

MACHINE LEARNING OPERATIONS



Presented by **Asst. Prof. Dr. Tuchsanai Ploysuwan**

WEEK 5



To apply for Google Cloud, follow these steps

The screenshot shows the Google Cloud homepage with a dark header. The main heading is "Solve real business challenges on Google Cloud". Below it are two buttons: "Get started for free" and "Contact sales". A large central section is titled "Run workloads for free" and lists three options: "20+ free products for all customers", "\$300 in free credits for new customers", and "Start deploying pre-built solutions free". Below this is a section titled "Free Tier products" with four cards: Compute Engine, Cloud Storage, BigQuery, and Google Kubernetes Engine. Each card has a brief description and a right-pointing arrow.

Solve real business challenges on Google Cloud

[Get started for free](#) [Contact sales](#)

Run workloads for free

20+ free products for all customers
All customers get [free hands-on experience](#) with popular products, including Compute Engine and Cloud Storage, [up to monthly limits](#).

\$300 in free credits for new customers
New customers get [\\$300 in free credits](#) to fully explore and conduct an assessment of Google Cloud. You won't be charged until you upgrade.

Start deploying pre-built solutions free
New customers get [\\$300 in free credits](#) on signup to use on deploying a dynamic website, launching a VM, building a three tier web app, and more [pre-built solutions templates](#).

Free Tier products

There is no charge to use these products up to their specified [free usage limit](#). The free usage limit does not expire, but is subject to change. Available for eligible customers.

Compute Engine
Scalable, high-performance virtual machines.
1 e2-micro instance per month →

Cloud Storage
Best-in-class performance, reliability, and pricing for all your storage needs.
5 GB-months Standard Storage →

BigQuery
Fully managed, petabyte scale, analytics data warehouse.
1TB queries per month →

Google Kubernetes Engine
One-click container orchestration via Kubernetes clusters, managed by Google.
One Autopilot or Zonal cluster per month →

<https://cloud.google.com/>

Free trial credit



THB10,864

Free trial credit

Out of THB10,864



90

Days remaining

Ends February 24, 2024

You are not billed during your Free Trial. When the Free Trial ends, all resources you created during the trial are stopped and you will not be charged, unless you upgrade to a paid Cloud Billing account.

Please note: The Free Trial period cannot be paused or extended. The Free Trial ends after all available credits are consumed, or at the end of the Free Trial period, whichever happens first.

[ACTIVATE](#)

[LEARN MORE](#) 

การสมัครใช้บริการ Google Cloud สามารถทำได้โดยขั้นตอนง่าย ๆ ดังนี้:

1. **เข้าไปที่เว็บไซต์ของ Google Cloud Platform (GCP)**:

- เปิดเบราว์เซอร์และเข้าไปที่ [\[https://cloud.google.com/\]\(https://cloud.google.com/\)](https://cloud.google.com/).
- คลิกที่ปุ่ม "Get started for free" หรือ "ลงทะเบียนใช้งานฟรี" ที่อยู่บนหน้าเว็บไซต์.

2. **ลงทะเบียนหรือเข้าสู่ระบบด้วยบัญชี Google**:

- ถ้าคุณมีบัญชี Google อยู่แล้ว (เช่น Gmail), คุณสามารถใช้บัญชีนั้นเข้าสู่ระบบ.
- ถ้าคุณยังไม่มีบัญชี Google, คุณจะต้องสร้างบัญชีใหม่.

3. **กรอกข้อมูลการลงทะเบียน**:

- คุณจะต้องกรอกข้อมูลส่วนตัว, เช่น ชื่อ, นามสกุล, และข้อมูลการติดต่อ.
- ทำการยืนยันอีเมลที่ใช้สมัคร.

4. **กรอกข้อมูลการเงิน (เพื่อการยืนยันตัวตน)**:

- แม้ว่า GCP จะเสนอเครดิตฟรีเมื่อคุณเริ่มใช้งาน, แต่ Google ยังคงต้องการข้อมูลบัตรเครดิตหรือบัญชีธนาคารเพื่อการยืนยันตัวตน.
- คุณจะไม่ถูกเรียกเก็บเงินจนกว่าจะใช้เครดิตที่ให้มาหมด.

5. **อ่านและยอมรับข้อกำหนดการใช้งาน**:

- ตรวจสอบและยอมรับข้อกำหนดและเงื่อนไขการให้บริการของ Google Cloud.

6. **การตั้งค่าโครงการและการใช้งาน**:

- หลังจากลงทะเบียนเสร็จสิ้น, คุณสามารถเริ่มต้นสร้างโครงการและใช้งานบริการต่าง ๆ ใน Google Cloud.

7. **การยืนยันตัวตนและการเริ่มต้นใช้งาน**:

- Google จะทำการยืนยันตัวตนผ่านโทรศัพท์หรือข้อความ SMS.
- หลังจากยืนยันแล้ว, คุณสามารถเข้าใช้งาน Google Cloud Console และเริ่มต้นใช้งานได้ทันที.

Google Cloud

Google

Sign in
to continue to Google Cloud Platform

Email or phone

Forgot email?

Not your computer? Use Guest mode to sign in privately.
[Learn more](#)

Create account

Next

English (United States)

Help Privacy Terms

Google Cloud

สร้างบัญชี Google
เข้าสู่ Google Cloud Platform

ชื่อ นามสกุล

อีเมลหรือเบอร์โทรศัพท์
คุณจะรับอีเมลยืนยันเมื่อเป็นเจ้าของ
สร้างบัญชี Gmail ใหม่แทน

รหัสผ่าน บีบบีน
รหัสผ่าน 8 ตัวอักษรไม่ต้องคำนึงตัว ตัวหนา ตัวเล็ก อักษรตัวเลขและสัญลักษณ์

แสดงรหัสผ่าน

ลงชื่อเว็บไซต์ของคุณ

ต่อไป

ไทย

ภาษาไทย

ไทย

ไทย

Google Cloud

Step 1 of 2 Account Information



deadmannewinter@gmail.com

SWITCH ACCOUNT

Country

Thailand

What best describes your organization or needs?

Please select
Business idea / startup idea

Terms of Service

I have read and agree to the [Google Cloud Platform Terms of Service](#), [Supplemental Free Trial Terms of Service](#), and the terms of service of any applicable services and APIs.

Required to continue

Email updates

I would like to receive periodic emails on news, product updates and special offers from Google Cloud and Google Cloud Partners.

CONTINUE

Access to all Cloud Platform Products

Get everything you need to build and run your apps, websites and services, including Firebase and the Google Maps API.

\$300 credit for free

Put Google Cloud to work with \$300 in credit to spend over the next 90 days.

No autocharge after free trial ends

We ask you for your credit card to make sure you are not a robot. You won't be charged unless you manually upgrade to a paid account.

Try Google Cloud for free

Step 2 of 2 Payment Information Verification

Your payment information helps us reduce fraud and abuse. If using a credit or debit card, you won't be charged until you manually activate your account.

Payments profile ⓘ

Choose the payments profile that will be associated with this account or transaction. A payments profile is shared and used across all Google products.

Thailand
Individual profile for Play, YouTube, and Colab
Payments profile ID: [REDACTED]

Payment method

VISA Visa [REDACTED]

START FREE

Access to all Google Cloud products

Get everything you need to build and run your apps, websites and services, including Firebase and the Google Maps API.

\$300 credit for free

Put Google Cloud to work with \$300 in credit to spend over the next 90 days.

No autocharge after free trial ends

We ask you for your credit card to make sure you are not a robot. If you use a credit or debit card, you won't be charged unless you manually activate your full account.

Welcome, Tuchsanai

Try Generative AI
Studio - Prompt, tune,
and deploy Google's
text, image, code, and
speech foundation
models ↗

Recommended based on your interest in General ▾

Pre-built solution templates ?

» Deploy a three-tier web app

Web app, rich media site, ecommerce website, database-backed website

» Deploy load balanced managed VMs

Data analysis, data pipeline, application logs, log management, log intelligence

» Create a data warehouse with BigQuery

Data warehouse, dashboards, ETL, analytics, data analysis

[View all Solutions](#)

Products

» Create a VM

Compute Engine

» Train and host ML models

Vertex AI

» Create a database

Cloud SQL

» Analyze and manage data

BigQuery

» Create a storage bucket

Cloud Storage

» Run containerized apps

Cloud Run

» Create a containerized app

Kubernetes Engine

» Embed maps

Google Maps Platform

» Convert text to speech

Text-to-Speech API

» Convert speech to text

Speech-to-Text API

[View all products](#)

[View all APIs](#)

[Compare with AWS and Azure](#) ↗

Interactive tutorials

» Building a custom website with Google...

15 min

» Get Started with Generative AI - Prompt...

5-60 min

» Get started with Compute Engine

5-60 min

» Query a public dataset with the Google Cloud...

5 min

[← Product details](#)

Compute Engine API

[Google Enterprise APIs](#)

Compute Engine API

[ENABLE](#)[TRY THIS API](#)[OVERVIEW](#)[DOCUMENTATION](#)[SUPPORT](#)

Overview

Creates and runs virtual machines on Google Cloud Platform.

Additional details

Type: [SaaS & APIs](#)

Last updated: 3/24/23

Category: [Compute](#), [Networking](#), [Google Enterprise APIs](#)

Service name: compute.googleapis.com

Tutorials and documentation

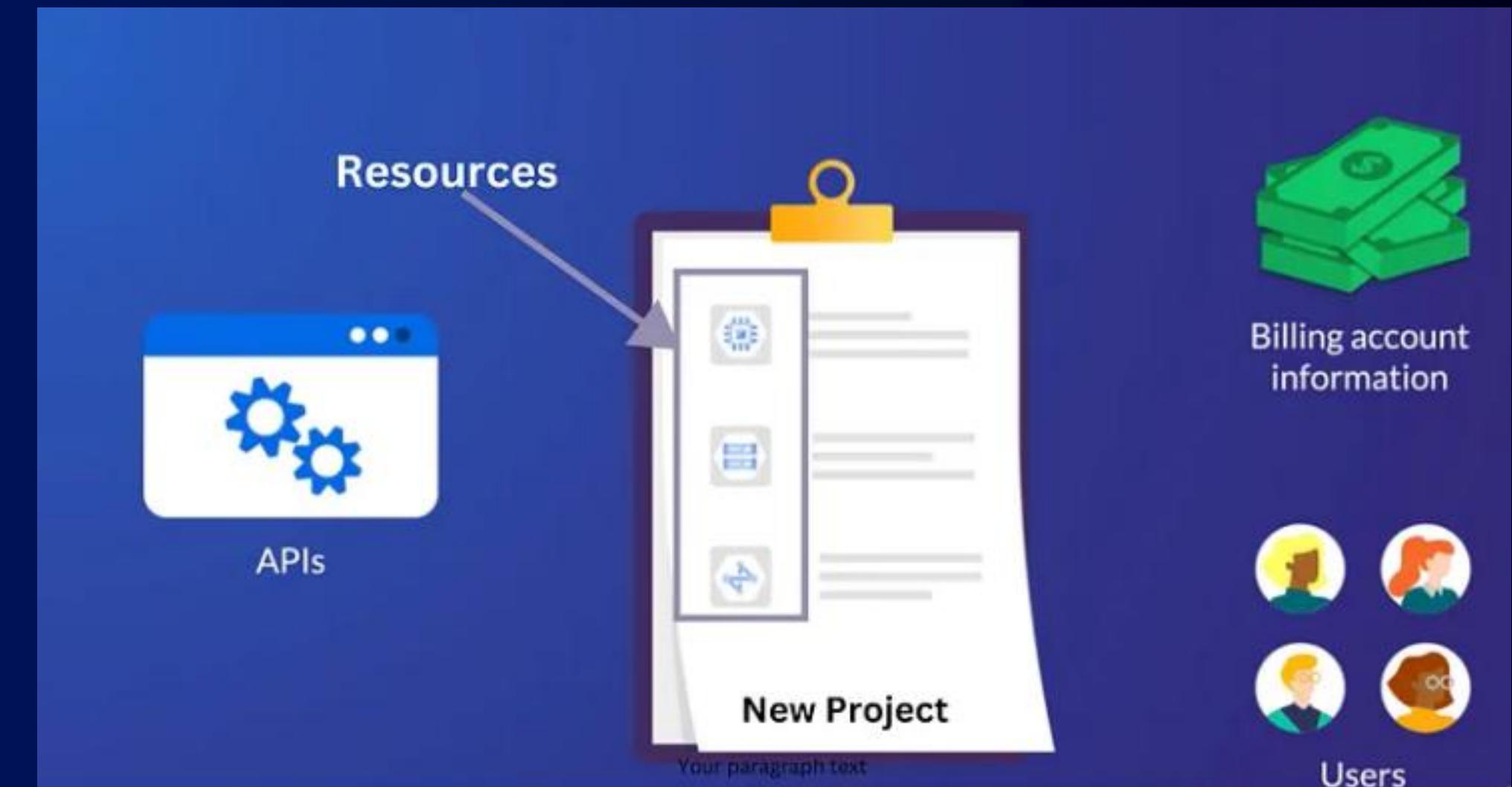
[Learn more](#)



LAB 1. Create a Project for GCP

1. Google Cloud Platform. Projects allow you to organize all the resources in your account easily. Every time you create a compute, storage, or network resource,

2. you must assign it to a Project. Projects also contain their own unique set of users, APIs, and billing account information.



The screenshot shows the Google Cloud Welcome screen. At the top, there is a navigation bar with the Google Cloud logo, a "Select a project" button (which is circled in red), a search bar, and several other icons. Below the navigation bar, the word "Welcome" is displayed in a large font next to the Google Cloud logo. A message encourages users to "Create or select a project to get up and running with Google Cloud." It includes a link to "Learn more about projects". Below this, there are two tabs: "Dashboard" (underlined) and "Recommendations". A "Try Gemini" button with a right-pointing arrow is visible. Under the "Quick access" section, there are eight cards: API APIs & Services, IAM & Admin, Billing, Compute Engine, Cloud Storage, BigQuery, VPC network, and Kubernetes Engine. At the bottom left, there is a "VIEW ALL PRODUCTS" button.

This screenshot shows a modal window titled "Select a project". The window displays a list of projects under the heading "RECENT". A single project, "tuchsanai", is listed with its name, ID, and a small icon. There is also a "Star" and "Unstar" button next to the project name. At the top right of the modal, there is a "NEW PROJECT" button (circled in red). At the bottom right, there is a "CANCEL" button.

Finish

Google Cloud

New Project

You have 22 projects remaining in your quota. Request an increase or delete projects. [Learn more](#)

[MANAGE QUOTAS](#)

Project name *

Project ID: mlops-class-2024. It cannot be changed later. [EDIT](#)

Location * [BROWSE](#)

Parent organization or folder

[CREATE](#) [CANCEL](#)

Google Cloud tuchsanai Search (/) for resources, docs, products, and more Search

Welcome

You're working in tuchsanai

Project number: 88599861549 Project ID: tuchsanai

[Dashboard](#) [Recommendations](#)

[+ Create a VM](#)

[Select a project](#) NEW PROJECT

Search projects and folders

RECENT	STARRED	ALL
Name	ID	Engine
✓ ⭐ tuchsanai	tuchsanai	mlops-class-2024
⭐ MLOPS-Class-2024		

Quick access

API APIs & Services

Cloud Storage

[VIEW ALL PRODUCTS](#)

Try our most advanced model: Gemini 1.5 Pro

Try Gemini →

CANCEL

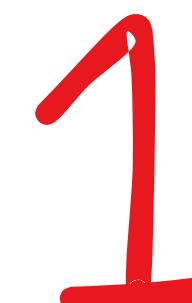
LAB 2. How Creating your first instance (virtual machine) in Google Cloud Platform (GCP)

Try Gemini: Prompt our new AI model with text, images, video, or code →

Go from prototype to production quickly with Gemini

Build generative AI apps with Vertex AI—enhanced by Gemini—our most capable multimodal model that delivers sophisticated results from simple inputs.

1



[Go to console](#) [Contact sales](#)

What's new in AI Upcoming events For developers

PRODUCT ANNOUNCEMENT
Learn how to customize and deploy Gemini in Vertex AI

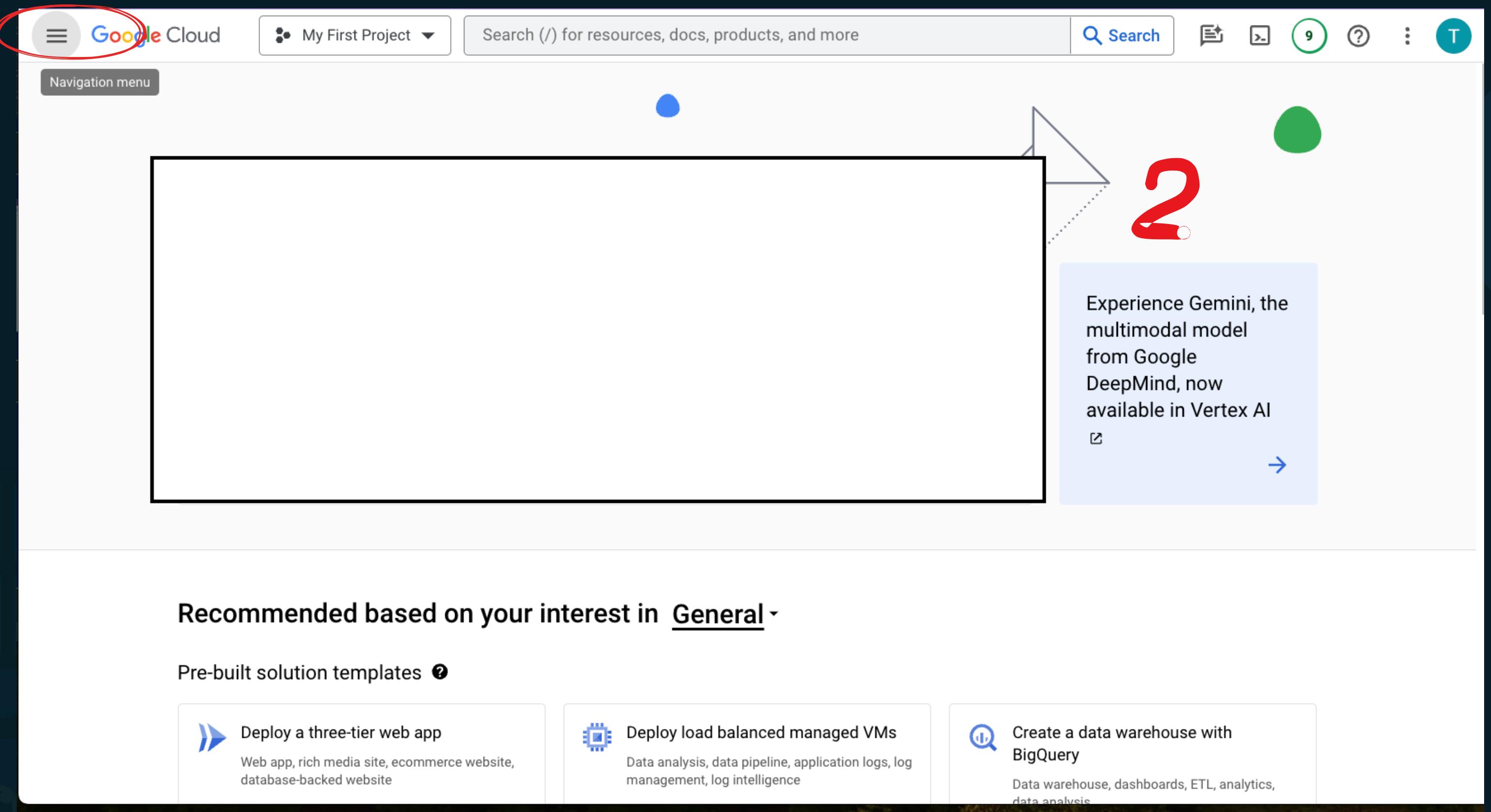


PRODUCT ANNOUNCEMENT
Catch up on our expanded Duet AI offerings for developer productivity



PRODUCT ANNOUNCEMENT
Deploy photorealistic image generation into production with Imagen 2 in Vertex AI





The screenshot shows the Google Cloud Platform homepage. At the top, there is a navigation bar with the "Google Cloud" logo, which is circled in red. To its right are links for "My First Project" and a search bar. Further right are icons for "Search", "Compose", "Cloud Shell", a notification bell with the number "9", a help icon, and a profile icon.

Below the navigation bar, there is a large, empty rectangular box outlined in black. To its right, a blue callout box contains a large red number "2". Inside the callout box, the text reads: "Experience Gemini, the multimodal model from Google DeepMind, now available in Vertex AI". There is also a small "↗" icon and a blue arrow pointing to the right.

Further down the page, the text "Recommended based on your interest in General ▾" is displayed. Below this, there is a section titled "Pre-built solution templates" with three items:

- Deploy a three-tier web app**
Web app, rich media site, ecommerce website, database-backed website
- Deploy load balanced managed VMs**
Data analysis, data pipeline, application logs, log management, log intelligence
- Create a data warehouse with BigQuery**
Data warehouse, dashboards, ETL, analytics, data analysis

Google Cloud

VIRTUAL MACHINES

- VM instances
- Instance templates
- Sole-tenant nodes
- Machine images
- TPUs
- Committed use discounts

STORAGE

- Disks
- Snapshots
- Images
- Async Replication

INSTANCE GROUPS

- Instance groups
- Health checks

VM MANAGER

- Patch

APIs & Services

Billing

IAM & Admin

Marketplace

Kubernetes Engine

Cloud Storage

BigQuery

VPC network

Cloud Run

SQL

Logging

Security

Compute Engine

Vertex AI

(/) for resources, docs, products, and more

Search

9

You're working on project [My First Project](#) ?

Number: 603981601739 ID: acquired-router-406202

Add people to your project

Set up budget alerts

Review product spend

Experience Gemini, the multimodal model from Google DeepMind, now available in Vertex AI

Deploy load balanced managed VMs

Create a data warehouse with Big Data

Interest in General ▾

← → C ⌛ console.cloud.google.com/compute/instances?hl=th&project=acquired-router-406202

Google Cloud My First Project Search (/) for resources, docs, products, and more Q S

Compute Engine VM instances CREATE INSTANCE IMPORT VM REFRESH

Virtual machines

VM instances

INSTANCES OBSERVABILITY INSTANCE SCHEDULES

VM instances

Filter Enter property name or value

Status Name ↑ Zone Recommendations In use by Internal IP External IP Connect

4

VM Instances

Compute Engine lets you use virtual machines that run on Google's infrastructure. Create micro-VMs or larger instances running Debian, Windows, or other standard images. Create your first VM instance, import it using a

Create an instance

To create a VM instance, select one of the options:

New VM instance

Create a single VM instance from scratch

New VM instance from template

Create a single VM instance from an existing template

New VM instance from machine image

Create a single VM instance from an existing machine image

Marketplace

Deploy a ready-to-go solution onto a VM instance

Name * ?

MANAGE TAGS AND LABELS

Region * ?

Region is permanent

Zone * ?

Zone is permanent

Monthly estimate

\$30.61

That's about \$0.04 hourly

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

Item	Monthly estimate
2 vCPU + 4 GB memory	\$30.17
10 GB standard persistent disk	\$0.44
Total	\$30.61

[Compute Engine pricing](#) ?

▲ LESS

Machine configuration

General purpose Compute optimized Memory optimized GPUs

Machine types for common workloads, optimized for cost and flexibility

Series ?	Description	vCPUs ?	Memory ?
<input type="radio"/>	C3	Consistently high performance	4 - 176 8 - 1,408 GB
<input type="radio"/>	C3D	Consistently high performance	4 - 360 8 - 2,880 GB
<input checked="" type="radio"/>	E2	Low cost, day-to-day computing	0.25 - 32 1 - 128 GB
<input type="radio"/>	N2	Balanced price & performance	2 - 128 2 - 864 GB
<input type="radio"/>	N2D	Balanced price & performance	2 - 224 2 - 896 GB

Create an instance

To create a VM instance, select one of the options:

New VM instance

Create a single VM instance from scratch

New VM instance from template

Create a single VM instance from an existing template

New VM instance from machine image

Create a single VM instance from an existing machine image

Marketplace

Deploy a ready-to-go solution onto a VM instance

DEPLOY CONTAINER

Boot disk ?

Name

Type

Size

License type ?

Image ?

[CHANGE](#)

!!Selected Ubuntu

Identity and API access ?

Service accounts ?

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

Monthly estimate

\$30.61

That's about \$0.04 hourly

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

Item	Monthly estimate
2 vCPU + 4 GB memory	\$30.17
10 GB standard persistent disk	\$0.44
Total	\$30.61

[Compute Engine pricing](#) ?

▲ LESS

[CREATE](#)

[CANCEL](#)

EQUIVALENT CODE

Google Cloud My First Project Search (/) for resources, docs, products, and more Search 10 ? T

Compute Engine VM instances CREATE INSTANCE IMPORT VM REFRESH LEARN

Virtual machines VM instances INSTANCES OBSERVABILITY INSTANCE SCHEDULES

VM instances Filter Enter property name or value

Status	Name ↑	Zone	Recommendations	In use by	Internal IP
<input type="checkbox"/>	instance-1	asia-southeast1-b			10.148.0.12 (nic0)

External IP 34.87.132.139 (nic0) Connect SSH

Related actions

Explore Backup and DR NEW Back up your VMs and set up disaster recovery

View billing report View and manage your Compute Engine billing

Monitor VMs View outlier VMs across metrics like CPU and network

Explore VM logs View, search, analyze, and download VM instance logs

Set up firewall rules Control traffic to and from a VM instance

Patch management Schedule patch updates and view patch compliance on VM instances

Load balance between VMs Set up Load Balancing for your applications as your traffic and users grow

Complete !



Finish

```
* Support: https://ubuntu.com/advantage
```

```
System information as of Fri Dec 22 05:29:36 UTC 2023
```

```
System load: 0.16
```

```
Processes: 99
```

```
Usage of /: 21.0% of 8.65GB
```

```
Users logged in: 0
```

```
Memory usage: 6%
```

```
IPv4 address for ens4: 10.148.0.12
```

```
Swap usage: 0%
```

```
0 updates can be applied immediately.
```



The list of available updates is more than a week old.

To check for new updates run: sudo apt update

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

```
tuchsanai@instance-1:~$
```

LAB3.How to create an SSH key for Google Cloud Platform (GCP)

Google Cloud My First Project Search (/) for resources, docs, products, and more Search 10 ? :

Compute Engine VM instances CREATE INSTANCE IMPORT VM REFRESH

Virtual machines VM instances INSTANCE OBSERVABILITY INSTANCE SCHEDULES

VM instances Filter Enter property name or value

Status	Name ↑	Zone	Recommendations	In use by	Internal IP	External IP	Connect
<input type="checkbox"/>	<input checked="" type="checkbox"/> instance-1	asia-southeast1-b			10.148.0.12 (nic0)	34.87.132.139 (nic0)	SSH

Related actions

Explore Backup and DR NEW Back up your VMs and set up disaster recovery

View billing report View and manage your Compute Engine billing

Monitor VMs View outlier VMs across metrics like CPU and network

Explore VM logs View, search, analyze, and download VM instance logs

Set up firewall rules Control traffic to and from a VM instance

Patch management Schedule patch updates and view patch compliance on VM instances

Load balance between VMs Set up Load Balancing for your applications as your traffic and users grow

Marketplace

Release Notes

<https://console.cloud.google.com/compute/instancesDetail/zones/asia-southeast1-b/instances/instance-1?hl=th&project=acquired-router-406202>

Compute Engine

instance-1

EDIT (highlighted with a red box)

RESET

CREATE MACHINE IMAGE

OPERATIONS

DETAILS (selected tab)

OBSERVABILITY

OS INFO

SCREENSHOT

SSH

CONNECT TO SERIAL CONSOLE

Connecting to serial ports is disabled [?](#)

Logs

[Logging](#)

[Serial port 1 \(console\)](#)

[SHOW MORE](#)

Basic information

Name	instance-1
Instance Id	885747146667227006
Description	None
Type	Instance
Status	<input checked="" type="checkbox"/> Running
Creation time	Dec 22, 2023, 11:45:14 AM UTC+07:00
Zone	asia-southeast1-b
Instance template	None
In use by	None
Reservations	Automatically choose
Labels	None
Tags ?	-
Deletion protection	Disabled



Compute Engine

Edit instance-1 instance

Virtual machines

VM instances

Instance templates

Sole-tenant nodes

Machine images

TPUs

Committed use discounts

Reservations

Migrate to Virtual Machin...

Storage

Disks

Snapshots

Images

Async Replication

Marketplace

Release Notes

Shielded VM ?

To edit Shielded VM features you need to stop the instance first.

Turn on all settings for the most secure configuration.

Turn on Secure Boot ?

Turn on vTPM ?

Turn on Integrity Monitoring ?

SSH Keys

These keys allow access only to this instance, unlike project-wide SSH keys. [Learn more](#)



Block project-wide SSH keys

When checked, project-wide SSH keys cannot access this instance. [Learn more](#)

+ ADD ITEM

Identity and API access ?

Service accounts ?

You must stop the VM instance to edit its service account

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 ?

You must stop the VM instance to edit its API access scopes

! SAVE

CANCEL

Google Cloud My First Project Search (/) for resources, docs, products, and more Search

Compute Engine Edit instance-1 instance

Virtual machines

- VM instances
- Instance templates
- Sole-tenant nodes
- Machine images
- TPUs
- Committed use discounts
- Reservations
- Migrate to Virtual Machin...

Storage

- Disks
- Snapshots
- Images
- Sync Replication
- Marketplace
- Release Notes

Shielded VM [?](#)

To edit Shielded VM features you need to stop the instance first.
Turn on all settings for the most secure configuration.

Turn on Secure Boot [?](#)

Turn on vTPM [?](#)

Turn on Integrity Monitoring [?](#)

SSH Keys

These keys allow access only to this instance, unlike project-wide SSH keys. [Learn more](#)

Block project-wide SSH keys
When checked, project-wide SSH keys cannot access this instance. [Learn more](#)

SSH key 1 *

Enter public SSH key

+ ADD ITEM

Identity and API access [?](#)

Service accounts [?](#)

You must stop the VM instance to edit its service account

Service account

Compute Engine default service account

Requires the Service Account User role (roles/iam.serviceAccountUser) to be set for users

SAVE CANCEL

วิธีสร้าง SSH Key

```
* Support: https://ubuntu.com/advantage
System information as of Fri Dec 22 05:29:36 UTC 2023
System load: 0.16 Processes: 99
Usage of /: 21.0% of 8.65GB Users logged in: 0
Memory usage: 6% IPv4 address for ens4: 10.148.0.12
Swap usage: 0%
0 updates can be applied immediately.

The list of available updates is more than a week old.
To check for new updates run: sudo apt update

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

tuchsanai@instance-1:~$
```

1. จาก ด้านบนพบว่า user:tuchsanai

Step 1: Generate the SSH Key Pair

1. Open a Terminal: On your local machine, open a terminal window.
2. Navigate to the Desired Directory: Use the `cd` command to navigate to the directory where you want to save the key. If you're already in the desired directory, you can skip this step.
3. Generate the SSH Key Pair: Use the `ssh-keygen` command to generate a new SSH key pair. The key will be saved in the current directory with the name `mykey`. Run the following command:

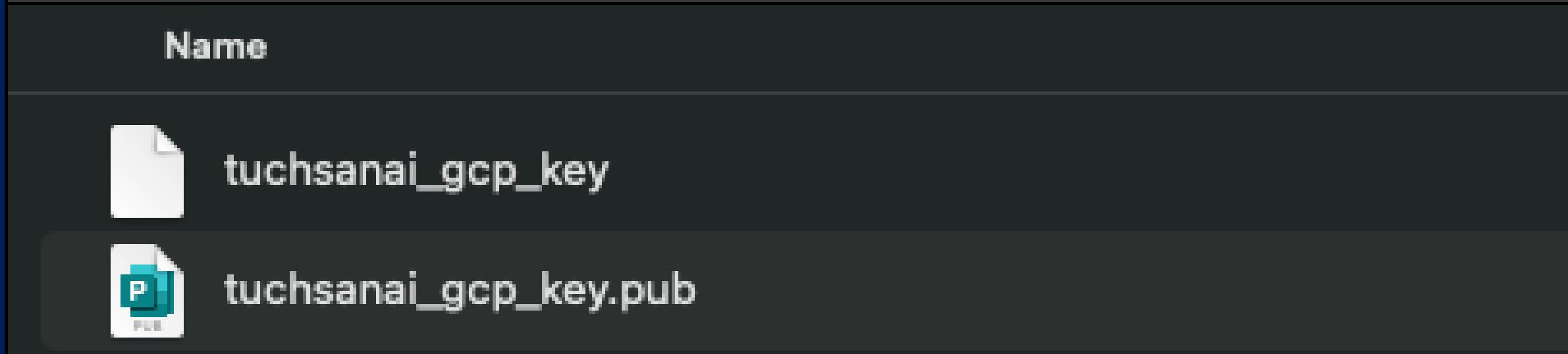
```
mkdir mykey
cd mykey
```

```
ssh-keygen -t rsa -b 2048 -C "tuchsanai" -f tuchsanai_gcp_key
```

- `-t rsa` : Specifies the type of key to create, in this case, RSA.
- `-b 2048` : Specifies the number of bits in the key, in this case, 2048 bits.
- `-C "username"` : Adds a comment to the key, here it is the username.
- `-f tuchsanai_gcp_key` : Specifies the filename and path of the key file.

2. ทำการสร้าง ssh key โดยใช้ user ของตัวเองดังรูป
ปล. สร้าง key ให้สร้างใน local com นะครับ

```
(base) tuchsanai@Tuchsanais-MacBook-Pro mykey % ssh-keygen -t rsa -b 2048 -C "tuchsanai" -f tuchsanai_gcp_key
Generating public/private rsa key pair.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in tuchsanai_gcp_key
Your public key has been saved in tuchsanai_gcp_key.pub
The key fingerprint is:
SHA256:c/LRSpAWrVO8GrZm5Aa5QP6V4CcmLQXKXcVb4cowNEI tuchsanai
The key's randomart image is:
+---[RSA 2048]----+
| .E.+ooo.. |
| . o.+o..+= |
| oo.+oo+*.. |
| = B=@o.. |
| * XS=+ . |
| o B* o |
| + o |
+---[SHA256]----+
```



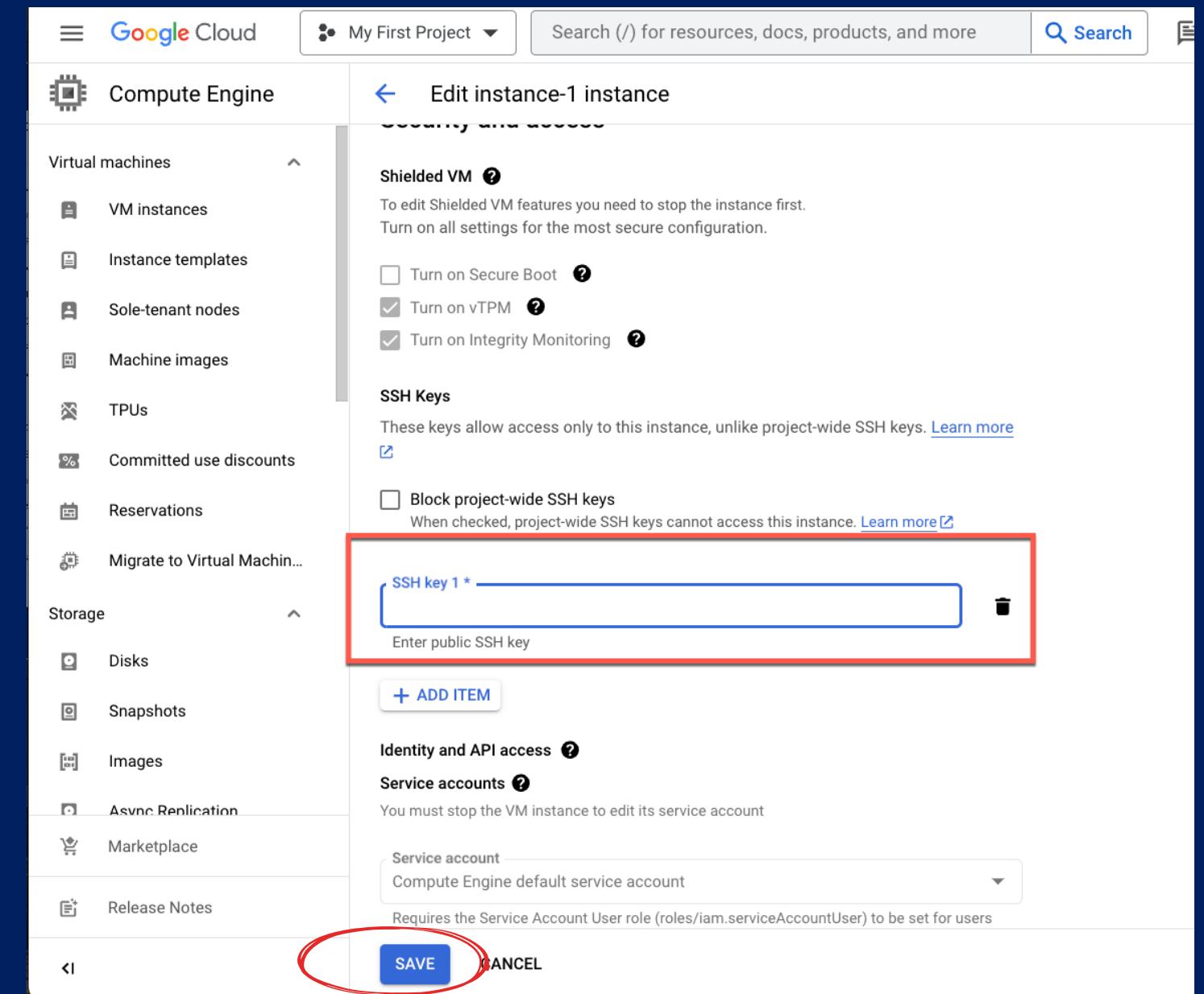
3. จะได้ File มา ทั้งหมด 2 files โดยที่
tuchsanai_gcp_key.pub คือ public key
tuchsanai_gcp_key คือ private key

```

1 ssh-rsa AAAAB3NzaC1yc2EAAAQABAAQDV/T4WDXpRzUqboc60/c
E9Xe5+nAJM0u1q0arq36siXjJS0grkDZbBmkSvK7XPTgBdXPnpKGQ4SJ0r
SJ9j8s95Bi3gJxna62jh87VmeMqobZYiI0dJM3HJvqAi7UKpwwug3MWXjM
jl+Yc9eiw7nPSfcS2n3VxN4CuJza2orKIiKwCFio9CVeMRnS2ATBC0013P
mcfCaa8JyMRp4y3zhhYvbXPsq9SgKd/nrD/
qQ2U3NG6R9r2knQJxSq3lz9Bps0qrQ6yjaFfevUIa/8bEzlsZ1MpYmZ9Lc
dzqdfnMaXFxEIjaolZUNz97qtH+5SCNrK5ngGtC36Q+ciJJf00vyDm7
tuchsanai
2

```

4. เมื่อทำการเปิด tuchsanai_gcp_key.pub ดูจะได้
ประมาณนี้



5. นำ public key : tuchsanai_gcp_key.pub มาใส่
ในช่องสุดท้าย โดยให้นำมากรอกแล้วกด enter
จากนั้นให้กด save ด้านล่าง

Step 2: Connect to a GCP Instance

1. **Find the External IP of Your Instance:** In the GCP console, go to the "VM instances" page and find the external IP address of the instance you want to connect to.

2. **Connect via SSH:** Use the SSH command to connect to the instance. Replace `[EXTERNAL_IP]` with the actual IP address:

```
ssh -i username.private username@[EXTERNAL_IP]
```

- `-i username.private` : Specifies the private key file for authentication.
- `username@[EXTERNAL_IP]` : The username and IP address of the GCP instance.

Following these steps, you should be able to generate an SSH key in your specified directory and use it to connect to your GCP instances securely. Remember to keep the private key (`mykey`) secure and private.

VM instances							
<input type="button" value="Filter"/> Enter property name or value							
<input type="checkbox"/>	Status	Name 	Zone	Recommendations	In use by	Internal IP	External IP
<input checked="" type="checkbox"/>		instance-20241225-011604	asia-southeast1-b			10.148.0.13 (nic0)	34.87.151.131 (nic0)

6. พนawa External IP គឺ 34.87.151.131

```
ssh -i tuchsanai_gcp_key tuchsanai@34.87.151.131
```

```
(base) tuchsanai@Tuchsanais-MacBook-Pro mykey % ssh -i tuchsanai_gcp_key tuchsanai@34.87.151.131
Welcome to Ubuntu 22.04.5 LTS (GNU/Linux 6.8.0-1020-gcp x86_64)
```

```
* Documentation: https://help.ubuntu.com
* Management: https://landscape.canonical.com
* Support: https://ubuntu.com/pro
```

```
System information as of Wed Dec 25 04:09:56 UTC 2024
```

```
System load: 0.0          Processes:      106
Usage of /: 20.9% of 9.51GB  Users logged in: 0
Memory usage: 5%           IPv4 address for ens4: 10.148.0.13
Swap usage: 0%
```

```
Expanded Security Maintenance for Applications is not enabled.
```

```
0 updates can be applied immediately.
```

```
Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status
```

```
The list of available updates is more than a week old.
To check for new updates run: sudo apt update
New release '24.04.1 LTS' available.
Run 'do-release-upgrade' to upgrade to it.
```

```
Last login: Wed Dec 25 04:07:16 2024 from 119.76.33.4
tuchsanai@instance-20241225-011604:~$
```

Finish



LAB4. Create Google Cloud Storage Bucket

1

Welcome

You're working in tuchsanai

Project number: 88599861549 Project ID: tuchsanai

Dashboard Recommendations

Create a VM Run a query in BigQuery Create a GKE cluster Create a storage bucket

Quick access

- API APIs & Services
- IAM & Admin
- Billing
- Compute Engine
- Cloud Storage
- BigQuery
- VPC network
- Kubernetes Engine

VIEW ALL PRODUCTS

Try our most advanced model: Gemini 1.5 Pro

Try Gemini →

The Google Cloud logo in the top left corner is circled in red.

2

Cloud overview Solutions

PINNED PRODUCTS

- API APIs & Services
- Billing
- IAM & Admin
- Marketplace
- Kubernetes Engine
- Cloud Storage
- BigQuery
- VPC Network
- Cloud Run
- SQL
- Logging
- Security
- Compute Engine
- Vertex AI

Overview NEW Buckets Monitoring Settings

VIEW ALL PRODUCTS

The 'Cloud Storage' menu item has a dropdown arrow pointing down. The 'Buckets' option in the dropdown is circled in red.

Google Cloud tuchsanai Search (/) for resources, docs, products, and more

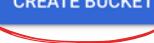
Cloud Storage Buckets + CREATE ⌂ REFRESH Filter buckets Overview NEW Buckets Monitoring Settings

No rows to display

3

Store and retrieve your data Get started by creating a bucket – a container where you can organize and control access to your data and files in Cloud Storage.

CREATE BUCKET TAKE QUICKSTART



Google Cloud tuchsanai Search (/) for resources, docs, products, and more

Cloud Storage Buckets Monitoring Settings

Get Started Name: lab_mlops_01xxv

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

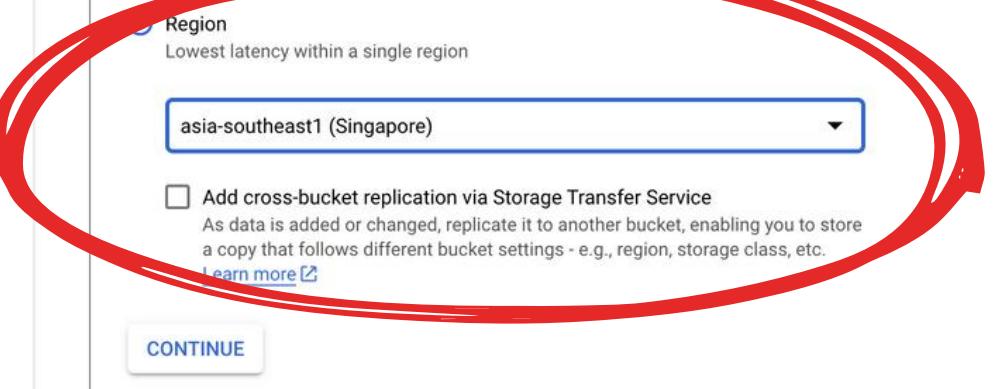
- Multi-region Highest availability across largest area
- Dual-region High availability and low latency across 2 regions
- Region Lowest latency within a single region

asia-southeast1 (Singapore)

Add cross-bucket replication via Storage Transfer Service As data is added or changed, replicate it to another bucket, enabling you to store a copy that follows different bucket settings - e.g., region, storage class, etc. Learn more

CONTINUE

5



Google Cloud tuchsanai ตั้งชื่อ อะไรก็ได้ Search (/) for resources, docs, products, and more

Cloud Storage Buckets Monitoring Settings

Create a bucket

Get Started Pick a globally unique, permanent name. Naming guidelines

lab_mlops_01xxv

Tip: Don't include any sensitive information

Optimize storage for data-intensive workloads

Labels (optional)

CONTINUE

Choose where to store your data Location: us (multiple regions in United States) Location type: Multi-region

Choose a storage class for your data Default storage class: Standard

Choose how to control access to objects Public access prevention: On Access control: Uniform

Choose how to protect object data Soft delete policy: Default Object versioning: Disabled Bucket retention policy: Disabled

4



Google Cloud tuchsanai Search (/) for resources, docs, products, and more

Cloud Storage Buckets Monitoring Settings

Get Started Name: lab_mlops_01xxv

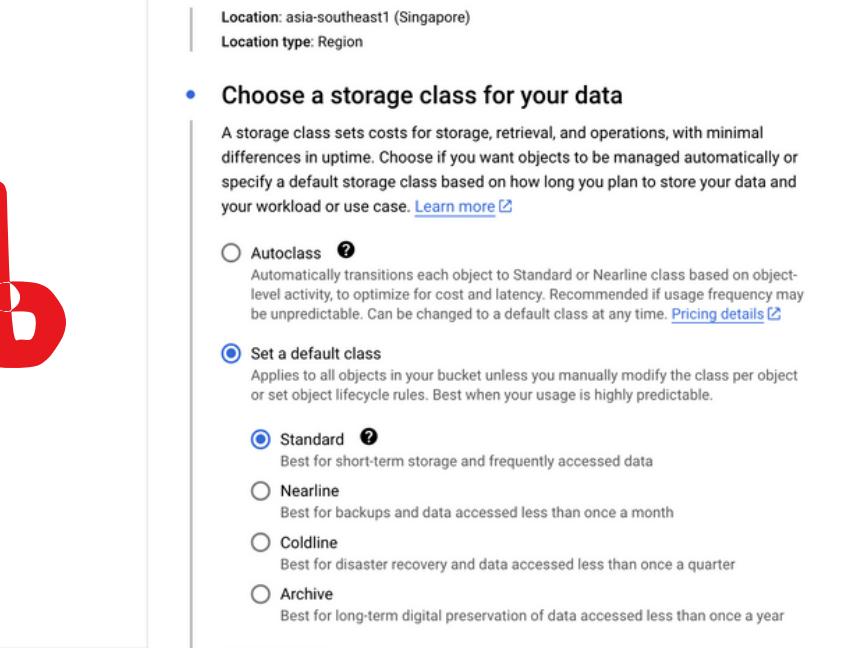
Choose where to store your data Location: asia-southeast1 (Singapore) Location type: Region

Choose a storage class for your data A storage class sets costs for storage, retrieval, and operations, with minimal differences in uptime. Choose if you want objects to be managed automatically or specify a default storage class based on how long you plan to store your data and your workload or use case. Learn more

- Autoclass Automatically transitions each object to Standard or Nearline class based on object-level activity, to optimize for cost and latency. Recommended if usage frequency may be unpredictable. Can be changed to a default class at any time. Pricing details
- Set a default class Applies to all objects in your bucket unless you manually modify the class per object or set object lifecycle rules. Best when your usage is highly predictable.
- Standard Best for short-term storage and frequently accessed data
- Nearline Best for backups and data accessed less than once a month
- Coldline Best for disaster recovery and data accessed less than once a quarter
- Archive Best for long-term digital preservation of data accessed less than once a year

Marketplace CONTINUE

6



Google Cloud tuchsanai Search (/) for resources, docs, products, and more

Cloud Storage Create a bucket

Get Started Name: lab_mlops_01xxv

Choose where to store your data Location: asia-southeast1 (Singapore)
Location type: Region

Choose a storage class for your data Default storage class: Standard

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

7

Google Cloud tuchsanai Search (/) for resources, docs, products, and more

Cloud Storage Create a bucket

Get Started Name: lab_mlops_01xxv

Choose where to store your data Location: asia-southeast1 (Singapore)
Location type: Region

Choose a storage class for your data Default storage class: Standard

Choose how to control access to objects Public access prevention: On
Access control: Uniform

Choose how to protect object data Your data is always protected with Cloud Storage but you can also choose from these additional data protection options to add extra layers of security.

Data protection

Soft delete policy (For data recovery) When enabled, this bucket and its objects will be kept for a specified period after they're deleted and can be restored during this time. [Learn more](#)

Use default retention duration All buckets have a 7 day soft delete duration by default, unless this default has been customized by your organization administrator.

Set custom retention duration Specify how long this bucket and its objects should be retained after they're deleted. Setting a "0" duration disables soft delete, meaning any deleted objects will be permanently deleted.

Object versioning (For version control) For restoring deleted or overwritten objects. To minimize the cost of storing versions, we recommend limiting the number of concurrent versions per object and scheduling them to expire after a number of days. [Learn more](#)

Retention (For compliance) For preventing the deletion or modification of the bucket's objects for a specified period of time.

DATA ENCRYPTION

Marketplace

Release Notes

CREATE CANCEL

8

Good to know

Location pricing Storage rates vary depending on the storage class of your data and location of your bucket. [Pricing details](#)

Current configuration: Region / Standard

Item	Cost
asia-southeast1 (Singapore)	\$0.020 per GB-month

ESTIMATE YOUR MONTHLY COST

Good to know

Location pricing Storage rates vary depending on the storage class of your data and location of your bucket. [Pricing details](#)

Current configuration: Region / Standard

Item	Cost
asia-southeast1 (Singapore)	\$0.020 per GB-month

ESTIMATE YOUR MONTHLY COST

Public access will be prevented

This bucket is set to prevent exposure of its data on the public internet.

Keep this setting enabled unless you have a use case that requires public access (such as static website hosting). You can change it now or later. [Learn more](#)

Enforce public access prevention on this bucket

Don't show this message again

CANCEL **CONFIRM**

9

Finish

Google Cloud tuchsanai Search (/) for resources, docs, products, and more

Cloud Storage Bucket details

lab_mllops_01xxv

Location	Storage class	Public access	Protection
asia-southeast1 (Singapore)	Standard	Not public	Soft Delete

OBJECTS CONFIGURATION PERMISSIONS PROTECTION LIFECYCLE OBSERVABILITY INVENTORY REPORTS OPERATIONS

Buckets > lab_mllops_01xxv CREATE FOLDER UPLOAD TRANSFER DATA OTHER SERVICES

Filter by name prefix only Filter objects and folders Show Live objects only

Name	Size	Type	Created	Storage class	Last modified	Public access	Version history	Encryption	Object retention retain until time	Retention expiration time
No rows to display										

Your bucket is ready. Just add data.
Drop files and folders here or use the upload button. To move a lot of data from another bucket or cloud storage provider, create a transfer job.

UPLOAD FILES CREATE TRANSFER JOB

Google Cloud tuchsanai Search (/) for resources, docs, products, and more

Cloud Storage Bucket details

lab_mllops_01xxv

Location	Storage class	Public access	Protection
asia-southeast1 (Singapore)	Standard	Not public	Soft Delete

OBJECTS CONFIGURATION PERMISSIONS PROTECTION LIFECYCLE OBSERVABILITY INVENTORY REPORTS OPERATIONS

Buckets > lab_mllops_01xxv CREATE FOLDER UPLOAD TRANSFER DATA OTHER SERVICES

Filter by name prefix only Filter objects and folders Show Live objects only

Name	Size	Type	Created	Storage class	Last modified	Public access	Version history	Encryption
balloon.jpg	45 KB	image/jpeg	Dec 24, 2024, 5:05:05 AM	Standard	Dec 24, 2024, 5:05:05 AM	Not public	-	

Test Upload File

Lab 5. How to Open Port for Cloud Platform (GCP)

Compute Engine

VM instances [CREATE INSTANCE](#) [IMPORT VM](#) [REFRESH](#)

[INSTANCES](#) [OBSERVABILITY](#) [INSTANCE SCHEDULES](#)

Virtual machines

- [VM instances](#)
- [Instance templates](#)
- [Sole-tenant nodes](#)
- [Machine images](#)
- [TPUs](#)
- [Committed use discounts](#)
- [Reservations](#)
- [Migrate to Virtual Machin...](#)

Storage

- [Disks](#)
- [Snapshots](#)
- [Images](#)
- [Async Replication](#)

Instance groups

- [Instance groups](#)
- [Health checks](#)

VM Manager

- [Patch](#)
- [OS policies](#)

VM instances

Filter Enter property name or value

Status	Name ↑	Zone	Recommendations	In use by	Internal IP	External IP	Connect
<input checked="" type="checkbox"/>	instance-2	asia-southeast1-b			192.168.1.2 (nic0)	34.143.159.17 (nic0)	SSH

Related actions

- [Explore Backup and DR NEW](#)
- [View billing report](#)
- [Monitor VMs](#)
- [Explore VM logs](#)

More actions / Resume

- Stop
- Suspend
- Reset
- Delete
- Create a group based on this VM PREVIEW
- View network details** (circled in red)
- Create new machine image
- View logs
- View monitoring

<https://www.youtube.com/watch?v=-RjDWwTZUnc&t=40s>



VPC network



VPC networks



IP addresses



Bring your own IP



Firewall



Routes



VPC network peering



Shared VPC



Serverless VPC access



Packet mirroring

Network interface details

Selected network interface: nic0

Network interface details

Name	Network	Subnetwork	Primary internal IP address	Alias IP ranges	IP stack type	External IP address	Network Service Tier
nic0	myvpc	private	192.168.1.2	—	IPv4	34.143.159.17	Premium

VM instance details

Name	Zone	Network tags	Service account	IP forwarding
instance-2	asia-southeast1-b	http-server, https-server	603981601739-compute@developer.gserviceaccount.com	Off

Firewall and routes details

[FIREWALLS](#) [ROUTES](#)[Filter](#) Enter property name or value

Name	Enforcement order	Type	Deployment scope	Rule priority	Targets	Source	Destination
vpc-firewall-rules	1	VPC firewall rules	Global				

Network analysis

[CONNECTIVITY TESTS](#)

Enable Network Management API

Connectivity test requires Network Management API. This is a one-time enablement per project and may take a few minutes to complete.

[ENABLE API](#)

Network Security

- Secure Web Proxy
- Cloud Armor
 - Cloud Armor policies
 - Adaptive Protection
 - Managed Protection
- Cloud IDS
 - IDS Dashboard
 - IDS Endpoints
 - IDS Threats
- Cloud Firewall
 - Firewall policies**
 - Threats PREVIEW
 - Firewall endpoints PREVIEW
- Common components
 - Security profiles PREVIEW
 - SSL policies

Firewall policies [+ CREATE FIREWALL POLICY](#) [+ CREATE FIREWALL RULE](#)

VPC firewall rules

Firewall rules control incoming or outgoing traffic to an instance. By default, incoming traffic from outside your network is blocked. [Learn more ↗](#)

Note: App Engine firewalls are managed in the [App Engine Firewall rules section ↗](#).

i SMTP port 25 disallowed in this project. [Learn more ↗](#)

[REFRESH](#) [CONFIGURE LOGS](#) [DELETE](#)

Filter Enter property name or value

<input type="checkbox"/>	Name	Type	Targets	Filters	Protocols / ports
<input type="checkbox"/>	default-allow-health-check	Ingress	lb-health-ch	IP ranges: 35.191.0.0/1	tcp
<input type="checkbox"/>	default-allow-health-check-ipv6	Ingress	lb-health-ch	IP ranges: 2600:1901:8	tcp
<input type="checkbox"/>	default-allow-http	Ingress	http-server	IP ranges: 0.0.0.0/0	tcp:80
<input type="checkbox"/>	default-	Ingress	https-server	IP ranges: 0.0.0.0/0	tcp:443

Network Security

- [Secure Web Proxy](#)
- [Cloud Armor](#)
- [Cloud Armor policies](#)
- [Adaptive Protection](#)
- [Managed Protection](#)
- [Cloud IDS](#)
- [IDS Dashboard](#)
- [IDS Endpoints](#)
- [IDS Threats](#)
- [Cloud Firewall](#)
- [Firewall policies](#) PREVIEW
- [Threats](#) PREVIEW
- [Firewall endpoints](#) PREVIEW

Common components

- [Security profiles](#) PREVIEW
- [SSL policies](#)
- [Client Authentication](#)

Create a firewall rule

Name * my-custom-firewalls

Lowercase letters, numbers, hyphens allowed

Description My define Firewall

Logs

Turning on firewall logs can generate a large number of logs which can increase costs in Logging. [Learn more](#)

On

Off

Network * default

Priority * 10000 CHECK PRIORITY OF OTHER FIREWALL RULES

Priority can be 0 - 65535

Direction of traffic ?

Ingress

Egress

Action on match ?

Allow

Deny

Targets All instances in the network

Source filter IPv4 ranges

Source IPv4 ranges * 0.0.0.0/0 ×

Second source filter None

Network Security

- [Secure Web Proxy](#)
- [Cloud Armor](#)
- [Cloud Armor policies](#)
- [Adaptive Protection](#)
- [Managed Protection](#)
- [Cloud IDS](#)
- [IDS Dashboard](#)
- [IDS Endpoints](#)
- [IDS Threats](#)
- [Cloud Firewall](#)
- [Firewall policies](#) PREVIEW
- [Threats](#) PREVIEW
- [Firewall endpoints](#) PREVIEW

Create a firewall rule

Deny

Targets All instances in the network

Source filter IPv4 ranges

Source IPv4 ranges * 0.0.0.0/0 ×

Second source filter None

Destination filter None

Protocols and ports ?

Allow all

Specified protocols and ports

TCP

Ports 8080-8095

E.g. 20, 50-60

UDP

Ports

E.g. all

Other

Protocols

Separate multiple protocols by commas, e.g. ah, sctp

CREATE CANCEL

EQUIVALENT COMMAND LINE

Google Cloud My First Project Search (/) for resources, docs, products, and more Search

Network Security Firewall policies CREATE FIREWALL POLICY CREATE FIREWALL RULE

Note: App Engine firewalls are managed in the [App Engine Firewall rules section](#).

SMTP port 25 disallowed in this project. [Learn more](#)

REFRESH CONFIGURE LOGS DELETE

Filter Enter property name or value

<input type="checkbox"/>	Name	Type	Targets	Filters	Protocols / ports	Action	Priority	Network	Logs
<input type="checkbox"/>	default-allow-health-check	Ingress	lb-health-check	IP ranges: 35.191.0.0/16, 130.211.0.0/22, 209.85.152.0/22, 209.85.204.0/22	tcp	Allow	1000	default	Off
<input type="checkbox"/>	default-allow-health-check-ipv6	Ingress	lb-health-check	IP ranges: 2600:1901:8001::/48, 2600:2d00:1:b029::/64	tcp	Allow	1000	default	Off
<input type="checkbox"/>	default-allow-http	Ingress	http-server	IP ranges: 0.0.0.0/0	tcp:80	Allow	1000	default	Off
<input type="checkbox"/>	default-allow-https	Ingress	https-server	IP ranges: 0.0.0.0/0	tcp:443	Allow	1000	default	Off
<input type="checkbox"/>	my-custom-firewalls	Ingress	Apply to all	IP ranges: 0.0.0.0/0	tcp:8080-8095	Allow	10000	default	Off
<input type="checkbox"/>	default-allow-icmp	Ingress	Apply to all	IP ranges: 0.0.0.0/0	icmp	Allow	65534	default	Off
<input type="checkbox"/>	default-allow-internal	Ingress	Apply to all	IP ranges: 10.128.0.0/9	tcp:0-65535 udp:0-65535 icmp	Allow	65534	default	Off
<input type="checkbox"/>	default-allow-rdp	Ingress	Apply to all	IP ranges: 0.0.0.0/0	tcp:3389	Allow	65534	default	Off
<input type="checkbox"/>	default-allow-ssh	Ingress	Apply to all	IP ranges: 0.0.0.0/0	tcp:22	Allow	65534	default	Off
<input type="checkbox"/>	myvpc-allow-http	Ingress	http-server	IP ranges: 0.0.0.0/0	tcp:80	Allow	1000	myvpc	Off
<input type="checkbox"/>	myvpc-allow-https	Ingress	https-server	IP ranges: 0.0.0.0/0	tcp:443	Allow	1000	myvpc	Off
<input type="checkbox"/>	port8080	Ingress	Apply to all	IP ranges: 0.0.0.0/0	tcp:8080, 8081	Allow	1000	myvpc	Off
<input type="checkbox"/>	myvpc-allow-ssh	Ingress	Apply to all	IP ranges: 0.0.0.0/0	tcp:22	Allow	65534	myvpc	Off

Network firewall policies

Firewall policies let you group several firewall rules so that you can update them all at once, effectively controlled by Identity and Access Management (IAM) roles. [Learn more](#)