

# GCP Assignment 1

## 1) What is the GCP project quota? If necessary, how GCP quota can be increased?

Project quotas protect Google Cloud users from unforeseen spikes in usage. However, as your usage of Google Cloud Platform increases, you can request an increase in your project quota. To request an increase to your quota, contact the Support team.

*GCP Quota can be increased by -*

1. Go to the Quotas page.
2. On the Quotas page, find the quota you want to increase in the Limit name column.
3. Select the checkbox to the left of your quota.
4. Click create EDIT QUOTAS.
5. In the Quota changes form, enter the increased quota that you want for your project in the New limit field.

## 2) What is the definition of a virtual machine? Virtual machine types are offered in GCP. How to create a virtual computer in Google Cloud Platform.

A VM is a virtualized instance of a computer that can perform almost all of the same functions as a computer, including running applications and operating systems. Virtual machines run on a physical machine and access computing resources from software called a hypervisor.

*Virtual machine types that are offered in GCP -*

- **Machine family:** A curated set of processor and hardware configurations optimized for specific workloads. When you create a VM instance, you choose a predefined or custom machine type from your preferred machine family.
- **Series:** Machine families are further classified by series and generation. For example, the N1 series within the general-purpose machine types is the older version of the N2 series. Generally, generations of a machine series use a

higher number to describe the newer generation. For example, the N2 series is the newer generation of the N1 series.

- **Machine type:** Every machine series has predefined machine types that provide a set of resources for your VM. If a predefined machine type does not meet your needs, you can also create a custom machine type.

#### *Creating a VM computer in GCP -*

1. In the Google Cloud Console, go to the **VM instances** page.

Go to VM instances

2. Select your project and click **Continue**.
3. Click **Create instance**.
4. Specify a **Name** for your VM.
5. Optional: Change the **Zone** for this VM. Compute Engine randomizes the list of zones within each region to encourage use across multiple zones.
6. Select a **Machine configuration** for your VM.
7. In the **Boot disk** section, click **Change**, and then do the following:
  - a) Select the **Custom Images** tab.
  - b) To select the image project, click **Select a project**, and then do the following:
    - a. Select the project that contains the image.
    - b. Click **Open**.
  - c) In the **Image** list, click the image that you want to import.
  - d) Select the type and size of your boot disk.
  - e) Optional: For advanced configuration options, click **Show advanced configuration**.
  - f) To confirm your boot disk options, click **Select**.
8. In the **Firewall** section, to permit HTTP or HTTPS traffic to the VM, select **Allow HTTP traffic** or **Allow HTTPS traffic**.

The Cloud Console adds a network tag to your VM and creates the corresponding ingress firewall rule that allows all incoming traffic

on tcp:80 (HTTP) or tcp:443 (HTTPS). The network tag associates the firewall rule with the VM. For more information, see Firewall rules overview in the Virtual Private Cloud documentation.

9. To create and start the VM, click **Create**.

### 3) What is Google Big Query, and how does it work? Replicate certain instances to demonstrate a use case.

BigQuery is a **cloud database solution provided by Google which executes queries on large amounts of data in seconds**. Being a full database solution and not just another query engine means that it provides its own storage, a query engine, and also uses SQL-like commands to run queries against data stored in it.

BigQuery is **the public implementation of Dremel** that was recently launched to general availability. ... It does so via a REST API, a command line interface, a Web UI, access control and more, while maintaining the unprecedented query performance of Dremel.

You can also use the Database Migration Service for continuous replication from a source database server to Cloud SQL.

Cloud SQL supports the following types of replicas:

- Read replicas
- Cross-region read replicas
- External read replicas
- Cloud SQL replicas, when replicating from an external server

Cloud SQL does not support replication between two external servers.

#### ***Replication use cases***

The following use cases apply for each type of replication.

Name	Primary	Replica	Benefits and use cases	More information
Read replica	Cloud SQL instance	Cloud SQL instance	<ul style="list-style-type: none"><li>• Additional read capacity</li><li>• Analytics target</li></ul>	<ul style="list-style-type: none"><li>• <a href="#">Creating read replicas</a></li><li>• <a href="#">Managing read replicas</a></li></ul>

Cross-region read replica	Cloud SQL instance	Cloud SQL instance	<ul style="list-style-type: none"> <li>• Additional read capacity</li> <li>• Analytics target</li> <li>• Additional disaster recovery capability</li> <li>• Improve read performance</li> <li>• Migrate data between regions</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Replication metrics</a></li> <li>• <a href="#">Read replica indexes</a></li> <li>• <a href="#">Creating read replicas</a></li> <li>• <a href="#">Managing read replicas</a></li> <li>• <a href="#">Replication metrics</a></li> </ul>
External read replica	Cloud SQL instance	MySQL instance external to Cloud SQL	<ul style="list-style-type: none"> <li>• Reduced latency for external connections</li> <li>• Analytics target</li> <li>• Migration path to other platforms</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Configuring external replicas</a></li> </ul>
Replication from an external server	MySQL instance external to Cloud SQL	Cloud SQL for MySQL instance	<ul style="list-style-type: none"> <li>• Migration path to Cloud SQL</li> <li>• Data replication to Google Cloud Platform</li> <li>• Analytics target</li> </ul>	<ul style="list-style-type: none"> <li>• <a href="#">Replicating from an ex</a></li> </ul>

### ***Prerequisites for creating a read replica***

Before you can create a read replica of a primary Cloud SQL instance, the instance must meet the following requirements:

- Automated backups must be enabled.

- Binary logging must be enabled which requires point-in-time recovery to be enabled about the impact of these logs.
- At least one backup must have been created after binary logging was enabled.

Additional requirements for the external replica:

- The MySQL version of the replica must be the same or higher than the MySQL version of the primary instance.
- For security, you must configure SSL/TLS on your primary instance.

#### **4) What exactly is the Google Cloud SDK? List the numerous Google cloud SDK installation options.**

Google Cloud SDK (Software Development Kit), in simple terms, is a set of tools that are used to manage applications and resources that are hosted on the Google Cloud Platform. It is composed of the `gsutil`, `gcloud`, and `bqcommand` line tools. The `gcloudtool` is automatically downloaded with the Cloud SDK.

##### **1. Download the Google Cloud CLI installer.**

Alternatively, open a PowerShell terminal and run the following PowerShell commands:

```
(New-Object
Net.WebClient).DownloadFile("https://dl.google.com/dl/cloudsdk/channels/rapid/GoogleCloudSDKInstaller.exe",
"$env:Temp\GoogleCloudSDKInstaller.exe")
& $env:Temp\GoogleCloudSDKInstaller.exe
```

##### **2. Launch the installer and follow the prompts. The installer is signed by Google LLC.**

If you're using a screen reader, check the **Turn on screen reader mode** checkbox. This option configures `gcloud` to use status trackers instead of unicode spinners, display progress as a percentage, and flatten tables.

##### **3. Cloud SDK requires Python; supported versions are Python 3 (preferred, 3.5 to 3.8) and Python 2 (2.7.9 or higher). Cloud SDK comes bundled with Python 3 by default. To use Cloud SDK, your operating system must be able to run a supported version of Python.**

The installer installs all necessary dependencies, including the needed Python version. While Cloud SDK installs and manages Python 3 by default, you can

use an existing Python installation if necessary by **unchecking** the option to Install Bundled Python. See [gcloud topic startup](#) to learn how to use an existing Python installation.

4. After installation is complete, the installer gives you the option to create Start Menu and Desktop shortcuts, start the Google Cloud CLI shell, and configure the gcloud CLI. Make sure that you leave the options to start the shell and configure your installation selected. The installer starts a terminal window and runs the [gcloud init](#) command.
5. The default installation doesn't include the App Engine extensions required to deploy an application using gcloud commands. These components can be installed using the [gcloud CLI component manager](#).

### ***Troubleshooting tips:***

- If your installation is unsuccessful due to the find command not being recognized, ensure your PATH environment variable is set to include the folder containing find. Usually, this is C:\WINDOWS\system32;.
- If you uninstalled the gcloud CLI, you must reboot your system before installing the gcloud CLI again.
- If unzipping fails, run the installer as an administrator.

## **5) List the many cloud computing deployment models.**

There are **four cloud** deployment models: public, private, community, and hybrid.

### **• Public Cloud**

The public cloud model is the most widely used cloud service. This cloud type is a popular option for web applications, file sharing, and non-sensitive data storage.

The service provider owns and operates all the hardware needed to run a public cloud. Providers keep devices in massive data centers.

The public cloud delivery model plays a vital role in development and testing. Developers often use public cloud infrastructure for development and testing purposes. Its virtual environment is cheap and can be configured easily and deployed quickly, making it perfect for test environments.

### **• Private Cloud**

Whereas a public model is available to anyone, a private cloud belongs to a specific organization. That organization controls the system and manages it in a centralized fashion. While a third party (e.g., service provider) can host a private cloud server (a type of colocation), most companies choose to keep the hardware in their on-premises data center. From there, an in-house team can oversee and manage everything. The private cloud deployment model is also known as the internal or corporate model.

- **Community Cloud**

The community cloud deployment model operates as a public cloud. The difference is that this system only allows access to a specific group of users with shared interests and use cases.

This type of cloud architecture can be hosted on-premises, at a peer organization, or by a third-party provider. A combination of all three is also an option.

Typically, all organizations in a community have the same security policies, application types, and legislative issues.

- **Hybrid Cloud**

A hybrid cloud is a combination of two or more infrastructures (private, community, VPC, public cloud, and dedicated servers). Every model within a hybrid is a separate system, but they are all a part of the same architecture.

A typical deployment model example of a hybrid solution is when a company stores critical data on a private cloud and less sensitive information on a public cloud. Another use case is when a portion of a firm's data cannot legally be stored on a public cloud.

The hybrid cloud model is often used for cloud bursting. Cloud bursting allows an organization to run applications on-premises but “burst” into the public cloud in times of heavy load. It is an excellent option for organizations with versatile use cases.

## **6) Describe the Google cloud platform's security features.**

*Google Cloud Platform's security features are-*

- 24/7/365 operations, device security detection and response from both internal and external threats

- Data in-transit encrypted communication to and from Google's public cloud, including layered defense redundancies to protect customers from denial-of-service (DoS) attacks
- Identity protection and management through multiple authentication factors
- Data at-rest storage security using encryption against unauthorized access and distribution for reliability
- An entire hardware infrastructure created, built, controlled, and secured by Google including servers, networking equipment, and security chips

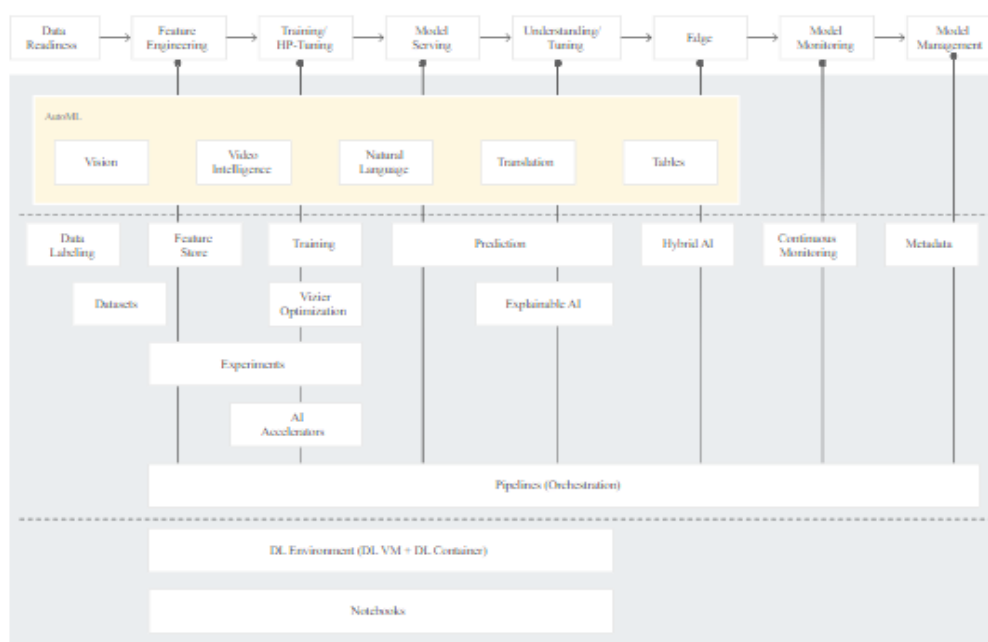
## 7) What exactly is vertex AI? With some usage scenarios, implement vertex AI.

Vertex AI Workbench is the single environment for data scientists to complete all of their ML work, from experimentation, to deployment, to managing and monitoring models. It is a Jupyter-based fully managed, scalable, enterprise-ready compute infrastructure with security controls and user management capabilities.

### USE CASE

#### Data readiness

Vertex AI supports your data preparation process. You can ingest data from BigQuery and Cloud Storage and leverage Vertex AI Data Labeling to annotate high-quality training data and improve prediction accuracy





#### USE CASE

### Feature engineering

Use Vertex AI Feature Store, a fully managed rich feature repository, to serve, share, and reuse ML features; Vertex AI Experiments to track, analyze, and discover ML experiments for faster model selection; Vertex AI TensorBoard to visualize ML experiments; and Vertex AI Pipelines to simplify the MLOps process by streamlining the building and running of ML pipelines.

#### USE CASE

### Training and hyperparameter tuning

Build state-of-the-art ML models without code by using AutoML to determine the optimal model architecture for your image, tabular, text, or video-prediction task, or build custom models using Notebooks. Vertex AI Training offers fully managed training services, and Vertex AI Vizier provides optimized hyperparameters for maximum predictive accuracy.

#### USE CASE

### Model serving

Vertex AI Prediction makes it easy to deploy models into production, for online serving via HTTP or batch prediction for bulk scoring. You can deploy custom models built on any framework (including TensorFlow, PyTorch, scikit or XGB) to Vertex AI Prediction, with built-in tooling to track your models' performance.

#### USE CASE

### Model tuning and understanding

Get detailed model evaluation metrics and feature attributions, powered by Vertex Explainable AI. Vertex Explainable AI tells you how important each input feature is to your prediction. Available out of the box in AutoML Forecasting, Vertex AI Prediction, and Vertex AI Workbench.

#### USE CASE

### Edge

Vertex AI Edge Manager (in experimental phase) is designed to facilitate seamless deployment and monitoring of edge inferences and automated processes with flexible APIs, to allow you to distribute AI across your private and public cloud infrastructure, on-premises data centers, and edge devices.

#### USE CASE

### Model monitoring

Continuous monitoring offers easy and proactive monitoring of model performance over time for models deployed in the Vertex AI Prediction service. Continuous monitoring monitors signals for your model's predictive performance and alerts when the signals deviate, diagnose the cause of the deviation, and trigger model-retraining pipelines or collect relevant training data.

#### USE CASE

### Model management

Vertex ML Metadata enables easier auditability and governance by automatically tracking inputs and outputs to all components in Vertex Pipelines for artifact, lineage, and execution tracking for your ML workflow. Track custom metadata directly from your code and query metadata using a Python SDK.

#### Vertex AI Workbench

Vertex AI Workbench is the single environment for data scientists to complete all of their ML work, from experimentation, to deployment, to managing and monitoring models. It is a Jupyter-based fully managed, scalable, enterprise-ready compute infrastructure with security controls and user management capabilities.

#### Vertex AI Matching Engine

Massively scalable, low latency, and cost-efficient vector similarity matching service.

#### Vertex AI Data Labeling

Get highly accurate labels from human labelers for better machine learning models.

#### Vertex AI Deep Learning Containers

Quickly build and deploy models in a portable and consistent environment for all your AI applications.

Vertex AI Edge Manager	Seamlessly deploy and monitor edge inferences and automated processes with flexible APIs.
Vertex Explainable AI	Understand and build trust in your model predictions with robust, actionable explanations integrated into Vertex AI Prediction, AutoML Tables, and Vertex AI Workbench.
Vertex AI Feature Store	A fully managed rich feature repository for serving, sharing, and reusing ML features.
Vertex ML Metadata	Artifact, lineage, and execution tracking for ML workflows, with an easy-to-use Python SDK.
Vertex AI Model Monitoring	Automated alerts for data drift, concept drift, or other model performance incidents which may require supervision.
Vertex AI Neural Architecture Search	Build new model architectures targeting application-specific needs and optimize your existing model architectures for latency, memory, and power with this automated service powered by Google's leading AI research.
Vertex AI Pipelines	Build pipelines using TensorFlow Extended and Kubeflow Pipelines, and

leverage Google Cloud's managed services to execute scalably and pay per use. Streamline your MLOps with detailed metadata tracking, continuous modeling, and triggered model retraining.

#### Vertex AI Prediction

Deploy models into production more easily with online serving via HTTP or batch prediction for bulk scoring. Vertex AI Prediction offers a unified framework to deploy custom models trained in TensorFlow, scikit or XGB, as well as BigQuery ML and AutoML models, and on a broad range of machine types and GPUs.

#### Vertex AI Tensorboard

This visualization and tracking tool for ML experimentation includes model graphs which display images, text, and audio data.

#### Vertex AI Training

Vertex AI Training provides a set of pre-built algorithms and allows users to bring their custom code to train models. A fully managed training service for users needing greater flexibility and customization or for users running training on-premises or another cloud environment.

#### Vertex AI Vizier

Optimized hyperparameters for maximum predictive accuracy.