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RStudio on a Virtual Machine

This is a guide to set up RStudio on a virtual machine ("VM"). The goal is to provide a computer capable of running analysis on large datasets. A PDF version is available in this repo.

> Note: Double curly brackets `{{}}` are used to denote placeholders for you to enter *your* values.

Requirements

- A computer with internet access
- DigitalOcean account

We will use DigitalOcean as our VM provider. They offer a free trial and have pre-configured VMs ready to use. DigitalOcean calls their VMs "Droplets".

Quick Setup

Set up a pre-configured Droplet that includes RStudio and other tools from the Marketplace.
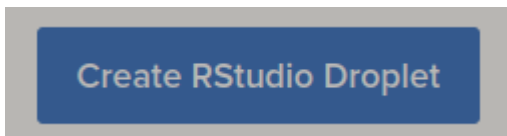
Sign into your account

After creating your DigitalOcean account, sign into it.

Create the Droplet

Navigate to the pre-configured Droplet: RStudio by Simply Statistics.

Click `Create RStudio Droplet`.

Configure the settings

Choose Region: Select the location closest to you.

Datacenter: Leave the defaults.

Choose an image: This should default to the Rstudio by Simply Statistics.
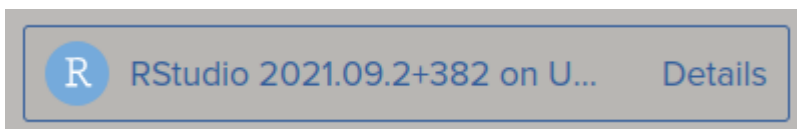
Choose Size: Select the specifications you need (more info on the options).

> Note: Free trial accounts may need to request access to the Dedicated CPU/Premium CPUs.

Backups: Select if needed.

Choose Authentication Method: Select the Password method for simplicity. Create a password for your Droplet.

Finalize Details: Change the Hostname to help identify your Droplet. Click `Create Droplet`.

[More info on settings](#).

Set up a new user

Under your project, you will see the newly-created Droplet. Note the green dot next to the Hostname indicating it is active. Click your Droplet.
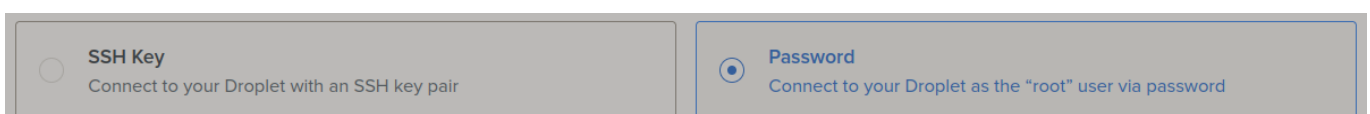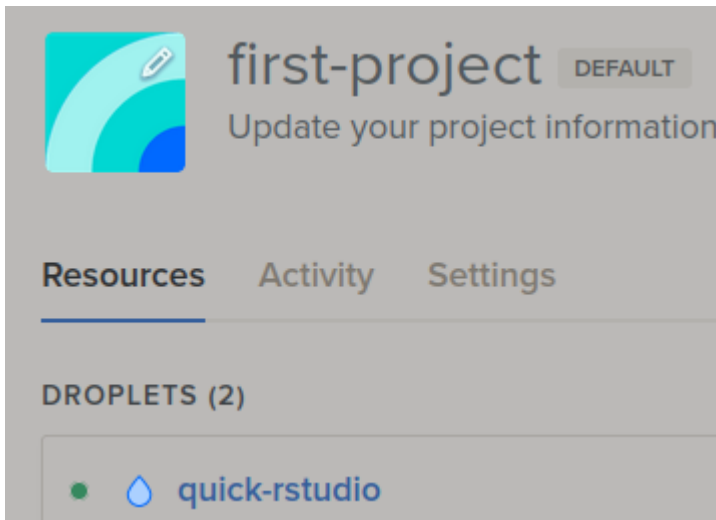

In the top menu bar, note your **ipv4 address**. To the right, click the `Console`.
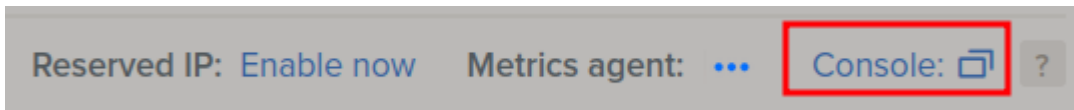
This will open a new window with a console to your Droplet. Look to the bottom for the line `root@{{your-hostname}}:~#`. This is where you will type commands.

Console Steps: Add a new user

Enter the following commands into the console.

1. `adduser {{username}}`
2. Enter a new password.

   > Note: The password will not be displayed while typing.

3. It will then ask for some basic info. You can leave them blank by pressing enter. At the end, enter y to confirm the info is correct.

Access RStudio

Open a new browser and type your **ipv4 address** and `:8787` into the URL address bar:

`{{your.ipv4.address}}:8787`

This will take you to the RStudio sign in page. Enter the new user credentials you previously created.
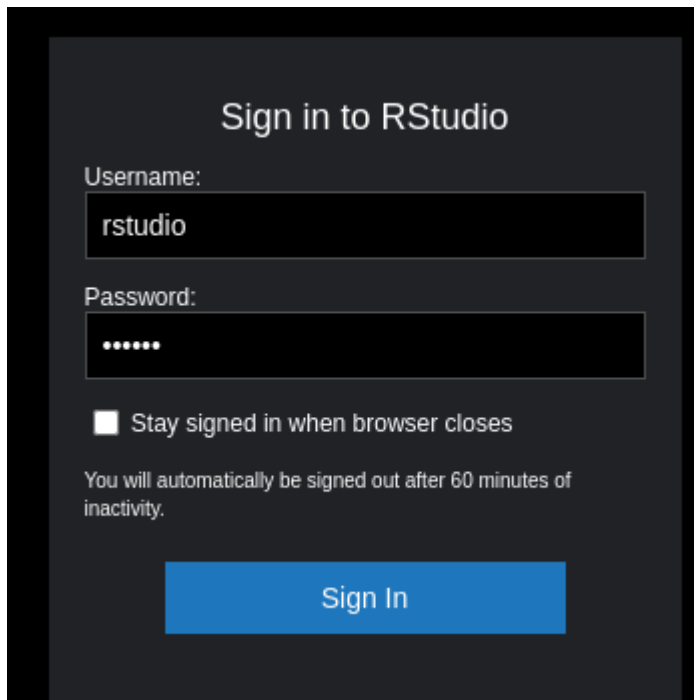
Congrats! You now have access to RStudio.

Manual Setup

Set up a Droplet with RStudio.

Sign into your account

After creating your DigitalOcean account, sign into it.

Create the Droplet

From your Projects page, click `Create` and then click `Droplets`.
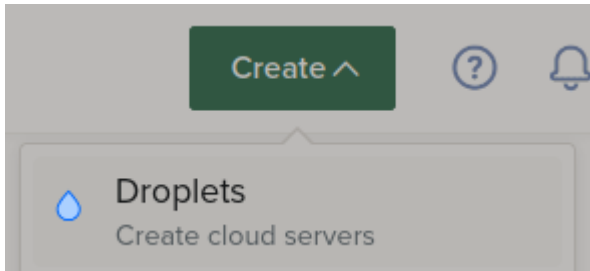
Configure the settings

Choose Region: Select the location closest to you.

Datacenter: Leave the defaults.

Choose an image: Unless you need a specific image, leave the default to Ubuntu (a Linux distribution) and its version.
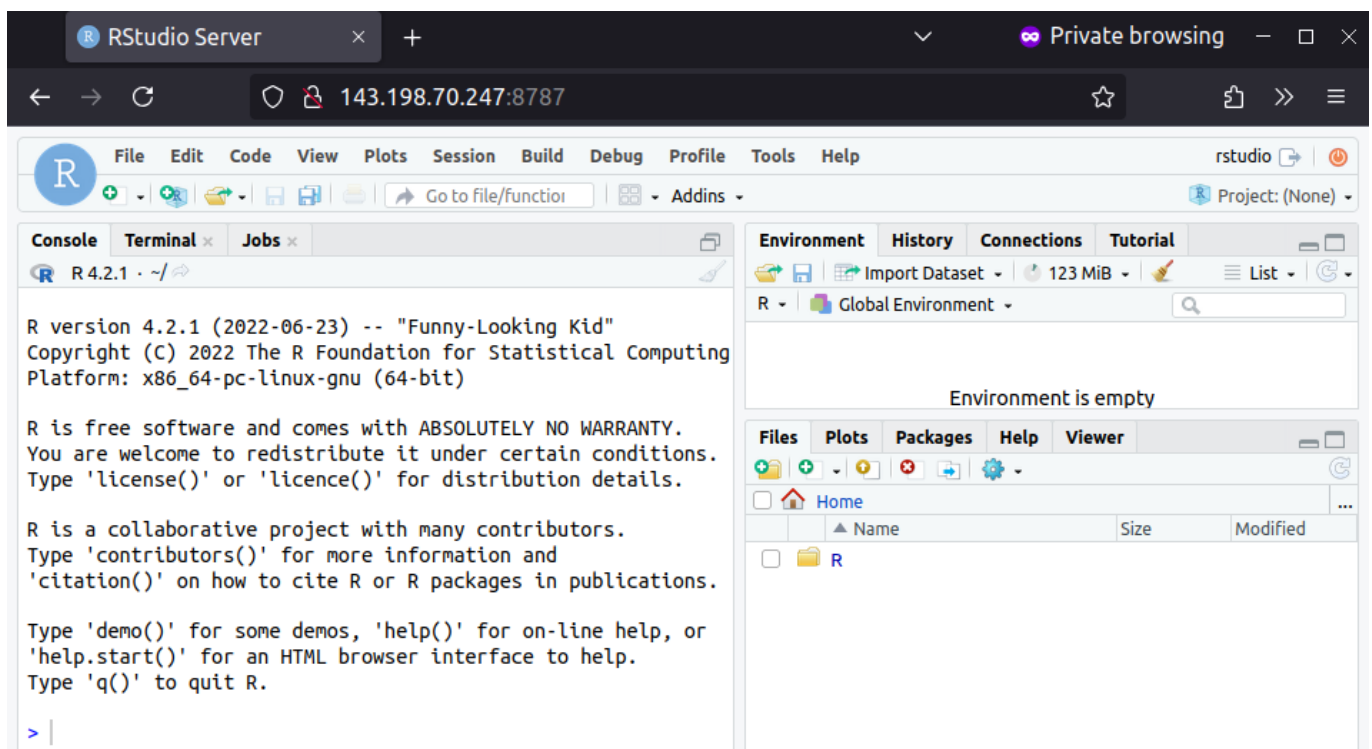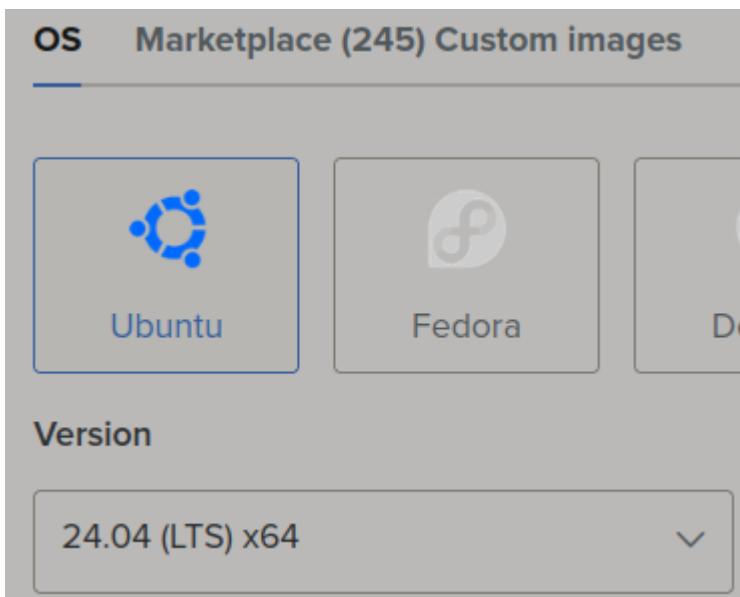

Choose Size: Select the specifications you need (more info on the options).

> Note: Free trial accounts may need to request access to the Dedicated CPU/Premium CPUs.

Backups: Select if needed.

Choose Authentication Method: Select the Password method for simplicity. Create a password for your Droplet.

Finalize Details: Change the Hostname to help identify your Droplet. Click `Create Droplet`.

More info on settings.

Install R and RStudio

Under your project, you will see the newly-created Droplet. Note the green dot next to the Hostname indicating it is active. Click your Droplet.

In the top menu bar, note your **ipv4 address**. To the right, click the `Console`.

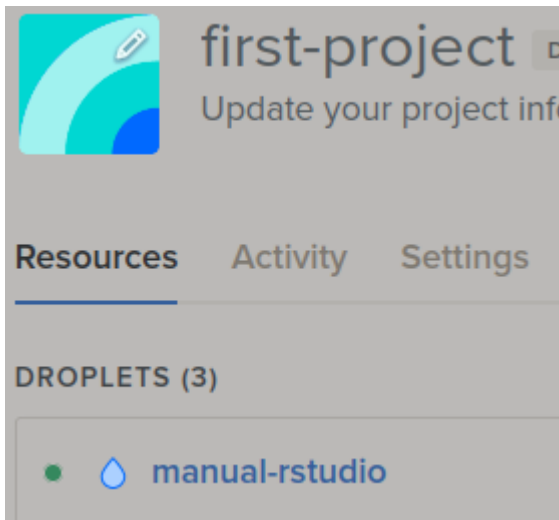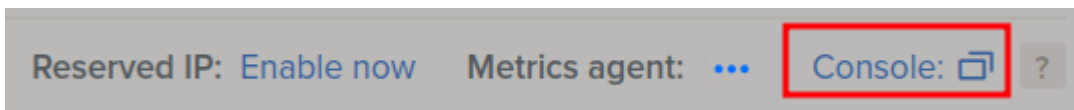This will open a new window with a console to your Droplet. Look to the bottom for the line `root@{{your-hostname}}:~#`. This is where you will type commands.
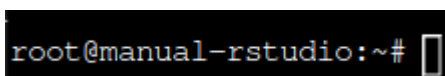
Console Steps: Install R and RStudio

> Note: This guide used Ubuntu v. 24.04. Be sure to check the official install instructions if you're on a different image/version.

Enter the following commands into the console.

1. `sudo apt update`
2. `sudo apt upgrade -y`
3. `sudo apt install r-base -y`
4. `sudo apt install gdebi-core -y`
5. `wget https://download2.rstudio.org/server/jammy/amd64/rstudio-server-2024.09.0-375-amd64.deb`
6. `sudo gdebi rstudio-server-2024.09.0-375-amd64.deb`

- You will be asked for confirmation. Enter y to continue.

> Note: You may receive pop-up windows during the installation process. Leave the default choices and press enter to continue.

The console will display RStudio Server as active. You can check the RStudio Server status with the command: `systemctl status rstudio-server`

```
● rstudio-server.service - RStudio Server
     Loaded: loaded (/usr/lib/systemd/system/rstudio-server.service; enabled; preset: enabled)
     Active: active (running) since Sat 2024-10-26 00:18:36 UTC; 1s ago
    Process: 21513 ExecStart=/usr/lib/rstudio-server/bin/rserver (code=exited, status=0/SUCCESS)
   Main PID: 21514 (rserver)
      Tasks: 1 (limit: 9489)
     Memory: 1.9M (peak: 40.9M)
        CPU: 1.010s
     CGroup: /system.slice/rstudio-server.service
             └─21514 /usr/lib/rstudio-server/bin/rserver

Oct 26 00:18:36 manual-rstudio systemd[1]: Starting rstudio-server.service - RStudio Server...
Oct 26 00:18:36 manual-rstudio systemd[1]: Started rstudio-server.service - RStudio Server.
```

Last steps

1. See Set up a new user.
2. See Access RStudio.

Final Considerations

The following may be useful to work effectively.

Elevated Privileges

Logging into the Droplet console defaults to root user with the highest privileges. In contrast, the new user (from Console Steps: Add a new user) has limited privileges.

You can elevate the new user's privileges with sudo. In the console, and as root user, enter the command:

`usermod -aG sudo {{username}}`

Now the new user can temporarily elevate its privileges by typing sudo in front of their commands (e.g., `sudo apt update`).

Transfer Files

Below are a few ways to transfer files to your Droplet depending on your local computer's operating system.

Windows

WinSCP

A graphical user interface tool.

1. Download it

2. [Connect to your Droplet](#)
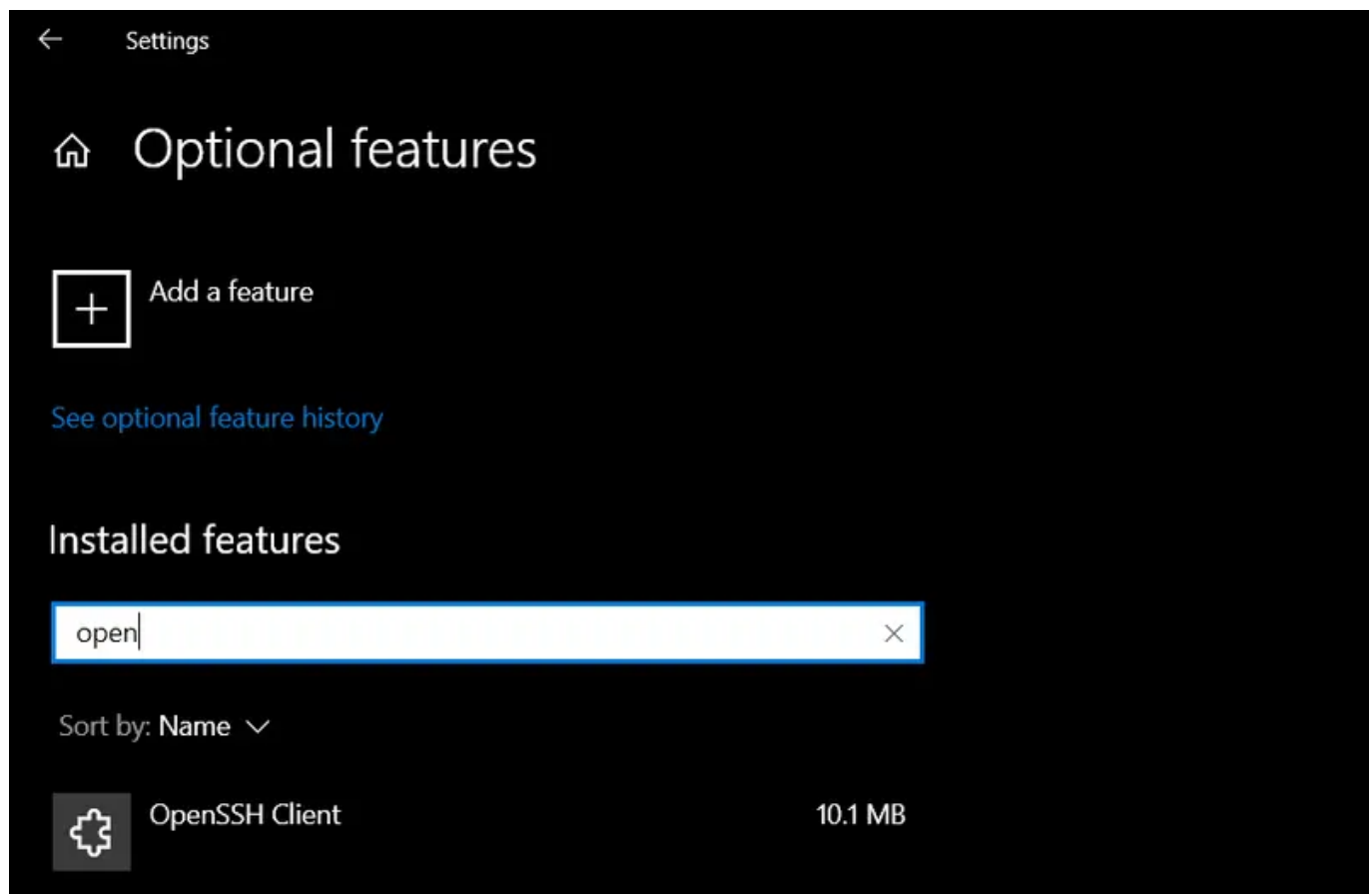3. [Transfer files](#)

OpenSSH

A command line tool.

> Note: Requires Windows 10 (build 1809 or later) and [PowerShell (5.1 or later)](#)

Enable OpenSSH [with PowerShell](#) or:

1. From the Start menu, search and open "optional features"
2. Click "Add a feature"
3. Search "OpenSSH Client" and click install

Transfer files by running the following command in your local terminal:

```
scp {{C:\path\to\local\file}} {{username}}@{{vm.ip.address}}:
{{/path/to/remote/directory}}
```

> Note: Windows uses backslashes \ while Mac/Linux uses forward slashes /.

Mac/Linux

rsync

A command line tool.

Transfer files by running the following command in your local terminal:

```
rsync -avzP -e ssh {{/path/to/local/file}} {{username}}@{{vm.ip.address}}:
{{/path/to/remote/directory/}}
```

Flag meanings:

- `-a`: Archive mode (preserves permissions and directory structure)
- `-v`: Verbose (shows detailed progress)
- `-z`: Compress files during transfer
- `-P`: Shows progress and allows partial transfers to be resumed
- `-e ssh`: Use SSH for encryption

> Note: In case the transfer gets interrupted, just the run the same `rsync` command again and it will resume where it left off.

Firewall

A firewall helps secure your VM.

Navigate to your Droplet. On the left-panel menu, click `Networking`.
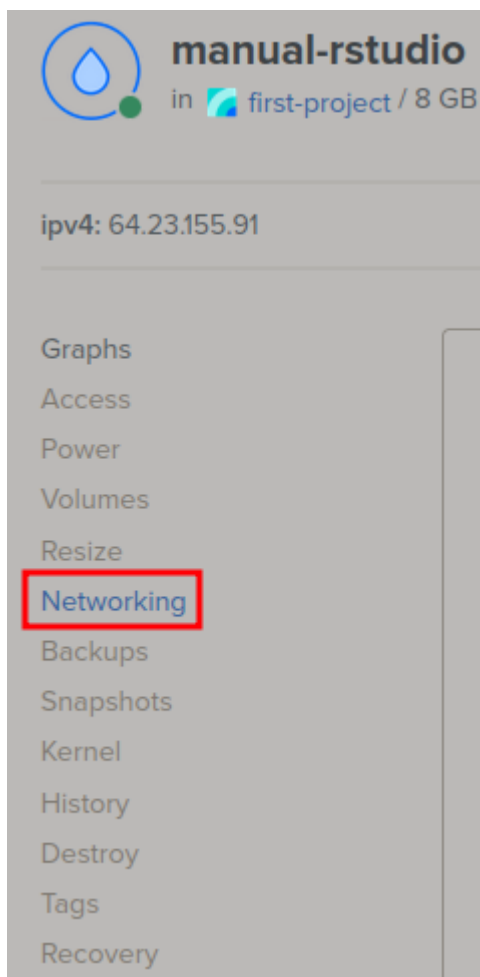
Scroll down to Firewalls, click `Edit`, and `Create Firewall`. This will take you to a page to configure your firewall:

Name: Create a name for this firewall.

Inbound Rules: Select the `New rule` drop-down and click `Custom`. Change the Port Range to `8787` and then save it.

Outbound Rules: Leave the defaults.

Apply to Droplets: Select your Droplet and then click `Create Firewall`.