

Ex 1.

Models	IaaS	PaaS	SaaS
Control	Greatest control over infrastructure, storage, networks etc.	Moderate control on deployment but infrastructure is managed by service provider	Least control. Developers can only adjust configuration of the software
Flexibility	Highly flexible. Deployment environment is fully controlled	Moderately flexible	Least flexible. Software is not managed by user
Use	Used by enterprises that need virtual machine-like infrastructure without need to manage the hardware.	Microservice architecture, web app development.	Ready to use software solutions. Ex: any Google generic app like Google Photos etc.
GCP services	Google Compute Engine	Google App Engine, Google Cloud Functions	Google Drive
Real word examples	Enterprise that needs to run multiple VMs for their services.	Team of developers that want to deploy multi-platform application	Tiny businesses that need gmail and other services for rapid and smooth delivery of their services.

Ex 2.

- Primary use case of Compute Engine - For enterprises that need to create and run multiple virtual machines for scalability and performance of their applications.
- It provides power of Kubernetes without the hassle of managing underlying infrastructure. GKE automatically manages clusters and offers both vertical and horizontal scaling. You don't need to manage nodes and control panes. It has CI/CD that allows for updating the code base while making the current version available. GKE also makes Kubernetes up to date. Aside from that it balances workload and runs in multiple cloud environments.
- Cloud storage can be cost effective. Businesses can scale their data on demand. Also cloud storage offers high reliability and security of data.
- BigQuery can lead to cost savings when it comes to processing large datasets. It is highly performant. It offers real time analytics and is compatible with vast data sources.

Ex 3. a) For creating choose your machine type to adjust cost, region, OS, traffic settings etc.

CREATE VM FROM...

Name *
instance-20240927-035548

MANAGE TAGS AND LABELS

Region *
us-central1 (Iowa)

Zone *
Any

Machine configuration

NEW: Google Axion virtual machines in Preview

Try Google Axion Arm-based Processors. Sign up for early access now

General purpose

Compute optimized

Memory optimized

Storage optimized

GPUs

Machine types for common workloads, optimized for cost and flexibility

Series	Description	vCPUs	Memory	Platform
C4	Consistently high performance	2 - 192	4 - 1,488 GB	Intel Emerald Rapids
N4	Flexible & cost-optimized	2 - 80	4 - 640 GB	Intel Emerald Rapids
C3	Consistently high performance	4 - 192	8 - 1,536 GB	Intel Sapphire Rapids
C3D	Consistently high performance	4 - 360	8 - 2,880 GB	AMD Genoa
E2	Low cost, day-to-day computing	0.25 - 32	1 - 128 GB	Based on availability
N2	Balanced price & performance	2 - 128	2 - 864 GB	Intel Cascade and Ice Lake
N2D	Balanced price & performance	2 - 224	2 - 896 GB	AMD EPYC
T2A	Scale-out workloads	1 - 48	4 - 192 GB	Ampere Altra Arm

CREATE

CANCEL

EQUIVALENT CODE

Monthly
\$25.46
That's at
Pay for w

Item
2 vCP
10 GB
Total

[Compute](#)
[LESS](#)

Machine type

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

PRESET

CUSTOM

e2-medium (2 vCPU, 1 core, 4 GB memory)

vCPU

1-2 vCPU (1 shared core)

Memory

4 GB

ADVANCED CONFIGURATIONS

Availability policies

VM provisioning model
Standard

Choose "Spot" to get a discounted, preemptible VM. Otherwise, stick to "Standard". [Learn more](#)

VM PROVISIONING MODEL ADVANCED SETTINGS

Display device

Enable to use screen capturing and recording tools.

☐ Enable display device

Confidential VM service

Confidential Computing is disabled on this VM instance

ENABLE

Container

Monthly estimate

\$25.46

That's about \$0.03 hourly

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

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

[Compute Engine pricing](#)
[LESS](#)

CREATE

CANCEL

EQUIVALENT CODE

Identity and API access ?

Service accounts ?

Service account

Compute Engine default service account

Requires the Service Account User role (roles/iam.serviceAccountUser) to be set for users who want to access VMs with this service account. [Learn more](#)

Access scopes ?

- ☒ Allow default access
- ☐ Allow full access to all Cloud APIs
- ☐ Set access for each API

Firewall ?

Add tags and firewall rules to allow specific network traffic from the Internet

- ☐ Allow HTTP traffic
- ☐ Allow HTTPS traffic
- ☐ Allow Load Balancer Health Checks

Observability - Ops Agent ?

Monitor your system through collection of logs and key metrics.

- ☐ Install Ops Agent for Monitoring and Logging

Advanced options

Networking, disks, security, management, sole-tenancy

b) Connected via SSH button on VM instance. Commands to install web server (apache):

- `sudo apt-get update`
- `sudo apt-get install apache2 php7.0`
- `echo '<!doctype html><html><body><h1>Hello World!</h1></body></html>' | sudo tee /var/www/html/index.html`

View the main web page via external IP.

For instance: 34.72.100..

c) When stopped data is persisted, and charged only for storage. When deleted data is also deleted.

Ex 4.

1. `npm init`

`npm install express`

2. `docker build -t ass1-kubernetes .`

`docker run -p 8080:8080 ass1-kubernetes`

3. `gcloud init`

`gcloud auth configure-docker gcr.io`

4. `docker images`

```
docker tag ass1-kubernetes:latest gcr.io/integral-server-383514/ass1-kubernetes:latest
```

```
5. docker push gcr.io/integral-server-383514/ass1-kubernetes:latest
```

```
6. gcloud container clusters get-credentials autopilot-cluster-1 --zone us-central1
```

- Message, otherwise install auth plugin:
Fetching cluster endpoint and auth data.
kubeconfig entry generated for autopilot-cluster-1.

(Optional). gcloud components install gke-gcloud-auth-plugin

- Update Your kubectl Configuration: Once the plugin is installed, you can update your kubectl config to use it.

```
export USE_GKE_GCLOUD_AUTH_PLUGIN=True
```

```
7. kubectl create deployment ass1-kubernetes
```

```
--image=gcr.io/integral-server-383514/ass1-kubernetes:latest
```

```
kubectl expose deployment ass1-kubernetes --type=LoadBalancer --port 80 --target-port 8080
```

```
kubectl get services ass1-kubernetes
```

```
kubectl get deployments
```

a) You build via “docker build -t”

To push to GCR you need to have gcloud cli installed

Once installed you log in, you retag your docker image to be compatible with google instructions.

```
“docker tag [image]:[tag] gcr.io/\[project-id\]/\[image\]:\[tag\]”
```

Then push via “docker push [gcr.io/\[project-id\]/\[image\]:\[tag\]](https://gcr.io/[project-id]/[image]:[tag])”

b) Installation is straightforward like in VM creation.

You go to Kubernetes Engine, go to tab Clusters and create new one.

[←](#) Clusters [DELETE](#) [DEPLOY](#) [CONNECT](#) [DUPLICATE](#)

✓ autopilot-cluster-1

[DETAILS](#) [STORAGE](#) [OBSERVABILITY](#) [LOGS](#) [APP ERRORS \(3\)](#)

Cluster basics

Name	autopilot-cluster-1	🔒
Location type	Regional	🔒
Region	us-central1	🔒
Default node zones ?	us-central1-f us-central1-a us-central1-b us-central1-c	✎
Release channel	Regular channel	✎
Version	1.30.3-gke.1969001	

c)

You expose with “`kubectl expose deployment [deployment-name] --type=LoadBalancer --port 80 --target-port 8080`”

Then via

”`kubectl get services`”

You should see your deployment with an external ip. When you proceed to ip you should see your web app.

Ex 5

- Simply go to Cloud storage and create bucket by giving name and setting right configuration (location, access control, storage class etc.)

✓ Get Started

Pick a globally unique, permanent name. [Naming guidelines](#)

internal-server-bucket

Tip: Don't include any sensitive information

Optimize storage for data-intensive workloads



Labels (optional)



CONTINUE

Good to know



Location pricing

Storage rates vary depending on the storage class of your bucket. [Pricing details](#)

Current configuration: Multi-region / Standard

Item	
us (multiple regions in United States)	\$0.02
With default replication	\$0.02

ESTIMATE YOUR MONTHLY COST

• Choose where to store your data

This choice defines the geographic placement of your data and affects cost, performance, and availability. Cannot be changed later. [Learn more](#)

Location type

☒ Multi-region

Highest availability across largest area

us (multiple regions in United States)



☐ Dual-region

High availability and low latency across 2 regions

☐ Region

Lowest latency within a single region

CONTINUE

• Choose how to control access to objects

Prevent public access

Restrict data from being publicly accessible via the internet. Will prevent this bucket from being used for web hosting. [Learn more](#)

☒ Enforce public access prevention on this bucket

Access control

☒ Uniform

Ensure uniform access to all objects in the bucket by using only bucket-level permissions (IAM). This option becomes permanent after 90 days. [Learn more](#)

☐ Fine-grained

Specify access to individual objects by using object-level permissions (ACLs) in addition to your bucket-level permissions (IAM). [Learn more](#)

CONTINUE

- b) In public access anyone (auth and non-auth users) can access the bucket
 In private only those with specific roles and permissions can access
 Can be set via IAM roles if you are using uniform level bucket control

The screenshot shows the Google Cloud Storage interface for a bucket named 'internal-server-bucket'. The 'Permissions' tab is selected, showing a list of roles and principals. The 'img/' folder is highlighted in the folder browser. The permissions table lists the following roles and principals:

Role / Principal	Inheritance
Compute Engine Service Agent (1)	
Container Registry Service Agent (1)	
Editor (2)	
Owner (1)	
dimash99is@gmail.com	
Storage Legacy Bucket Owner (2)	
Storage Legacy Bucket Reader (1)	

3. If you are using fine-grained control over your bucket you can use Access Control Lists (ACLs) to grant specific file permissions.

Ex6.

a) Tap create dataset, choose dataset Id and any other settings, then press create dataset. After that, create a table, choose the source. For our purpose, we will be using Google's public dataset. Later review the schema and create a table.

The screenshot shows the 'Create dataset' form in Google Cloud. The form is for creating a new dataset with the following settings:

- Project ID:** bigquery-public-data
- Dataset ID:** (empty field)
- Location type:** Multi-region (selected)
- Multi-region:** US (multiple regions in United States)
- External Dataset:** (checked)
- Default table expiration:** (checked)
- Tags:** (empty field)
- Advanced options:** (empty field)

The form includes a 'CREATE DATASET' button and a 'CANCEL' button.

Create table

Source

Create table from
Empty table

Destination

Project *
integral-server-383514

Dataset *
investor

Table *
blocks

Maximum name size is 1,024 UTF-8 bytes. Unicode letters, marks, numbers, connectors, dashes, and spaces are allowed.

Table type
Native table

Schema

Edit as text

Partition and cluster settings

Partitioning
No partitioning

Clustering order

Clustering order determines the sort order of the data. Clustering can be used on both partitioned and non-partitioned tables.

Tags

CREATE TABLE CANCEL

blocks

QUERY SHARE COPY SNAPSHOT DELETE EXPORT

This is a partitioned table. [Learn more](#)

SCHEMA

DETAILS

PREVIEW

TABLE EXPLORER

PREVIEW

INSIGHTS

LINEAGE

DATA PROFILE

DATA QUALITY

Filter

Enter property name or value

	Field name	Type	Mode	Key	Collation	Default Value	Policy Tags	Description
<input type="checkbox"/>	hash	STRING	REQUIRED	-	-	-	-	Hash of this block
<input type="checkbox"/>	size	INTEGER	NULLABLE	-	-	-	-	The size of block data in bytes
<input type="checkbox"/>	stripped_size	INTEGER	NULLABLE	-	-	-	-	The size of block data in bytes excluding witness data
<input type="checkbox"/>	weight	INTEGER	NULLABLE	-	-	-	-	Three times the base size plus the total size. https://github.com/bitcoin/bips/bl
<input type="checkbox"/>	number	INTEGER	REQUIRED	-	-	-	-	The number of the block
<input type="checkbox"/>	version	INTEGER	NULLABLE	-	-	-	-	Protocol version specified in block header
<input type="checkbox"/>	merkle_root	STRING	NULLABLE	-	-	-	-	The root node of a Merkle tree, where leaves are transaction hashes
<input type="checkbox"/>	timestamp	TIMESTAMP	REQUIRED	-	-	-	-	Block creation timestamp specified in block header
<input type="checkbox"/>	timestamp_month	DATE	REQUIRED	-	-	-	-	Month of the block creation timestamp specified in block header
<input type="checkbox"/>	nonce	STRING	NULLABLE	-	-	-	-	Difficulty solution specified in block header
<input type="checkbox"/>	bits	STRING	NULLABLE	-	-	-	-	Difficulty threshold specified in block header
<input type="checkbox"/>	coinbase_param	STRING	NULLABLE	-	-	-	-	Data specified in the coinbase transaction of this block

b) Im using “crypto blockchain” public dataset.
My queries:

```
SELECT timestamp_month FROM `integral-server-383514.investor.blocks` WHERE
timestamp_month = "2011-06-01" LIMIT 1000
SELECT COUNT(*), AVG(size) FROM `integral-server-383514.investor.blocks` LIMIT 1000
SELECT * FROM `integral-server-383514.investor.blocks` ORDER BY version LIMIT 1000
```

c) By visualizing data one can analyze the trends over time, outliers of the data, aggregated information about the data, etc.