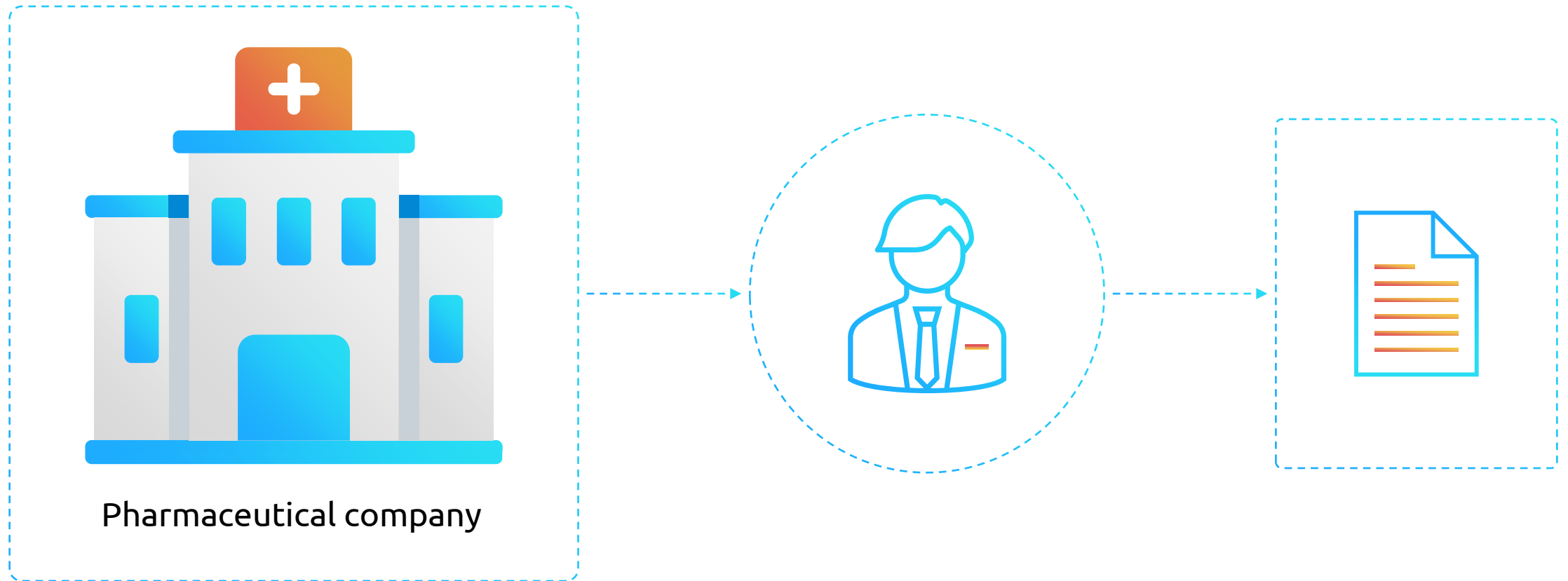


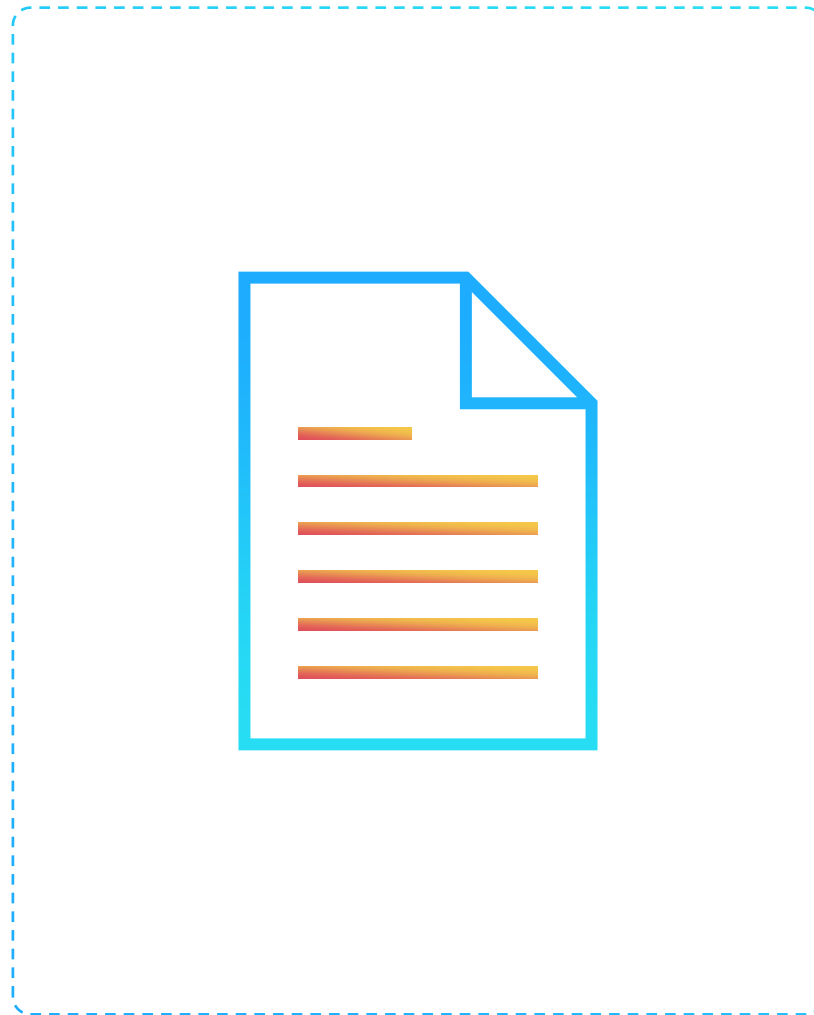
KodeCloud

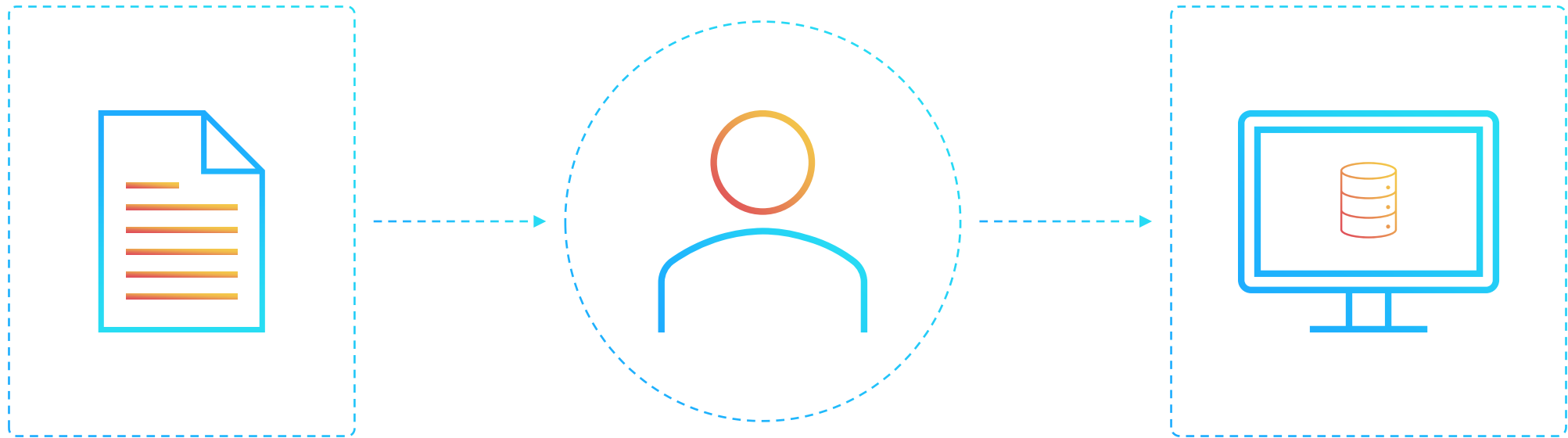
Document AI



Pharmaceutical company



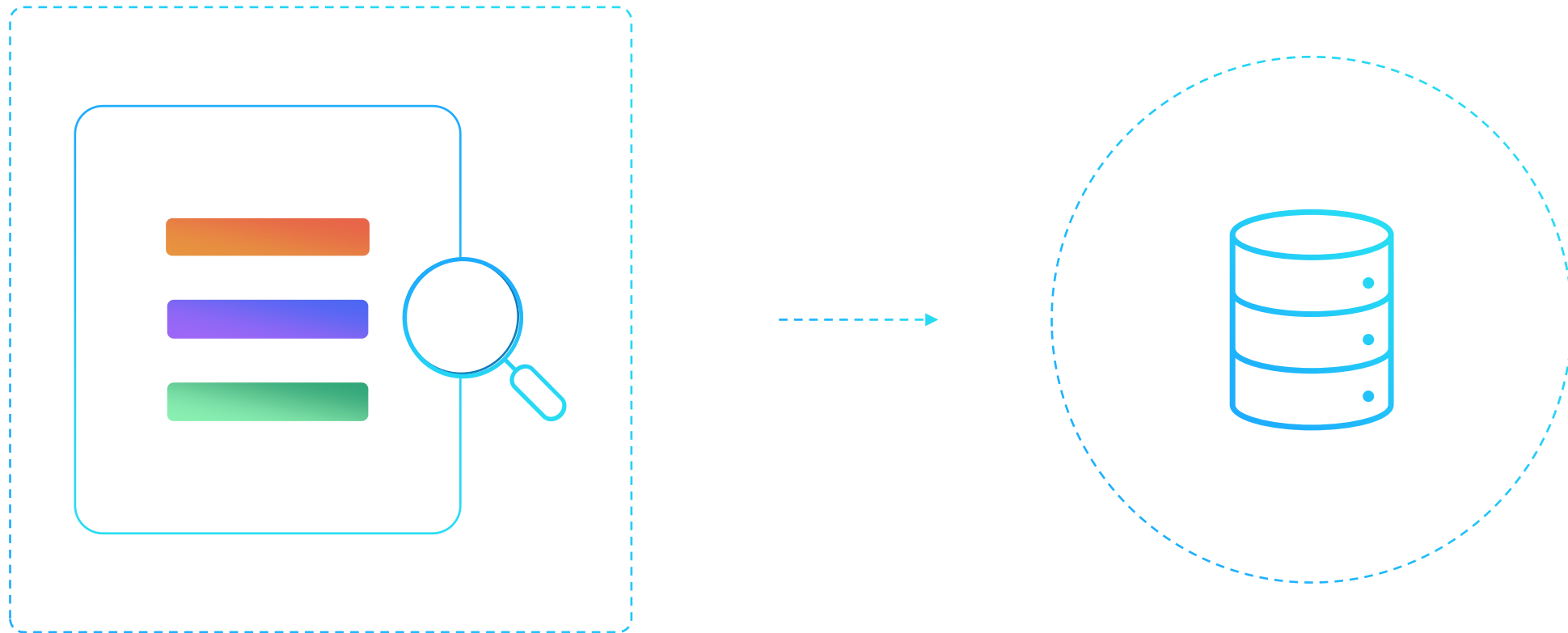




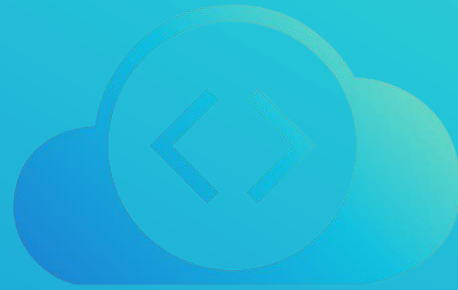




GCP Document AI

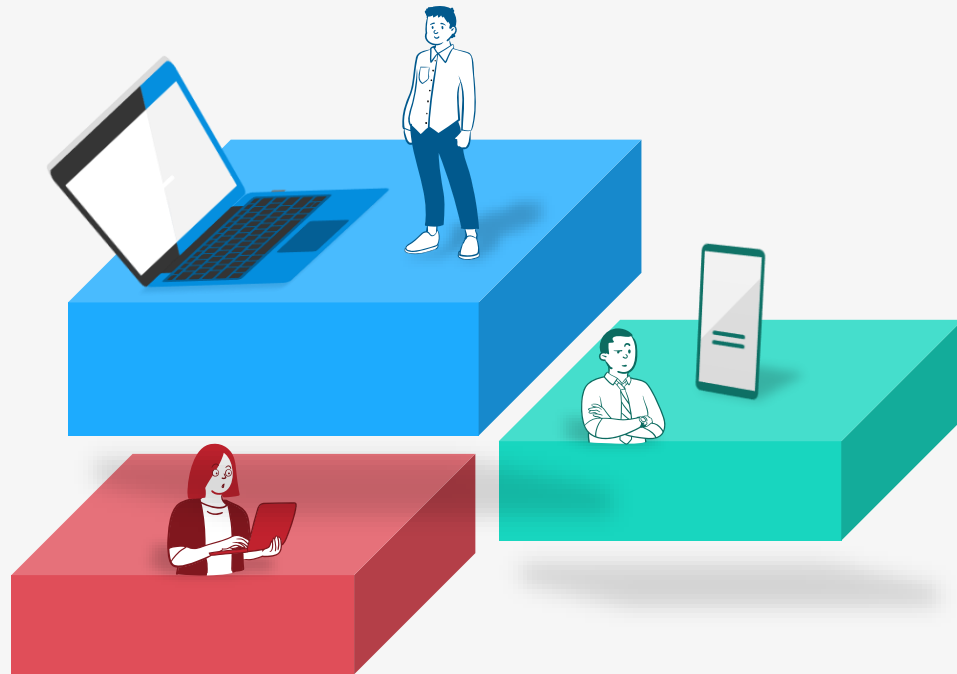


Extract structured data from documents **analyse**, **search** and **store** this data.



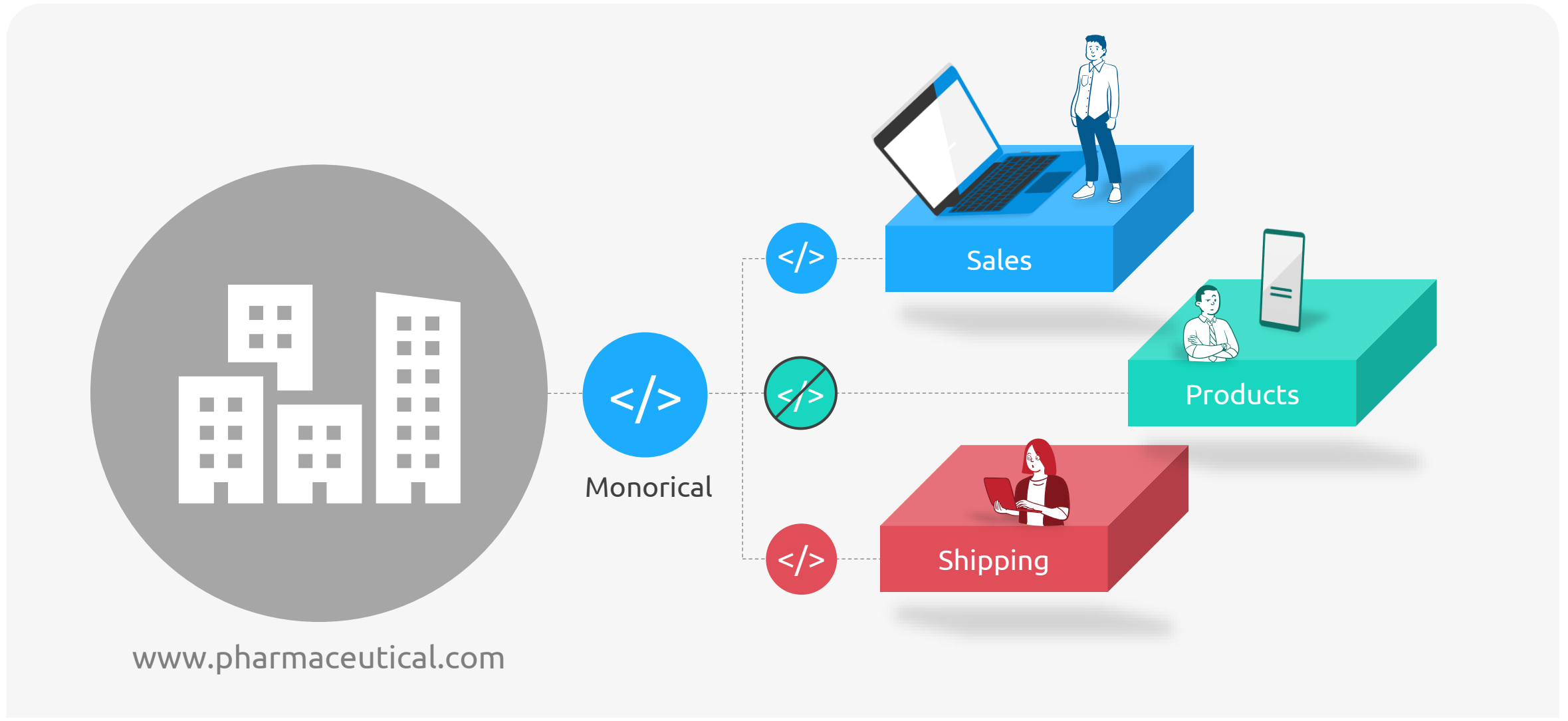
KodeKloud

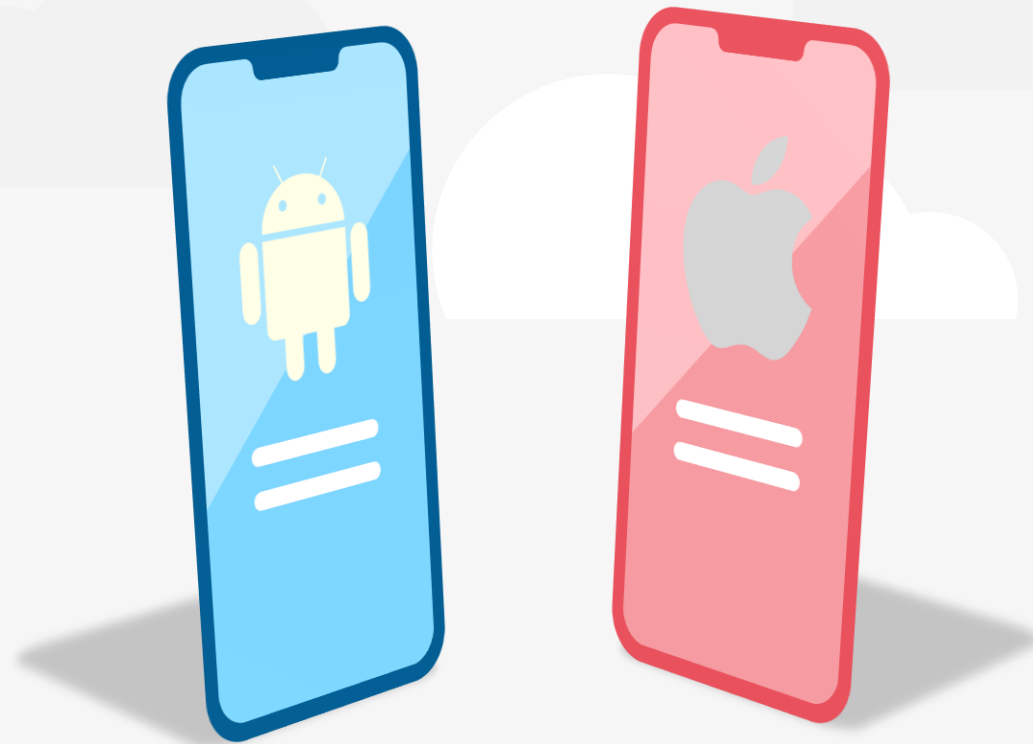
Container Orchestration in GCP



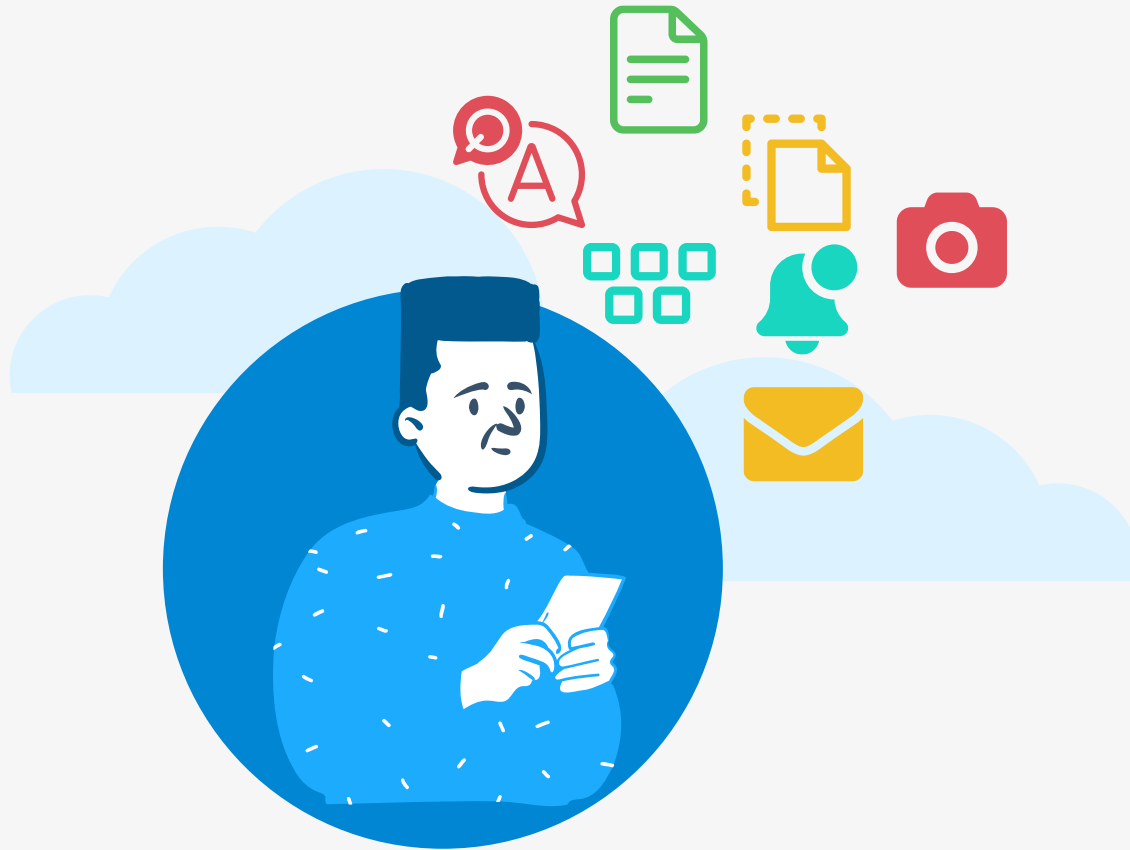
🔍 | Why do we need containerization?

🔍 | What are the tools and services?





Why containers are required?

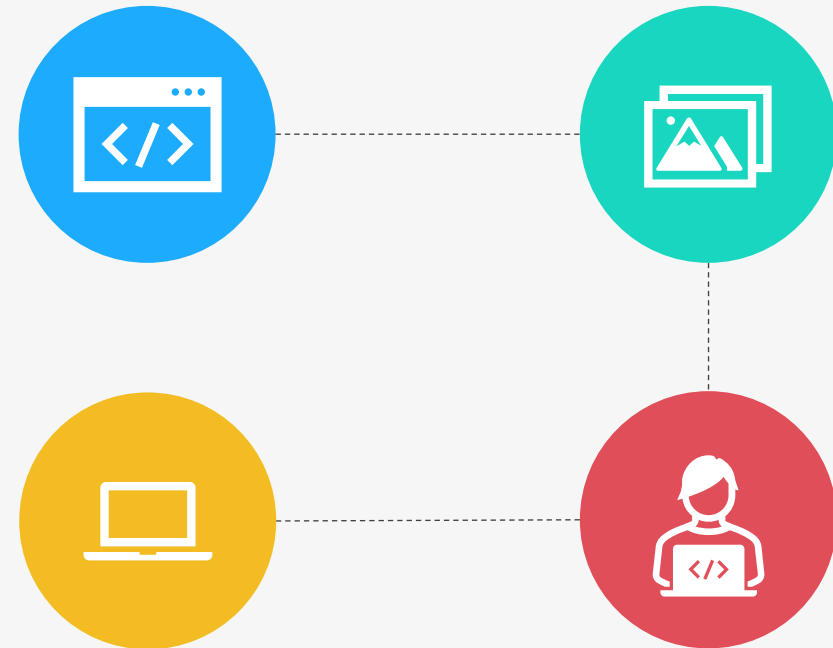
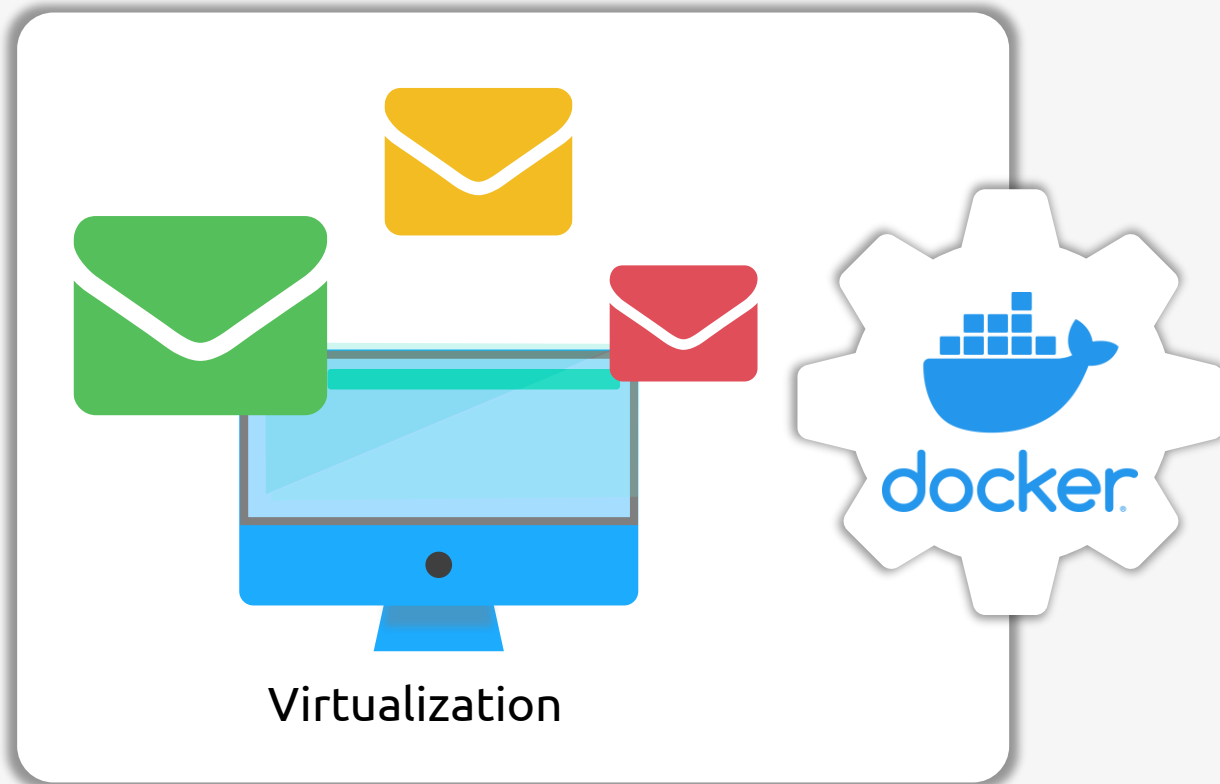


Streamlines the development lifecycle by allowing developers to work in standardized environments



Shipping code to clients is easy

Q | What is the software required?





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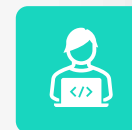


Kubernetes

The open-source container
orchestration system



Automating



Software deployment



Scaling

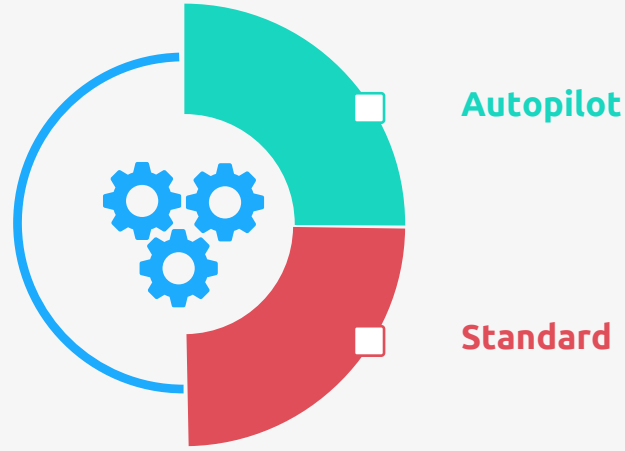


Management



GKE

The most automated and scalable managed Kubernetes platform

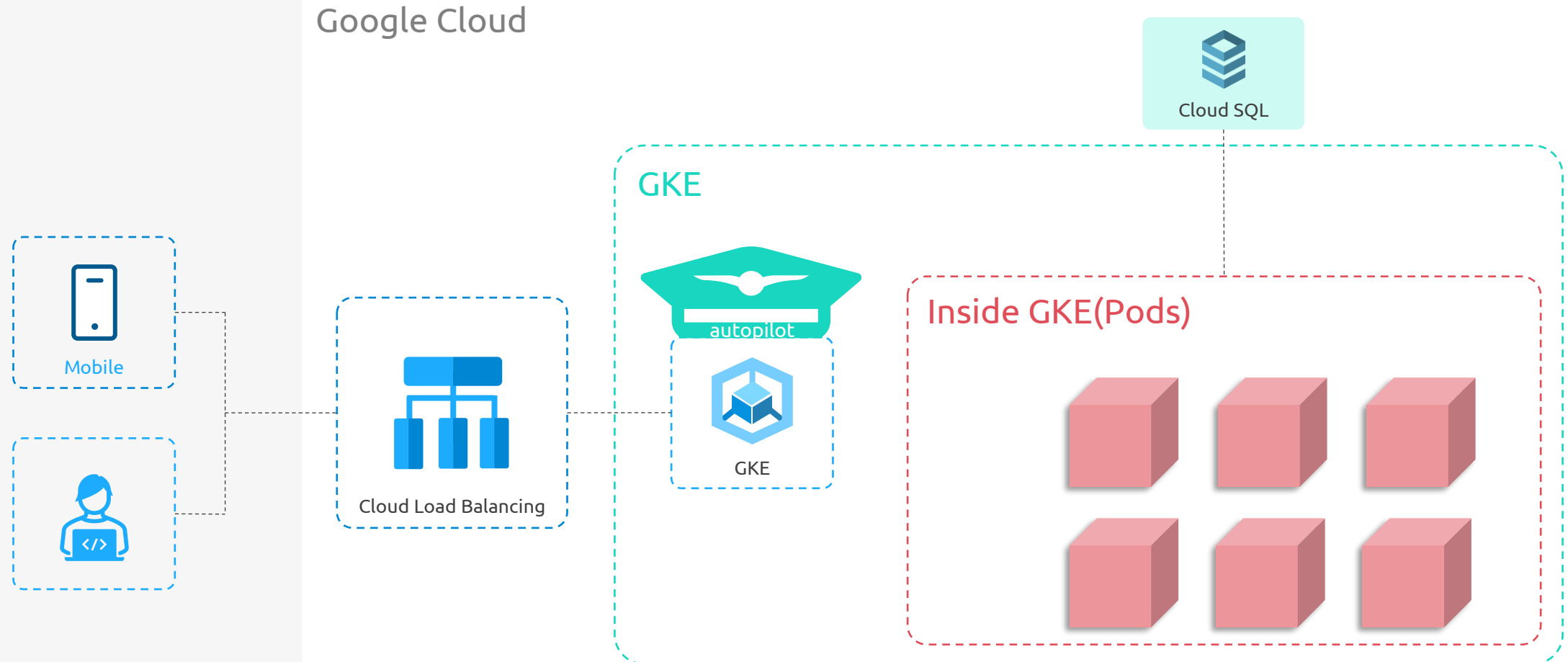


Easy integration with Load Balancers and other services to expose our application APIs



GKE is the developer favorite tool while building modern data applications

Exam Tip : GKE is used for container orchestration



Auto Pilot: Manage, Scale, Backup, Minor upgrades, Patches, Bug Fixes



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Cloud Run



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



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

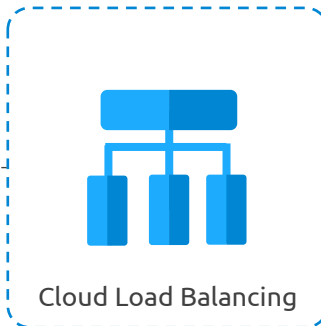
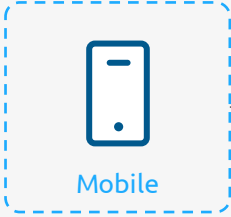


Only pay when your code is running, billed to the nearest 100 milliseconds.

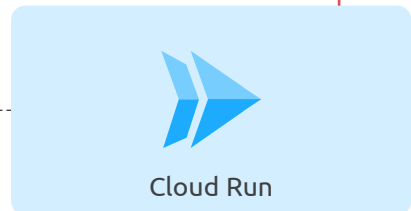


Cloud Run integrations --- Load Balancer, Logging

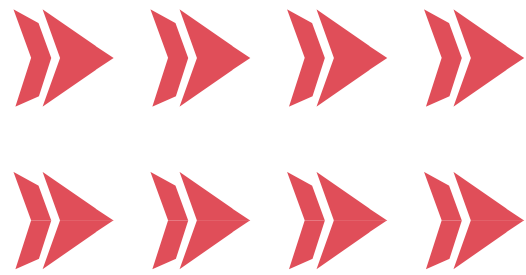
Google Cloud



Region



Inside Cloud Run

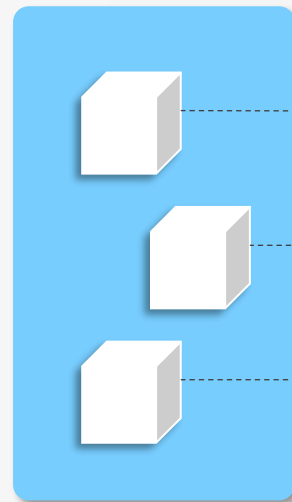




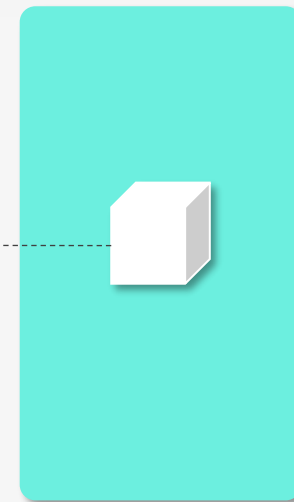
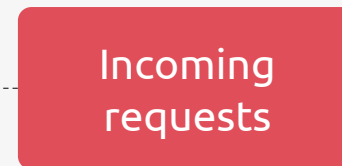
Cloud Run is a scalable solution to be chosen to test and deploy a simple containerized application



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



Concurrency = 1



Concurrency = 80



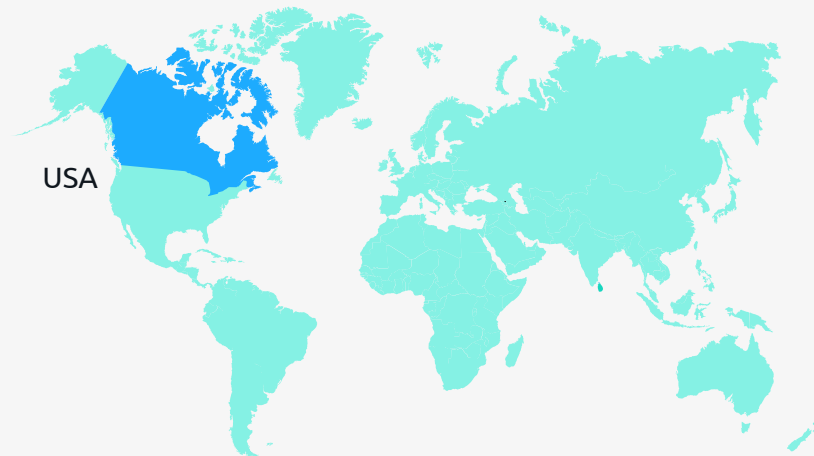
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GCP Security, Privacy, and Cloud Compliance

GCP Security, Privacy, and Cloud Compliance



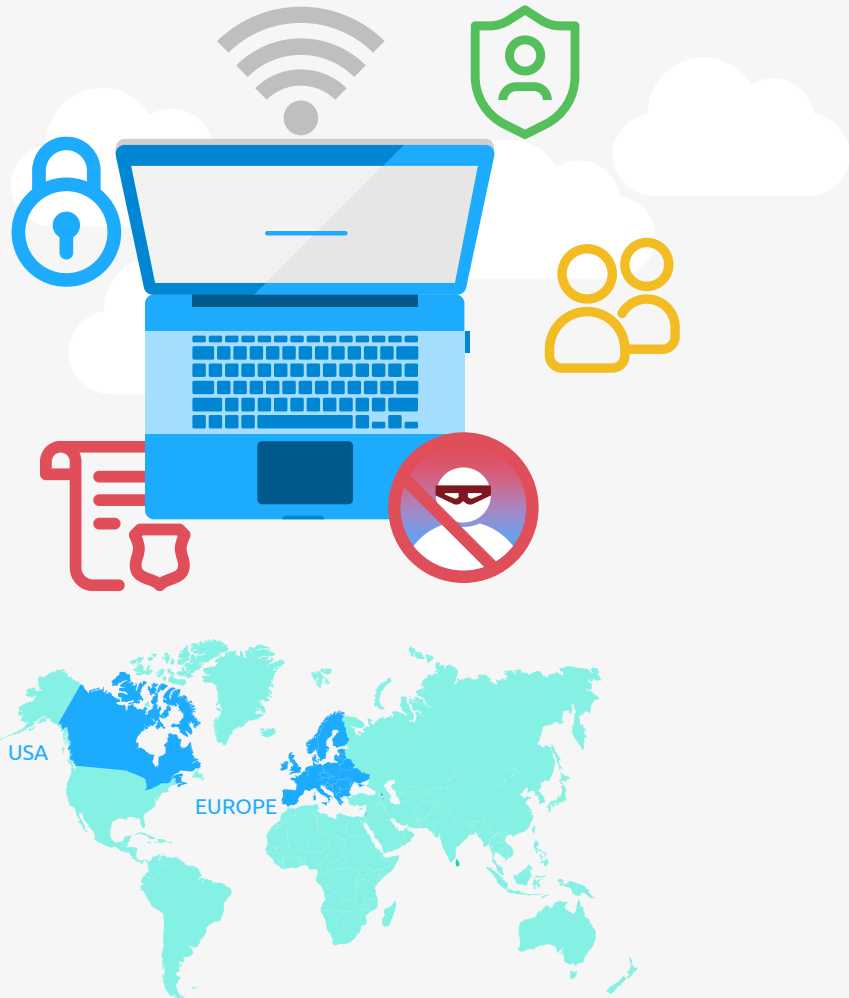
- 1 Detect, investigate, and respond to threats faster
- 2 Protect business-critical apps from fraud and web attacks
- 3 Digital sovereignty
- 4 Provide secure access to systems, data, and resources





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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



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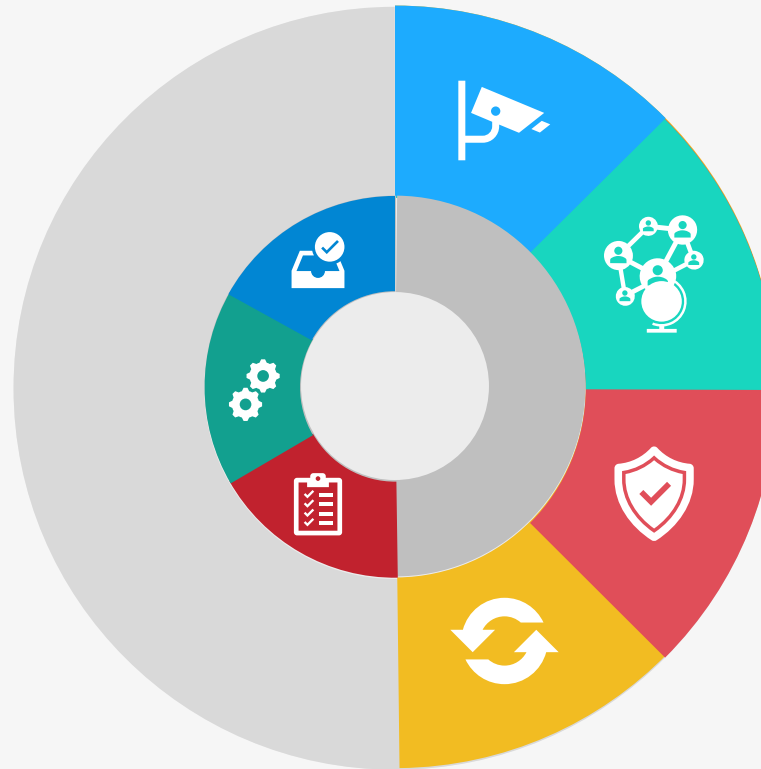
Shared responsibility model

Security inside the cloud

Data Security inside the cloud ■

Application configuration
according to best practice ■

Taking proactive measures in
solving security threats. ■



Security of the cloud

■ 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

