<TOP>

Feb 21, 2025

🟢 How to Import

The process is pretty straightforward—you can create the VM with just a single command. However, the initial setup and the post-creation configuration can be quite confusing and tedious.

- First, upload the .ova file to a Google Cloud Platform (GCP) bucket via GCloud CLI or the console UI. You can run cloud CLI locally in a terminal or in the Cloud shell. (I uploaded the file through the console, hence I will skip the gcloud CLI here.)

- Set up a **host project** and a **target project**, both of which could be the same project. e.g. I chose "P1 Udacity Robotics 20250220" as both. Set up roles and permissions in GCP IAM (similar to AWS IAM) by following the official documentation.
  e.g. Find the the service account used to run a Compute Engine instance:
  service-HOST_PROJECT_NUMBER@gcp-sa-vmmigration.iam.gserviceaccount.com

✅✅✅ Feb 24, 2025 Update: In the section below I introduce 2 ways to create an instance from the .ova file. I would recommend the 2nd way, unzip .ova -> .vmdk -> create an image (not machine image) from .vmdk -> create an instance from image.

- Then, spend some time on choosing the right VM type, and create a Virtual Machine instance from the .ova file. During the creation, you can check the progress by visiting "GCP Compute Engine -> Storage -> Disks". Once it is created, you can find the VM in "Compute Engine -> Virtual machines -> VM instances". You can find the code template on the console after configuring the instance type under the "CREATE INSTANCE" tab.

  ✅ $ **gcloud compute instances import** instance-robond-cpu-20250222 \
  --source-uri=gs://p1_udacity_robotics/Ubuntu_64-bit_Robo_V2.1.0.ova \
  --zone=us-central1-a \
  --os=ubuntu-1604 \
  --machine-type=n1-highmem-8 ## e2-medium - probably no need to use small instance for import
  ~~--accelerator=count=1,type=nvidia-tesla-t4-vws~~ ## ❌ the "import" command doesn't have this argument

e.g. You can create a GPU instance with a lot of configuration. However you can't do it with the "import" command.

```
$ gcloud compute instances create instance-robond-20250223-000614
--project=tactile-timer-451521-d6 --zone=us-central1-a
--machine-type=n1-highmem-8
--network-interface=network-tier=PREMIUM,stack-type=IPV4_ONLY,subnet=default --maintenance-policy=TERMINATE --provisioning-model=STANDARD
--service-account=823353037229-compute@developer.gserviceaccount.com
--scopes=https://www.googleapis.com/auth/devstorage.read_only,https://www.googleapis.com/auth/logging.write,https://www.googleapis.com/auth/monitoring.write,https://www.googleapis.com/auth/service.management.readonly,https://www.googleapis.com/auth/servicecontrol,https://www.googleapis.com/auth/trace.append
--accelerator=count=1,type=nvidia-tesla-t4
--create-disk=auto-delete=yes,boot=yes,device-name=instance-robond-20250223-000614,image=projects/debian-cloud/global/images/debian-12-bookworm-v20250212,mode=rw,size=100,type=pd-balanced --no-shielded-secure-boot
--shielded-vtpm --shielded-integrity-monitoring
--labels=goog-ec-src=vm_add-gcloud --reservation-affinity=any
```

✅ Use the above command to create a CPU instance, then edit the instance to add GPU (accelerator).

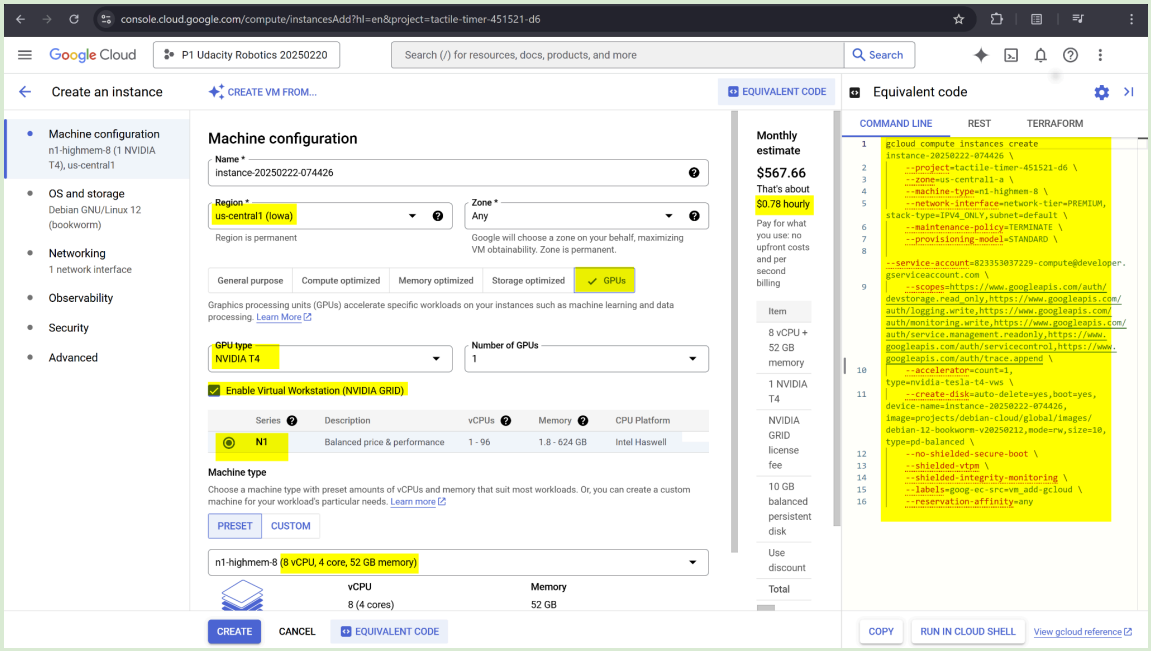
Choose "terminate maintenance" rather than "migrate", or you will get the Error:
Instances with guest accelerators do not support live migration.

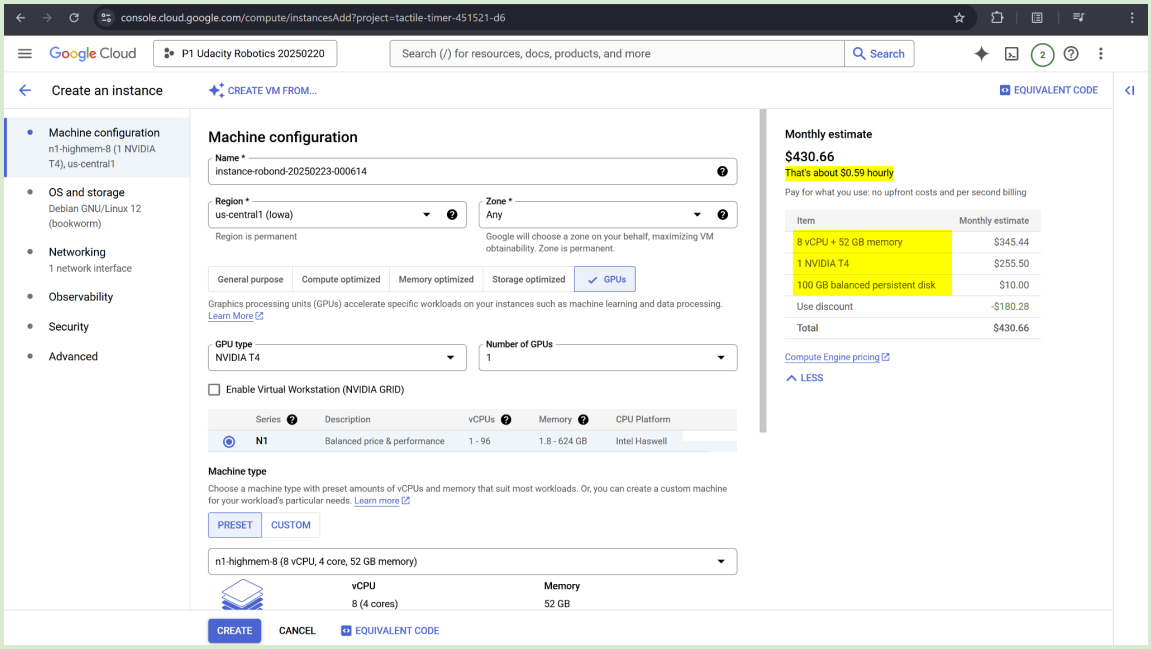
Once you have successfully edited the instance, you can try to start it. However, certain GPU types might not be available in certain zones.

e.g. The Nvidia T4 is almost impossible to obtain.

Machine configuration

Machine type	n1-highmem-8 (8 vCPUs, 52 GB Memory)
CPU platform	Unknown CPU Platform
Minimum CPU platform	None
Architecture	x86/64
vCPUs to core ratio	—
Custom visible cores	—
All-core turbo-only mode	—
Display device	Disabled Enable to use screen capturing and recording tools
GPUs	1 x NVIDIA Tesla P4 Virtual Workstation
Resource policies	

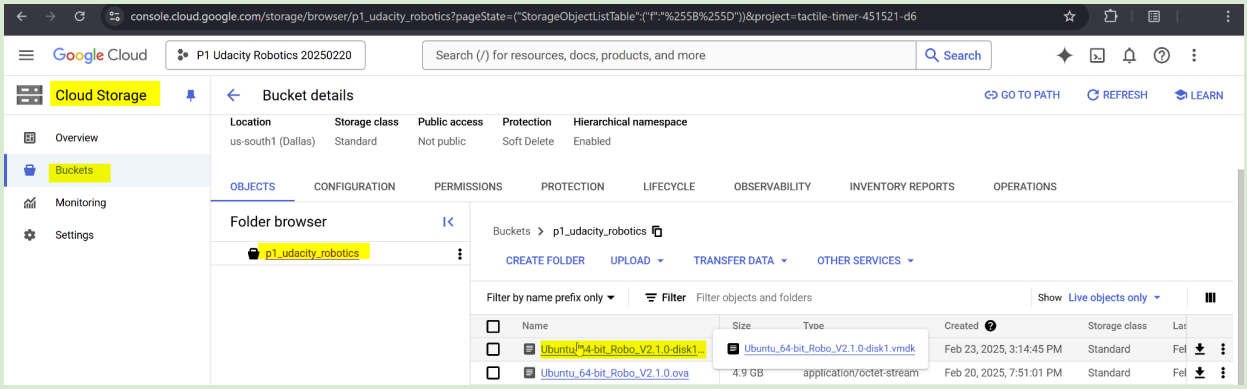




- [Import a machine image to Compute Engine](#) (if you don't create instance from .ova)
    - locally **tar -xvf** unzip the .ova file. upload the .vmdk file to a gcp bucket. Import the machine image from the Compute Engine console or by using the following gcloud cli.

$ gcloud alpha migration vms machine-image-imports create IMAGE_NAME \
--source-file=SOURCE_FILE \
--location=REGION_ID \
--target-project=projects/HOST_PROJECT_ID/locations/global/targetProjects/TARGET_PROJECT

e.g. (I haven't tried this command.)
$ gcloud alpha migration vms machine-image-imports create image_robond_20250223
--source_file=gs://p1_udacity_robotics/Ubuntu_64-bit_Robo_V2.1.0.ova
--location=central1
--target-project=projects/tactile-timer-451521-d6/locations/targetProjects/tactile-timer-451521-d6


console.cloud.google.com/storage/browser/p1_udacity_robotics?pageState=("StorageObjectListTable":("f":"%255B%255D"))&project=tactile-timer-451521-d6
Google Cloud
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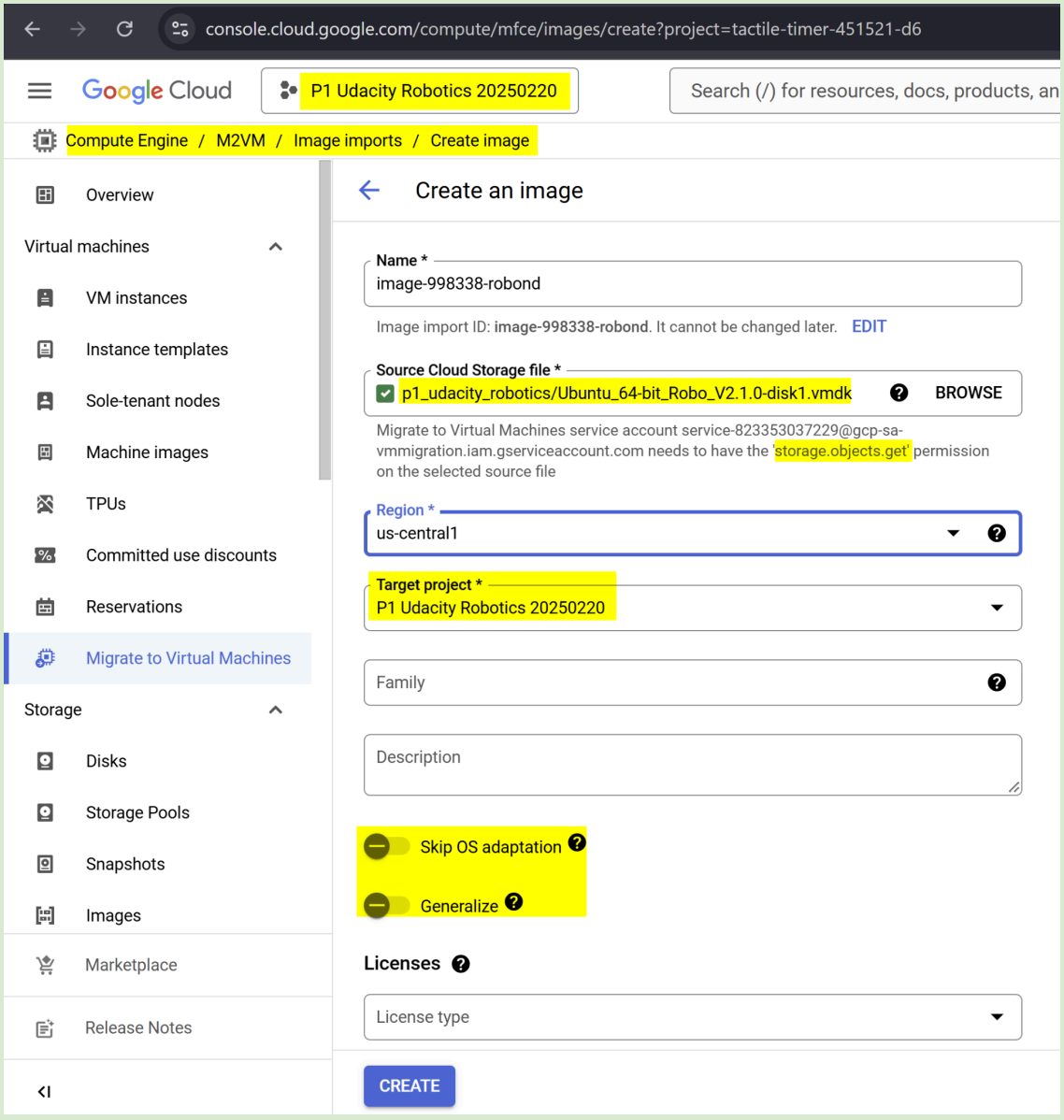
Search (/) for resources, docs, products, and more
Search
Cloud Storage
Bucket details
GO TO PATH
REFRESH
LEARN
Overview
Buckets
Monitoring
Settings
Location
us-south1 (Dallas)
Storage class
Standard
Public access
Not public
Protection
Soft Delete
Hierarchical namespace
Enabled
OBJECTS
CONFIGURATION
PERMISSIONS
PROTECTION
LIFECYCLE
OBSERVABILITY
INVENTORY REPORTS
OPERATIONS
Folder browser
p1_udacity_robotics
Buckets
p1_udacity_robotics
CREATE FOLDER
UPLOAD
TRANSFER DATA
OTHER SERVICES
Filter by name prefix only
Filter
Filter objects and folders
Show
Live objects only
Name
Size
Type
Created
Storage class
Ubuntu_64-bit_Robo_V2.1.0-disk1...
Ubuntu_64-bit_Robo_V2.1.0-disk1.vmdk
Feb 23, 2025, 3:14:45 PM
Standard
Ubuntu_64-bit_Robo_V2.1.0.ova
4.9 GB
application/octet-stream
Feb 20, 2025, 7:51:01 PM
Standard


console.cloud.google.com/compute/mfce/images/create?project=tactile-timer-451521-d6
Google Cloud
P1 Udacity Robotics 20250220
Search (/) for resources, docs, products, an
Compute Engine / M2VM / Image imports / Create image
Overview
Virtual machines
VM instances
Instance templates
Sole-tenant nodes
Machine images
TPUs
Committed use discounts
Reservations
Migrate to Virtual Machines
Storage
Disks
Storage Pools
Snapshots
Images
Marketplace
Release Notes
Create an image
Name *
image-998338-robond
Image import ID: image-998338-robond. It cannot be changed later. EDIT
Source Cloud Storage file *
p1_udacity_robotics/Ubuntu_64-bit_Robo_V2.1.0-disk1.vmdk
BROWSE
Migrate to Virtual Machines service account service-823353037229@gcp-sa-vmmigration.iam.gserviceaccount.com needs to have the 'storage.objects.get' permission on the selected source file
Region *
us-central1
Target project *
P1 Udacity Robotics 20250220
Family
Description
Skip OS adaptation
Generalize
Licenses
License type
CREATE

Failed to create image.

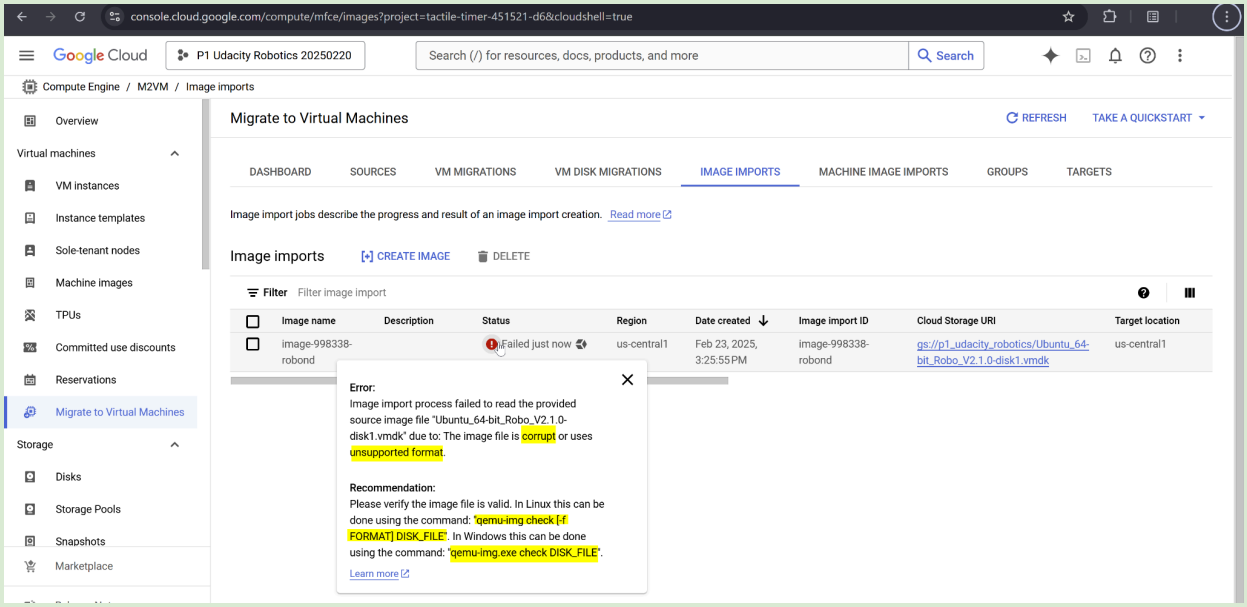
Failed to create image.

Additional information:
generic::permission_denied: Permission "storage.objects.get" denied on "gs://p1_udacity_robotics/Ubuntu_64-bit_Robo_V2.1.0-disk1.vmdk", or it may not exist: Please make sure the service account "service-823353037229@gcp-sa-vmmigration.iam.gserviceaccount.com" is granted with the Storage Object Viewer role. This can be done with the following command: gcloud storage buckets add-iam-policy-binding gs://p1_udacity_robotics --member=serviceAccount:service-823353037229@gcp-sa-vmmigration.iam.gserviceaccount.com --role=roles/storage.objectViewer

Tracking number: c5594671354209651

SEND FEEDBACK CLOSE

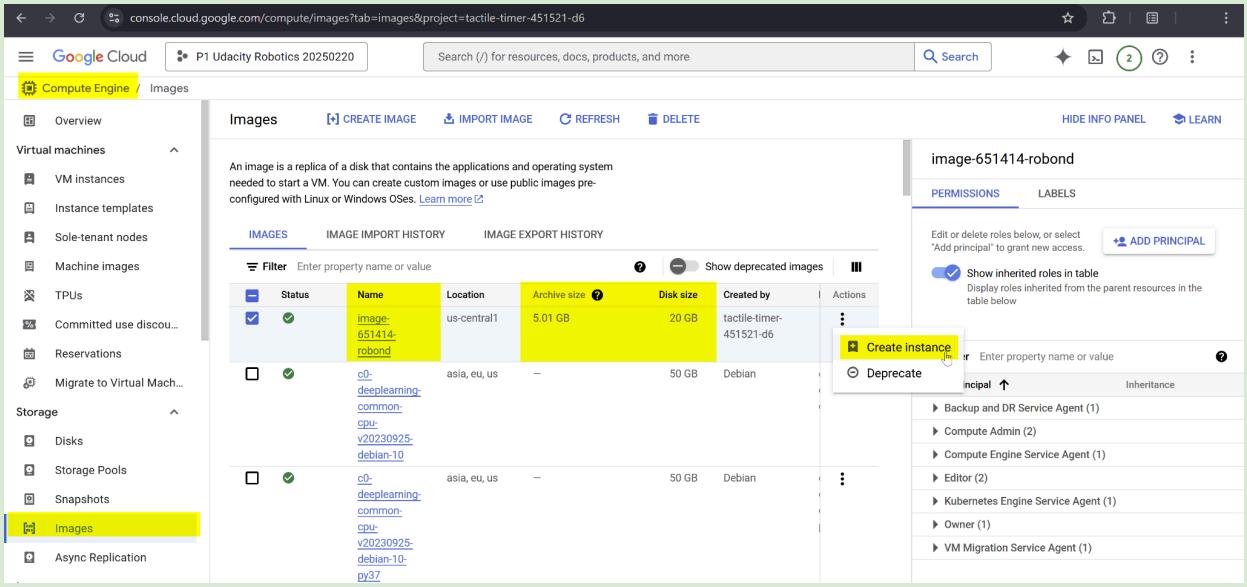
✅ $ gcloud **storage buckets add-iam-policy-binding** gs://p1_udacity_robotics --member=serviceAccount:service-823353037229@gcp-sa-vmmigration.iam.gserviceaccount.com --role=roles/storage.objectViewer



🟢⚠️ Issue solved: Here my .vmdk file is corrupted. Because I didn't wait for the "tar -xvf" command to end its execution. It takes a while to unzip and then upload to the cloud.

$ sudo tar -xvf 'Ubuntu 64-bit Robo V2.1.0.ova'

$ qemu-img check -f vmdk <disk_file> (<- not sure whether this works)



👉 Tips:

- If you create an instance from an image (not a machine image), you can change the disk type and size. Here I will change it from 20GB to 40GB. This way offers more flexibility to choose the hardware than directly creating an instance by importing an .ova file.
- You can start from a less capable instance, if later you think it is not working well, you can stop the instance and edit it to increase the hardware capability.

  NVIDIA L4 $408.83 per month

  NVIDIA Tesla P4 $438.00 (almost impossible to obtain)

  NVIDIA V100 $1,810.40

  NVIDIA A100 40GB $2,141.75

- Finally, you can connect to the VM via SSH. Here I choose SSH via the gcloud command line (find and copy it on the console). e.g. GCP will generate the following code (I didn't type it), run it in the Cloud Shell.

  $ gcloud compute ssh --zone "us-central1-a" "instance-20250221" --project "tactile-timer-451521-d6"

  Verify the instance by:

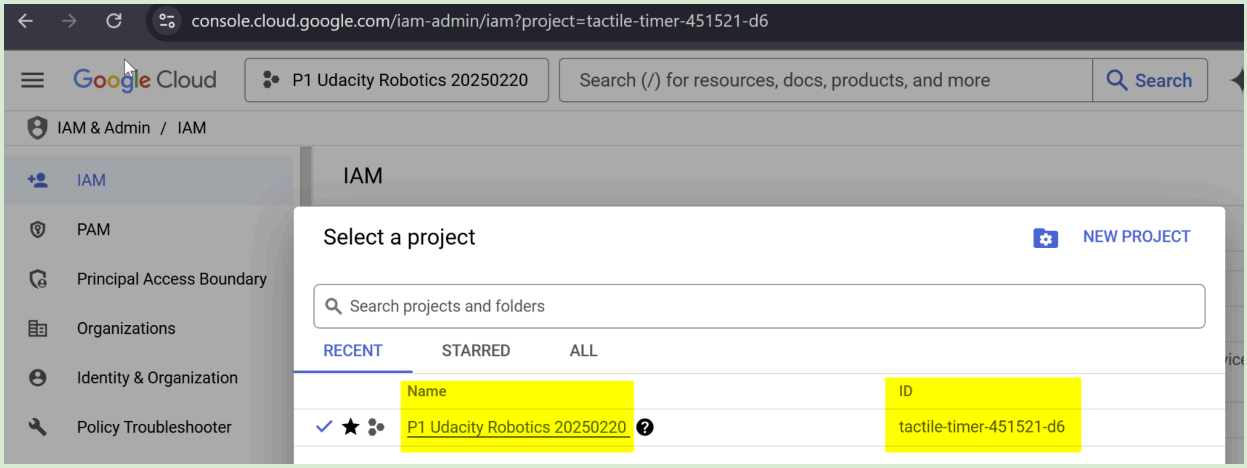
  $ echo "Hello world\!"

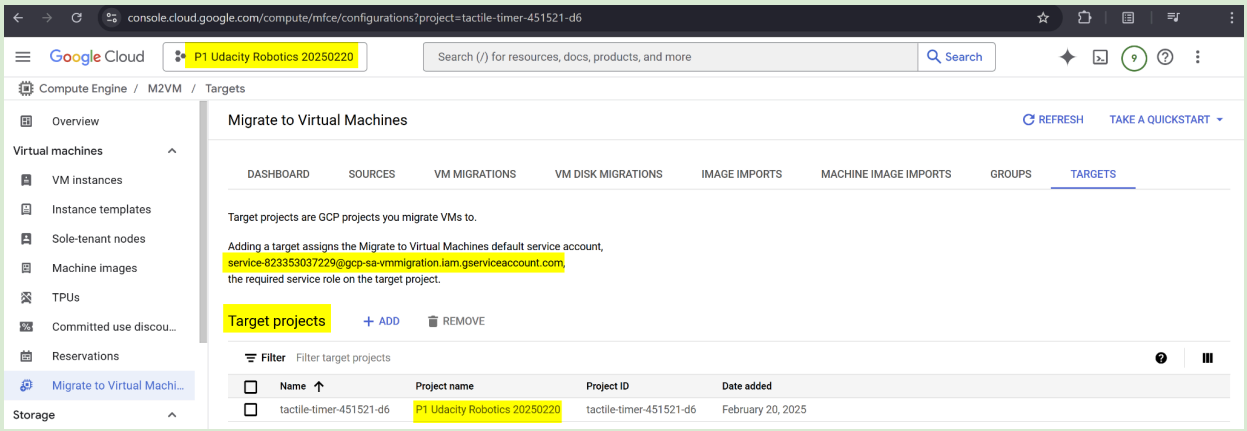
  $ cat /etc/os-release

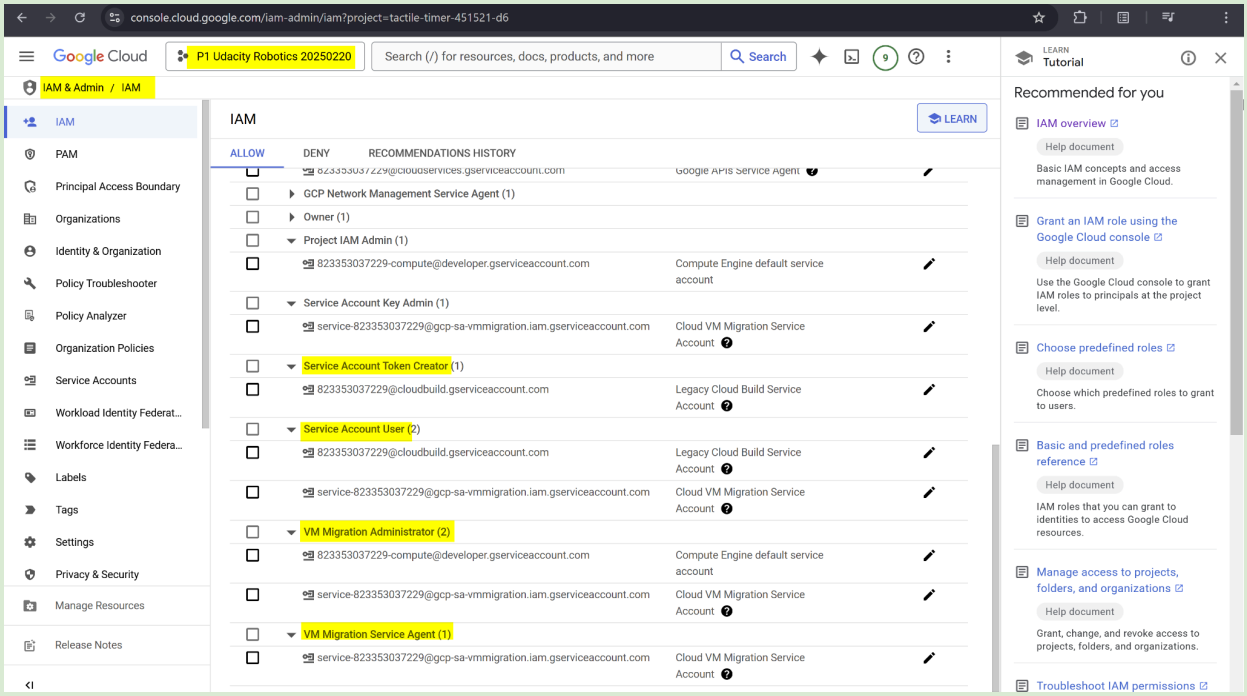
  NAME="Ubuntu"
  VERSION="16.04.2 LTS (Xenial Xerus)"
  ID=ubuntu
  ID_LIKE=debian
  PRETTY_NAME="**Ubuntu 16.04.2 LTS**"
  VERSION_ID="16.04"

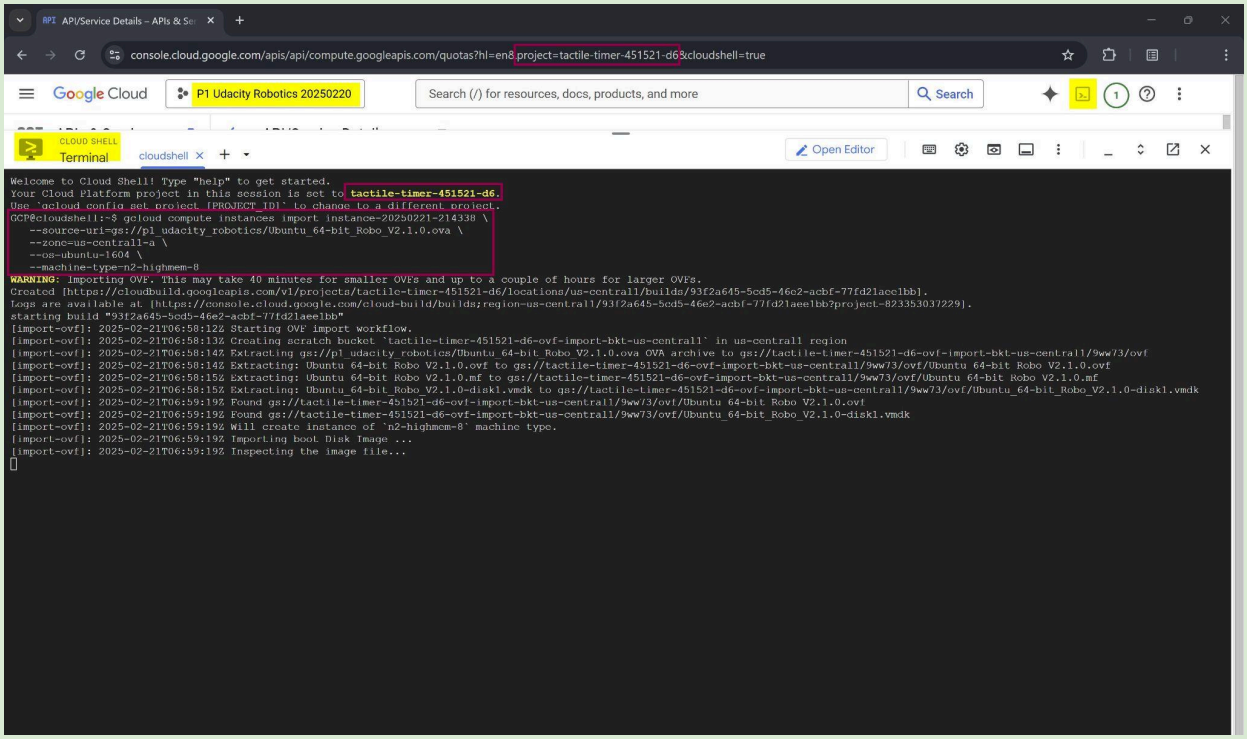
```
HOME_URL="http://www.ubuntu.com/"
SUPPORT_URL="http://help.ubuntu.com/"
BUG_REPORT_URL="http://bugs.launchpad.net/ubuntu/"
VERSION_CODENAME=xenial
UBUNTU_CODENAME=xenial
```

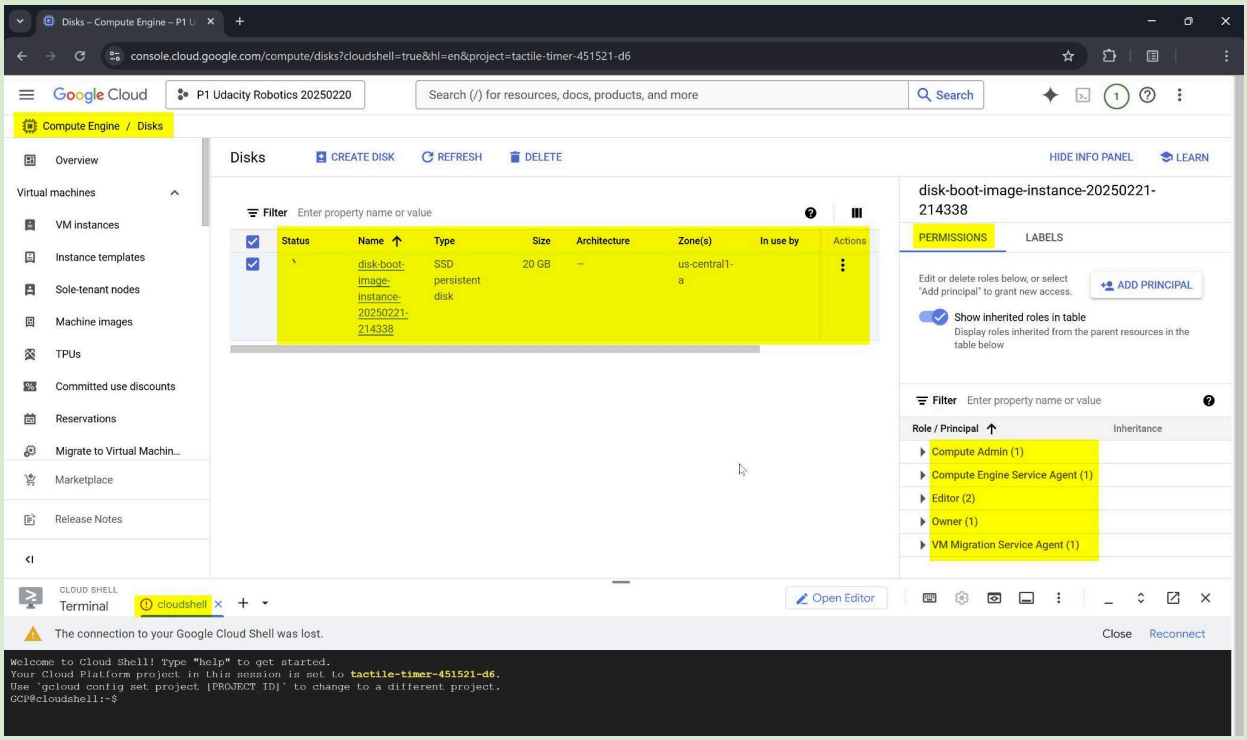
⚠️ Note: I ended up creating the instance twice and left it running for some post-configuration. The next day, the billing showed it cost around $2 USD.

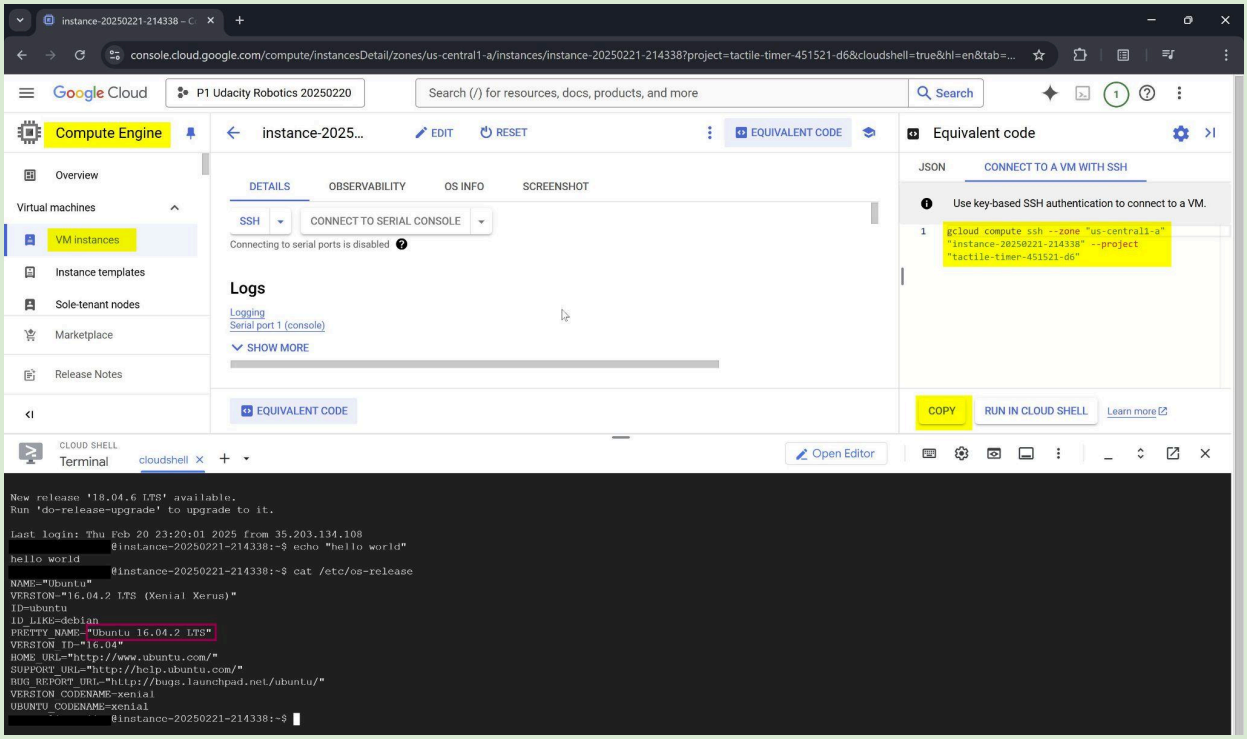





console.cloud.google.com/iam-admin/iam?project=tactile-timer-451521-d6
Google Cloud
P1 Udacity Robotics 20250220
Search (/) for resources, docs, products, and more
Search
IAM & Admin / IAM
IAM
PAM
Principal Access Boundary
Organizations
Identity & Organization
Policy Troubleshooter
Policy Analyzer
Organization Policies
Service Accounts
Workload Identity Federat...
Workforce Identity Federa...
Labels
Tags
Settings
Privacy & Security
Manage Resources
Release Notes
IAM
LEARN
ALLOW
DENY
RECOMMENDATIONS HISTORY
GCP Network Management Service Agent (1)
Owner (1)
Project IAM Admin (1)
823353037229-compute@developer.gserviceaccount.com
Compute Engine default service account
Service Account Key Admin (1)
service-823353037229@gcp-sa-vmmigration.iam.gserviceaccount.com
Cloud VM Migration Service Account
Service Account Token Creator (1)
823353037229@cloudbuild.gserviceaccount.com
Legacy Cloud Build Service Account
Service Account User (2)
823353037229@cloudbuild.gserviceaccount.com
Legacy Cloud Build Service Account
service-823353037229@gcp-sa-vmmigration.iam.gserviceaccount.com
Cloud VM Migration Service Account
VM Migration Administrator (2)
823353037229-compute@developer.gserviceaccount.com
Compute Engine default service account
service-823353037229@gcp-sa-vmmigration.iam.gserviceaccount.com
Cloud VM Migration Service Account
VM Migration Service Agent (1)
service-823353037229@gcp-sa-vmmigration.iam.gserviceaccount.com
Cloud VM Migration Service Account
LEARN
Tutorial
Recommended for you
IAM overview
Help document
Basic IAM concepts and access management in Google Cloud.
Grant an IAM role using the Google Cloud console
Help document
Use the Google Cloud console to grant IAM roles to principals at the project level.
Choose predefined roles
Help document
Choose which predefined roles to grant to users.
Basic and predefined roles reference
Help document
IAM roles that you can grant to identities to access Google Cloud resources.
Manage access to projects, folders, and organizations
Help document
Grant, change, and revoke access to projects, folders, and organizations.
Troubleshoot IAM permissions


API/Service Details – APIs & Se
console.cloud.google.com/apis/api/compute.googleapis.com/quotas?hl=en&project=tactile-timer-451521-d6&cloudshell=true
Google Cloud
P1 Udacity Robotics 20250220
Search (/) for resources, docs, products, and more
Search
CLOUD SHELL
Terminal
cloudshell
Open Editor
Welcome to Cloud Shell! Type "help" to get started.
Your Cloud Platform project in this session is set to tactile-timer-451521-d6.
Use `gcloud config set project [PROJECT_ID]` to change to a different project.
GCP@cloudshell:~$ gcloud compute instances import instance-20250221-214338 \
--source-uri=gs://pl_udacity_robotics/Ubuntu_64-bit_Robo_V2.1.0.ova \
--zone=us-central1-a \
--os=ubuntu-1604 \
--machine-type=n2-highmem-8
WARNING: Importing OVF. This may take 40 minutes for smaller OVFs and up to a couple of hours for larger OVFs.
Created [https://cloudbuild.googleapis.com/v1/projects/tactile-timer-451521-d6/locations/us-central1/builds/93f2a645-5cd5-46e2-acbf-77fd21aee1bb].
Logs are available at [https://console.cloud.google.com/cloud-build/builds;region=us-central1/93f2a645-5cd5-46e2-acbf-77fd21aee1bb?project=823353037229].
starting build "93f2a645-5cd5-46e2-acbf-77fd21aee1bb"
[import-ovf]: 2025-02-21T06:58:12Z Starting OVF import workflow.
[import-ovf]: 2025-02-21T06:58:13Z Creating scratch bucket `tactile-timer-451521-d6-ovf-import-bkt-us-central1` in us-central1 region
[import-ovf]: 2025-02-21T06:58:14Z Extracting gs://pl_udacity_robotics/Ubuntu_64-bit_Robo_V2.1.0.ova OVA archive to gs://tactile-timer-451521-d6-ovf-import-bkt-us-central1/9ww73/ovf
[import-ovf]: 2025-02-21T06:58:14Z Extracting: Ubuntu_64-bit_Robo_V2.1.0.ovf to gs://tactile-timer-451521-d6-ovf-import-bkt-us-central1/9ww73/ovf/Ubuntu_64-bit_Robo_V2.1.0.ovf
[import-ovf]: 2025-02-21T06:58:15Z Extracting: Ubuntu_64-bit_Robo_V2.1.0.mf to gs://tactile-timer-451521-d6-ovf-import-bkt-us-central1/9ww73/ovf/Ubuntu_64-bit_Robo_V2.1.0.mf
[import-ovf]: 2025-02-21T06:58:15Z Extracting: Ubuntu_64-bit_Robo_V2.1.0-disk1.vmdk to gs://tactile-timer-451521-d6-ovf-import-bkt-us-central1/9ww73/ovf/Ubuntu_64-bit_Robo_V2.1.0-disk1.vmdk
[import-ovf]: 2025-02-21T06:59:19Z Found gs://tactile-timer-451521-d6-ovf-import-bkt-us-central1/9ww73/ovf/Ubuntu_64-bit_Robo_V2.1.0.ovf
[import-ovf]: 2025-02-21T06:59:19Z Found gs://tactile-timer-451521-d6-ovf-import-bkt-us-central1/9ww73/ovf/Ubuntu_64-bit_Robo_V2.1.0-disk1.vmdk
[import-ovf]: 2025-02-21T06:59:19Z Will create instance of `n2-highmem-8` machine type.
[import-ovf]: 2025-02-21T06:59:19Z Importing boot Disk Image ...
[import-ovf]: 2025-02-21T06:59:19Z Inspecting the image file...


Disks – Compute Engine – P1 U
console.cloud.google.com/compute/disks?cloudshell=true&hl=en&project=tactile-timer-451521-d6
Google Cloud
P1 Udacity Robotics 20250220
Search (/) for resources, docs, products, and more
Search
Compute Engine / Disks
Overview
Virtual machines
VM instances
Instance templates
Sole-tenant nodes
Machine images
TPUs
Committed use discounts
Reservations
Migrate to Virtual Machin...
Marketplace
Release Notes
Disks
CREATE DISK
REFRESH
DELETE
HIDE INFO PANEL
LEARN
Filter
Enter property name or value
Status
Name
Type
Size
Architecture
Zone(s)
In use by
Actions
disk-boot-image-instance-20250221-214338
SSD persistent disk
20 GB
us-central1-a
disk-boot-image-instance-20250221-214338
PERMISSIONS
LABELS
Edit or delete roles below, or select "Add principal" to grant new access.
ADD PRINCIPAL
Show inherited roles in table
Display roles inherited from the parent resources in the table below
Filter
Enter property name or value
Role / Principal
Inheritance
Compute Admin (1)
Compute Engine Service Agent (1)
Editor (2)
Owner (1)
VM Migration Service Agent (1)
CLOUD SHELL
Terminal
cloudshell
Open Editor
The connection to your Google Cloud Shell was lost.
Close
Reconnect
Welcome to Cloud Shell! Type "help" to get started.
Your Cloud Platform project in this session is set to tactile-timer-451521-d6.
Use `gcloud config set project [PROJECT_ID]` to change to a different project.
GCP@cloudshell:~$



🟢 Configure the VM

- Update the image
  $ sudo apt-get update && sudo apt-get upgrade -y --allow-unauthenticated

⚠️🟢 Note: After updating the image, I wanted to create an **instant snapshot** for the VM. Because the following steps messed up the machine once.

- 【Skip this part】
  Check privileges and ~~change GCP assigned user name~~.
  The original image has two users: **robond** (password: robo-nd) and **ubuntu** (no password)
  Don't change the GCP assigned username for the SSH access relies on this user.
  $ whoami
  $ sudo su - ## change to root user
  $ groups ## check root privileges
  $ sudo su - <GCP-assigned-user-name>
  $ <GCP-assigned-user-name>@instance-20250221:~$ groups <GCP-assigned-user-name>
  <GCP-assigned-user-name> : <GCP-assigned-user-name> adm dialout cdrom floppy audio dip video plugdev netdev lxd ubuntu google-sudoers
  If a group exists with the same name, you can change it using:

~~$ sudo groupmod -n nov05 <GCP-assigned-user-name>~~ ## change group name
~~$ sudo usermod -l nov05 <GCP-assigned-user-name>~~ ## change the user name
~~$ sudo mv /home/<GCP-assigned-user-name> /home/nov05~~ ## change home dir name
~~$ sudo usermod -d /home/nov05 -m nov05~~ ## attach home directory to the new username

- Now it is about enabling a remote GUI, or you can't see anything from the VM.
  - 【Skip this command】Check whether it has a Virtual Network Computing (VNC) server installed. The answer for this image is no.
    $ dpkg -l | grep vnc

    - Install X2Go server on the VM (Ubuntu 16.04):
      ~~$ sudo apt update~~
      ~~$ sudo apt-get install lubuntu-desktop~~ ⚠️
      ~~$ sudo apt-get install lubuntu-core~~
      ~~$ sudo apt-get install x2goserver x2goserver-xsession~~ ⚠️
      E: Unable to locate package x2goserver
      E: Unable to locate package x2goserver-xsession
      ~~$ sudo sh -c 'echo "deb http://packages.x2go.org/debian stable main" > /etc/apt/sources.list.d/x2go.list'~~
      ~~$ sudo apt install wget~~
      ~~$ wget https://packages.x2go.org/keys/x2go.asc~~ ⚠️

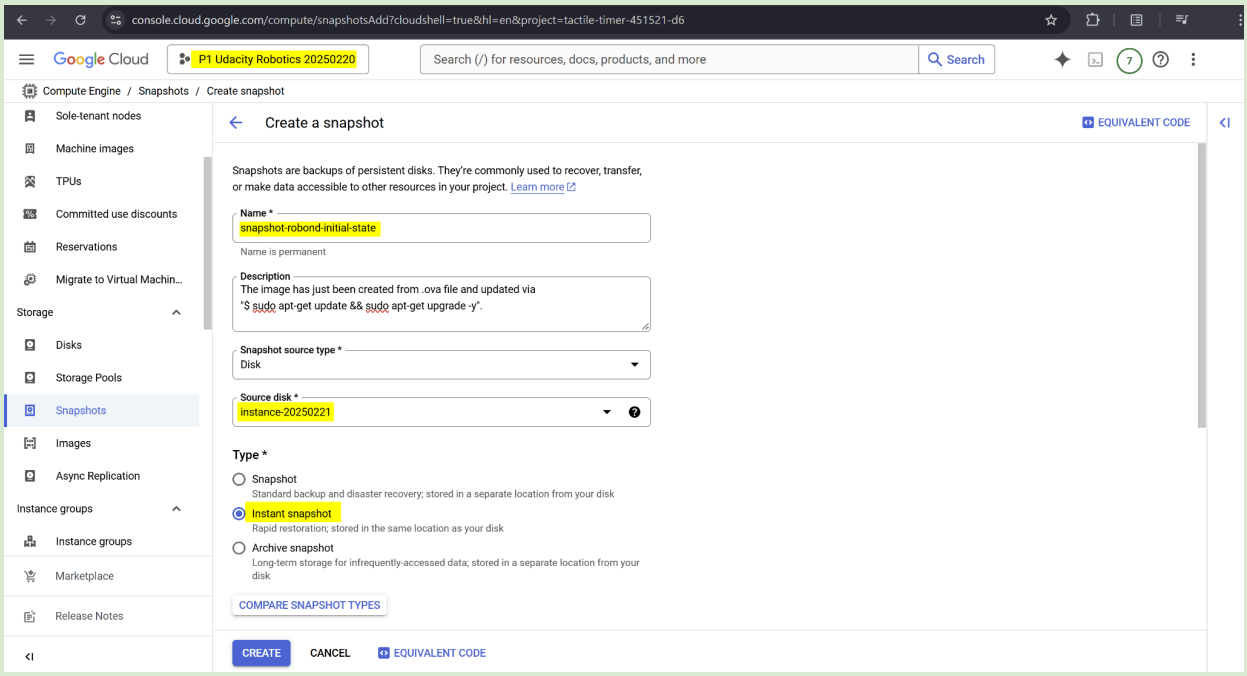
      https://wiki.x2go.org/doku.php/wiki:repositories:ubuntu
      https://wiki.x2go.org/doku.php/doc:installation:x2goclient

      - ✅ The following command works fine.
        $ sudo apt -y install xfce4
        $ sudo add-apt-repository ppa:x2go/stable
        $ sudo apt-get update ## ⚠️ Issue solved
        $ sudo apt-key adv --keyserver keyserver.ubuntu.com --recv-keys F42ED6FBAB17C654 ## you might not need this
        $ sudo apt-key adv --keyserver keyserver.ubuntu.com --recv-keys 32EE5355A6BC6E42 ## you might not need this
        $ sudo apt-get -y install x2goserver x2goserver-xsession

      - Install a X2GO client on the local machine. Mine is on **Windows 11**.
        - Download the lastest **x2goclient** for Windows and install. Administrator rights required for a normal install.

🟢 Note: I checked with my local VM, the image has installed lubuntu-desktop.
robond@udacity:~/catkin_ws$ echo $DESKTOP_SESSION

Lubuntu


console.cloud.google.com/compute/snapshotsAdd?cloudshell=true&hl=en&project=tactile-timer-451521-d6
Google Cloud
P1 Udacity Robotics 20250220
Search (/) for resources, docs, products, and more
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Compute Engine / Snapshots / Create snapshot
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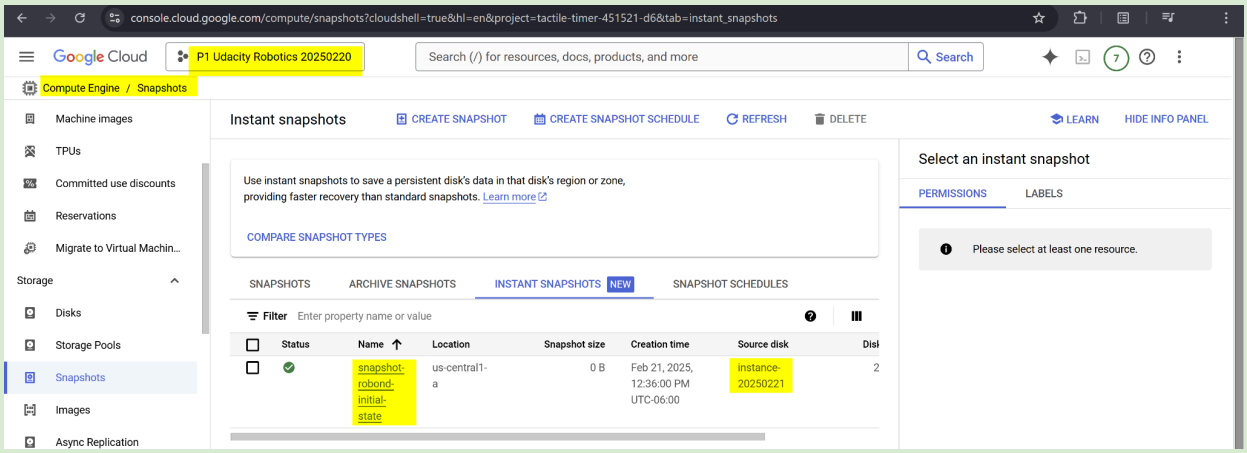
Storage Pools
Snapshots
Images
Async Replication
Instance groups
Instance groups
Marketplace
Release Notes
Create a snapshot
EQUIVALENT CODE
Snapshots are backups of persistent disks. They're commonly used to recover, transfer, or make data accessible to other resources in your project. Learn more
Name *
snapshot-robond-initial-state
Name is permanent
Description
The image has just been created from .ova file and updated via "$ sudo apt-get update && sudo apt-get upgrade -y".
Snapshot source type *
Disk
Source disk *
instance-20250221
Type *
Snapshot
Standard backup and disaster recovery; stored in a separate location from your disk
Instant snapshot
Rapid restoration; stored in the same location as your disk
Archive snapshot
Long-term storage for infrequently-accessed data; stored in a separate location from your disk
COMPARE SNAPSHOT TYPES
CREATE
CANCEL
EQUIVALENT CODE


console.cloud.google.com/compute/snapshots?cloudshell=true&hl=en&project=tactile-timer-451521-d6&tab=instant_snapshots
Google Cloud
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Storage
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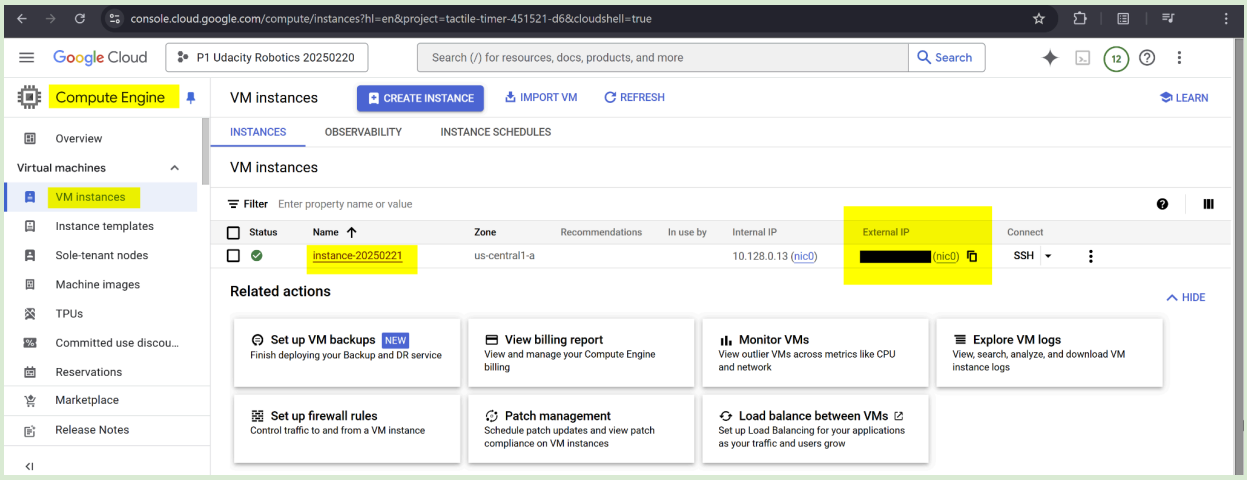
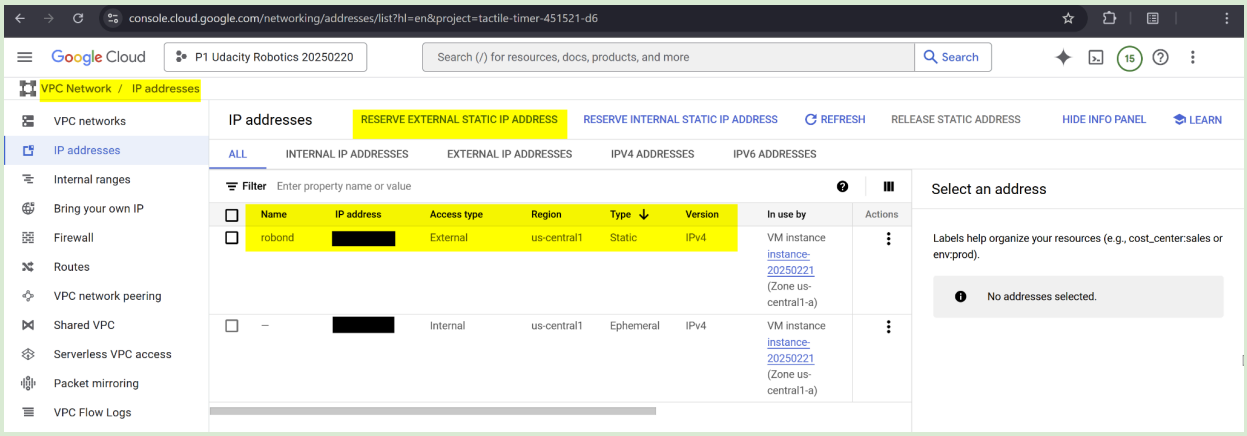
Storage Pools
Snapshots
Images
Async Replication
Instant snapshots
CREATE SNAPSHOT
CREATE SNAPSHOT SCHEDULE
REFRESH
DELETE
LEARN
HIDE INFO PANEL
Use instant snapshots to save a persistent disk's data in that disk's region or zone, providing faster recovery than standard snapshots. Learn more
COMPARE SNAPSHOT TYPES
SNAPSHOTS
ARCHIVE SNAPSHOTS
INSTANT SNAPSHOTS NEW
SNAPSHOT SCHEDULES
Filter
Enter property name or value
Status
Name
Location
Snapshot size
Creation time
Source disk
snapshot-robond-initial-state
us-central1-a
0 B
Feb 21, 2025, 12:36:00 PM UTC-06:00
instance-20250221
2
Select an instant snapshot
PERMISSIONS
LABELS
Please select at least one resource.



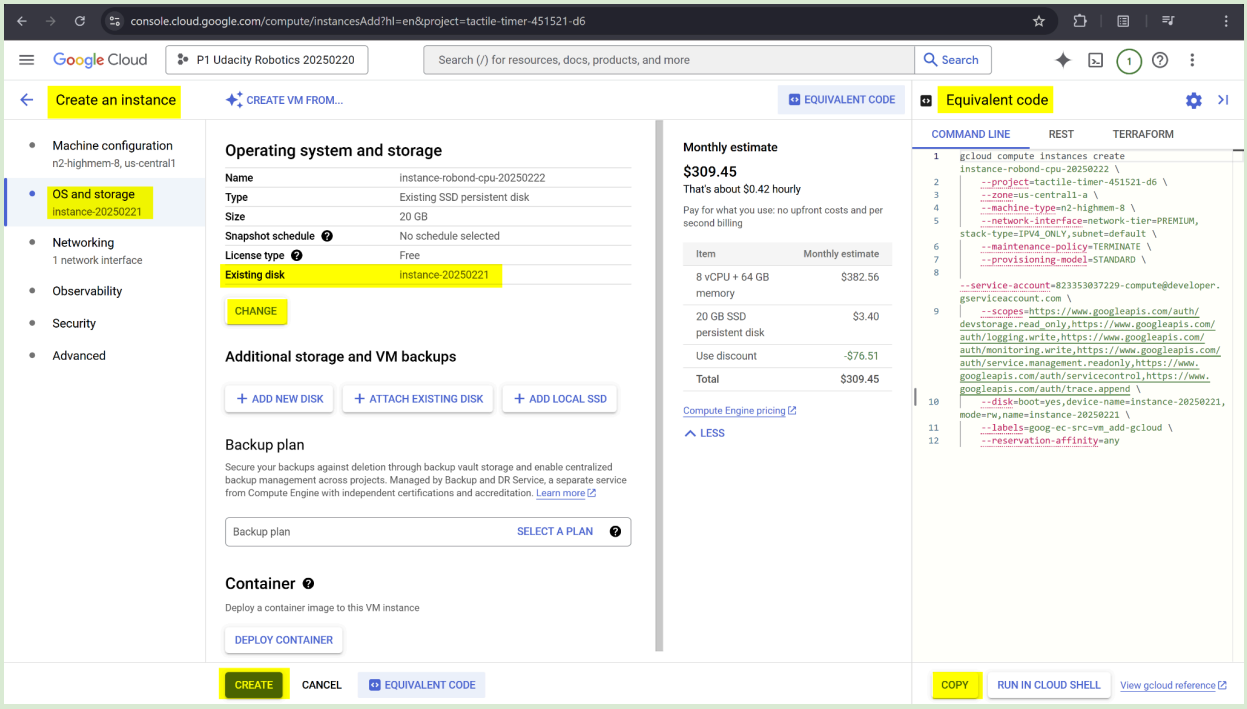


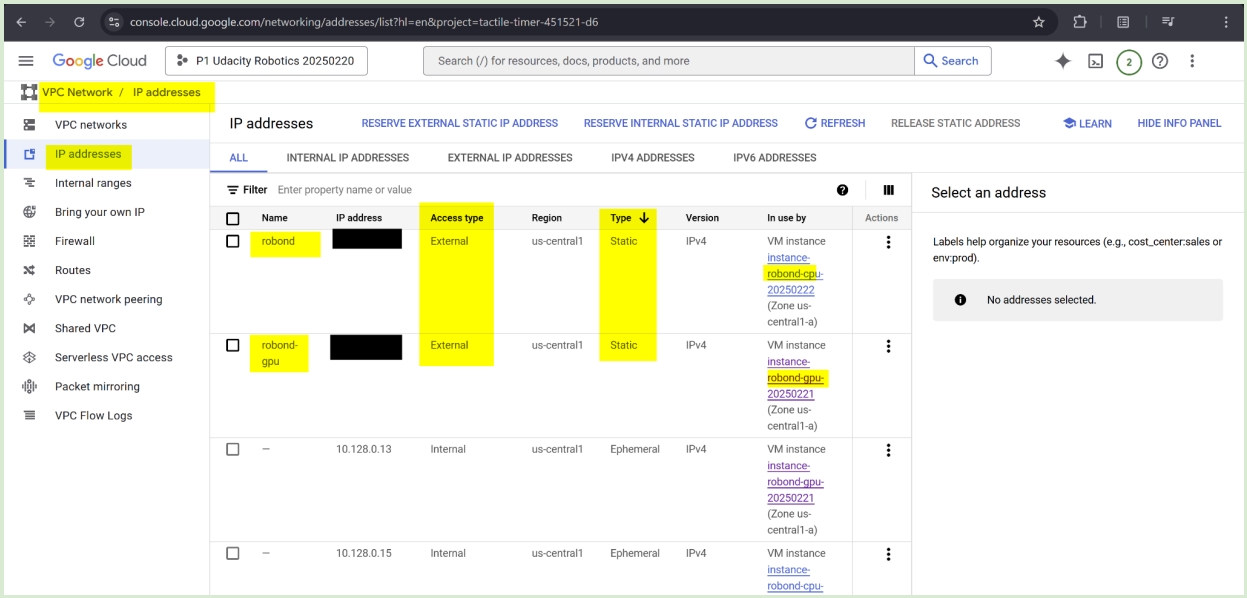
👉 Tips: Snapshot, instant snapshot, disk, image, machine image, etc.

- You can take a snapshot of an instance, create a disk from the snapshot, create another instance and attach the newly created disk as boot disk or additional storage.
- In my case, I first created a cpu instance, after I installed all the packages and made sure it could be accessed remotely via X2GO, I took a snapshot, and created a disk. Then I created a gpu instance and attached the newly created disk to it.

- ⚠️ Update: The following method **isn't** the best option for me. Unzip .ova, upload its .vmdk to a bucket. create an image (not a machine image) from the .vmdk. create an instance from the image, which has been documented in the "How to import" section.

  I have deleted all the instances and started over. This time, I will
  - import OVA to create an instance "**instance-robond-cpu-*"**
    assign static IP, add SSH pub key, verify SSH login
  - take an instant snapshot, "**snapshot-robond-cpu-import-*"**
  - create a disk "**disk-from-snapshot-robond-import-*"** from "snapshot-robond-cpu-import-*", 100GB
  - ~~stop the instance to edit, change type to gpu, change name to "**instance-robond-gpu-*"**,~~
    Create a gpu instance "**instance-robond-gpu-*"**, L2
  - ~~Nvidia Tesla P4~~ (P4 causes SSH error; T4 is impossible to obtain)
    Enable display device, Enable Virtual Workstation (NVIDIA GRID)
    ~~On host maintenance = Terminate VM instance~~
  - $ sudo apt-get update && sudo apt-get upgrade -y
    install x2go, x11, etc. to enable remote desktop
    git clone my repos (so far there are 3 repos)
  - take a snapshot, "snapshot-robond-gpu-p1-p2"





Google GenAI output:

In Google Cloud Platform, a "disk" is a storage unit within a VM, while a "snapshot" is a point-in-time copy of a single disk, a "machine image" is a backup of an entire VM including all attached disks, and an "instant snapshot" is a near-instantaneous snapshot of a disk, allowing for very fast restores; essentially, **a snapshot is a backup of a single disk, while a machine image is a backup of an entire VM with all its disks**. [1, 2, 3, 4, 5, 6]

Key differences: [2, 4, 7]

- **Disk:** A basic storage unit within a VM, like a hard drive on a physical machine. [2, 4, 7]
- **Snapshot:** A copy of a single disk at a specific point in time, allowing you to restore that exact state of the disk later. [1, 2, 8]
- **Machine Image:** A backup of an entire VM, capturing the state of all disks attached to the instance. [1, 2, 3]
- **Instant Snapshot:** A type of snapshot that is created almost instantly, ideal for quick restores from a specific point in time. [1, 5, 6]

Example Use Cases: [2, 7]

- **Snapshot:** Backup a database disk on a VM to quickly restore to a previous state if needed. [2, 7]
- **Machine Image:** Create a standard VM configuration to quickly deploy new instances with the same settings. [1, 3, 4]
- **Instant Snapshot:** Capture a snapshot of an application during a critical update to quickly roll back if issues arise. [5, 6]

Generative AI is experimental.

[1] https://cloud.google.com/compute/docs/machine-images
[2] https://www.youtube.com/watch?v=RvTJjD_l6Cs
[3] https://cloud.google.com/compute/docs/disks/data-protection
[4] https://cloud.google.com/compute/docs/disks/snapshots
[5] https://cloud.google.com/compute/docs/disks/instant-snapshots
[6] https://cloud.google.com/blog/products/compute/introducing-compute-engine-instant-snapshots
[7] https://cloud.google.com/compute/docs/disks/restore-snapshot
[8] https://diana-moraa.medium.com/snapshots-and-images-in-google-cloud-platform-406b23224e9f

🟢 Connect to the VM instance from remote

- Access the VM instance from a local machine via SSH login
    - Go to “VPC networks -> IP Addresses -> Reserve external static IP addresses”
      Reserve a static external IP address for the VM instance

    - Get the VM instance external IP address in “GCP Compute Engine”
    - Go to “VPC Network -> default (for the GCP project “P1 Udacity Robotics 20250220”) -> Firewalls (tab) -> “default-allow-ssh””.
      Make sure the ingress ssh traffic is allowed.
      Check region (in my case it is “us-central1”).
      Check Protocols and ports tcp:**22**

    - Check the Google Cloud documentation: Connect to VMs -> OpenSSH client
        - Create SSH keys
          $ ssh-keygen -t rsa -f C:\Users\<WINDOWS_USER>\.ssh\<KEY_FILENAME> -C <VM_USERNAME>
          e.g. $ ssh-keygen -t rsa -f d:\users\guido\.ssh\gcp-robond-ssh-key -C robond

            - Download Google Cloud CLI and install it on Windows
              https://dl.google.com/dl/cloudsdk/channels/rapid/GoogleCloudSDKInstaller.exe

            - add an SSH public key to an OS Login profile

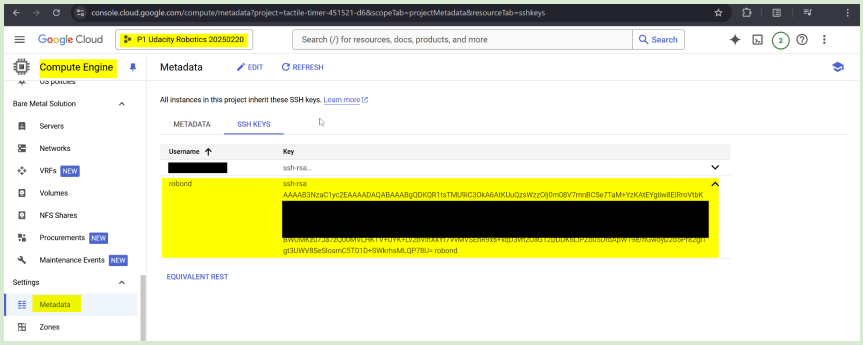
- from local machine: install gcloud cli, configure the system path, you can run gcloud command in PowerShell
  ~~$ gcloud compute os-login ssh-keys add \~~
  ~~--key-file=*KEY_FILE_PATH* \~~
  ~~--project=*PROJECT* \~~
  ~~--ttl=*EXPIRE_TIME*~~

- from Cloud Shell
  ~~$ gcloud compute os-login ssh-keys add \~~
  ~~--key-=KEY \~~
  ~~--project=PROJECT \~~
  ~~--ttl=EXPIRE_TIME~~

~~$ gcloud compute os-login ssh-keys add --key-file="D:\\Users\\guido\\.ssh\\gcp-robond-ssh-key.pub" --project=tactile-timer-451521-d6 --ttl=30d~~

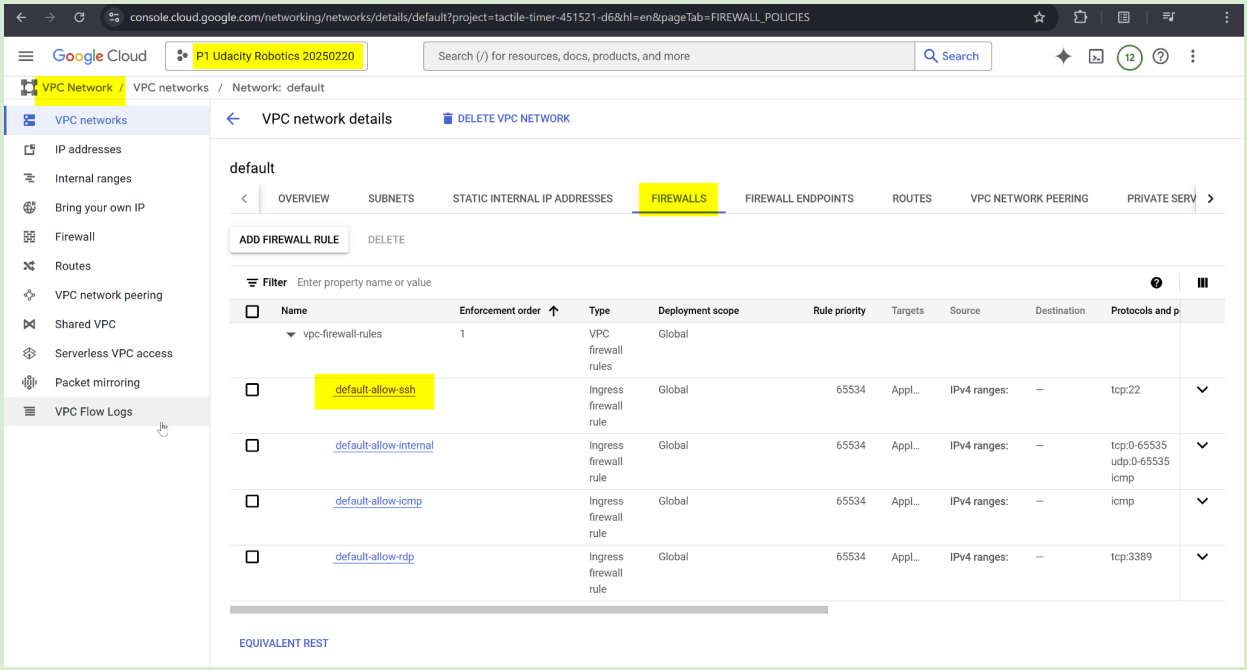
- ✅✅✅ If you want an instance-level ssh access, login the VM instance with gcloud CLI + SSH. Paste the SSH public key content to the following file
  $ nano ~/.ssh/authorized_keys

- ✅ if you want an project-level ssh access, add your ssh public key in “Compute Engine -> Metadata -> SSH KEYS”.
  e.g. in this case, “robond” is a user of my Udacity course instance. If there is a “robond” user also in another instance, the ssh private key can be used to login that instance as well.



- Connect to the VM instance from local machine PowerShell
  $ ssh -i <PATH_TO_PRIVATE_KEY> <VM_USERNAME>@<VM_EXTERNAL_IP>
  e.g. $ ssh -i "D:\\Users\\guido\\.ssh\\gcp-robond-ssh-key" robond@*.*.*.*

- Connect to the VM instance from X2GO Client from local machine
  set host = GCP VM instance external IP address


console.cloud.google.com/networking/networks/details/default?project=tactile-timer-451521-d6&hl=en&pageTab=FIREWALL_POLICIES
Google Cloud
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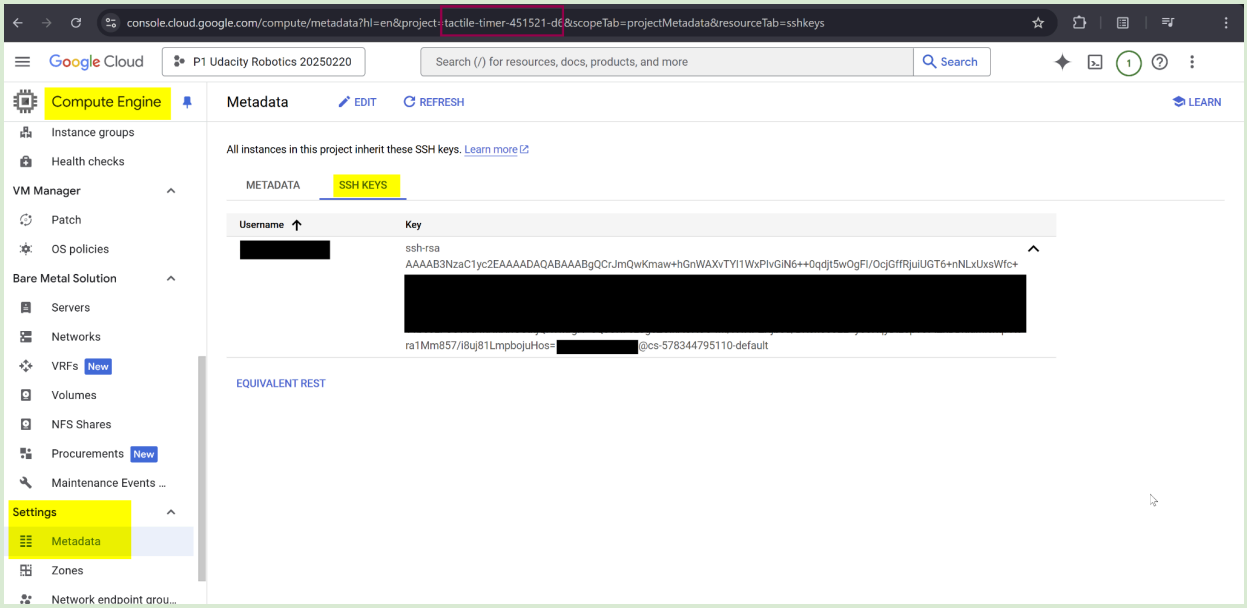
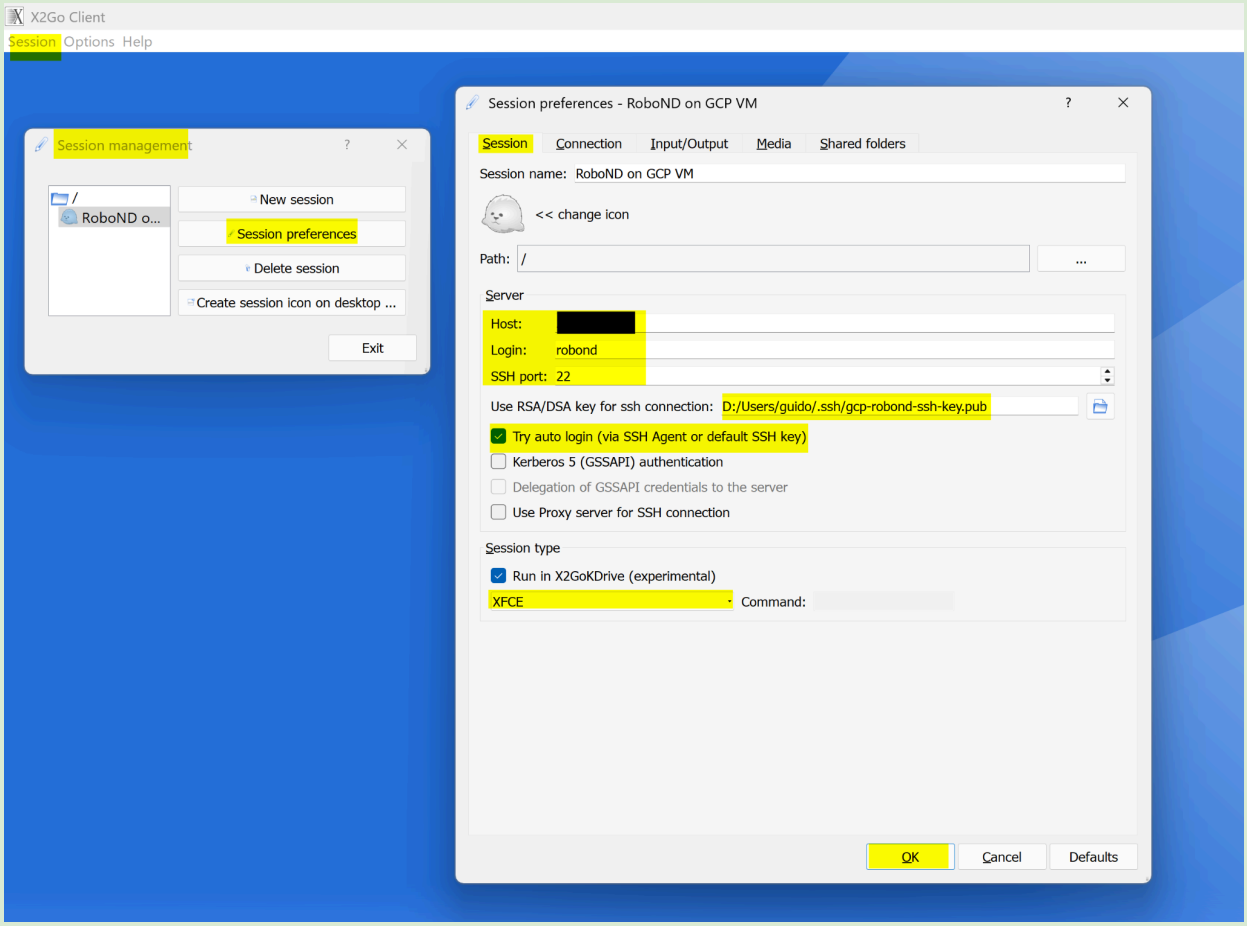
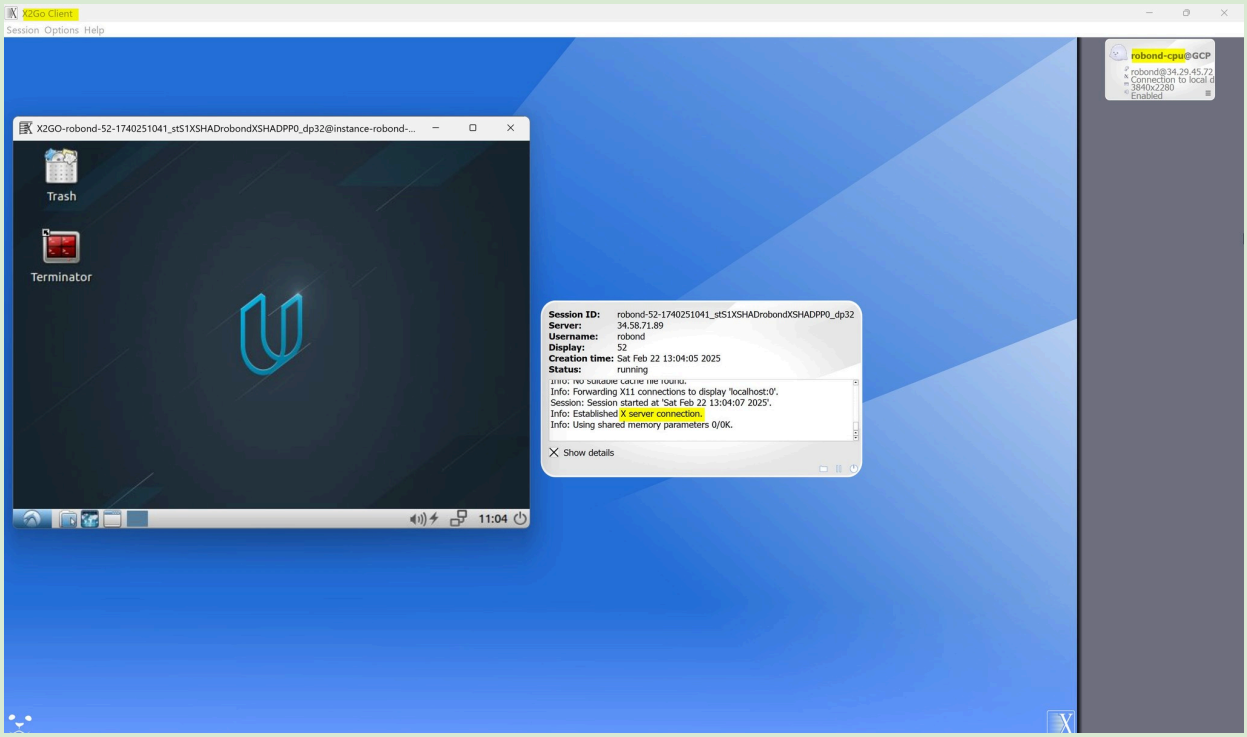
Search
VPC Network / VPC networks / Network: default
VPC networks
IP addresses
Internal ranges
Bring your own IP
Firewall
Routes
VPC network peering
Shared VPC
Serverless VPC access
Packet mirroring
VPC Flow Logs
VPC network details
DELETE VPC NETWORK
default
OVERVIEW
SUBNETS
STATIC INTERNAL IP ADDRESSES
FIREWALLS
FIREWALL ENDPOINTS
ROUTES
VPC NETWORK PEERING
PRIVATE SERV
ADD FIREWALL RULE
DELETE
Filter
Enter property name or value
Name
Enforcement order
Type
Deployment scope
Rule priority
Targets
Source
Destination
Protocols and p
vpc-firewall-rules
1
VPC firewall rules
Global
default-allow-ssh
Ingress firewall rule
Global
65534
Appl...
IPv4 ranges:
–
tcp:22
default-allow-internal
Ingress firewall rule
Global
65534
Appl...
IPv4 ranges:
–
tcp:0-65535
udp:0-65535
icmp
default-allow-icmp
Ingress firewall rule
Global
65534
Appl...
IPv4 ranges:
–
icmp
default-allow-rdp
Ingress firewall rule
Global
65534
Appl...
IPv4 ranges:
–
tcp:3389
EQUIVALENT REST


console.cloud.google.com/compute/metadata?hl=en&project=tactile-timer-451521-d6&scopeTab=projectMetadata&resourceTab=sshkeys
Google Cloud
P1 Udacity Robotics 20250220
Search (/) for resources, docs, products, and more
Search
Compute Engine
Instance groups
Health checks
VM Manager
Patch
OS policies
Bare Metal Solution
Servers
Networks
VRFs New
Volumes
NFS Shares
Procurements New
Maintenance Events ...
Settings
Metadata
Zones
Network endpoint grou...
Metadata
EDIT
REFRESH
LEARN
All instances in this project inherit these SSH keys. Learn more
METADATA
SSH KEYS
Username
Key
[redacted]
ssh-rsa
AAAAB3NzaC1yc2EAAAADAQABAAABgQCrJmQwKmaw+hGnWAXvTYl1WxPlvGiN6++0qdjt5wOgFl/OcjGffRjuiUGT6+nNLxUxsWfc+
[redacted]
ra1Mm857/i8uj81LmpbojuHos=[redacted]@cs-578344795110-default
EQUIVALENT REST

```
(base) PS D:\github\udacity-nd209-robots-software-engineering-nanodegree> ssh -i "D:\\Users\\guido\\.ssh\\gcp-robond-ssh-key" robond@
robond@          's password:
Permission denied, please try again.
robond@          's password:
Permission denied, please try again.
robond@          's password:
Welcome to Ubuntu 16.04.7 LTS (GNU/Linux 4.8.0-58-generic x86_64)

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

415 packages can be updated.
32 updates are security updates.

New release '18.04.6 LTS' available.
Run 'do-release-upgrade' to upgrade to it.

Last login: Fri Feb 21 16:12:17 2025 from
Do you want to source ROS in this workspace (y/n): y
ROS sourced!
robond@instance-20250221:~$
```





- Check the GPU
  $ **lspci | grep -i nvidia**

```
robond@instance-20250221:~/myrobot/world$ lspci | grep -i nvidia
00:04.0 3D controller: NVIDIA Corporation GP104GL [Tesla P4] (rev a1)
```

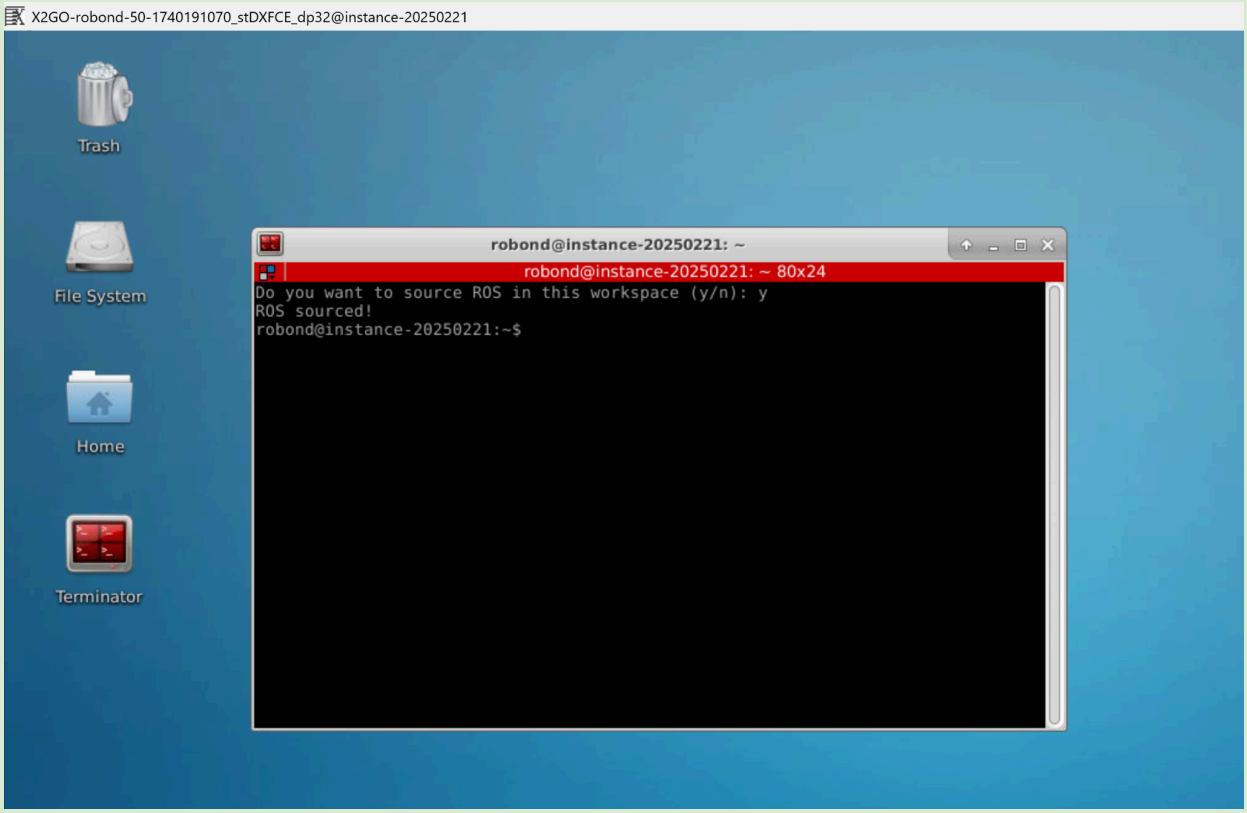
- Install cuda
  $ sudo apt-get install nvidia-cuda-toolkit

```
robond@instance-20250221:~/myrobot/world$ nvcc --version
nvcc: NVIDIA (R) Cuda compiler driver
Copyright (c) 2005-2015 NVIDIA Corporation
Built on Tue_Aug_11_14:27:32_CDT_2015
Cuda compilation tools, release 7.5, V7.5.17
```

robond@instance-20250221:~/myrobot/world$ glxinfo | grep "OpenGL version"
OpenGL version string: 1.2 (1.5 Mesa 6.4.2)

Set up workspaces

- Follow [my main course repo](), download code repos, etc.
    - Change user, [sudo] password for robond: is “**robo-nd**”.
      “Do you want to source ROS in this workspace (y/n):”, answer “y”.
      $ sudo su - robond

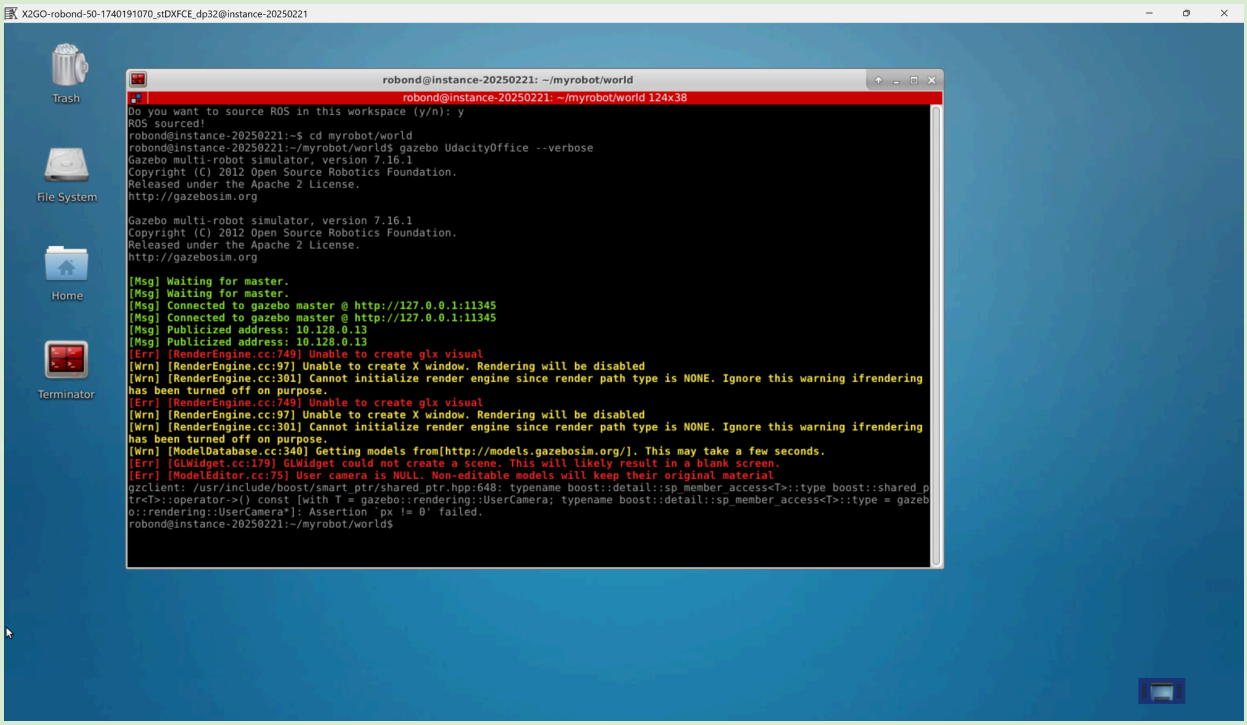


- Git clone project 1 - build my “UdacityOffice” gazebo world. The following commands should show the office model in Gazebo.
  If you have forked the repo to your own and created a personal token for commit, add the token when cloning the repo to the VM instance.

  $ cd ~
  $ git clone -b master
  https://**<GitHub-personal-token>@**github.com/nov05/udacity-RoboND-myrobot.git **myrobot**
  $ cd myrobot/build
  $ sudo cmake ..
  $ sudo make ## You might get errors if your system is not up to date!

$ export GAZEBO_PLUGIN_PATH=${GAZEBO_PLUGIN_PATH}:/home/robond/myrobot/build
$ echo $GAZEBO_PLUGIN_PATH
$ cd ~/myrobot/world
$ gazebo UdacityOffice --verbose

🟢⚠️ However I chose a VM instance type without GPU, which might have caused the error in the screenshot. So I decided to take another snapshot of the instance, and migrate it to a GPU VM instance. (Update: It seems that ~~both Gazebo and X11 require GPU~~, but not CUDA. However, with CUDA enabled, Gazebo can render faster.)
Feb 24, 2025 Update: This is caused by the X2GO client session preference - If it is not X11, Gazebo won't start.



- Course 3, simple_arm
  - Launch the arm. <PAT> = GitHub Personal Access Token
    $ mkdir -p ~/catkin_ws/src
    $ cd ~/catkin_ws/src
    $ catkin_init_workspace
    $ cd ~/catkin_ws
    $ catkin_make
    $ cd ~/catkin_ws/src/
    $ git clone -b first_interaction https://<PAT>@github.com/nov05/udacity-RoboND-simple_arm simple_arm
    $ cd ~/catkin_ws
    $ catkin_make

$ source devel/setup.bash
$ rosdep install -i simple_arm ## output: e.g. #All required rosdeps installed successfully
$ rosdep check simple_arm ## output: e.g. All system dependencies have been satisified
$ roslaunch simple_arm robot_spawn.launch

- Run the simple_mover mode in another terminal
  $ cd ~/catkin_ws/
  $ source devel/setup.bash
  $ rosrun simple_arm simple_mover

- To view the camera image stream, in one terminal:
  $ rqt_image_view /rgb_camera/image_raw ## or
  $ rosrun rqt_image_view rqt_image_view

🟢⚠️ Issue: The /rgb_camera/image_raw topic is listed by "$ rostopic list". However, this line doesn't work on the Cloud VM instance.

"$ rostopic info /rgb_camera/image_raw" works as well.

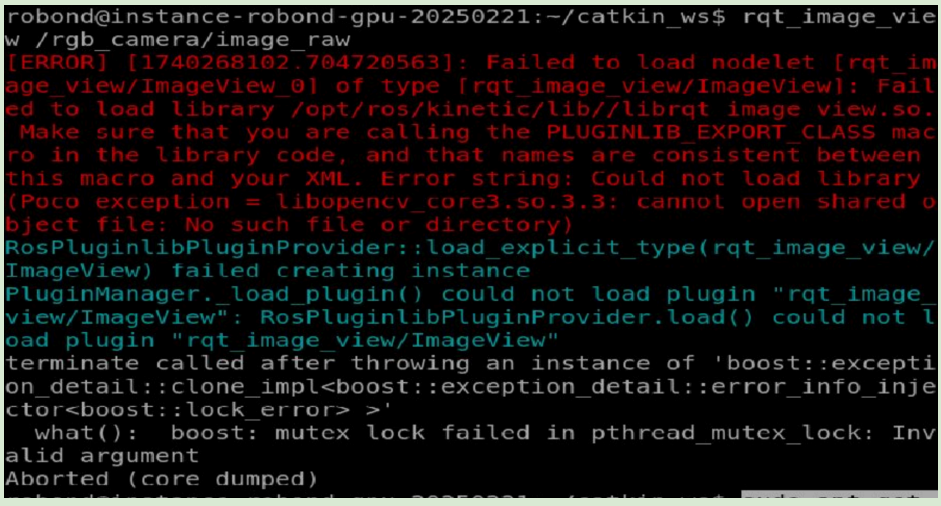
"$ rospack find rqt" can't find the package "rqt".

robond@udacity:~/catkin_ws$ rospack find rqt_image_view
/opt/ros/kinetic/share/rqt_image_view

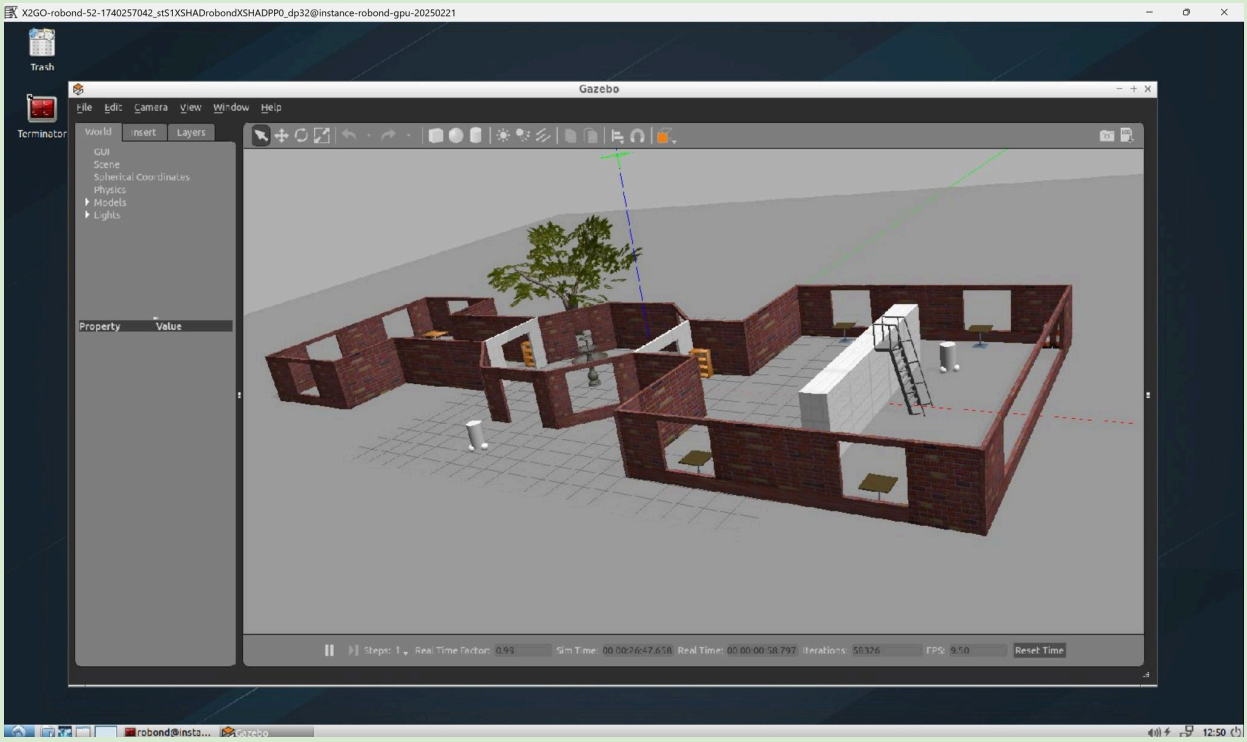
- ✅ ROS——问题解决：rqt工具包中image_view消失；bash: rosrun rqt_image_view未找到命令
  Irving.Gao 于 2021-08-12 17:25:19 发布
  https://blog.csdn.net/qq_45779334/article/details/119649421 (web archive)
  $ sudo apt-get install ros-kinetic-rqt
  $ sudo apt-get install ros-kinetic-rqt-common-plugins
  $ rm ~/.config/ros.org/rqt_gui.ini

🟢⚠️ installed the package. however the system asked me to run

$ sudo apt-get update && sudo apt-get install –only-upgrade python-catkin-pkg



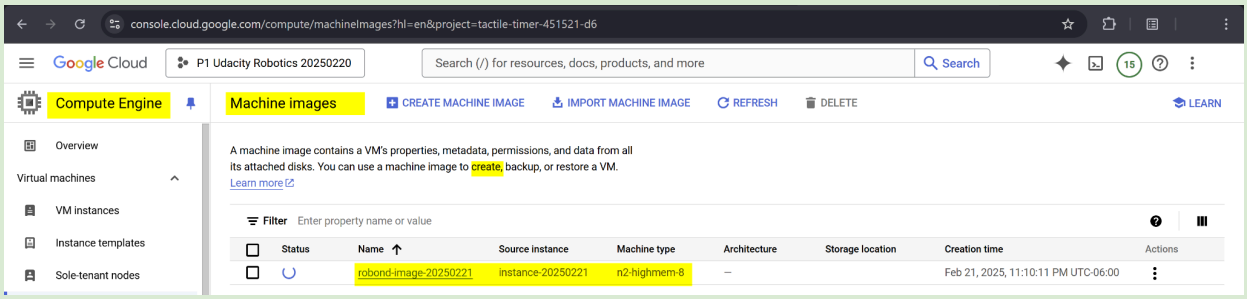
Feb 24, 2025 update: I unzipped the .ova file to .vmdk, and created an image (note machine image) from the .vmdk file, then created an instance (w/o gpu) from the image. and did all the update, installation, git cloning, etc. and the issues are gone.

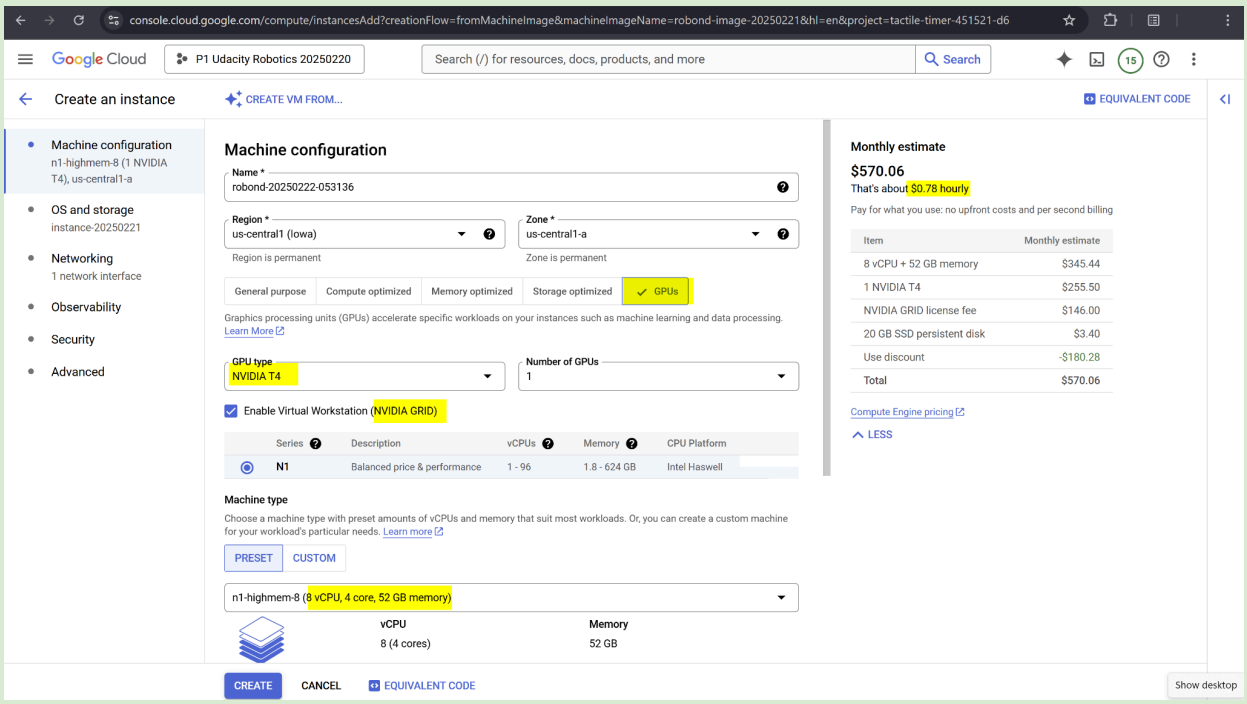


~~Create machine image, then create an instance with GPU from the image~~

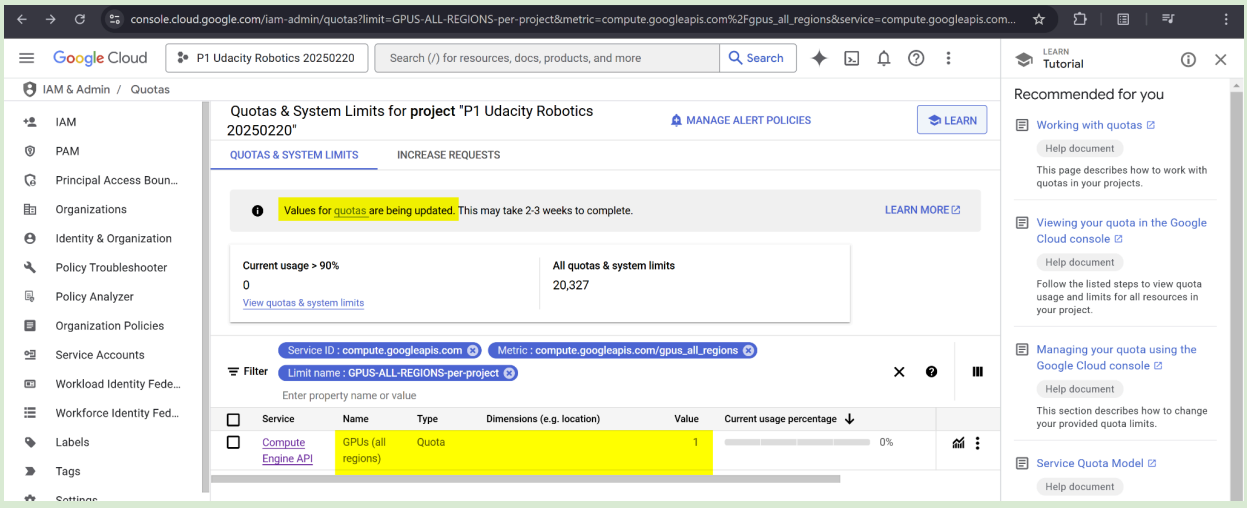
⚠️ Don't create VM instance with machine image, ~~for users, packages in the source instance won't be copied to the target instance~~. Create from the .ova file again.
✅ However you can create a "disk" from a snapshot, then create an instance and attach the disk, or edit an instance to change the disk attached, which preserve all the packages and states.

- Certain GPU instances might not be available in certain zones.
- Official documentation: GPU availability by regions and zones



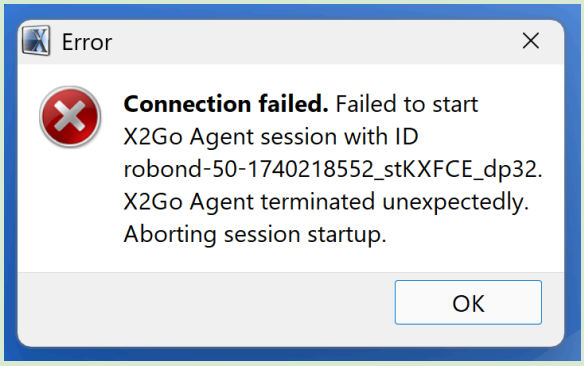


- Request to increase the GPU quota



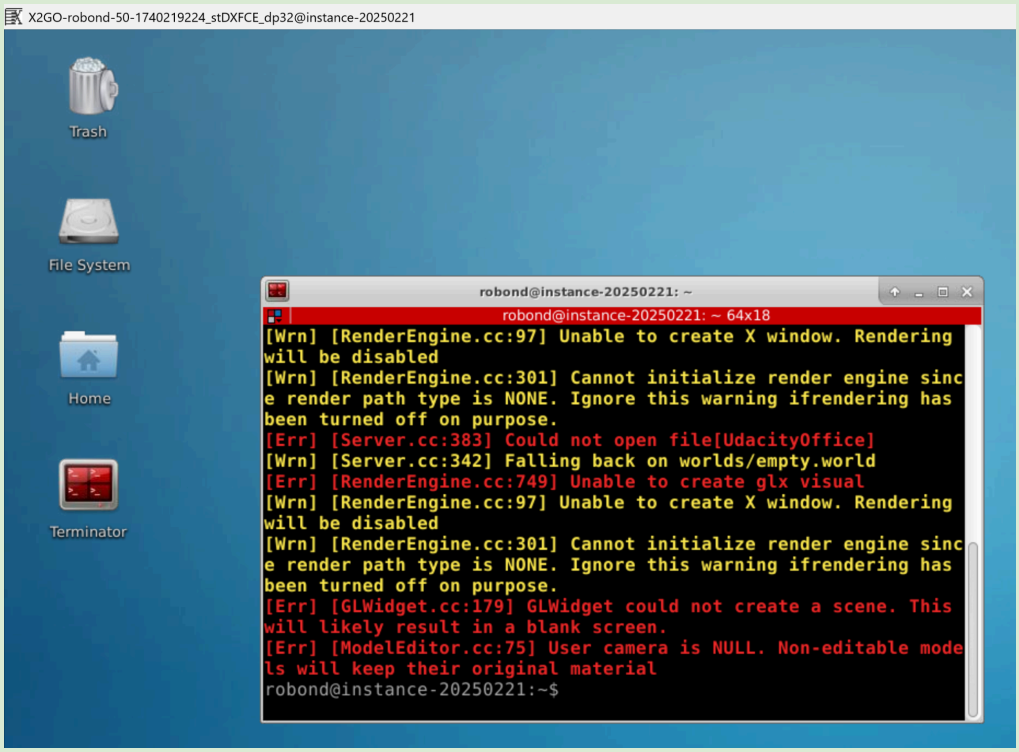
⚠️ Issues and solutions

🟢⚠️ Issue solved.



- Make sure x2goserver is installed on the VM instance.
  $ dpkg -l | grep x2goserver
- Make sure ssh pub key is pasted to the VM
  $ sudo cat /home/<GCP-assigned-user>/.ssh/authorized_keys
- It seems the x2go client had some issue. I just changed the session type in the preference and started the client a few times. The issue was gone.

🟢⚠️ Issue solved: Gazebo won't launch. Solution: You can do it with the "x2go client - session preference - session type - X2GO/X11 Desktop Sharing", but not with the "XFCE" option, and with X11 Forwarding allowed.



[Err] [RenderEngine.cc:749] Unable to create glx visual
[Wrn] [RenderEngine.cc:97] Unable to create X window. Rendering will be disabled
[Wrn] [RenderEngine.cc:301] Cannot initialize render engine since render path type is NONE. Ignore this warning if rendering has been turned off on purpose.
[Err] [GLWidget.cc:179] GLWidget could not create a scene. This will likely result in a blank screen.
[Err] [ModelEditor.cc:75] User camera is NULL. Non-editable models will keep their original material

- It might be an X11 problem. (StackExchange)
- ✅ Configure X11 in Ubuntu
  Edit ssh_config and sshd_config files:
  ForwardX11 yes
  ForwardX11Trusted yes
  $ sudo nano /etc/ssh/ssh_config
  $ sudo nano /etc/ssh/sshd_config

⚠️ Issue: Cloud Ubuntu VM with xorg x11 on x2go desktop has 800*600 low resolution, and there are no other resolution options to choose from.

And it seems not to be able to copy and paste with the x2go client “x2go/x11 desktop sharing” session type.

robond@instance-20250224-015140:~$ xrandr --listactivemonitors
xrandr: Failed to get size of gamma for output default
Monitors: 1

0: +default 1280/339x768/203+0+0 default

- xrandr --output eDP1 --auto --scale-from 3840x2160
- September 30th, 2015 #2 seattle vic
  “1. Insert a dummy video driver: **sudo apt-get install xserver-xorg-video-dummy**
  2. Since there's no default **xorg.conf** file that I could find anywhere, AND there are several locations where you can supposedly put it (/etc/X11, /usr/share/X11, ~) I created one and placed it in **/etc/X11**”

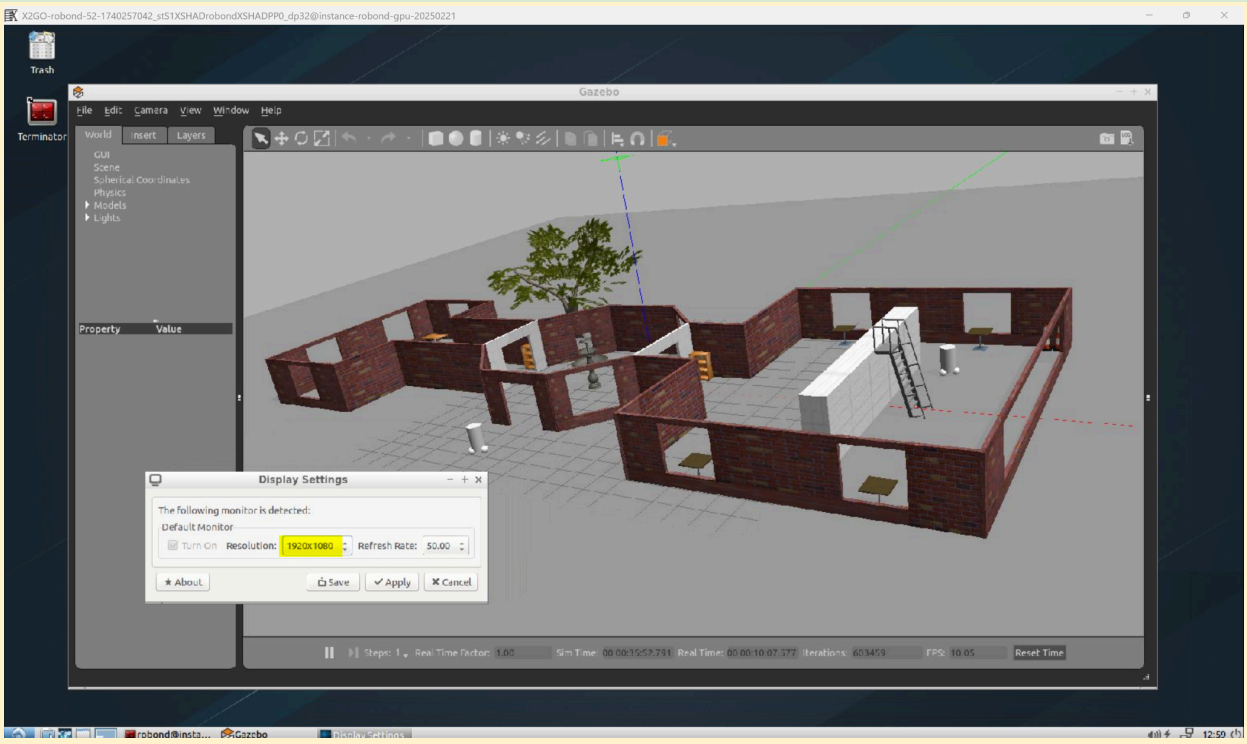
```
Section "Device"    Identifier  "Configured Video Device"
   Driver      "dummy"
   VideoRam 256000
EndSection

Section "Monitor"
   Identifier  "Configured Monitor"
   HorizSync 5.0 - 1000.0
   VertRefresh 5.0 - 200.0
   ModeLine "1920x1080" 148.50 1920 2448 2492 2640 1080 1084 1089 1125
+Hsync +Vsync
#    Modeline "1280x800" 24.15 1280 1312 1400 1432 800 819 822 841
EndSection

Section "Screen"
   Identifier  "Default Screen"
   Monitor     "Configured Monitor"
   Device      "Configured Video Device"
   DefaultDepth 24
   SubSection "Display"
   Depth 24
   Modes "1920x1080"
   EndSubSection
EndSection
```

  StackExchange, answered May 26, 2021 at 18:27
  “I'm running Ubuntu 15.04. Once I knew that X does pick up the xorg.org file in /etc/X11, the real challenge was to find the settings that work.”
  “I removed the xorg.conf file I had created in the original post and followed the instructions at the above link. I had to comment out the 1920X1080 modeline to get it to work (not sure why but it worked so I'm not complaining). Was able to connect to the desktop at the desired resolution 1920x1080 using NoMachine.”
- ✅⚠️ I ran the following commands. It worked, the desktop image stretched out, however it is not clear. And copy-paste is not working.

```
$ sudo apt-get install xserver-xorg-core
$ sudo apt-get install xserver-xorg-video-dummy
$ cd /etc/X11
```

$ sudo nano xorg.conf
$ sudo apt autoremove

```
robond@instance-robond-gpu-20250221:~$ robond@instance-robond-gpu-20250221:~$ dpkg -l | grep xserver-xorg-core
ii  xserver-xorg-core                2:1.18.4-0ubuntu0.12                amd64        Xorg X server - core server
rc  xserver-xorg-core-hwe-16.04     2:1.18.4-1ubuntu6.1~16.04.1         amd64        Xorg X server - core server
```



👉 Notes: [Other remote desktop issues]

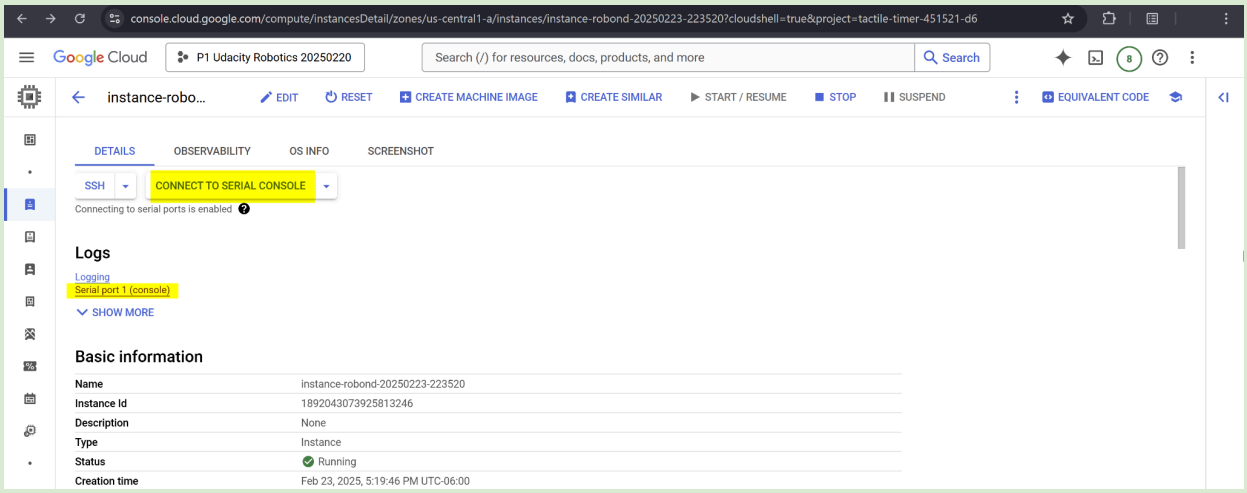
⚠️ Issue: [$ rosrun rviz rviz doesn't work.]
Stereo is NOT SUPPORTED.
OpenGl version: 3 (GLSL 1.3)
terminate called after throwing an instance of `std::runtime_error`
what(): Duration is out of dual 32-bit range

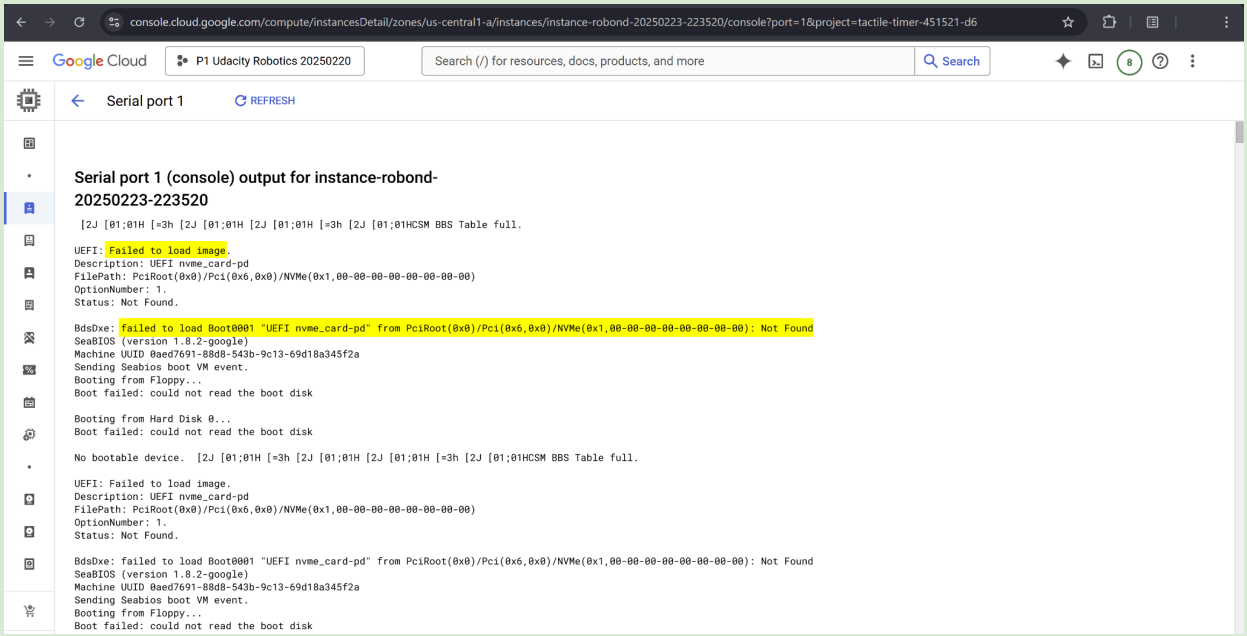
```
robond@instance-20250224-015140:~/catkin_ws$ rosrun rviz rviz
[ INFO] [1740432218.101778656]: rviz version 1.12.10
[ INFO] [1740432218.101838755]: compiled against Qt version 5.5.1
[ INFO] [1740432218.101871848]: compiled against OGRE version 1.9.0 (Ghadamon)
[ INFO] [1740432218.229595184]: Stereo is NOT SUPPORTED
[ INFO] [1740432218.229705431]: OpenGl version: 3 (GLSL 1.3).
terminate called after throwing an instance of 'std::runtime_error'
  what():  Duration is out of dual 32-bit range
Aborted (core dumped)
```

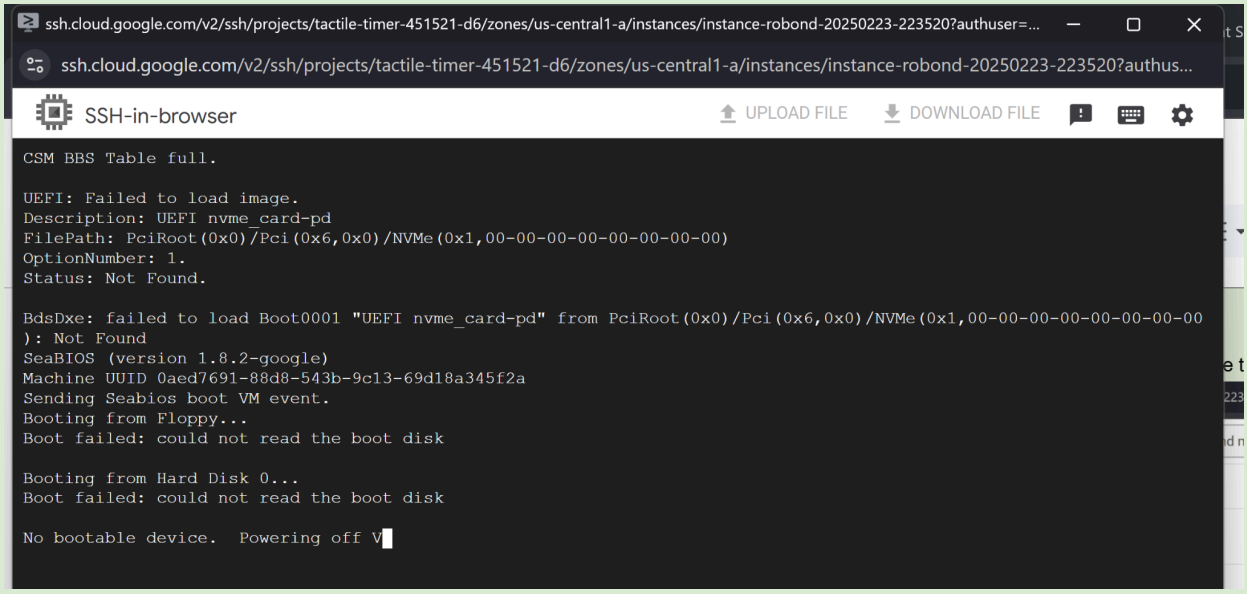
[Run RViz from remote docker using X11]
Asked by Elgin.D on 2020-04-19 21:19:53 UTC
[https://medium.com/@viirya/setting-up-linux-gui-container-on-mac-728194b20e78]
r/ROS • 1 mo.ago Siliquy8
[RViz on a remote computer?]

⚠️ Issue: [can’t ssh access GPU VM instances. if I change machine type to CPU, it is fine to ssh connect.]

Feb 24, 2025 Update: the issue persists. However, I find that I can use x11 without gpu.







Editing VM instance "instance-robond-20250223-223520" failed. Error: Invalid accelerator specs for 'g2-standard-4' instances. Accelerator name: 'nvidia-tesla-p4-vws', count 1. Supported accelerator(s): [nvidia-l4, nvidia-l4-vws].

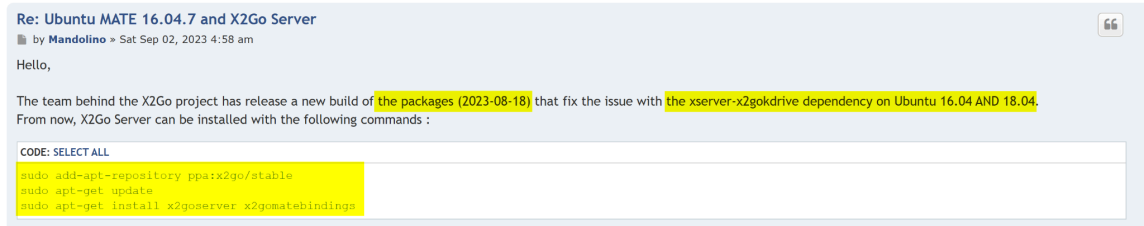
Reference

- [How to run your VirtualBox OVA Applications on Google Cloud]
  Adrian Roque Jan 10, 2021

  This post introduced another way to set up the virtual machine. First upload .ova to a GCP bucket, then create a machine image from .ova, and then create a VM from the machine image.

- Digital Ocean Tutorial
  [How To Set Up a Remote Desktop with X2Go on Ubuntu 20.04] ⚠️ The course image is on **Ubuntu 16.04.7 LTS**.
  Published on July 14, 2020

- https://forum.odroid.com/viewtopic.php?t=46864
  https://serverok.in/ubuntu-16-x2go-server



Re: Ubuntu MATE 16.04.7 and X2Go Server

by **Mandolino** » Sat Sep 02, 2023 4:58 am

Hello,

The team behind the X2Go project has release a new build of the packages (2023-08-18) that fix the issue with the xserver-x2gokdrive dependency on Ubuntu 16.04 AND 18.04.
From now, X2Go Server can be installed with the following commands :

CODE: SELECT ALL

```
sudo add-apt-repository ppa:x2go/stable
sudo apt-get update
sudo apt-get install x2goserver x2gomatebindings
```

apt -y install xfce4
add-apt-repository ppa:x2go/stable
apt-get update
apt-get -y install x2goserver x2goserver-xsession
(apt-get -y install x2goserver x2gomatebindings)

- https://blog.hostonnet.com/x2go-ubuntu
  X2Go client

- r/linux_gaming 9 mo. ago Fluffy_Wafer_9212
  I made a guide to help you install & manage the NVIDIA GPU drivers (including driver 555) on your Ubuntu system(s)
  “Never, ever, install using Nvidia's .run script - Wait until the Launchpad PPA has the driver available.
  The .run script overwrites important libraries.”

- u/ad97lb • 2y ago
  For running a heavy application, it's pretty good I'd say. I installed ROS Noetic on it, all the cuda drivers, Pytorch and have been running a DRL training that connects to Gazebo and Rviz and the GPU is being used fully but my Nvidia GPU isn't that great. It's an Nvidia GeForce MX450.
  Qkumbazoo • 2y ago
  I don't know which was more painful, running gazebo sim without a gpu or installing the cuda drivers on linux. You might have better luck though.

<END>