


Introduction to RStudio and Shiny servers



Who am I?

- ▶ **Name:** Nicolas Attalides
- ▶ **Coding in  since:** 2005 (yes that's before RStudio!)
- ▶ **Profession:** Data Scientist consultant and trainer (5+ yrs.)
- ▶ **Education:** PhD in Statistical Science from UCL (2015)
- ▶ **R Status:** A never-ending evolving R dinosaur
- ▶ **Hobbies:** Tennis and coding (not at the same time)

Workshop Setup:

- ▶ Wi-Fi

Network Name: N/A


Password: N/A

- ▶ Requirements

An active Gmail account

Some patience

What is Google Cloud Platform?

Google Cloud Platform – known as GCP  - is a collection of cloud computing services that use the resources available at Google. GCP offers services **via the cloud** that access Google's physical hardware infrastructure such as: computers, hard disk drives, solid state drives and networking. This is a **fast** and **cost effective** alternative to having to build and maintain your own physical infrastructure.



Other popular services:




- Microsoft Azure Cloud Computing Platform & Services
- Amazon Web Services (AWS)

Topics

► Workshop aim:

Learn how to setup RStudio and Shiny servers on GCP and host a shiny app online.

► Topics:

- Setup GCP Virtual Machine (VM) instance 
- Setup RStudio server  R Studio®
- Setup Shiny server 
- Host a shiny app online

Setup GCP VM instance (for free)



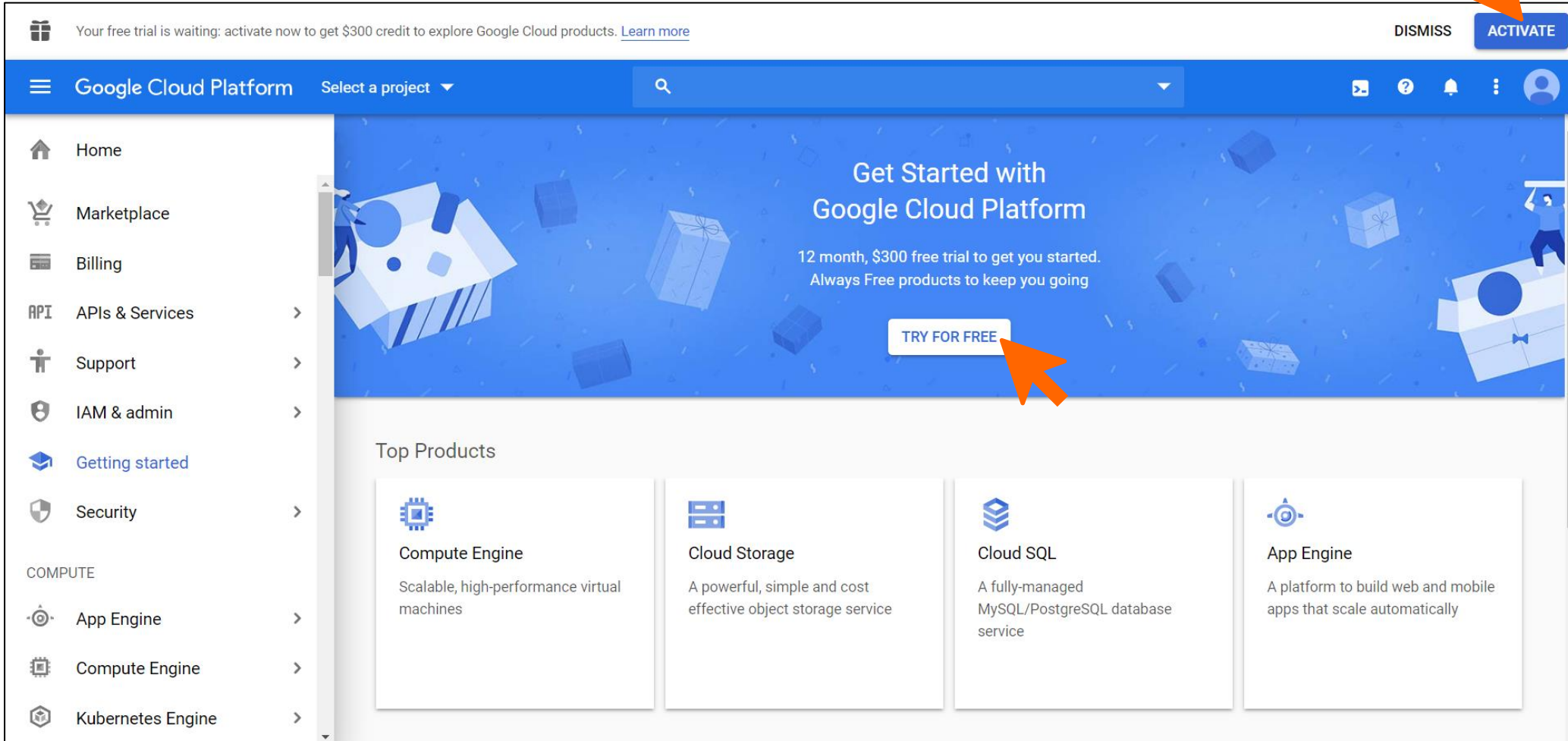
In order to access the Google Cloud Platform you will need to do the following:

1. Create a Gmail account (if you don't have one already 🤖)
2. Visit <https://console.cloud.google.com/> (you might need to sign in)
3. Deal with the boring stuff (Terms of Service)
4. Get \$300 free trial (for 12 months) 🎉
5. Get started!



You might need to provide your card details – don't worry you are able to close your billing account if you want.

Live Demo Part 1



Your free trial is waiting: activate now to get \$300 credit to explore Google Cloud products. [Learn more](#)

DISMISS **ACTIVATE**

Google Cloud Platform Select a project





Home
Marketplace
Billing
APIs & Services
Support
IAM & admin
Getting started
Security
COMPUTE
App Engine
Compute Engine
Kubernetes Engine

Get Started with Google Cloud Platform

12 month, \$300 free trial to get you started.
Always Free products to keep you going

TRY FOR FREE

Top Products

Icon	Product Name	Description
	Compute Engine	Scalable, high-performance virtual machines
	Cloud Storage	A powerful, simple and cost effective object storage service
	Cloud SQL	A fully-managed MySQL/PostgreSQL database service
	App Engine	A platform to build web and mobile apps that scale automatically



Try Google Cloud Platform for free

Step 1 of 2

Country

Spain

Terms of Service

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

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

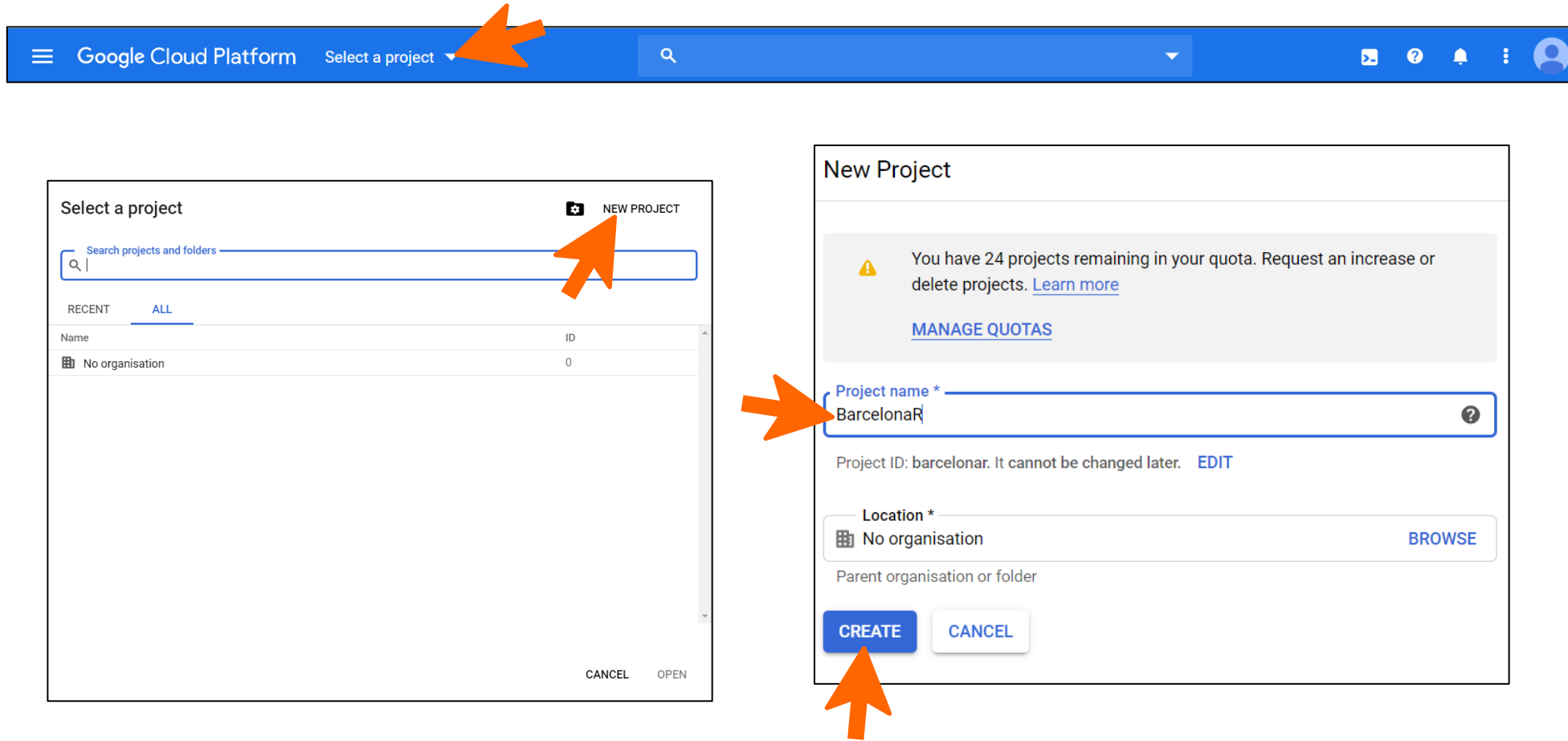
- Welcome to Google Cloud Platform**

Get everything you need to build and run your apps, websites and services, including Firebase and the Google Maps API.
- Free \$300 credit for you**

Sign up and get \$300 to spend on Google Cloud Platform over the next 12 months.
- We're always transparent**

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.

Create a project



Google Cloud Platform Select a project

Select a project

NEW PROJECT

Search projects and folders

RECENT ALL

Name	ID
No organisation	0

CANCEL OPEN

New Project

You have 24 projects remaining in your quota. Request an increase or delete projects. [Learn more](#)

[MANAGE QUOTAS](#)

Project name * BarcelonaR

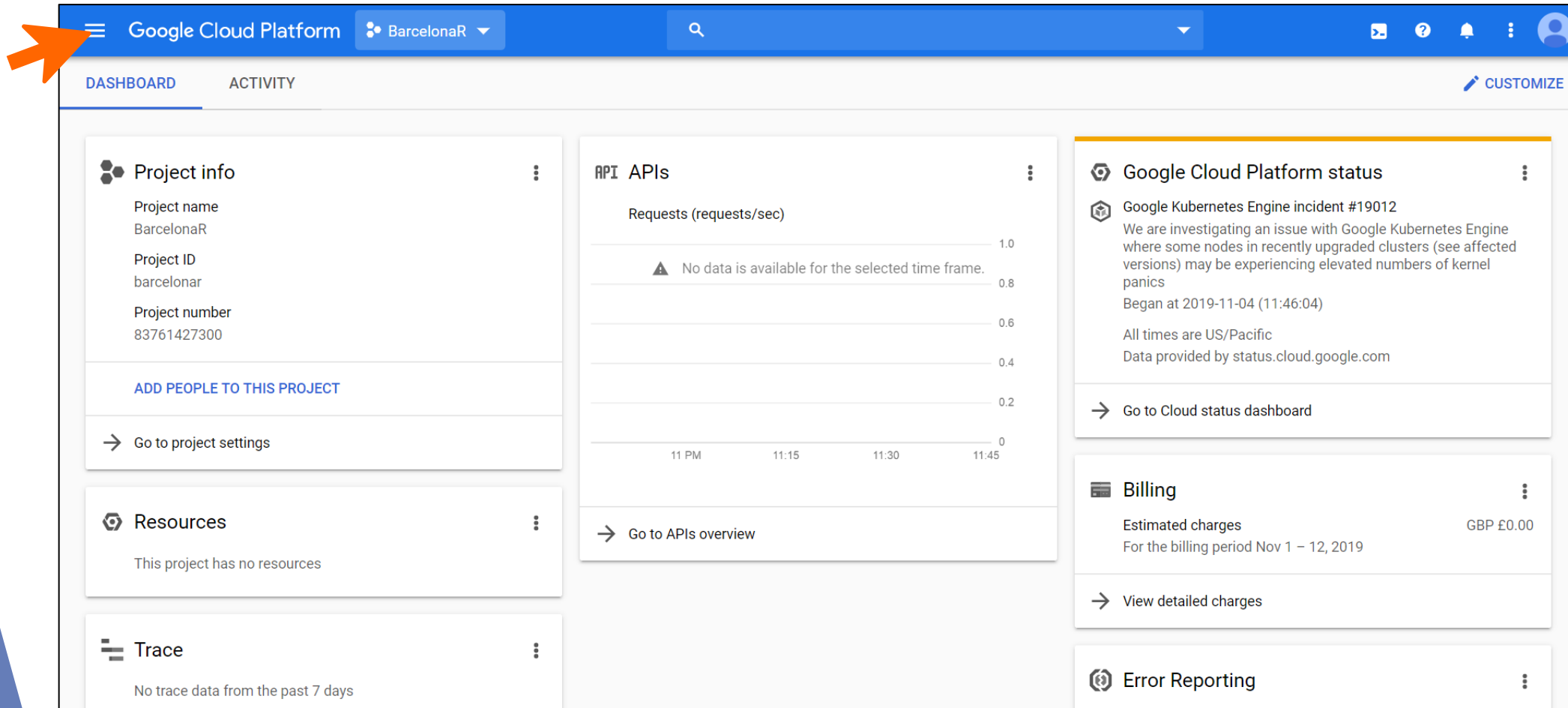
Project ID: barcelonar. It cannot be changed later. [EDIT](#)

Location * No organisation [BROWSE](#)

Parent organisation or folder

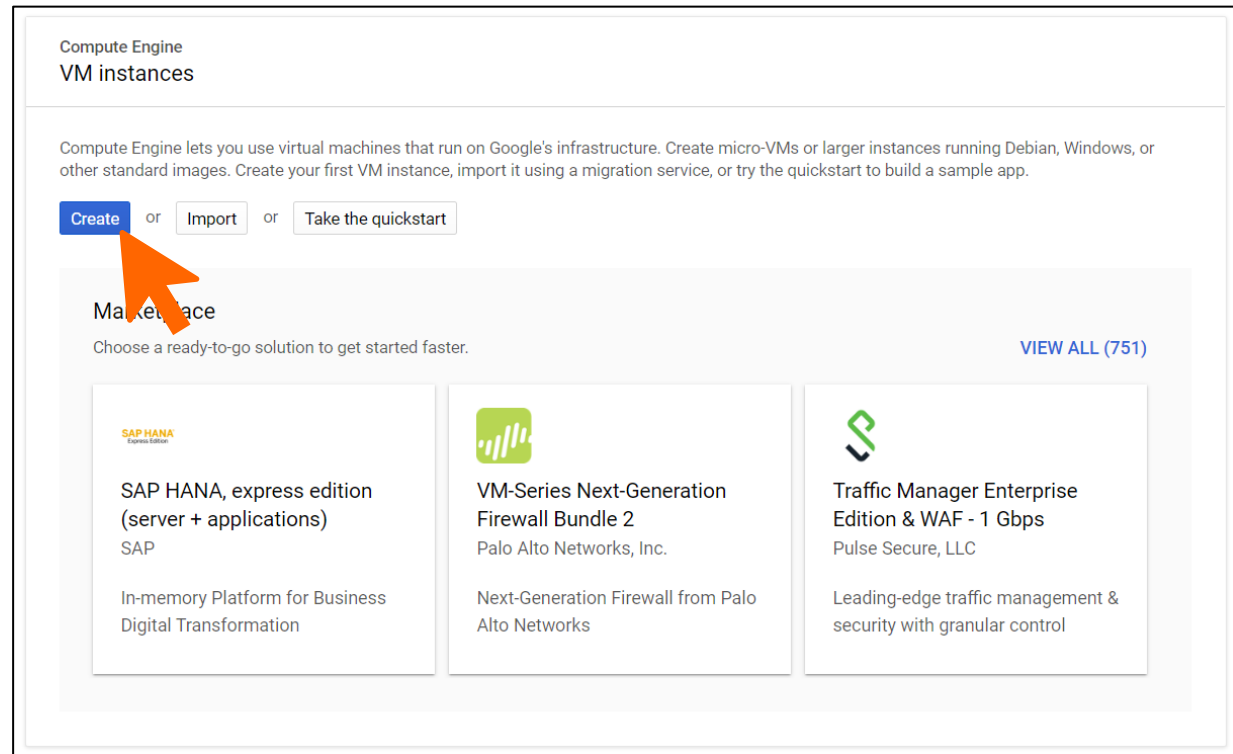
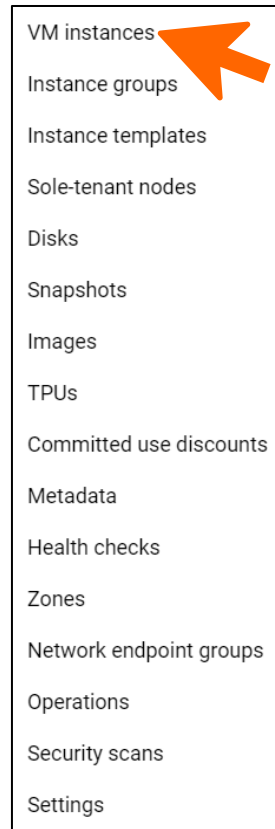
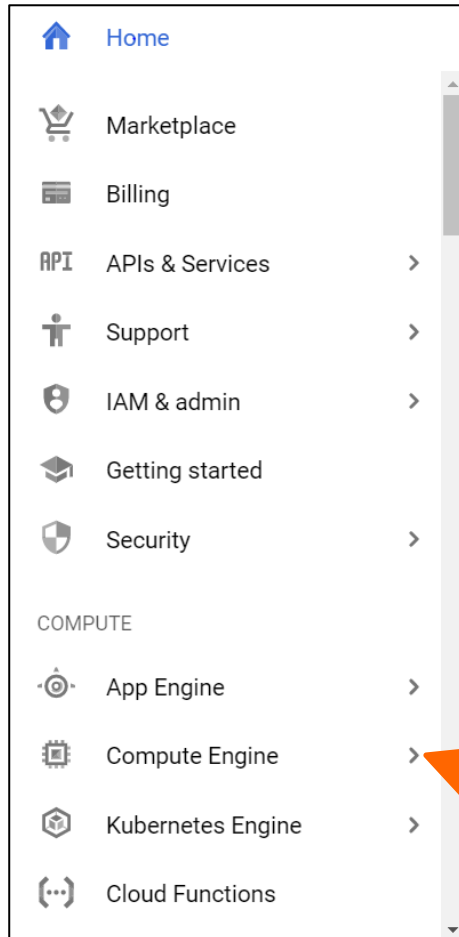
CREATE CANCEL

Create a VM instance



The screenshot shows the Google Cloud Platform dashboard for the project 'BarcelonaR'. The top navigation bar includes the Google Cloud Platform logo, the project name 'BarcelonaR', a search bar, and user account icons. The main content area is divided into several sections:

- Project info:** Displays project details such as Project name (BarcelonaR), Project ID (barcelonar), and Project number (83761427300). It includes a link to 'ADD PEOPLE TO THIS PROJECT' and a button to 'Go to project settings'.
- Resources:** A section indicating 'This project has no resources'.
- Trace:** A section indicating 'No trace data from the past 7 days'.
- API APIs:** A section showing a graph of 'Requests (requests/sec)' over time. The graph displays a warning message: 'No data is available for the selected time frame.' Below the graph is a button to 'Go to APIs overview'.
- Google Cloud Platform status:** A section providing status updates, including a 'Google Kubernetes Engine incident #19012' and a link to 'Go to Cloud status dashboard'.
- Billing:** A section showing 'Estimated charges' for the billing period Nov 1 – 12, 2019, with a total of GBP £0.00. It includes a link to 'View detailed charges'.
- Error Reporting:** A section for monitoring errors.



Use the pin frequently!



functionality to pin the services you use most



Name ?
Name is permanent

rstudio-shiny-servers

Labels ? (Optional)

+ Add label

Region ?
Region is permanent

us-central1 (Iowa)

Zone ?
Zone is permanent

us-central1-a

Machine configuration

Machine family

General-purpose Compute-optimized Memory-optimized

Machine types for common workloads, optimized for cost and flexibility


Series

E2

CPU platform selection based on availability

Machine type

e2-medium (2 vCPU, 4 GB memory)

	vCPU	Memory	GPUs
	1 shared core	4 GB	-

Name you VM instance
e.g. "rstudio-shiny-servers"



You can select a different region/zone
to specify the location the resource is
used and where the data is stored.

Select the VM machine type
e.g. "e2-medium" is OK



The "stronger" the machine type (more
CPUs and/or more memory) the more
expensive it is to run!

\$24.86 monthly estimate


That's about \$0.034 hourly

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

[Details](#)



Boot disk ?



New 10 GB standard persistent disk

Image

Debian GNU/Linux 9 (stretch)

Change

Identity and API access ?

Service account ?

Compute Engine default service account

Access scopes ?

☒ Allow default access

☐ Allow full access to all Cloud APIs

☐ Set access for each API

Firewall ?

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

☒ Allow HTTP traffic

☐ Allow HTTPS traffic

Management, security, disks, networking, sole tenancy

You will be billed for this instance. [Compute Engine pricing](#)

Create

Cancel

Equivalent [REST](#) or [command line](#)

Select the OS image.
We will use "Ubuntu 16.04 LTS"



Other OS images may also work but you would need to adjust the installation procedure.

Check the "Allow HTTP traffic" box to allow incoming traffic.



We will later setup specific Firewall rules to allow incoming traffic to RStudio and Shiny servers

VM instance is running!

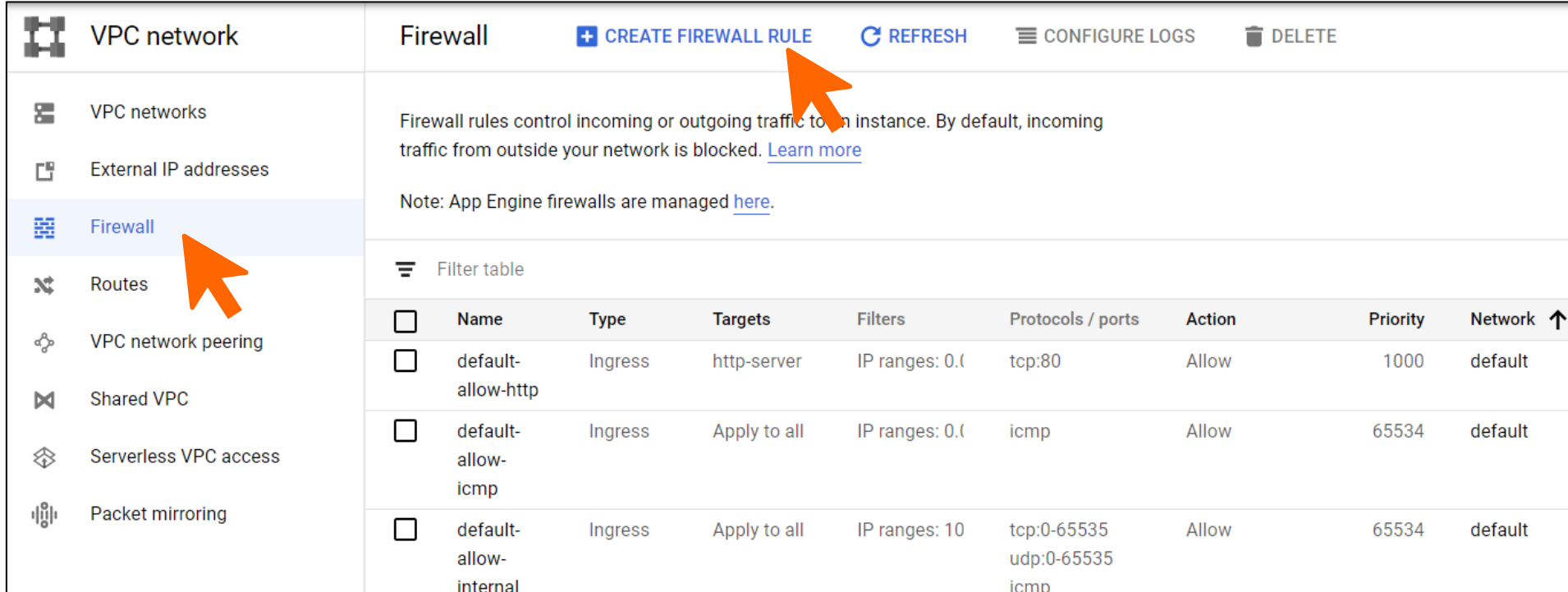


Filter VM instances							?	Columns ▾
<input type="checkbox"/> Name ^	Zone	Recommendation	In use by	Internal IP	External IP	Connect		
<input checked="" type="checkbox"/>  rstudio-shiny-servers	us-central1-a			10.128.0.2 (nic0)	34.67.35.39 	SSH ▾		⋮



Make a note of this IP address...
it will be important!

Create a firewall rule – Go to VPC network



Firewall [+ CREATE FIREWALL RULE](#) [REFRESH](#) [CONFIGURE LOGS](#) [DELETE](#)

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 [here](#).

Filter table

<input type="checkbox"/>	Name	Type	Targets	Filters	Protocols / ports	Action	Priority	Network ↑
<input type="checkbox"/>	default-allow-http	Ingress	http-server	IP ranges: 0.0.0.0/0	tcp:80	Allow	1000	default
<input type="checkbox"/>	default-allow-icmp	Ingress	Apply to all	IP ranges: 0.0.0.0/0	icmp	Allow	65534	default
<input type="checkbox"/>	default-allow-internal	Ingress	Apply to all	IP ranges: 10.0.0.0/8	tcp:0-65535 udp:0-65535 icmp	Allow	65534	default



Configuring firewall rules to allow access via ports 8787 and 3838 means that you and others can access RStudio and Shiny servers from a web browser such as Chrome

“rstudio”

← Create a firewall rule

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

Name [?]
lowercase, no spaces

Description (Optional)

Logs
Turning on firewall logs can generate a large number of logs which can increase costs in Stackdriver. [Learn more](#)
☐ On
☒ Off

Network [?]
default

Priority [?]
Priority can be 0 - 65535 [Check priority of other firewall rules](#)
1000

Direction of traffic [?]
☒ Ingress
☐ Egress

Action on match [?]
☒ Allow
☐ Deny

Targets [?]
Specified service account

Service account scope [?]
☒ In this project
☐ In another project

Target service account
No service account

Source filter [?]
IP ranges

Source IP ranges [?]
0.0.0.0/0

Second source filter [?]
None

Protocols and ports [?]
☐ Allow all
☒ Specified protocols and ports

☒ tcp : 8787
☐ udp : all
☐ Other protocols
protocols, comma separated, e.g. ah, sctp

⌵ Disable rule

Create Cancel

For RStudio server

“shiny”

← Create a firewall rule

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

Name [?]

Description (Optional)

Logs
 Turning on firewall logs can generate a large number of logs which can increase costs in Stackdriver. [Learn more](#)
☐ On
☒ Off

Network [?]

Priority [?]
 Priority can be 0 - 65535 [Check priority of other firewall rules](#)

Direction of traffic [?]
☒ Ingress
☐ Egress

Action on match [?]
☒ Allow
☐ Deny

Targets [?]

Service account scope [?]
☒ In this project
☐ In another project

Target service account

Source filter [?]

Source IP ranges [?]

Second source filter [?]

Protocols and ports [?]
☐ Allow all
☒ Specified protocols and ports


☒ tcp :
☐ udp :
☐ Other protocols


[Disable rule](#)

[Create](#) [Cancel](#)

For Shiny server



 Filter resources



 Columns ▾

<input type="checkbox"/> Name	Type	Targets	Filters	Protocols / ports	Action	Priority	Network ^
<input type="checkbox"/> default-allow-http	Ingress	http-server	IP ranges: 0.0.0.0/0	tcp:80	Allow	1000	default
<input type="checkbox"/> rstudio	Ingress	Apply to all	IP ranges: 0.0.0.0/0	tcp:8787	Allow	1000	default
<input type="checkbox"/> shiny	Ingress	Apply to all	IP ranges: 0.0.0.0/0	tcp:3838	Allow	1000	default
<input type="checkbox"/> default-allow-icmp	Ingress	Apply to all	IP ranges: 0.0.0.0/0	icmp	Allow	65534	default
<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
<input type="checkbox"/> default-allow-rdp	Ingress	Apply to all	IP ranges: 0.0.0.0/0	tcp:3389	Allow	65534	default
<input type="checkbox"/> default-allow-ssh	Ingress	Apply to all	IP ranges: 0.0.0.0/0	tcp:22	Allow	65534	default

Setup RStudio server



In order to setup RStudio server you will need to do the following:

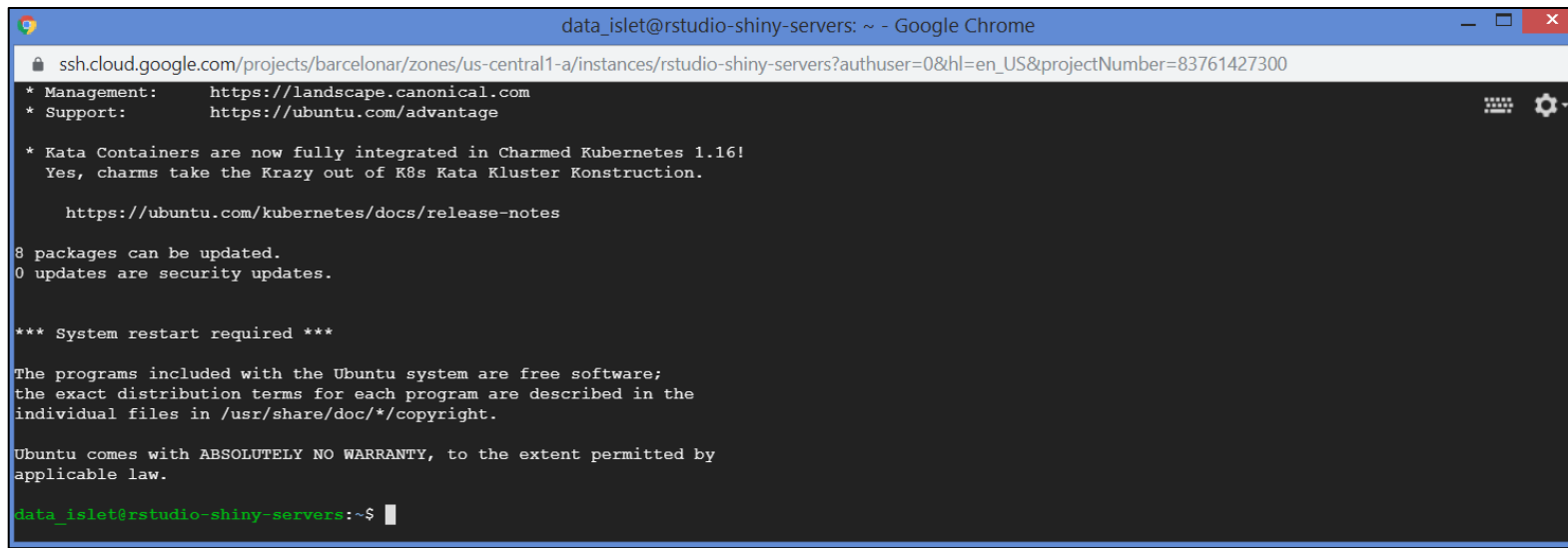
1. Connect to your VM instance (via Secure Shell - SSH)
2. Update and Upgrade stuff
3. Install 
4. Install R packages
5. Install Studio server
6. Create a user
7. Access RStudio server! 🥳



Remember you need to run commands as the “superuser” = **sudo**

Live Demo Part 2 – Connect to VM

Filter VM instances							?	Columns ▾
<input type="checkbox"/> Name ^	Zone	Recommendation	In use by	Internal IP	External IP	Connect		
<input type="checkbox"/>  rstudio-shiny-servers	us-central1-a			10.128.0.2 (nic0)	34.67.35.39 ↗	SSH ▾		⋮



```
data_islet@rstudio-shiny-servers: ~ - Google Chrome
ssh.cloud.google.com/projects/barcelonar/zones/us-central1-a/instances/rstudio-shiny-servers?authuser=0&hl=en_US&projectNumber=83761427300
* Management: https://landscape.canonical.com
* Support:    https://ubuntu.com/advantage

* Kata Containers are now fully integrated in Charmed Kubernetes 1.16!
  Yes, charms take the Krazy out of K8s Kata Kluster Konstruktion.

https://ubuntu.com/kubernetes/docs/release-notes

8 packages can be updated.
0 updates are security updates.

*** System restart required ***

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.

data_islet@rstudio-shiny-servers:~$
```

Update / Upgrade

```
data_islet@rstudio-shiny-servers:~$ sudo apt-get update
...

data_islet@rstudio-shiny-servers:~$ sudo apt-get upgrade
...
Do you want to continue? [Y/n] Y

data_islet@rstudio-shiny-servers:~$ sudo apt-key adv --keyserver keyserver.ubuntu.com --recv-keys
E298A3A825C0D65DFD57CBB651716619E084DAB9
...

data_islet@rstudio-shiny-servers:~$ sudo echo "deb https://cloud.r-project.org/bin/linux/ubuntu
xenial-cran35/" | sudo tee -a /etc/apt/sources.list
...

data_islet@rstudio-shiny-servers:~$ sudo apt-get update
...
```



You might need: `sudo apt-get install dirmngr`


Install R / Install packages

```
data_islet@rstudio-shiny-servers:~$ sudo apt-get install r-base r-base-dev
...
Do you want to continue? [Y/n] Y

data_islet@rstudio-shiny-servers:~$ sudo apt-get install libcurl4-openssl-dev libssl-dev libxml2-dev
...
Do you want to continue? [Y/n] Y
...

data_islet@rstudio-shiny-servers:~$ sudo R
...

data_islet@rstudio-shiny-servers:~$ install.packages(c('shiny', 'rmarkdown'), Ncpus = 2)
...
q("no")
```



Time for a break and let it run!

Install RStudio server & add a user

```
data_islet@rstudio-shiny-servers:~$ sudo gpg --keyserver keys.gnupg.net --recv-keys
3F32EE77E331692F
...

data_islet@rstudio-shiny-servers:~$ sudo apt-get install gdebi-core
...

data_islet@rstudio-shiny-servers:~$ wget wget
https://download2.rstudio.org/server/xenial/amd64/rstudio-server-1.3.1093-amd64.deb
...

data_islet@rstudio-shiny-servers:~$ sudo gdebi rstudio-server-1.3.1093-amd64.deb
...
Do you want to install the software package? [y/N]: Y
...

data_islet@rstudio-shiny-servers:~$ sudo adduser <username>
Enter new UNIX password:
Retype new UNIX password:
...
Is the information correct? [Y/n] Y
```



Choose your <username>

RStudio server is running!

In a web browser navigate to the following address: **http://<External IP>:8787**

Where <External IP> is found


...


Filter VM instances

?

Columns

<input type="checkbox"/> Name ^	Zone	Recommendation	In use by	Internal IP	External IP	Connect
<input type="checkbox"/>  rstudio-shiny-servers	us-central1-a			10.128.0.2 (nic0)	34.67.35.39 	SSH ▾ ⋮



 Studio


Sign in to RStudio

Username:

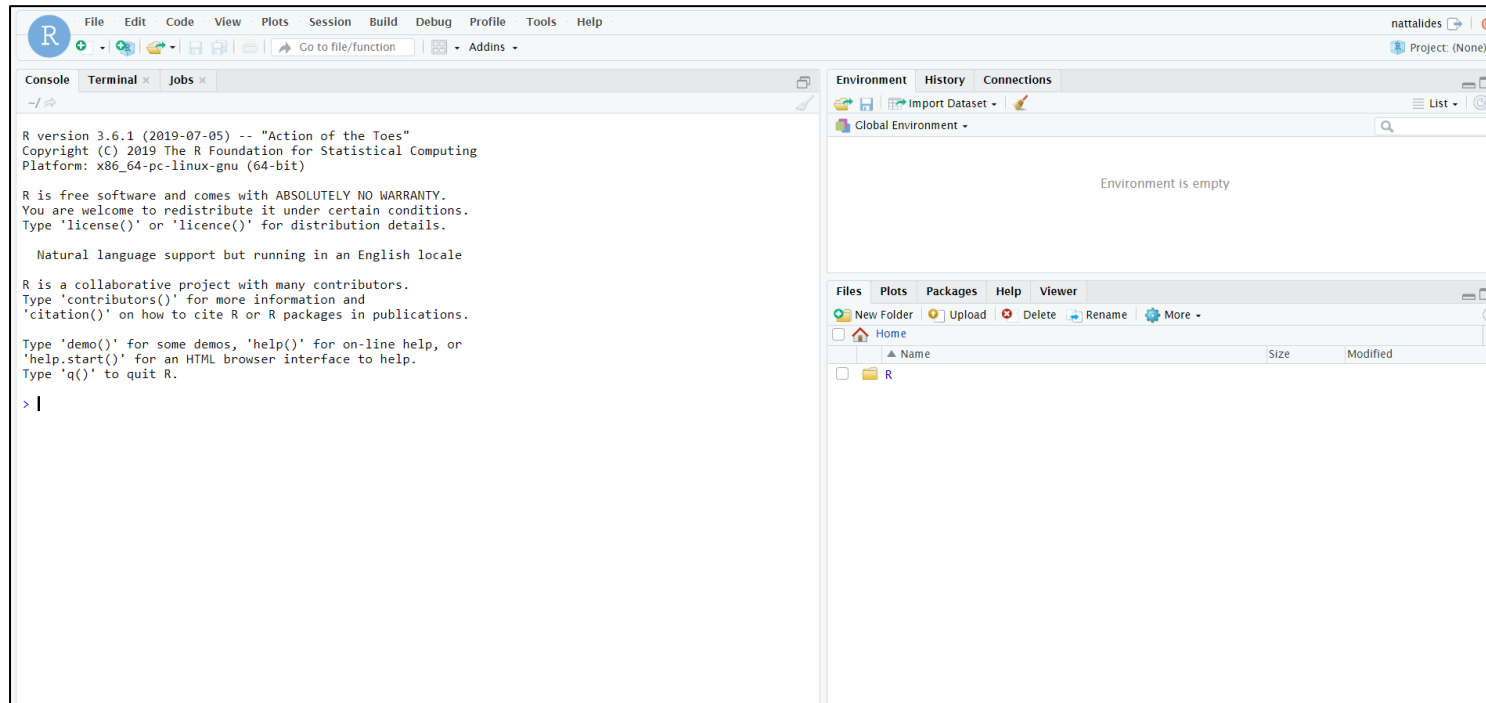
Password:

☐ Stay signed in

Sign In

 Your chosen <username> and <password>


RStudio server is running!



Setup Shiny server



In order to setup Shiny server you will need to do the following:

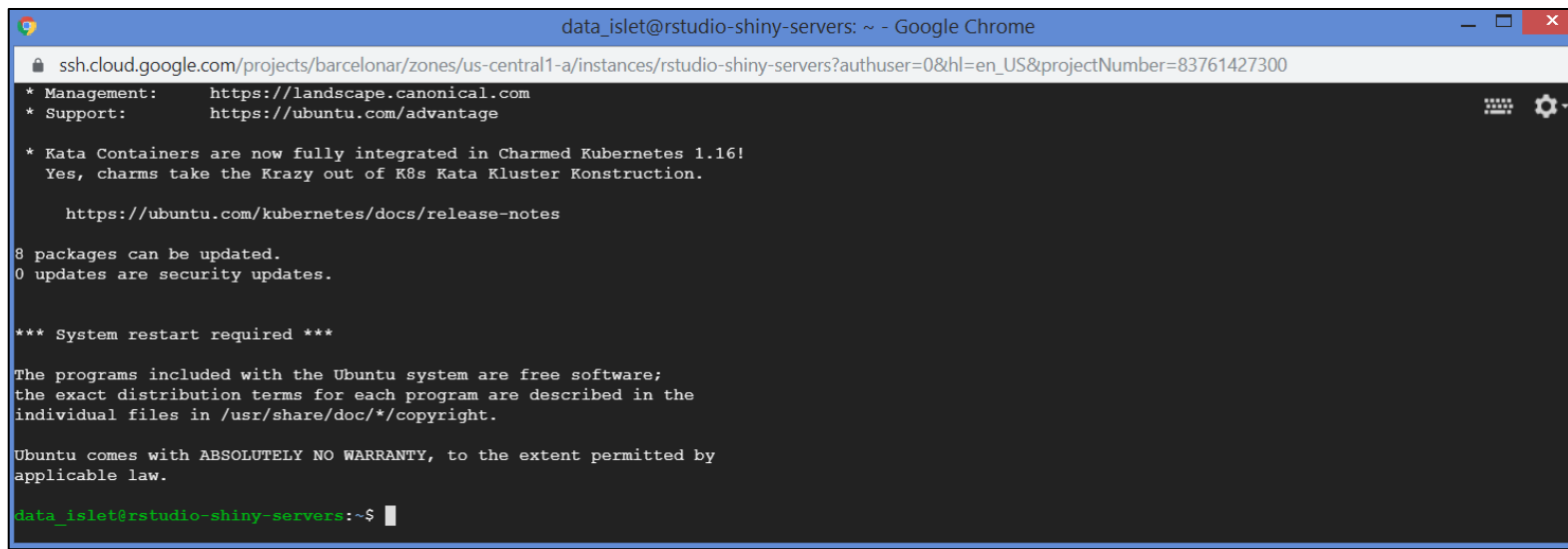
1. Connect to your VM instance (via SSH)
2. Install  server
3. Check shiny server status
4. Success! 🥳



Remember you need to run commands as the “superuser”

Live Demo Part 3 – Connect to VM

Filter VM instances							?	Columns ▾
<input type="checkbox"/> Name ^	Zone	Recommendation	In use by	Internal IP	External IP	Connect		
<input type="checkbox"/>  rstudio-shiny-servers	us-central1-a			10.128.0.2 (nic0)	34.67.35.39 ↗	SSH ▾		⋮



```
data_islet@rstudio-shiny-servers: ~ - Google Chrome
ssh.cloud.google.com/projects/barcelonar/zones/us-central1-a/instances/rstudio-shiny-servers?authuser=0&hl=en_US&projectNumber=83761427300
* Management: https://landscape.canonical.com
* Support:    https://ubuntu.com/advantage

* Kata Containers are now fully integrated in Charmed Kubernetes 1.16!
  Yes, charms take the Krazy out of K8s Kata Kluster Konstruktion.

https://ubuntu.com/kubernetes/docs/release-notes

8 packages can be updated.
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*** System restart required ***

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.

data_islet@rstudio-shiny-servers:~$
```

Install Shiny server & check status

```
data_islet@rstudio-shiny-servers:~$ sudo apt-get install gdebi-core
...

data_islet@rstudio-shiny-servers:~$ wget https://download3.rstudio.org/ubuntu-14.04/x86_64/shiny-
server-1.5.14.948-amd64.deb
...

data_islet@rstudio-shiny-servers:~$ sudo gdebi shiny-server-1.5.14.948-amd64.deb
...
Do you want to install the software package? [y/N]: Y
...

data_islet@rstudio-shiny-servers:~$ sudo systemctl status shiny-server
...
```



To stop the shiny server: `sudo systemctl stop shiny-server`



To start the shiny server: `sudo systemctl start shiny-server`

Shiny server is running!

In a web browser navigate to the following address: **http://<External IP>:3838**

Where <External IP> is found

...

Filter VM instances

?

Columns

<input type="checkbox"/> Name ^	Zone	Recommendation	In use by	Internal IP	External IP	Connect
<input type="checkbox"/>  rstudio-shiny-servers	us-central1-a			10.128.0.2 (nic0)	34.67.35.39 	SSH <div></div> <div></div>



Welcome to Shiny Server!

If you're seeing this page, that means Shiny Server is installed and running. **Congratulations!**

What's Next?

Now you're ready to setup Shiny — if you haven't already — and start deploying your Shiny applications.

If you see a Shiny application running on the right side of this page, then Shiny is configured properly on your server and already running an example. Bravo! You can see this application on your server at </sample-apps/hello/>.

If you see a gray box or an error message, then there's a bit more work to do to get Shiny running fully. You can continue with [the installation instructions](#) or use [the Admin Guide](#) for more information. If you're seeing an error message in the panel to the right, you can use it to help diagnose what may be wrong. If you think Shiny is installed and setup properly and things still aren't working, you can look in the Shiny Server log which may have more information about what's wrong. By default, the log is stored in `/var/log/shiny-server.log`.

If you're really stuck and you've read the relevant sections in [the Admin Guide](#) then please ask for help on our [RStudio Community forum](#).

rmarkdown

Once you have Shiny working properly (the top application on the right

It's Alive!

Number of bins:



Frequency

x



When Shiny is properly configured on your server, you'll see a Shiny app above.



Live Demo Part 4 - Host a shiny app online



In order to host a shiny app online you will need to do the following:

1. Log in to your RStudio server user account
2. Create a folder that will contain the shiny app scripts ... name it “my-app”
3. Write the ui.R script
4. Write the server.R script
5. Create a symbolic link to the folder * 
6. Test that it works
7. Share the URL! 



*It's easier than it sounds

Example ui.R script



```
# Define UI for application
ui <- fluidPage(

  # Application title
  titlePanel("Hello BarcelonaR!"),

  # Sidebar with an input
  sidebarLayout(
    sidebarPanel(
      textInput("text_input", "Input text here:")
    ),

    # Main with output
    mainPanel(
      textOutput("text_output")
    )
  )
)
```

Example server.R script

```
library(shiny)

# Define server logic and R code
server <- function(input, output) {

  output$text_output <- renderText({
    # Display text input
    paste("You typed:", input$text_input)
  })
}
```

Create symbolic link

```
data_islet@rstudio-shiny-servers:~$ sudo ln -s /home/<username>/my-app /srv/shiny-server/my-app
```



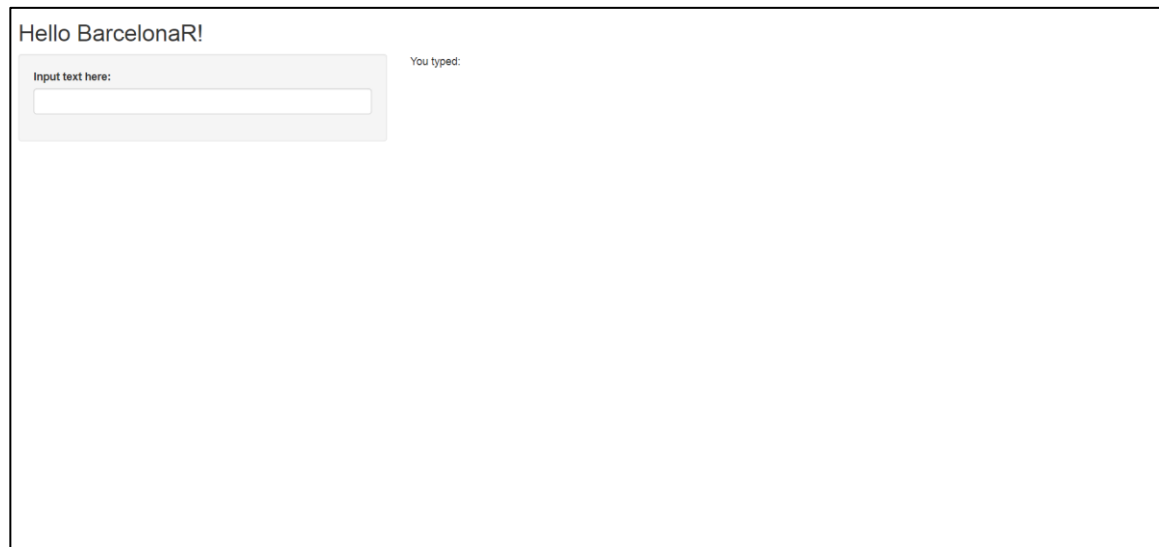
Your chosen RStudio server <username>

Your shiny app is hosted online!

In a web browser navigate to the following address:

<http://<External IP>:3838/<app-folder>>

Where <External IP> is found just as before and <app-folder> is the name of the folder that contains the ui.R and server.R scripts



If you stop and start the GCP VM instance you will most likely get assigned a different <External IP> address!

Other improvements

- ▶ If your shiny app code is becoming larger and more complex then why not Build a Production Grade Shiny App with **{golem}**
 - ▶ Write your shiny app in a project with code version control (such as GitHub)
 - ▶ Make <External IP> static
 - ▶ Add user authentication to Shiny Server with Nginx
 - ▶ Create an SSL certificate for Shiny server (https)
 - ▶ Control who can access your shiny apps (via GCP firewall settings)
 - ▶ Create custom domains for RStudio server, Shiny server and for your shiny apps
- 💡 Check out: <https://docs.rstudio.com/shiny-server/> for a useful guide on how to customise other aspects of the Shiny server

Tips for troubleshooting

- ▶ If your shiny app crashes you can use the stored shiny server logs to view what happened
 - 1) navigate to `cd /var/log/shiny-server/`
 - 2) list of available logs `ls`
 - 3) view log `cat <file-name>.log`
- ▶ In most cases the issue might be due to file and/or folder permissions – you might need to give root permissions to read/write/execute
- ▶ You might need to install necessary libraries using:
 - 1) `sudo R`
 - 2) `install.packages('magrittr')`so that they are available at root level and to all users

Other R programming meetup events!

Thursday, November 5, 2020

Why R? Webinar: R on AWS



Hosted by
Kevin O'Brien and MarcinKosinski



Dublin R
Public group ?



Thursday, November 5, 2020
7:00 PM to 9:00 PM GMT

[Add to calendar](#)

Thursday, November 19, 2020

November Virtual R Lightning Talks



Hosted by
Jessica Peterka-Bonetta and David



Köln R User Group
Public group ?



Thursday, November 19, 2020
6:00 PM to 7:30 PM GMT+1

[Add to calendar](#)

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