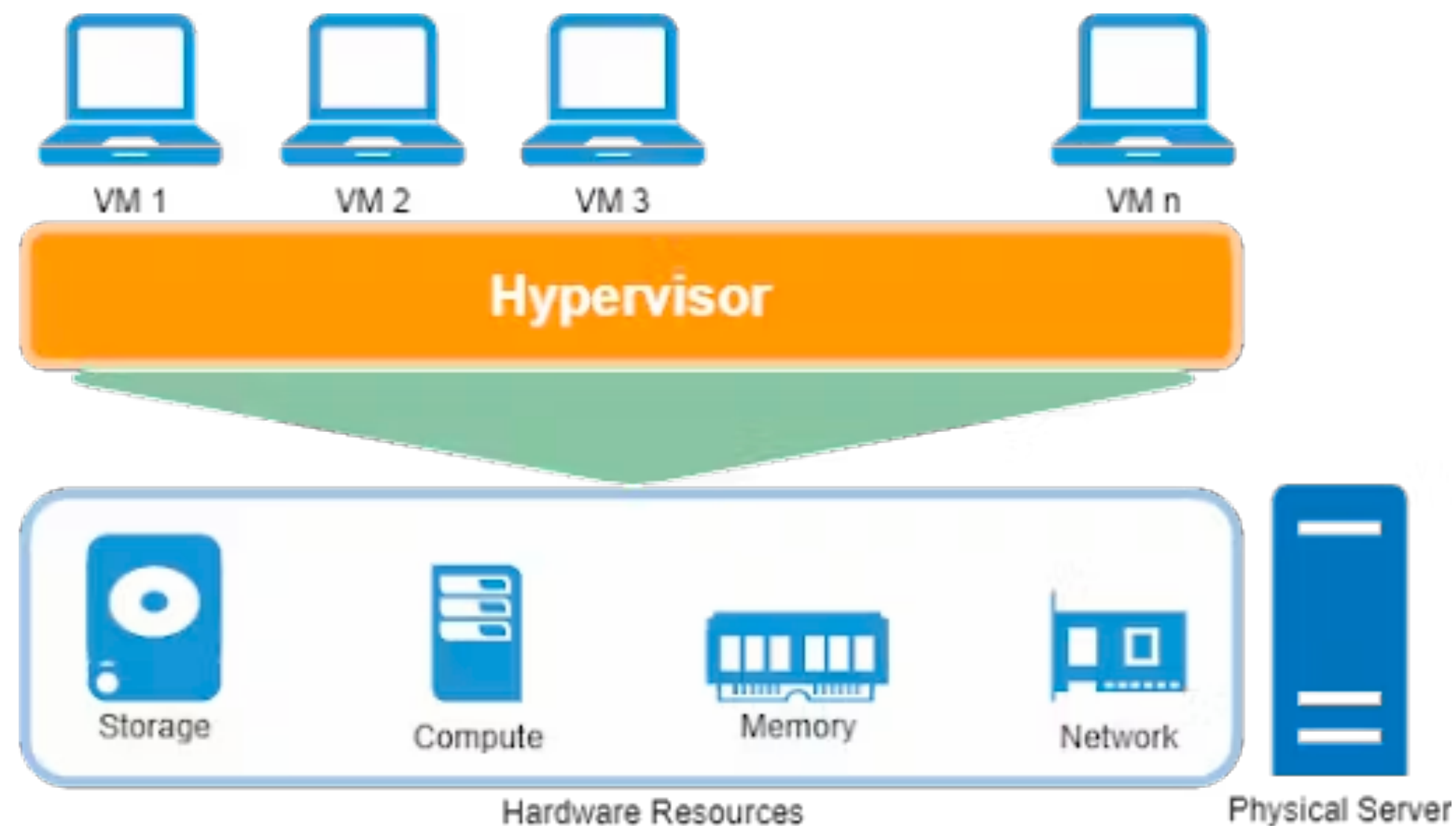


# RShiny Deployment on GCP

## Tutorial

Claire

# Intro: why use a computing platform?



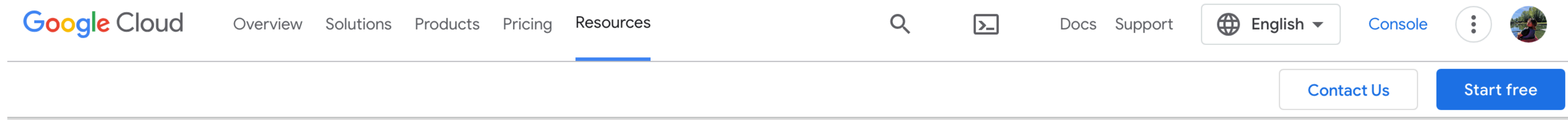
Remote access to VM: virtual machines

Host machine: can be bigger, simpler, more powerful, and far away.

Nowadays, many platforms lend computing resources: AWS, Google, Microsoft Azure, etc. and most of them work similarly.

# Step 0: Register on GCP and create project

You will have to enter your details after registering for a 12-month free trial.



## Solve real business challenges on Google Cloud

Get started for free

Contact sales

### Run workloads for free

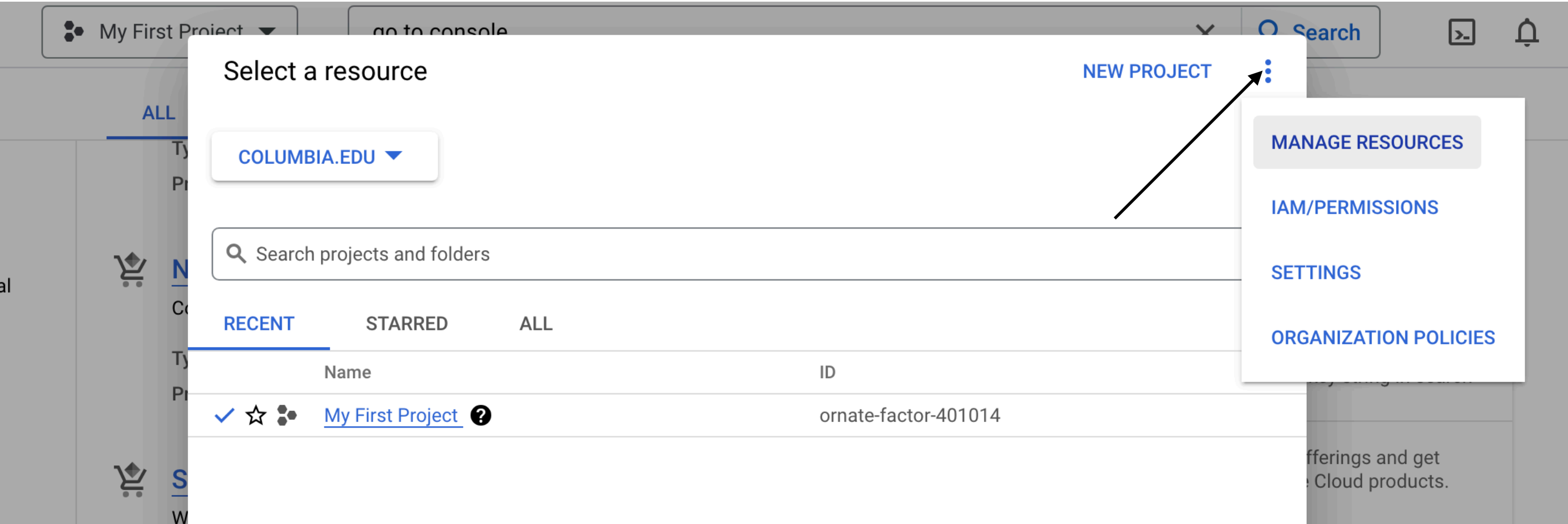
20+ free products for all customers

\$300 in free credits for new customers

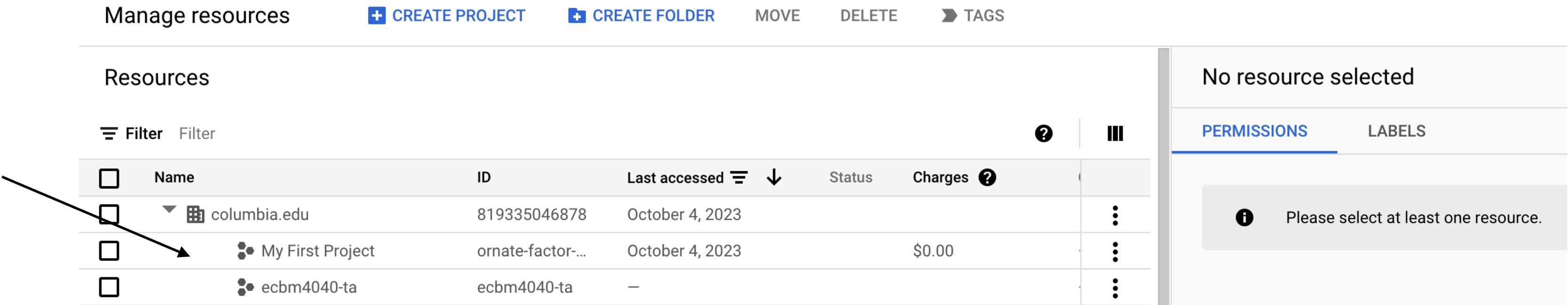
Start deploying pre-built solutions free

# Step 0: Register on GCP and create project

Click on 'My First Project' and select the drop down menu on the side to go to 'Manage resources'



This will open the console view of the GCP and you can create your project.



# Step 0: Register on GCP and create project





Check that billing has been enabled on your project.

If not you can access billing details in the drop down menu.

Resources

Filter

Filter

<input type="checkbox"/>	Name	ID	Last accessed <div>⌵</div>	Status	Charges <div>?</div>	
<input type="checkbox"/>	<div>▼</div>  columbia.edu	819335046878	October 4, 2023			<div>⋮</div>
<input type="checkbox"/>	 GCP-tutorial	ornate-factor-...	October 4, 2023		\$0.00	<div>⋮</div>
<input type="checkbox"/>	 ecbm4040-ta	ecbm4040-ta	—			
<input type="checkbox"/>	 ELEN-E6040-2020spring	research-267...	—			

RESOURCES PENDING DELETION

Move

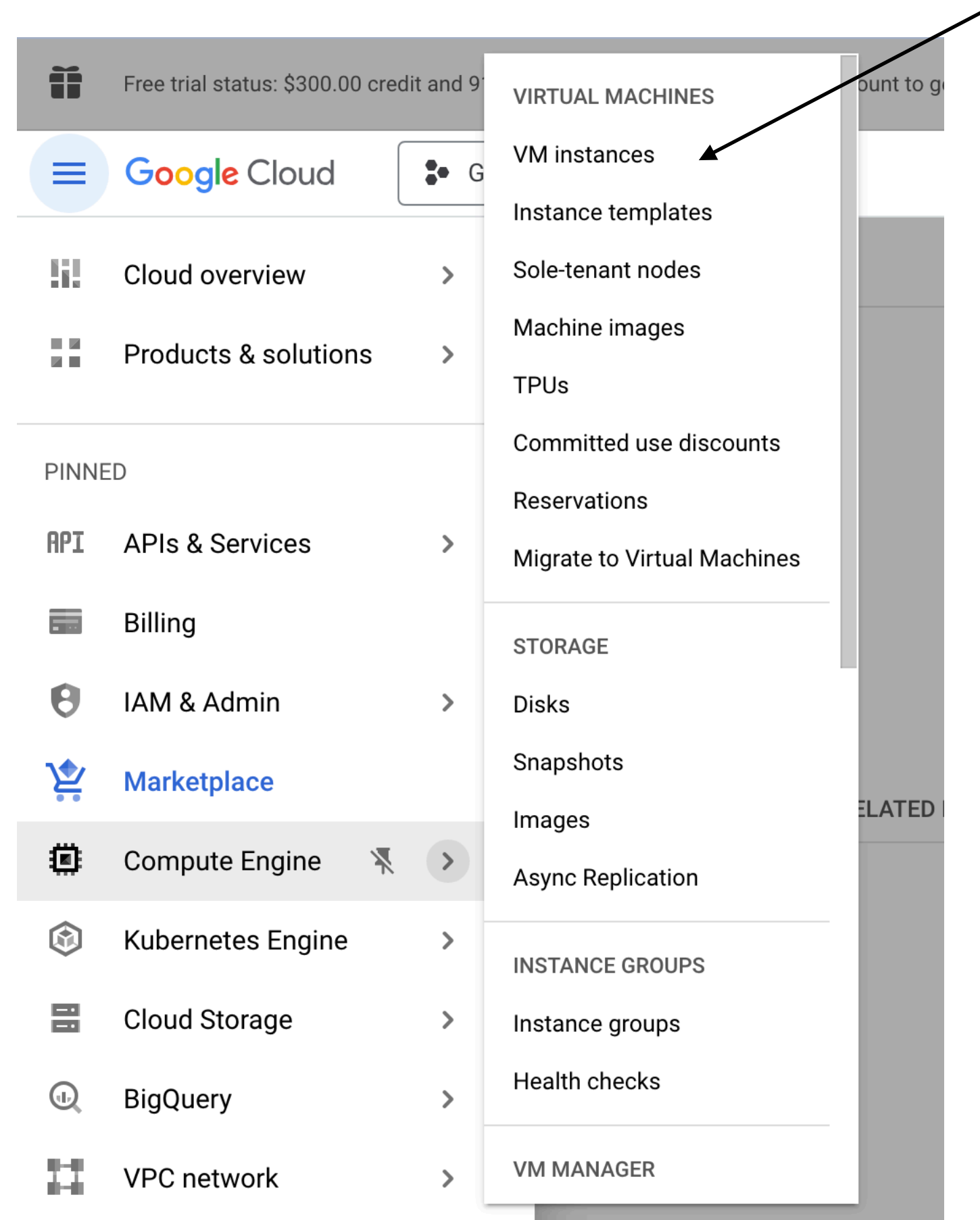
Delete

Billing

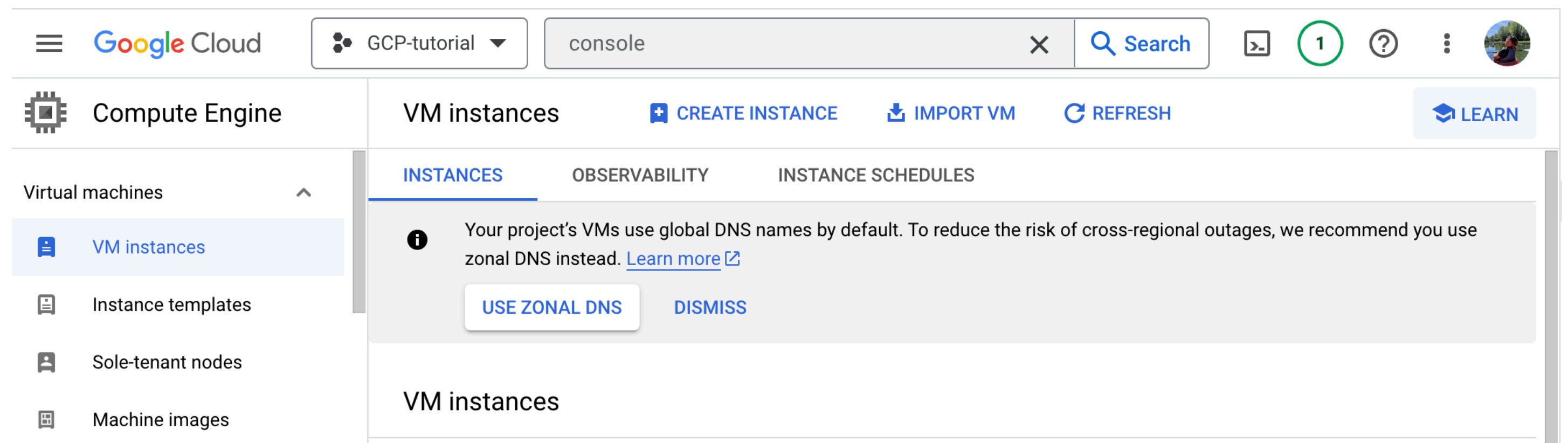
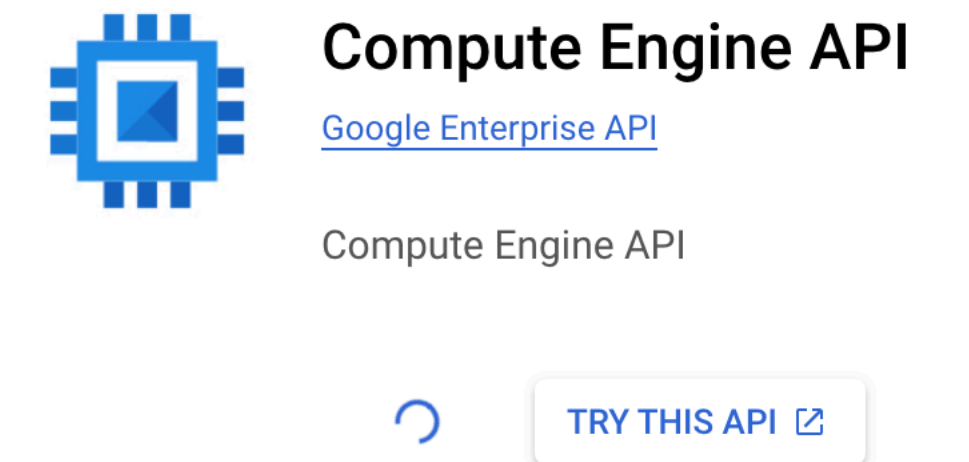
Settings

# Step 1: Create a virtual machine instance

In Compute Engine menu from the sidebar, go to VM instances.



## Create a VM instance by enabling the Compute Engine API



The VM instances page should look like the above.



# Step 1: Create a virtual machine instance

Create your instance by completing the following

Google Cloud

GCP-tutorial

console

Search

1

Create an instance

EQUIVALENT CODE

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 \*

instance-1

MANAGE TAGS AND LABELS

Region \*

us-west4 (Las Vegas)

Zone \*

us-west4-b

Machine configuration

Try the new H3 machine series, optimized for HPC.

TRY NOW

General purpose

Compute optimized

NEW

Memory optimized

GPUs

Machine types for common workloads, optimized for cost and flexibility

Monthly estimate

\$28.65

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	\$27.55
10 GB balanced persistent disk	\$1.10
Total	\$28.65

Compute Engine pricing

LESS

## Boot disk

Select an image or snapshot to create a boot disk; or attach an existing disk. Can't find what you're looking for? Explore hundreds of VM solutions in [Marketplace](#)

PUBLIC IMAGES

CUSTOM IMAGES

SNAPSHOTS

ARCHIVE SNAPS

Operating system

Ubuntu

Version \*

Ubuntu 20.04 LTS

x86/64, amd64 focal image built on 2023-09-18

Boot disk type \*

SSD persistent disk

COMPARE DISK TYPES

Size (GB) \*

20

Provision between 10 and 65536 GB

SHOW ADVANCED CONFIGURATION

SELECT

CANCEL

# Step 1: Create a virtual machine instance

In Firewall, allow HTTP traffic.

In Access scopes allow full access to all Cloud APIs.

Firewalls

- ☒ Allow HTTP traffic
- ☐ Allow HTTPS traffic
- ☐ Allow Load Balancer Health checks

Network tags

Network tags

http-server

Identity and API access

Service accounts

Service account

Compute Engine default service account

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

Access scopes

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

Run your VM instance by clicking start.

1

START / RESUME

STOP

SUSPEND

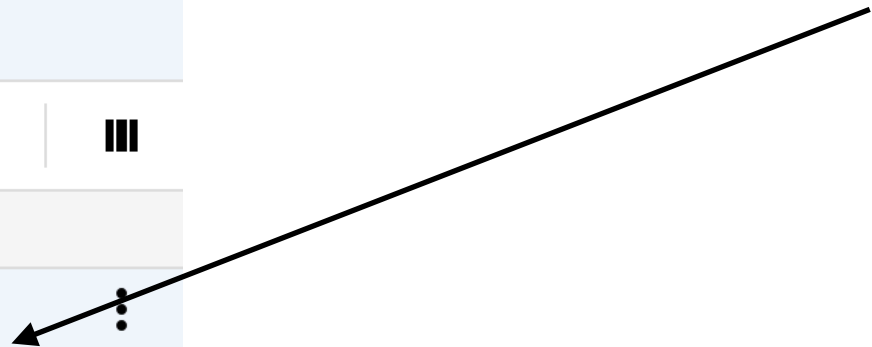
RESET

DELETE

Filter

Enter property name or value

<input checked="" type="checkbox"/>	Status	Name ↑	Zone	Recommendations	In use by	Internal IP	Connect
<input checked="" type="checkbox"/>	<div>✓</div>	<a href="#">gcp-tuto</a>	northamerica-northeast1-a			10.162.0.4 <a href="#">(nic0)</a>	SSH <div></div>





# Step 2: Create a virtual machine instance

Now we want to set up the virtual machine so that it supports R Shiny apps

```
SSH-in-browser  UPLOAD FILE  DOWNLOAD FILE  !  ⌨  ⚙

Welcome to Ubuntu 20.04.6 LTS (GNU/Linux 5.15.0-1042-gcp x86_64)

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

System information as of Wed Oct  4 15:04:00 UTC 2023

System load:  0.06          Processes:           106
Usage of /:   9.6% of 19.20GB Users logged in:       0
Memory usage: 5%          IPv4 address for ens4: 10.162.0.4
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

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.

cmh2277@gcp-tuto:~$ sudo gcloud compute firewall-rules create rstudio-conn --allow=tcp:8787
Creating firewall...#Created [https://www.googleapis.com/compute/v1/projects/ornate-factor-401014/global/firewa
lls/rstudio-conn].
Creating firewall...done.
NAME          NETWORK  DIRECTION  PRIORITY  ALLOW     DENY  DISABLED
rstudio-conn  default  INGRESS    1000      tcp:8787  False
cmh2277@gcp-tuto:~$ sudo gcloud compute firewall-rules create shiny-conn --allow=tcp:3838
Creating firewall...#Created [https://www.googleapis.com/compute/v1/projects/ornate-factor-401014/global/firewa
lls/shiny-conn].
Creating firewall...done.
NAME          NETWORK  DIRECTION  PRIORITY  ALLOW     DENY  DISABLED
shiny-conn    default  INGRESS    1000      tcp:3838  False
```

In these steps we allow R Shiny app and R Shiny server connections to our Virtual Machine.

We can now move on to installing R and R Studio on the VM.

Using a VM is like giving you access to a remote but powerful computer on which to run the usual operations you would on your local machine.

# Step 3/4/5: Install R/RStudio on the VM

We will install R and RStudio on the VM using the pop-up window which is the terminal of your VM.

Remember you clicked on 'SSH' to open the window? This guarantees you can remote login safely.

For most Unix systems you can google the bash script to do your tasks... or ask your CompSci friends to help out.

We do all the necessary upgrading. And use the code to download R and the needed packages.

- The code chunk below adds a line to the repository list, then passes a key for the Ubuntu server to download R, updates the existing packages, and installs r-base and r-base dev.

```
sudo sh -c 'echo "deb https://cloud.r-project.org/bin/linux/ubuntu bionic-cran35/" >> /etc/apt/sources.list'
sudo apt-key adv --keyserver keyserver.ubuntu.com --recv-keys E084DAB9
sudo apt-get update
sudo apt-get install r-base r-base-dev
```

- A few features won't work using only the r-base, since the packages are based on other programs as well, so to cover a few of those, below are the codes used to install the software needed.
  - Spatial Libraries:

```
sudo apt-get install libgeos-dev libproj-dev libgdal-dev
```

- Tidyverse Universe:

```
sudo apt-get install libcurl4-openssl-dev libssl-dev libxml2-dev
```

- other:

```
sudo add-apt-repository -y ppa:opencpu/jq
sudo apt-get update
sudo apt-get install libjq-dev

sudo apt-get install libudunits2-dev
sudo apt-get install libprotobuf-dev
sudo apt-get install libv8-dev
sudo apt-get install protobuf-compiler
```

These are the lines that are automatically fed to/ executed by your computer when you install R by downloading the packages.

# Step 3/4/5: Install R/RStudio on the VM

- Follow the steps that allow you to install RStudio likewise.
- Note that we can run R without RStudio from the command line as soon as we have installed R.
- The command 'sudo -i R' tells the machine you are now writing lines in R. You can install packages that way like *dplyr*, *rmarkdown*, *shiny*.
- Remember that you need to quit the R app that is running in order to use the command line of you VM by typing 'quit()'.  
Note that this works similarly with Python and other languages.

VM instances

Filter Enter property name or value								
<input type="checkbox"/>	Status	Name ↑	Zone	Recommendations	In use by	Internal IP	External IP	Connect
<input type="checkbox"/>	✓	<a href="#">gcp-tuto</a>	northamerica-northeast1-a			10.162.0.4 (nic0)	<a href="#">35.203.114.106</a> (nic0)	SSH

For Ubuntu 20 + users, the wget url might change to

`wget https://download2.rstudio.org/server/jammy/amd64/rstudio-server-2023.09.0-463-amd64.deb`

`sudo gdebi rstudio-server-2023.09.0-463-amd64.deb`

Other debugs here (<https://posit.co/download/rstudio-server/>)

To get your external IP, look up the VM instance you have created. Mine looks like <http://35.203.114.1065:8787>

# Step 6/7: Reserve a static external IP/Develop your app

In the linked networking page you will find the following. Create a static IP attached to your project.

IP addresses

[RESERVE EXTERNAL STATIC IP ADDRESS](#)

[RESERVE INTERNAL STATIC IP ADDRESS](#)

[REFRESH](#)

[SHOW](#)

ALL	INTERNAL IP ADDRESSES	EXTERNAL IP ADDRESSES	IPV4 ADDRESSES	IPV6 ADDRESSES					
<div><div>Filter</div><div>Enter property name or value</div></div>									
<input type="checkbox"/>	Name	IP address	Access type	Region	Type ↓	Version	In use by	Subnetwork	VPC Network
<input type="checkbox"/>	—	10.162.0.4	Internal	northamerica-northeast1	Ephemeral	IPv4	VM instance <a href="#">gcp-tuto</a> (Zone northamerica-northeast1-a)	<a href="#">default</a>	<a href="#">default</a>
<input type="checkbox"/>	—	10.188.0.2	Internal	northamerica-northeast2	Ephemeral	IPv4	VM instance <a href="#">gcp-tuto-2</a> (Zone northamerica-northeast2-a)	<a href="#">default</a>	<a href="#">default</a>
<input type="checkbox"/>	—	34.130.239.231	External	northamerica-northeast2	Ephemeral	IPv4	VM instance <a href="#">gcp-tuto-2</a> (Zone northamerica-northeast2-a)	<a href="#">default</a>	<a href="#">default</a>

Premium

⋮

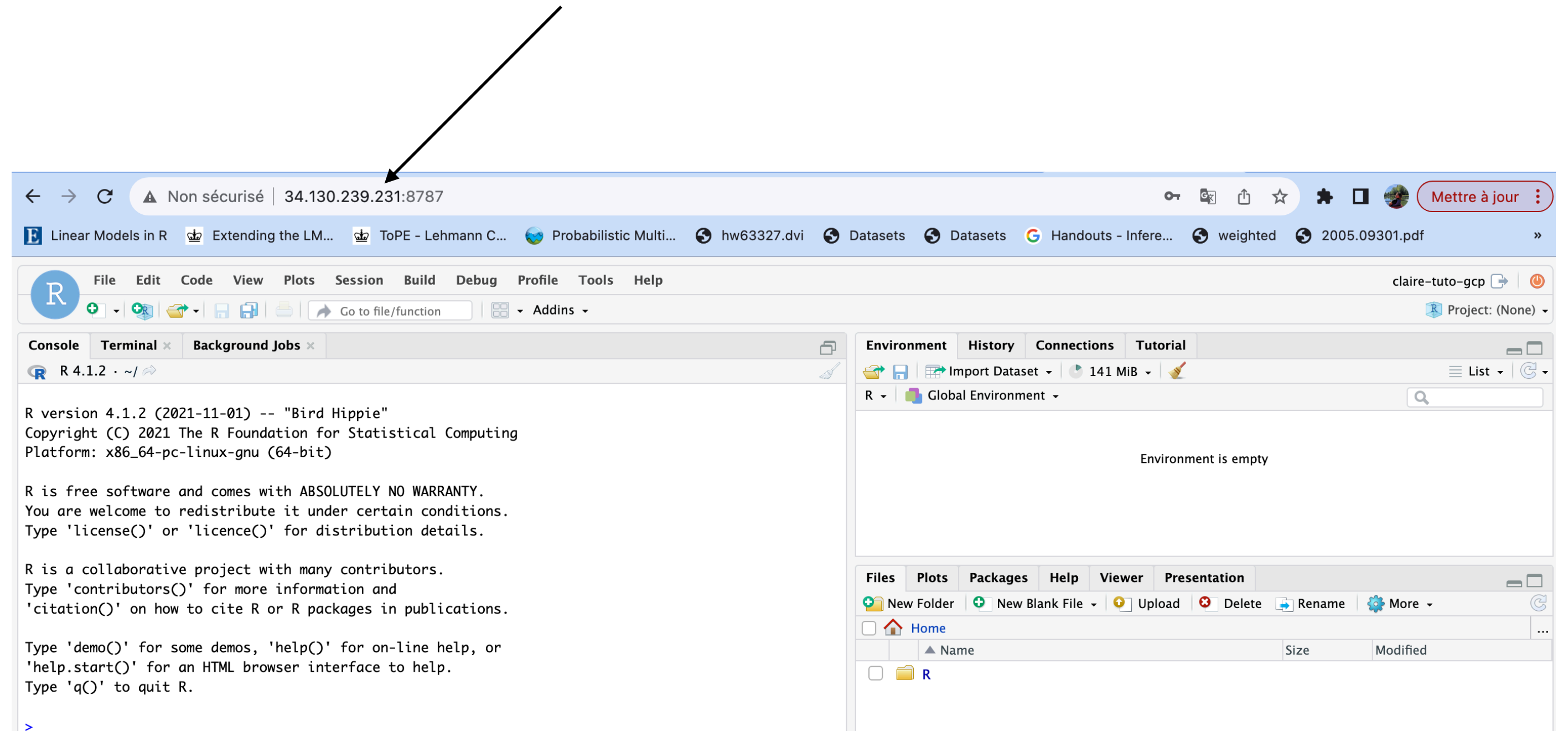
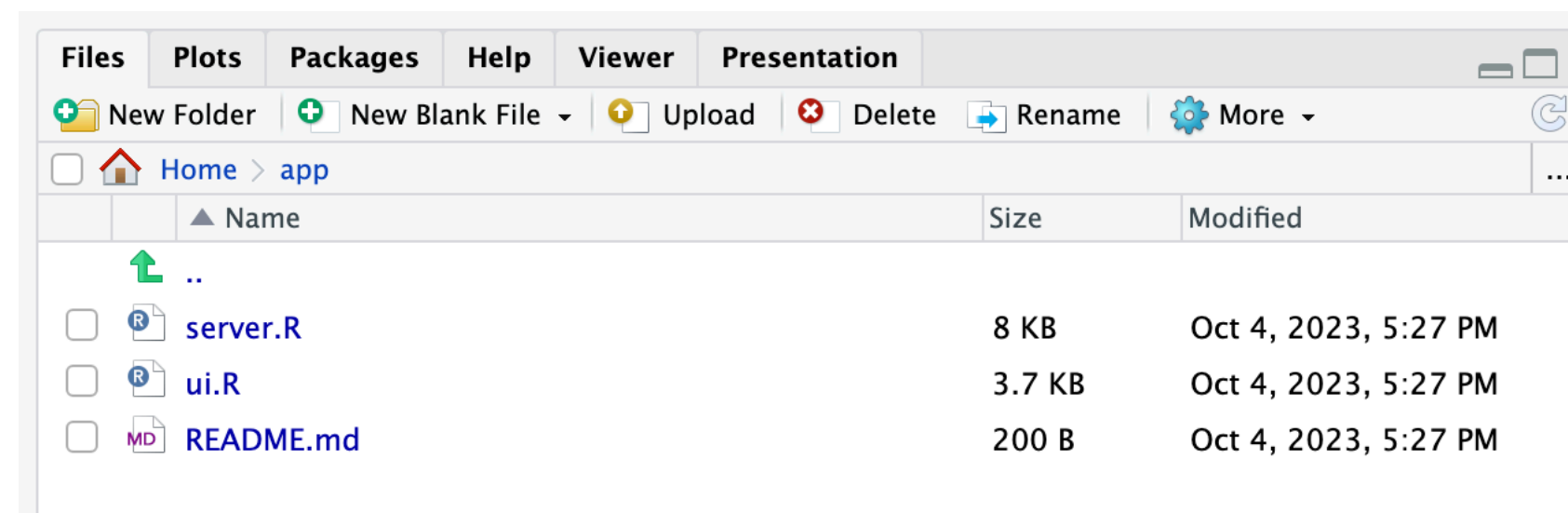
Promote to static IP address



# Step 6/7: Reserve a static external IP/Develop your app

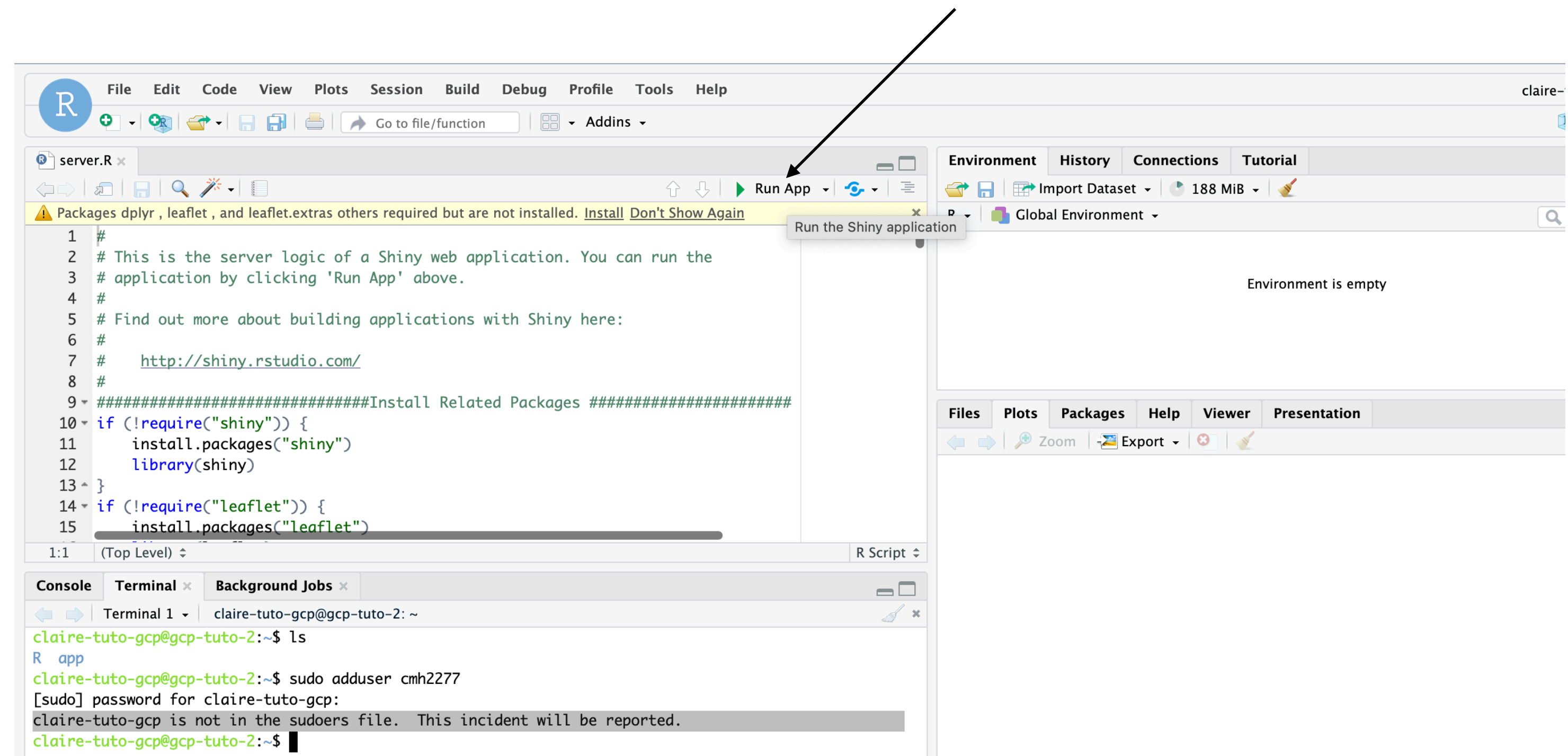
In the linked networking page you will find the following. Create a static IP attached to your project.

You can now upload your files for your Shiny App.



# Step 8: Publish your Rshiny App

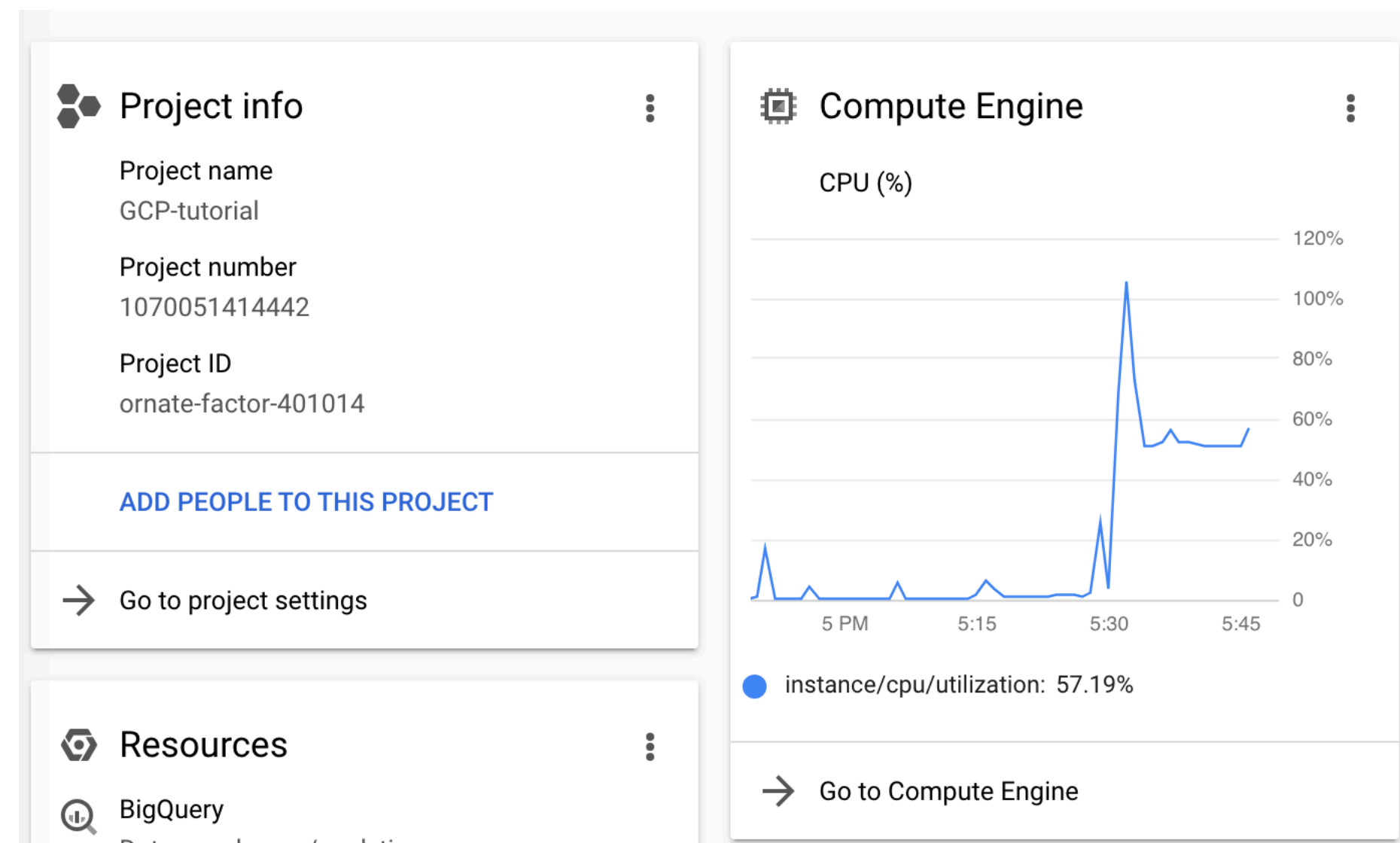
Last week, the tutorial showed you could use [shinyapp.io.com](https://shinyapp.io.com) to deploy your app using the package *rsconnect*. With GCP you can use a command line to copy all the files to your shiny-server (Step 5) which publishes your RShiny App *as long as the vm is running*.





# Take away

You can log into the R studio server using your username and password and work remotely on a more powerful computational engine than you own laptop.



Sign in to RStudio

Username:

Password:

☐ Stay signed in when browser closes

You will automatically be signed out after 60 minutes of inactivity.

[Sign in](#)