How to Setup a Remote Linode Cloud Server with Jacktrip Installed

betaFeb252022: updated screenshots & **charge for images** Linode v.1.60.0 Debian 11

IMPORTANT: ALWAYS BE SURE TO DELETE your remote Linode Cloud Server before you logout of your Linode website user account, **otherwise you will get charged** even if it is OFFLINE!!

Most of the material in this guide was extracted from *JackTrip remote server notes (on Debian via Linode) by Michael Dessen and Bonnie Kwong*[1] and the video tutorial created for CCRMA[2] by Nick Porcaro.

For this guide, you will be working with two software entities. One is the Linode platform (https://www.linode.com/ via your web browser) which I will refer to as the **Linode website.** The other is the **Terminal** application on your computer (which doesn't necessarily have to be the same computer that you are accessing the Linode website from). You use Terminal to send commands to the remote Linode Cloud Server.

This guide shows you step by step how to create and save the image of a remote Linode Cloud Server with the latest version of jacktrip installed on it. To do this, the basic steps are:

Create a Linode Image* with jacktrip installed on it:

1. Create a remote Linode Cloud Server via the Linode website
2. Login to your remote Linode Cloud Server via Terminal (on your computer)
3. Install jacktrip on Linode Cloud Server via Terminal (on your computer)
4. Test jacktrip in Server Mode on Linode Cloud Server via Terminal (on your computer)
5. Create a Linode Image of Linode Cloud Server contents via the Linode website
6. Delete Linode Cloud Server via the Linode website

Once you have a Linode Image saved with jacktrip already installed, you can deploy it anytime you want to host a jacktrip session in hub server mode via a remote Linode Cloud Server.
This process is detailed in the document: **ImageExistsLJTbetaFeb252022.pdf**

There is also a guide on the Linode website that Gloria Damijan found helpful:
https://www.linode.com/docs/guides/getting-started/

*About Linode Images[3]

Linode's Images service allows users to store custom disk images in the Cloud. These images can be preconfigured with the exact software and settings required for your applications and workloads. Once created, they can be quickly deployed to new or existing Linode Compute Instances, saving users time from manually setting up their entire system after each deployment.

Linode Images will be retained whether or not you have an active Linode on your account, which also makes them useful for long term storage of a private template that you may need in the future.

As of this writing, **there is a monthly charge of $0.10/GB** to store Images for Linode users. Limits per user account are: 6 GB per Image, 150 GB maximum combined size of all images, up to 25 images. When saving a Linode image, it is the aspects of the Linode that are on the disk that are saved, not any additional aspects such as IP addresses, fully qualified domain names, and MAC addresses.

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[1] *Jacktrip remote server or raspberry pi notes.docx* - JackTrip remote server notes (on Debian via Linode) by Michael Dessen and Bonnie Kwong, last updated Sept. 6, 2020

[2] CCRMA : Center for Computer Research in Music and Acoustics (Stanford University)

[3] https://www.linode.com/docs/products/tools/images/

A brief explanation of how remote Linode Cloud Servers work

There are a few concepts that I found very confusing initially.

To begin with, your computer setup, audio setup and where you are physically located are all **local** to you. You can be running any version of jacktrip and jack/qjackctl etc **locally.**

When you create a **remote** Linode Cloud Server, anything you put on that **remote** server is completely independent of what you have on your **local** computer. You could have jacktrip version 1.2.2 running **locally** on your computer and set up a **remote** server which is running jacktrip released version 1.3.0 for example.

You can also pick any **Region** you want when you create a new remote Linode Cloud Server; it doesn't even have to be geographically on the same continent as you. The Regions currently available on the Linode website are still limited to North America, Europe and Asia Pacific as of February 18, 2022.

When you get on the internet via the Google Chrome web browser and access the Linode website, any images you create will live somewhere in Linode land (that is **not locally** on your computer), so you don't have to worry about whether your computer has enough room to store it.

In addition, once you have saved an Image of a server with jacktrip already installed on it, you don't have to go through the jacktrip installation process again unless you want to run a jacktrip session with the **hub server** running a different version of jacktrip (for example, a future release of jacktrip or you want to go back to using an older version of jacktrip on your **remote** hub server).

Once you create a **remote** Linode Cloud Server, you use the **ssh** commmand in Terminal on your computer to login to that remote Linode Cloud Server. The **ssh** [secure shell] Terminal command is a protocol used to securely connect to a remote server/system. So it's kind of like remotely controlling a space ship somewhere in outer space from the comfort of your cozy quarantine bunker.

Disclaimer:
Several members of the ensemble and I tested the processes documented here on Macs and Raspberry Pi 4B's. We haven't tested on Windows so I don't know how different those processes might be.

GENERAL TIPS:

1. When using Terminal commands, if something doesn't work as you expected **always recheck what you typed in**, sometimes a little typo can make the difference between failure and success!

2. When using the Linode website, whenever you perform an action, make sure to wait until the action completes. For example, when you power up your remote Linode Cloud Server, be sure wait until it says RUNNING with a **green dot** before copying the **`ssh`** command and trying to login to your remote Linode Cloud Server.

3. **Before you logout of your Linode website user account**, make sure to always **DELETE** your remote Linode Cloud Server **otherwise you will continue to get charged** for it even if it's listed as being OFFLINE. Be sure to **DELETE** it even if you didn't finish properly setting up an image, etc.

Create a Linode Website User Account if you don't already have one

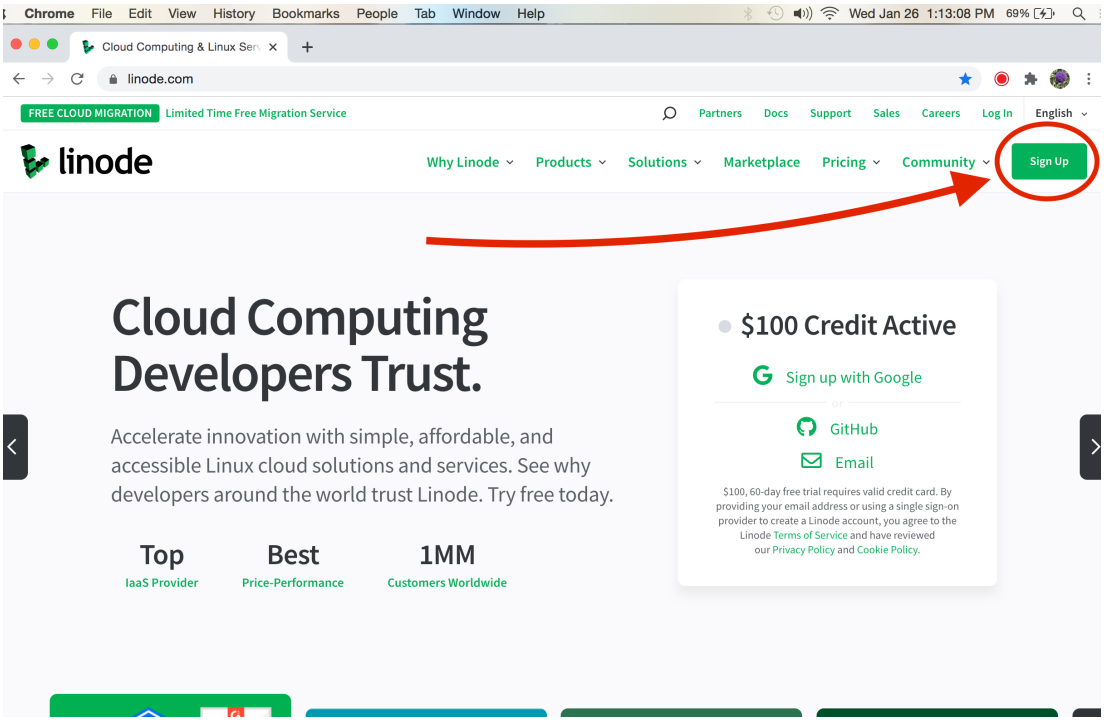
Notes:

- you will have to provide your billing information to create an account.

- once you create an account you do NOT have to sign up for monthly charges. you can just pick and choose on the fly. The default cost for Plans is *charged by the hour* and it's very inexpensive as long as you always remember to delete the server after you are done using it each time

1. Via Google Chrome web browser[4], go to:
https://www.linode.com/

2. Click on green Sign Up button in the upper right corner and follow all the steps (you will have to verify via email as per usual).



3. Once you create a user account for the Linode website successfully, you should be at the **Linode Manager** page. Continue on to the next section.

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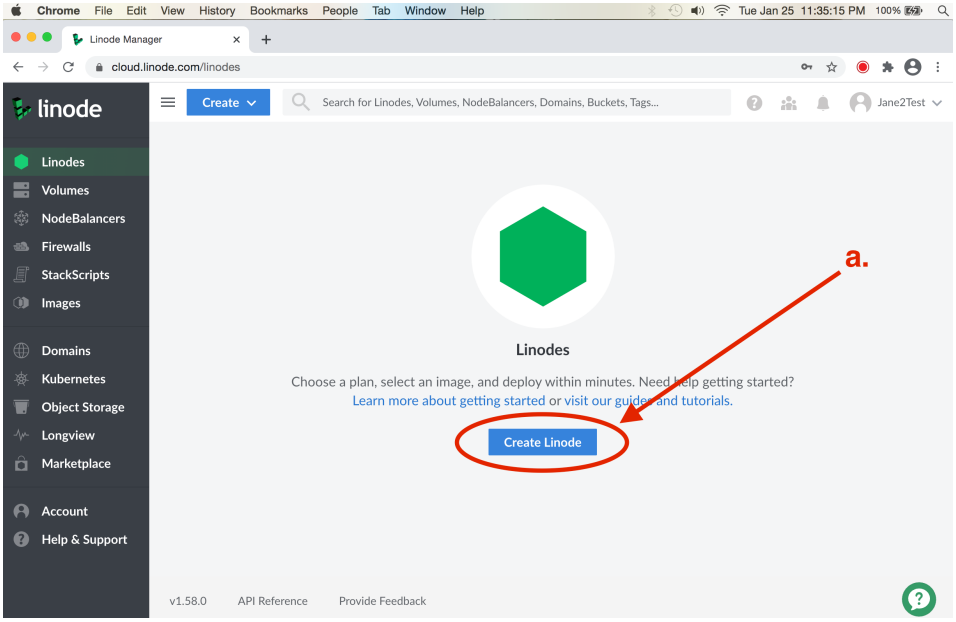
4 Using the Google Chrome web browser is recommended but not mandatory

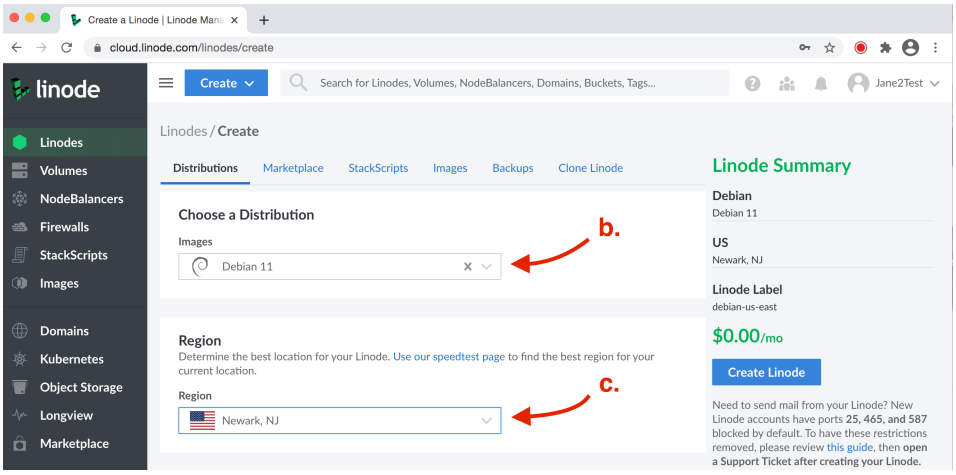
Create a Linode Image with jacktrip installed on it

1. Create a remote Linode Cloud Server via the Linode website



a. Click on the blue **Create Linode** button

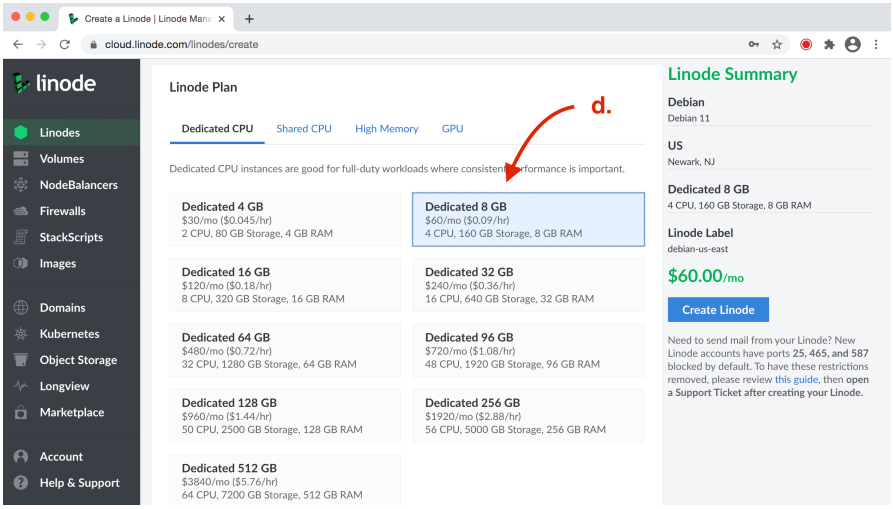
[the **Linodes / Create** page should appear]



b. Set **Distribution Images** to **Debian 10** or **Debian 11** *[remember which you selected]*

c. Select the **Region** for the Linode server [eg, **Newark, NJ**]

[scroll down page if necessary to **Linode Plan** selections]



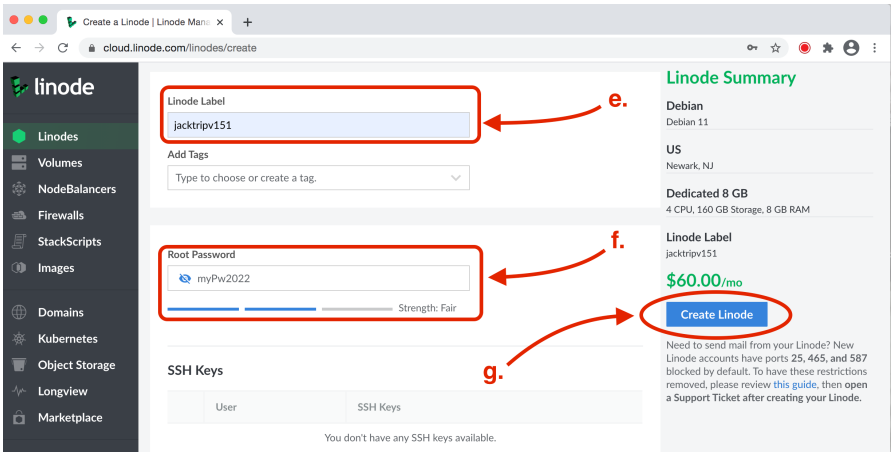
d. Select a **Linode Plan** [eg, **Dedicated 8 GB**]

For creating a Linode Image, 8 GB is fine[5]

Note:
You should only be charged **Hourly** by default

When selecting which plan to select for your ensemble, 1 CPU = 2 to 5 connections, a hub requires 2 connections per ensemble member; 8 CPU is probably fine for 8 ensemble members.
If you are just creating a Linode image, you can select the plan for 4 CPU = 8 GB.

[scroll down page if necessary to fill in **Linode Label** and **Root Password**]



e. Type in something you will remember for the **Linode Label**

f. Create the **Root Password*** for your Linode remote cloud server

g. Click on blue **Create Linode** button

*click on the blue eye to see your password; you will need to use this **Password** later in Terminal.

Note: ***You will only get charged by the hour*** even though the pop-up window makes it look like you are going to get charged by the month.

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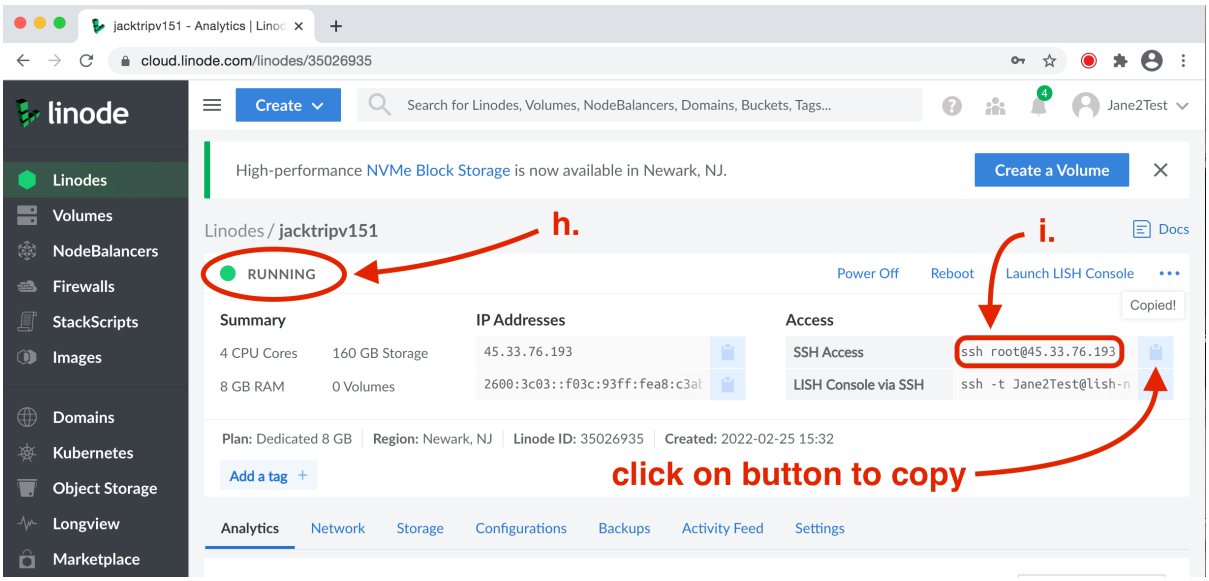
[5] If you decide to select Dedicated 16 GB or greater, the first time you do so, you will get the message:
'Additional verification is required to add this service. Please open a Support ticket'
You can open a support ticket and the Linode Support team will give you permission to select higher plans.

[The **Linodes** page for your remote Linode Cloud Server should appear]

h. current status will go from PROVISIONING -> BOOTING -> RUNNING

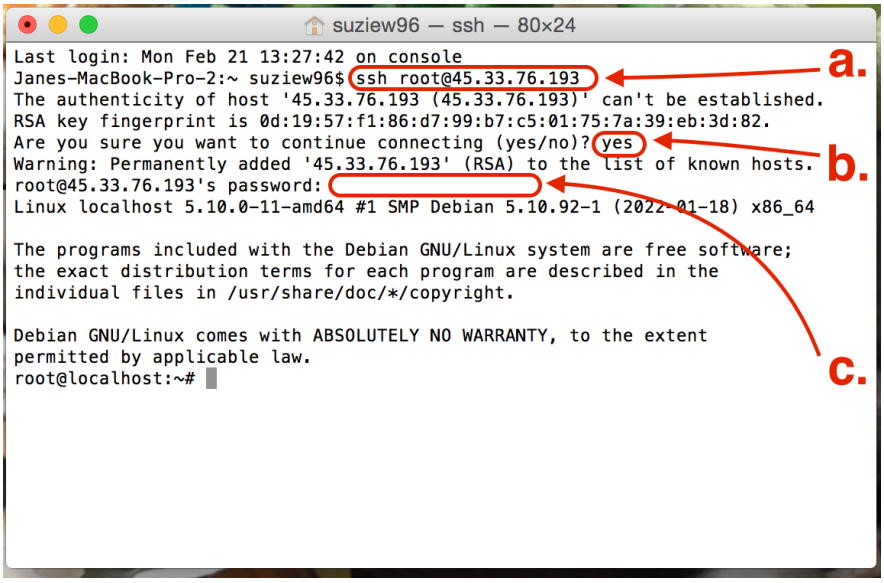
i. click on button to copy **ssh root@[ip-address]** command[6] into your clipboard



[6] the **ssh** [secure shell] Terminal command is a protocol used to securely connect to a remote server/system

2. Login to your remote Linode Cloud Server via Terminal

Open Terminal on your computer.



a. Paste from clipboard **`ssh root@[ip-address]`** command, and hit <enter>
[if nothing happens, quit Terminal and try again]

b. when prompted, type **yes**<enter>

c. when prompted, type in the **Root Password*** and hit <enter>

***** use the **Root Password** you entered in { **1. Create a remote Linode Cloud Server via the Linode website: f.** }

the password is hidden when you type it in, and the cursor will not move

If Steps **a., b.** and **c.** worked, go on to **3.**

Note About Using Terminal:

If Terminal responds with a line starting with: **root@localhost:~**

then that particular Terminal window is logged onto your remote Linode Cloud Server and all commands from then on will be sent to your remote Linode Cloud Server. This comes in especially handy to observe if you have multiple Terminal windows open.

For example, you might want to simultaneously run jacktrip in Server Mode *remotely* via your remote Linode Cloud Server in one Terminal window and run jacktrip in Client Mode *locally* in another Terminal window.

In the screenshot above, the Terminal window fired up locally as indicated by it's responding with a line starting with: **Janes-MacBook-Pro-2:~**

but after I logged into my remote Linode Could Server via the **`ssh`** command, Terminal responded with a line starting with: **root@localhost:~**

Note from Gloria Damijan regarding if you have a problem getting the ssh command to work properly:

If you ever get a strange message like the one shown in this screenshot when trying to login to your remote Linode Cloud Server via the **ssh** command:

```
annapasztor — -bash — 80×24
Creative Cloud Files    Library                 Public
Desktop                 Movies
Documents               Music
Brownstones-MBP:~ annapasztor$ ssh root@23.239.11.26
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
@    WARNING: REMOTE HOST IDENTIFICATION HAS CHANGED!     @
@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@@
IT IS POSSIBLE THAT SOMEONE IS DOING SOMETHING NASTY!
Someone could be eavesdropping on you right now (man-in-the-middle attack)!
It is also possible that a host key has just been changed.
The fingerprint for the ECDSA key sent by the remote host is
SHA256:rL1E817G8Wkxdwxi6FUqyXOUGpNy19hmYEixjSW79Gw.
Please contact your system administrator.
Add correct host key in /Users/annapasztor/.ssh/known_hosts to get rid of this m
essage.
Offending ECDSA key in /Users/annapasztor/.ssh/known_hosts:1
ECDSA host key for 23.239.11.26 has changed and you have requested strict checki
ng.
Host key verification failed.
Brownstones-MBP:~ annapasztor$ ssh-keygen -R 23.239.11.26
# Host 23.239.11.26 found: line 1
/Users/annapasztor/.ssh/known_hosts updated.
Original contents retained as /Users/annapasztor/.ssh/known_hosts.old
Brownstones-MBP:~ annapasztor$
```

you can try the **ssh-keygen** command as follows to resolve it.

For Linux and macOS (put in your remote Linode Cloud Server's IP address for **[ip-address]**):

ssh-keygen -R [ip-address]

for example, if your remote Linode Cloud Server's ip address is **23.239.11.26** as shown in the screenshot above, you would type in:

ssh-keygen -R 23.239.11.26

Then go back to a. at the top of this section (that is, the **ssh root@[ip-address]** command) and see if you can proceed with the login process.

3. Install jacktrip on Linode Cloud Server via Terminal

Type in the Terminal commands below (shown in boldface) and hit the **<enter>** key.

Note that on your remote Linode Cloud Server, after each command completes, Terminal will prompt you for a new command with a line beginning with **root@localhost:~** The exception is if you use "**&**" in a command line in which case hit **<enter>** to get a prompt for a new command from Terminal.

a. Update debian and install apt build tools (if you are asked a Y/n question, type in **Y** and hit **<enter>**)

```
sudo apt-get update && apt-get upgrade
```

b. Install jack, qjackctl, audacity and other software needed to run jack/jacktrip
[type in the entire command shown below before hitting **<enter>**]:

If you selected **Debian 10** {in step **b.** Set **Distribution Images** of **1. Create a remote Linode Cloud Server via the Linode website**}, type in:

```
sudo apt install -y --no-install-recommends build-essential librtaudio-dev
qt5-default autoconf automake libtool make libjack-jackd2-dev qjackctl
audacity git
```

[select yes to realtime priority if asked, with the arrow key(s) on your keyboard]

If you selected **Debian 11** {in step **b.** Set **Distribution Images** of **1. Create a remote Linode Cloud Server via the Linode website**}, type in:

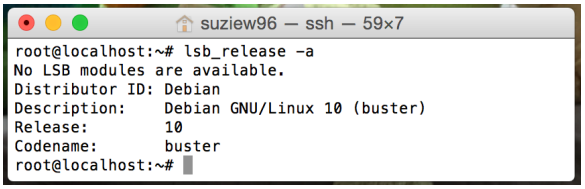
```
sudo apt install -y --no-install-recommends build-essential librtaudio-dev
qtbase5-dev qtchooser qt5-qmake qtbase5-dev-tools autoconf automake libtool
make libjack-jackd2-dev qjackctl audacity git
```

[select yes to realtime priority if asked, with the arrow key(s) on your keyboard]

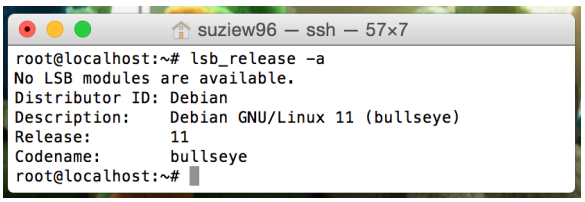
If you aren't sure whether you had selected **Debian 10** or **Debian 11**, type in

```
lsb_release -a
```

If you selected **Debian 10**, **Release:** will be **10** and **Codename: buster**



If you selected **Debian 11**, **Release:** will be **11** and **Codename: bullseye**



c. Clone the JackTrip repo [= repository]. *If the git command isn't found or you get some other error*, try going back to step b. and type in the long sudo command *manually*.

`git clone https://github.com/jacktrip/jacktrip.git`

Now you have the source code on the remote Linode Cloud Server.

d. Change directory to jacktrip:

`cd jacktrip`

e. Build jacktrip [this might take a few minutes]:

`./build`

f. Once the build is complete, go to the builddir directory[7]:

`cd builddir`

g. Check what version of jacktrip you just installed on your remote Linode Cloud Server:

`./jacktrip –v`

[7] if nothing happens or you get an error message, you might be in the wrong directory, to get back to builddir, you can try the following three commands (one line at a time): **`cd`**<enter> **`cd jacktrip`**<enter> **`cd builddir`**<enter>

4. Test jacktrip in Server Mode on Linode Cloud Server via Terminal

a. Start jack in server mode:

in this example, buffer of 512 frames/period, sample rate of 48k, **&**=run command in background

`jackd -d dummy -p512 -r48000 &`

After the jackd messages appear, hit **<enter>** to see the prompt for a new command.

b. Start jacktrip[8] in server mode:

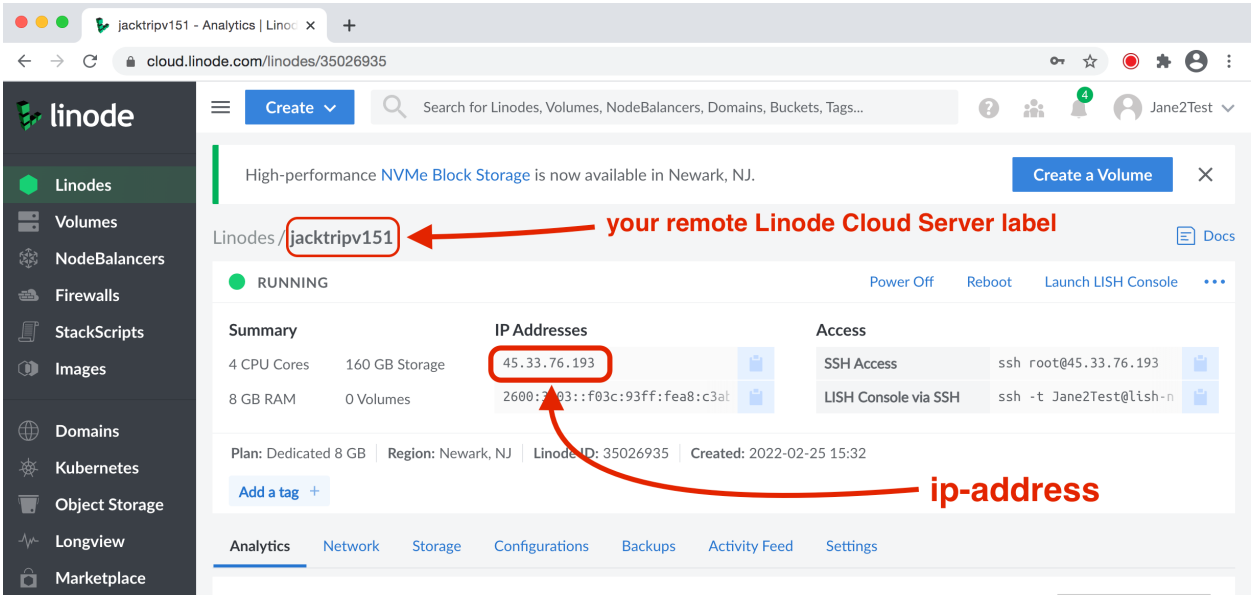
here is an example of a command Sarah Weaver has used with the NowNet ensembles
[**–S** = run in Hub Server Mode, **–p2** = client out/in but no loopback]

`./jacktrip -S -p2 -q32 -z`

c. Try to connect in jacktrip to your remote Linode Cloud Server as you normally would do.

To do this, you will need the **ip-address** for your remote Linode Cloud Server.

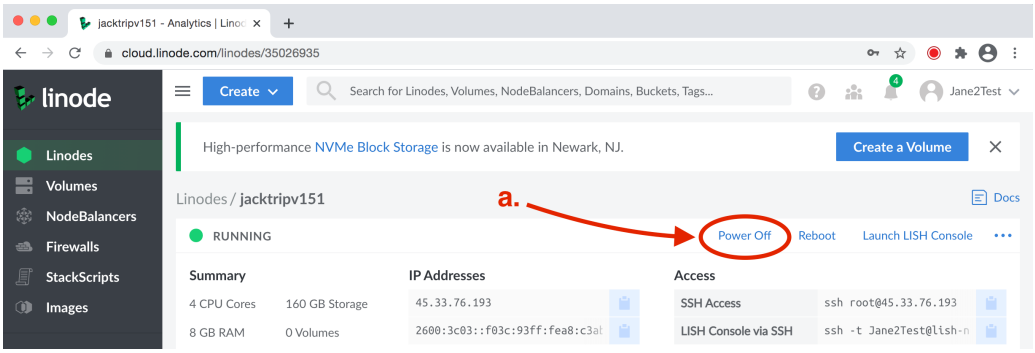
You can find it on the Linode website back on the Linodes page for your remote Linode Cloud Server:



[8] to see all the jacktrip command options, type **`./jacktrip –h`**
or go to: https://manpages.debian.org/testing/jacktrip/jacktrip.1.en.html

5. Create a Linode Image of Linode Cloud Server contents via the Linode website

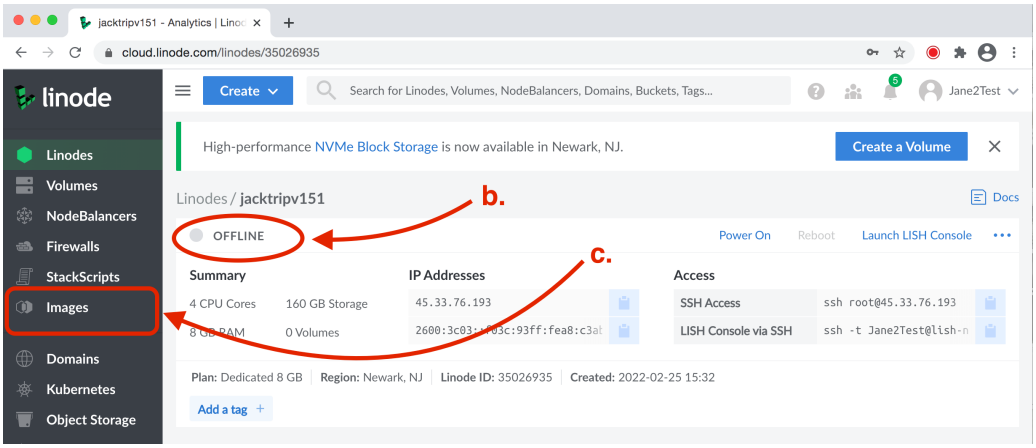
[back at the Linode website, on the **Linodes** page]



a. click on

Power Off

to power off your remote Linode



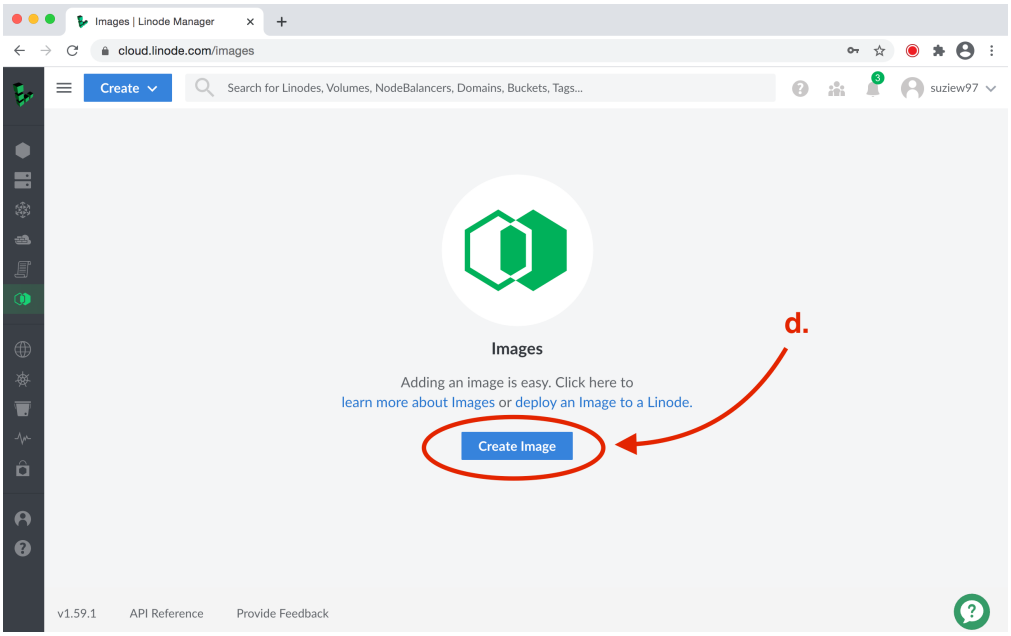
b. once it is **OFFLINE**,

c. click on

Images

in the leftmost black menu

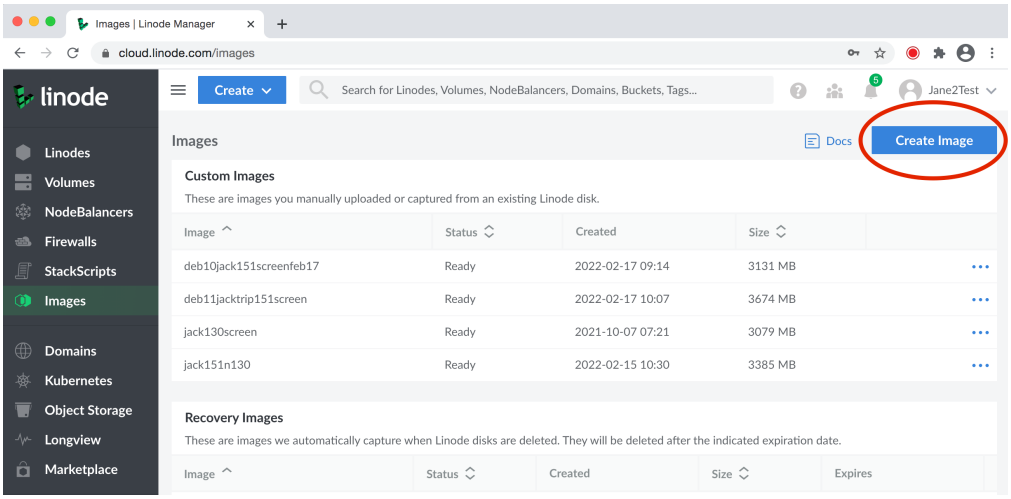
[**Images** page should appear]



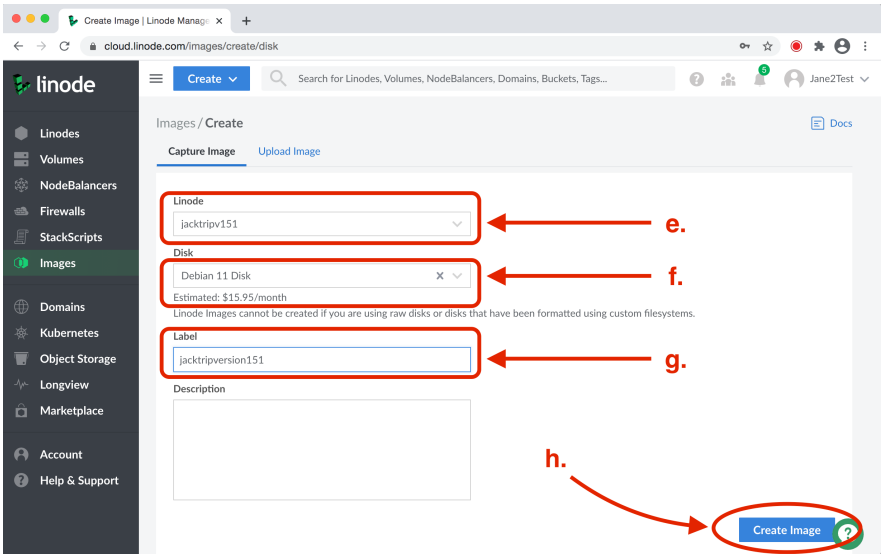
d. Click on the blue **Create Image** button

Note:

If you already have existing images, the **Images** page will look more like the screenshot below. If that is the case, the blue **Create Image** button will be on the upper right as shown below.



[**Images / Create** page should appear]



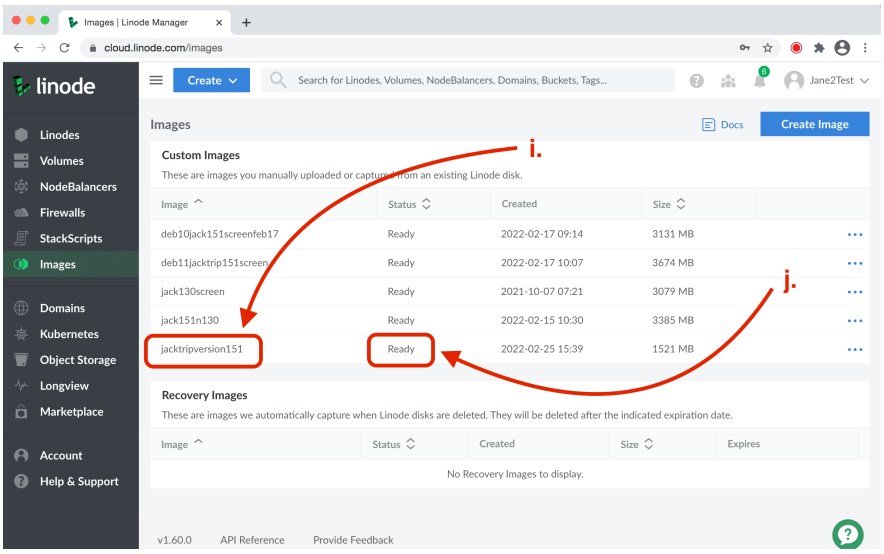
e. select the **Linode Label** you typed in at { **1. Create a remote Linode Cloud Server via the Linode website: e.** }

f. select **Debian 11 Disk**[9] *[FYI: actual charge is a lot less]*

g. type in a memorable **Label** (= name) for the Image

h. click on the blue **Create Image** button

[the **Images** page will appear again]



i. the **Label** you typed in { **Images / Create** page: **e.** } appears under **Custom Images**

j. Wait until **Status** is listed as **Ready**

This might take a little while:
under **Status** you might see **"Creating: Scheduled"**
and then **"Creating: xx%"**
while it is working on it.

You now have an Image of a server with the latest release of jacktrip installed.

The next very important step is to **Delete** your **remote Linode Cloud Server** so you don't get charged when it's not being used. Next time you want to use a remote **Linode Cloud Server**, you can **Deploy to New Linode** using the **Image** you just created and select whatever **Region** and **CPU Plan** you want.

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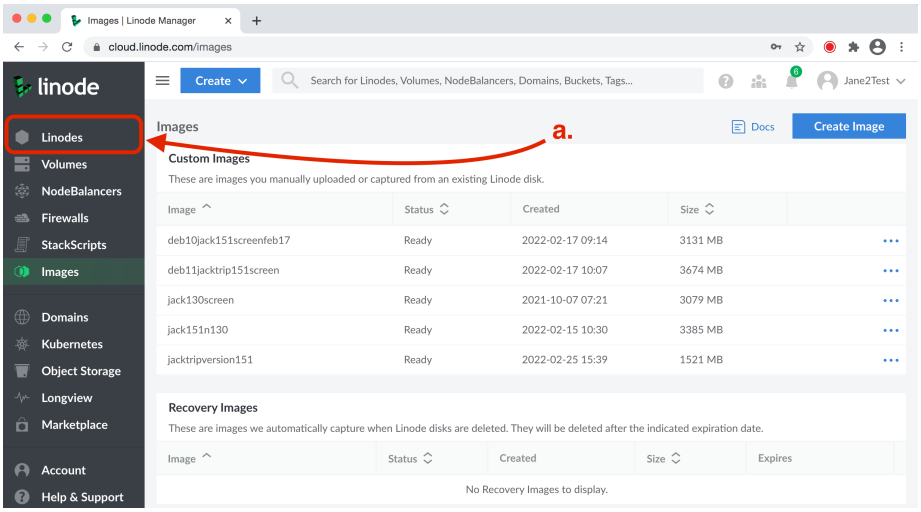
[9] if you had selected **Debian 10 {**in step **b.** Set **Distribution Images** of **1. Create a remote Linode Cloud Server via the Linode website}**, select **Debian 10**; if your Linode was created by deploying an old image, select the old image's label

6. Delete Linode Cloud Server via the Linode website

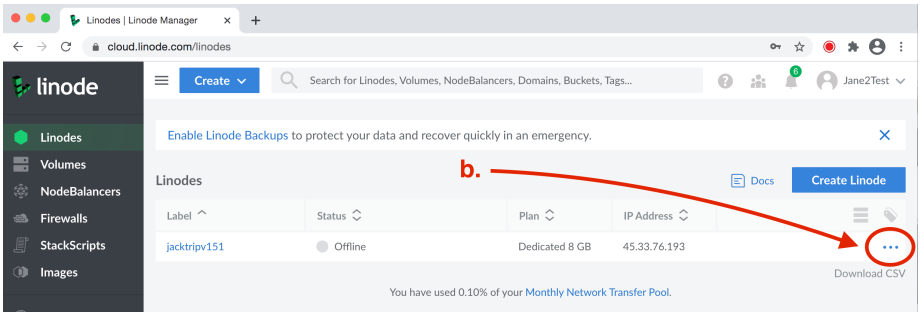


a. Back at the Linode website, if you aren't already on the **Linodes** page,
click on

Linodes

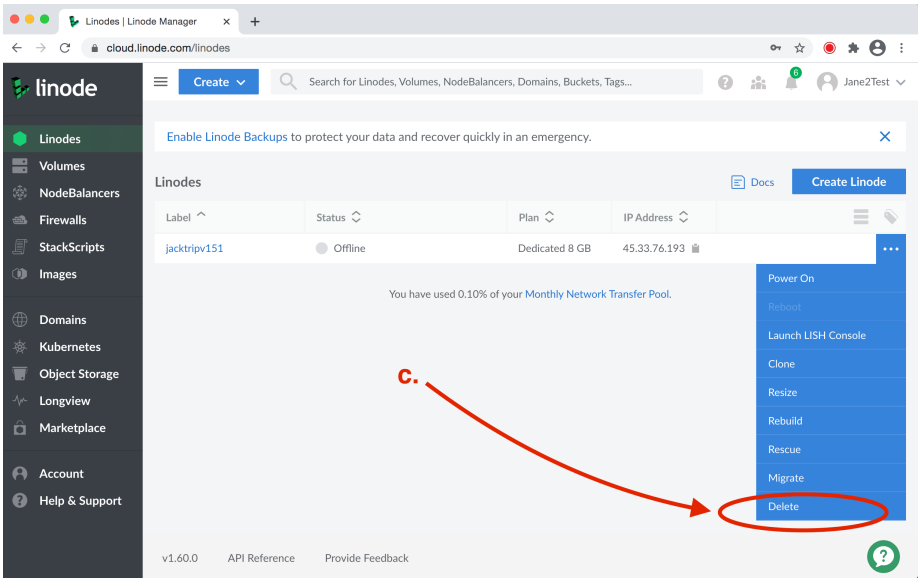
in the black menu on the left.

[The **Linodes** page should appear - **double check that you are on the Linodes not the Images page!**]



b. Click on **...**
by your remote Linode Cloud Server to see the **more options pop up menu**

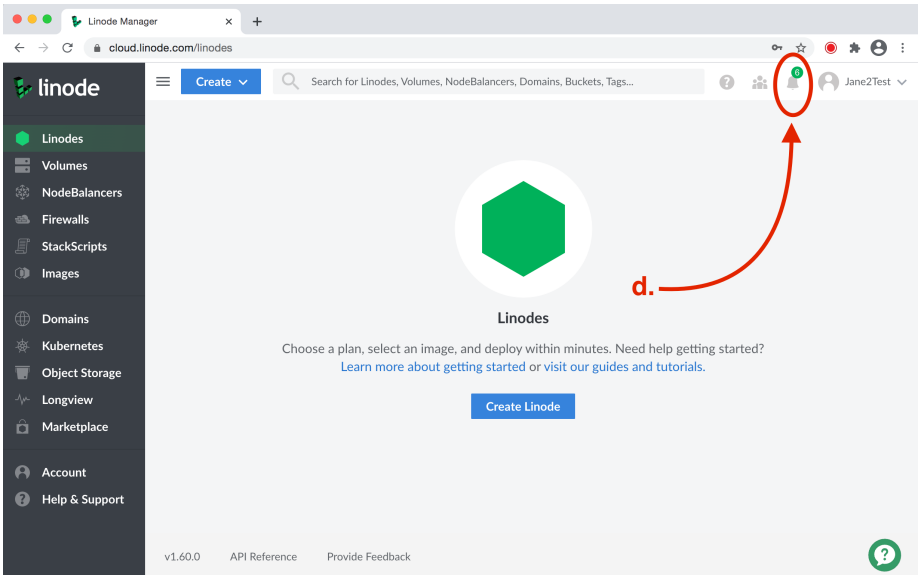
[the **more options pop up menu** should appear]



c. Click on **Delete** on the **more options pop up menu**

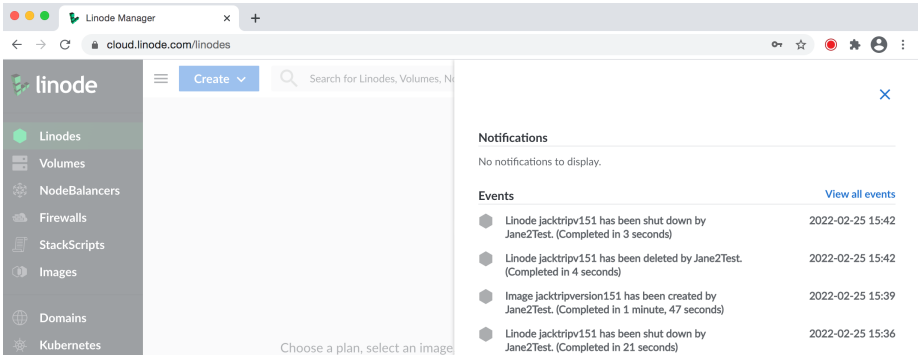
You will know your remote Linode Cloud Server was successfully deleted when you see the **Linode Manager** page appear again with no Linodes listed (unless you had multiple remote Linodes in which case you would see that the remote Linode you deleted is not longer listed).

To double check that the remote Linode Cloud Server you wanted to delete was deleted:



d. Click on
the bell icon
to check your messages

Check the list of **Events** to see that the remote Linode Cloud Server you wanted to delete was deleted:



in this example,

Linode Jacktripv151 has been deleted by Jane2Test. (Completed in 4 seconds)