

How to Setup a Remote Linode Cloud Server with Jacktrip Installed

LinodeJacktripGuidebetaMay042021: fixed a few typos

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 Kwong¹ and the video tutorial created for CCRMA² by Nick Porcaro.

For this guide, you will be working with two applications. One is the Linode application on 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 running the Linode application 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 your remote Linode Cloud Server via Terminal (on your computer)
4. Test jacktrip in Server Mode on your remote Linode Cloud Server via Terminal (on your computer)
5. Create a Linode Image of your remote Linode Cloud Server contents via the Linode website
6. Power Down and Delete your remote 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: **ImageExistsLinodeJacktripGuideMay042021.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** [from <https://www.linode.com/docs/guides/linode-images/>]

Linode Images allow you to take snapshots of your disks, and then deploy them to any Linode under your account. This can be useful for bootstrapping a master image for a large deployment, or retaining a disk for a configuration that you may not need running, but wish to return to in the future.

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.

There is no additional charge to store Images for Linode users. Images are limited to 6GB per Image and 3 Images per account. Additionally, images can only be created on disks with ext3 or ext4 filesystems with a single partition.

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.

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)

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. It looks like the Regions currently available on the Linode website are still limited to North America, Europe and Asia Pacific as of February 12, 2021.

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 application 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** command 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 in green 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 POWER DOWN and **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

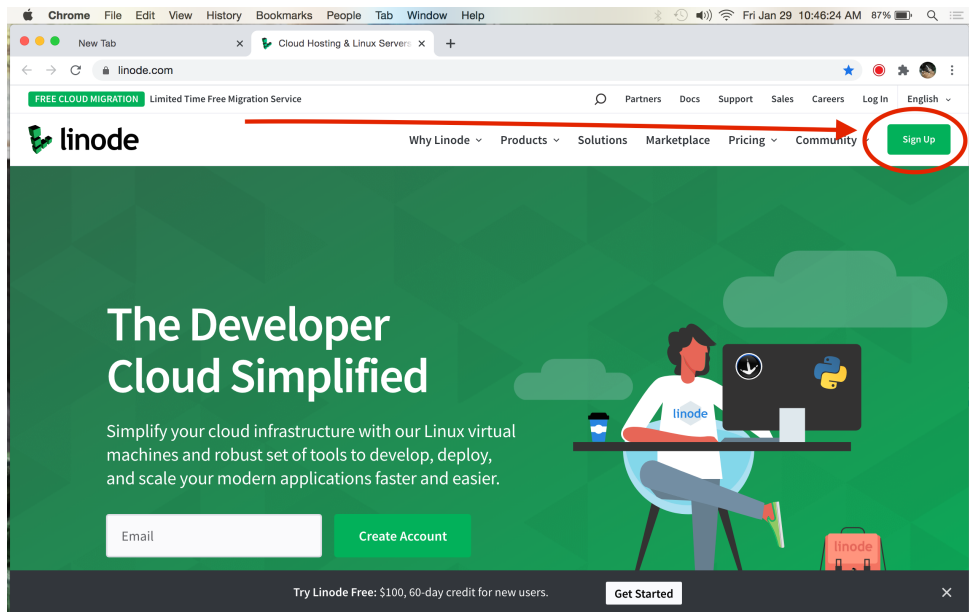
Notes:

- 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, go to:

<https://www.linode.com/>

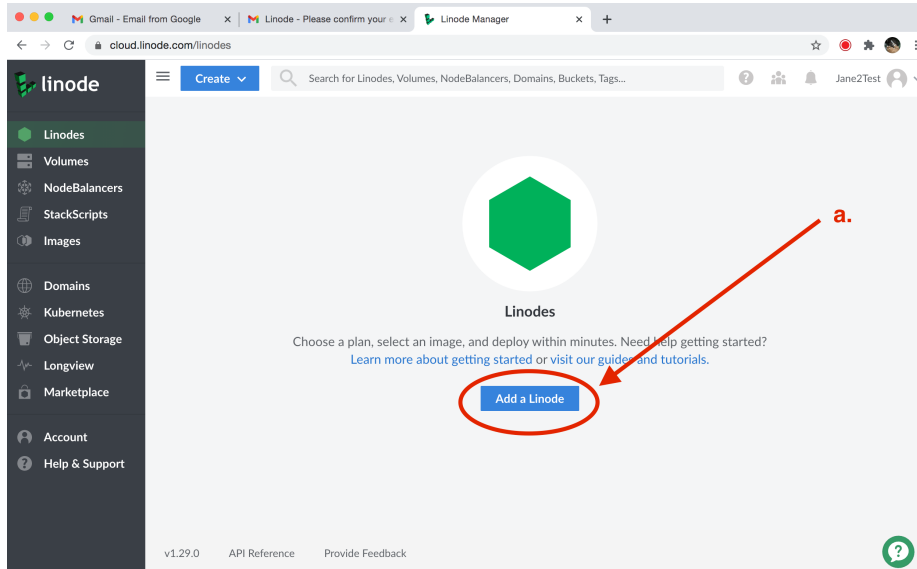
2. Click on green Sign Up button in the upper right corner and follow all the steps (you will have to verify via email as per usual).



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.

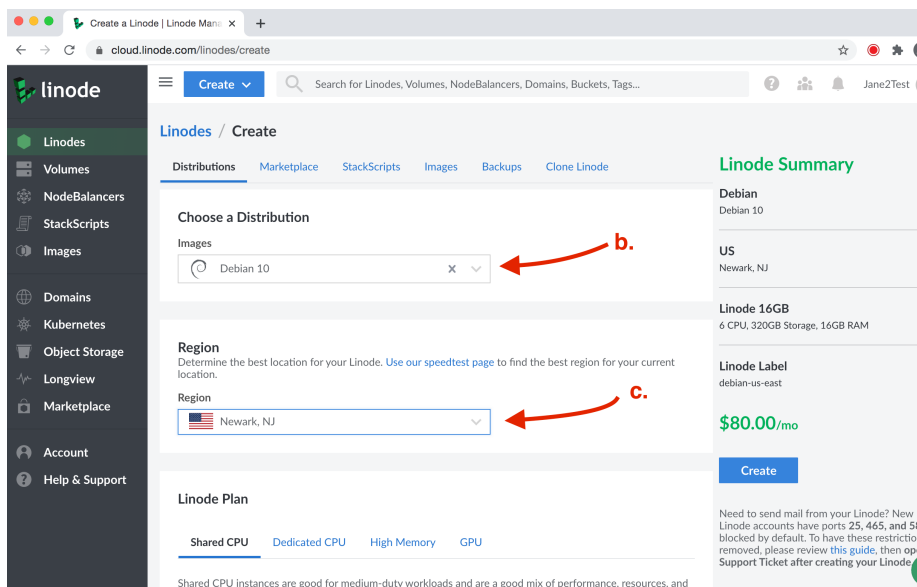
Create a Linode Image with jacktrip installed on it

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



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

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



b. Set **Distribution Images** to **Debian 10**

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

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

Shared CPU instances are good for medium-duty workloads and are a good mix of performance, resources, and price.

Linode Plan	Monthly	Hourly	RAM	CPU's	Storage
<input type="radio"/> Nanode 1GB	\$5	\$0.0075	1 GB	1	25 GB
<input type="radio"/> Linode 2GB	\$10	\$0.015	2 GB	1	50 GB
<input type="radio"/> Linode 4GB	\$20	\$0.03	4 GB	2	80 GB
<input type="radio"/> Linode 8GB	\$40	\$0.06	8 GB	4	160 GB
<input checked="" type="radio"/> Linode 16GB	\$80	\$0.12	16 GB	6	320 GB
<input type="radio"/> Linode 32GB	\$160	\$0.24	32 GB	8	640 GB
<input type="radio"/> Linode 64GB	\$320	\$0.48	64 GB	16	1280 GB
<input type="radio"/> Linode 96GB	\$480	\$0.72	96 GB	20	1920 GB
<input type="radio"/> Linode 128GB	\$640	\$0.96	128 GB	24	2560 GB
<input type="radio"/> Linode 192GB	\$960	\$1.44	192 GB	32	3840 GB

Linode Summary

Debian
Debian 10

US
Newark, NJ

Linode 16GB
6 CPU, 320GB Storage, 16GB RAM

Linode Label
debian-us-east

\$80.00/mo

Create

Need to send mail from your Linode? New Linode accounts have ports 25, 465, and 587 blocked by default. To have these restrictions removed, please review [this guide](#), then open Support Ticket after creating your Linode.

d. Select a Linode Plan
[eg, **Linode 16GB**]

My advice is that you pick a plan that is at least 16GB.

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

Still to be determined:
optimum GB's & CPU's
for particular ensemble size

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

Linode Label
jacktripV130Release

Root Password
testPW1\$23
Strength: Good

SSH Keys

User SSH Keys

You don't have any SSH keys available.

[Add an SSH Key](#)

Optional Add-ons

☐ Backups \$20.00 per month
These backup plans are executed and rotated automatically: a daily backup, a 7-day old backup, and so on.

Linode Summary

Debian
Debian 10

US
Newark, NJ

Linode 16GB
6 CPU, 320GB Storage, 16GB RAM

Linode Label
jacktripV130Release

\$80.00/mo

Create

Need to send mail from your Linode? New Linode accounts have ports 25, 465, and 587 blocked by default. To have these restrictions removed, please review [this guide](#), then open Support Ticket after creating your Linode.

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

f. Create the
Root Password for
the Linode remote
cloud server
[you will use this password
later in Terminal]

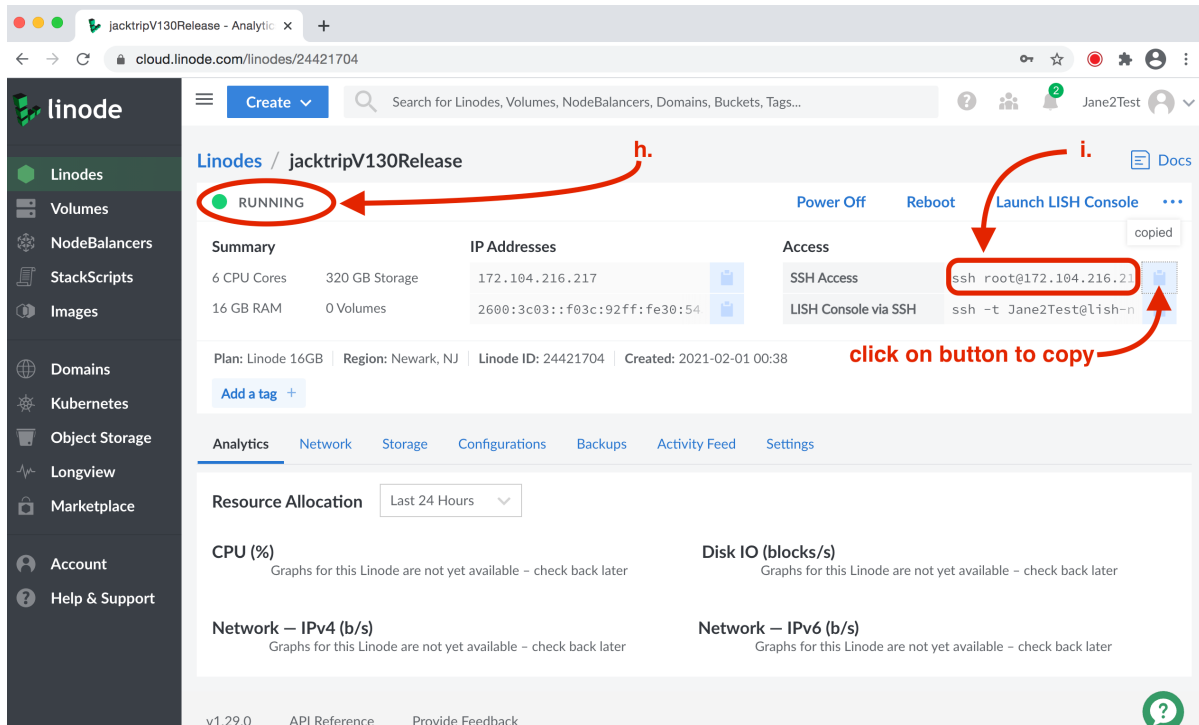
g. Click on blue
Create button

Note: ***You should 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.

[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]** command³ into your clipboard



The screenshot shows the Linode cloud management interface for a Linode named 'jacktripV130Release'. The status is 'RUNNING', indicated by a green circle. Annotations include:

- h.** A red arrow points to the 'RUNNING' status indicator.
- i.** A red arrow points to the 'SSH Access' section, specifically to the 'ssh root@172.104.216.217' command, which is highlighted with a red box and a 'copied' button.

Below the status bar, there is a table with the following data:

Summary		IP Addresses	Access
6 CPU Cores	320 GB Storage	172.104.216.217	SSH Access
16 GB RAM	0 Volumes	2600:3c03::f03c:92ff:fe30:54	LISH Console via SSH

Additional information includes: Plan: Linode 16GB, Region: Newark, NJ, Linode ID: 24421704, Created: 2021-02-01 00:38. The bottom section shows resource allocation graphs for CPU, Disk IO, and Network, all of which are currently unavailable.

³ 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.

```

Last login: Fri Jan 29 14:23:11 on ttys000
Janes-MacBook-Pro-2:~ suziew96$ ssh root@172.104.216.217
The authenticity of host '172.104.216.217 (172.104.216.217)' can't be established.
RSA key fingerprint is 7b:65:ad:d1:d3:2b:16:6f:33:7d:ff:b8:75:52:7e:d2.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '172.104.216.217' (RSA) to the list of known hosts.
root@172.104.216.217's password:
Linux localhost 4.19.0-13-amd64 #1 SMP Debian 4.19.160-2 (2020-11-28) x86_64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
root@localhost:~#
  
```

a. Paste from clipboard **ssh root@[ip-address]** command, and hit <enter>

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

c. when prompted, type in 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]

Note that 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:

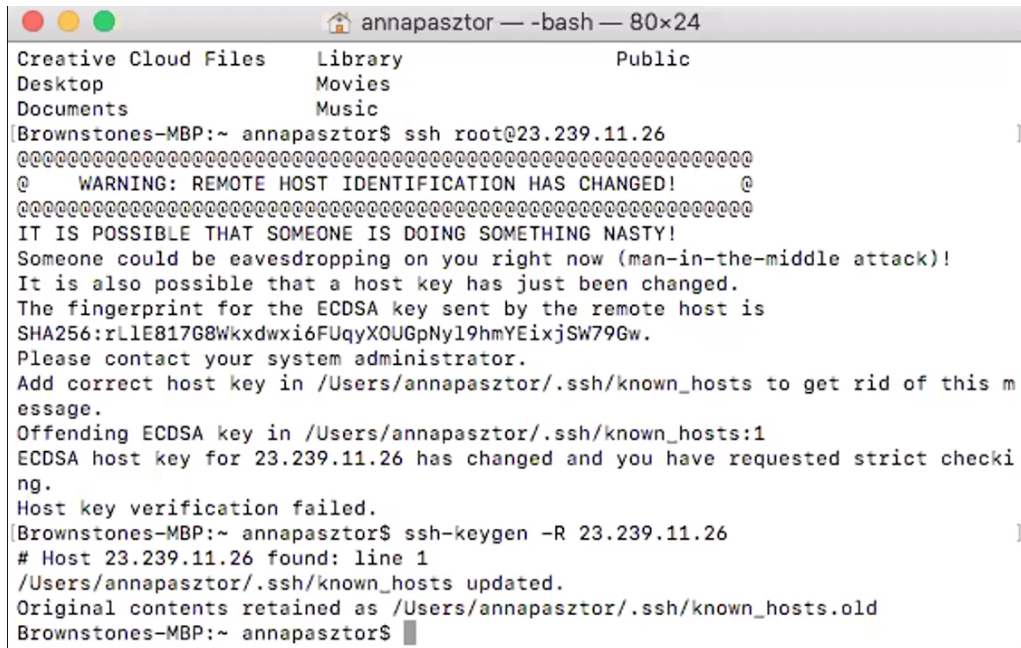
Janes-MackBook-Pro-2:~

but after I logged into my remote Linode Cloud 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:



```

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:rLlE817G8Wkxdwxi6FUqyXOUGpNyl9hmYEixjSW79Gw.
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 Linode remote cloud server's IP address for **[ip-address]**):

ssh-keygen -R [ip-address]

for example, if your Linode remote 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 your remote 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 you can type in a new command without waiting for Terminal to come back with a prompt for a new command.

a. Update debian and install apt build tools:

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>]:

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 when asked, with the arrow key(s) on your keyboard]

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

d. Build in the source directory [this might take a few minutes]:

cd src

then

./build

e. Once the build is complete, go to the builddir directory⁴:

cd ../builddir/

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

./jacktrip -v

⁴ 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 the Remote Linode Cloud Server via Terminal

a. Start jack and jacktrip⁵ in server mode:

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

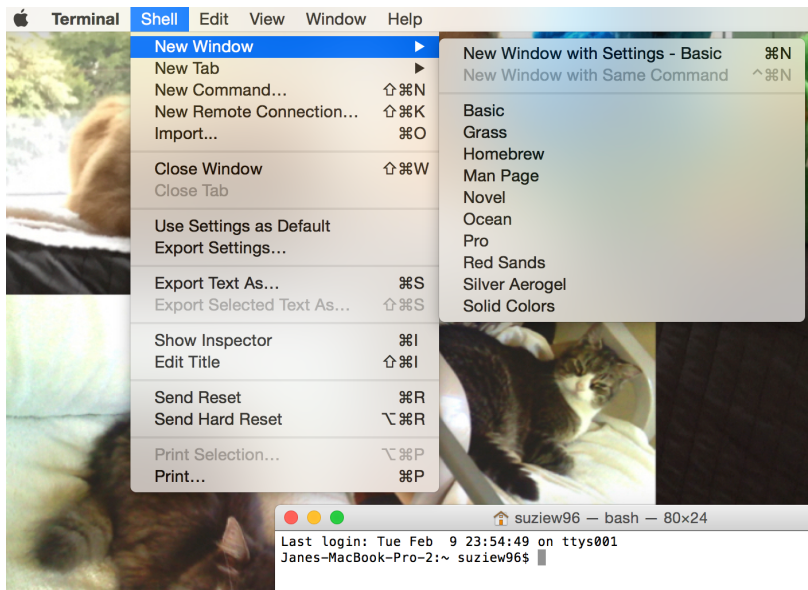
jackd -d dummy -p512 -r48000 &

here is an example of the command Sarah Weaver generally uses with the NowNet Arts Lab Ensemble
[-S = run in Hub Server Mode, -p2 = client out/in but no loopback]

./jacktrip -S -p2 -q32 -z

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

If you need to use Terminal on the same computer that you are running your remote Linode Cloud Server from, you can open up a new Terminal window by selecting Shell / New Window. Make sure that the new Terminal window responds with a line starting with your local computer's name:



For the jacktrip command in *client mode*, use the **ip-address** of your remote Linode Cloud Server. In the example shown in this guide, the ip-address is **172.104.216.217**, so I would put:

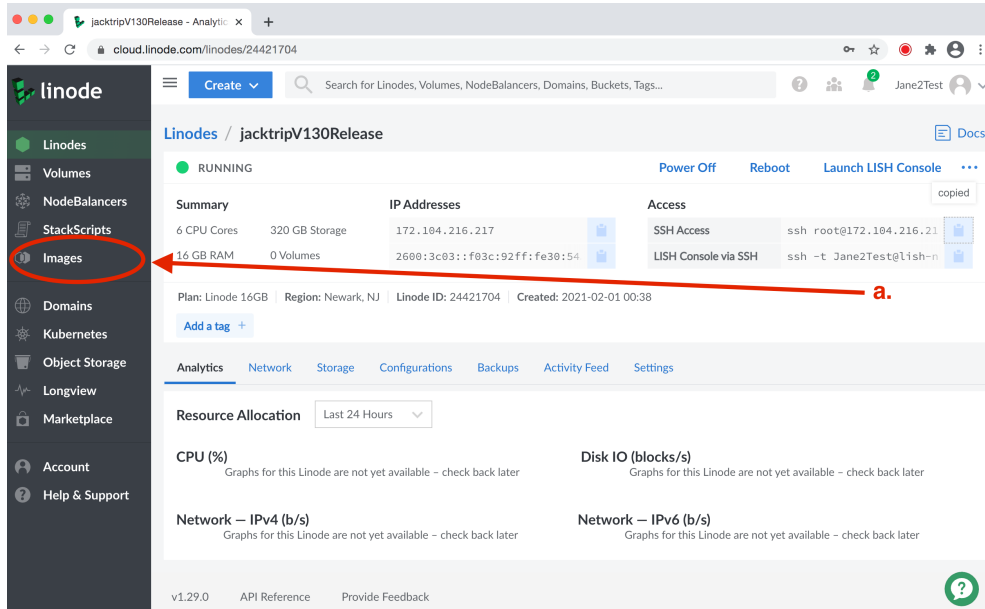
jacktrip -C 172.104.216.217 -q16 -n1 -z

Once you finish testing, you can close/quit out of all the open Terminal windows, it won't hurt anything. For steps 5. and 6. you will be working with the Linode website.

⁵ to see all the jacktrip command options, type **./jacktrip -h**
or go to: <https://manpages.debian.org/testing/jacktrip/jacktrip.1.en.html>

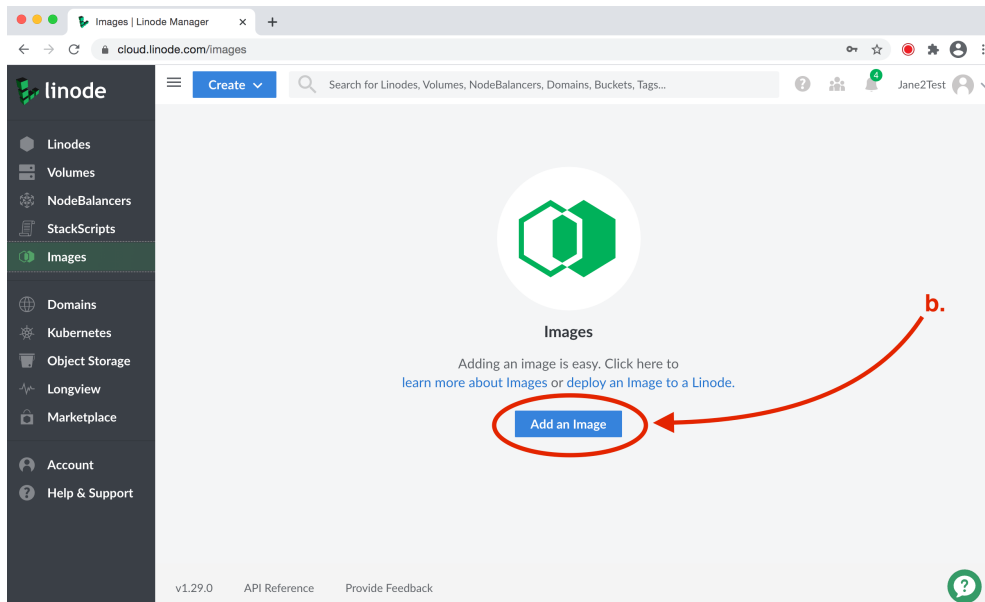
5. Create a Linode Image of the Remote Linode Cloud Server contents via the Linode website

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



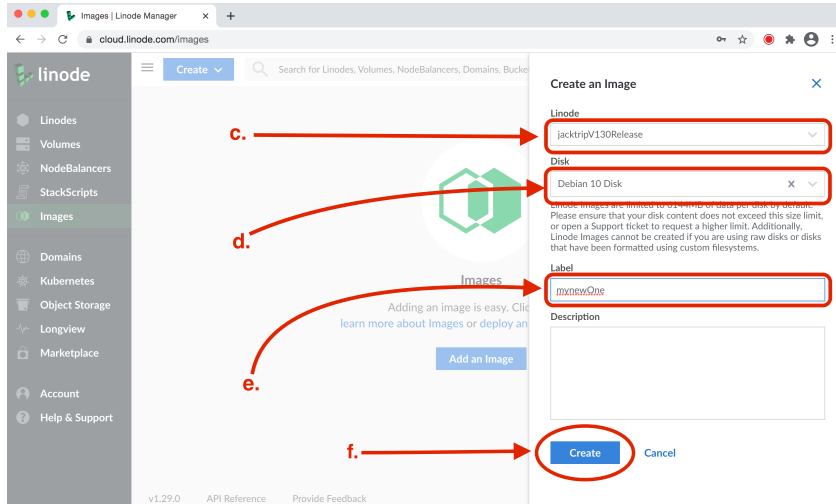
a. click on **Images** in the leftmost black menu

[the **images** page should appear]



b. Click on the blue **Add an Image** button

[pop up menu should appear]



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

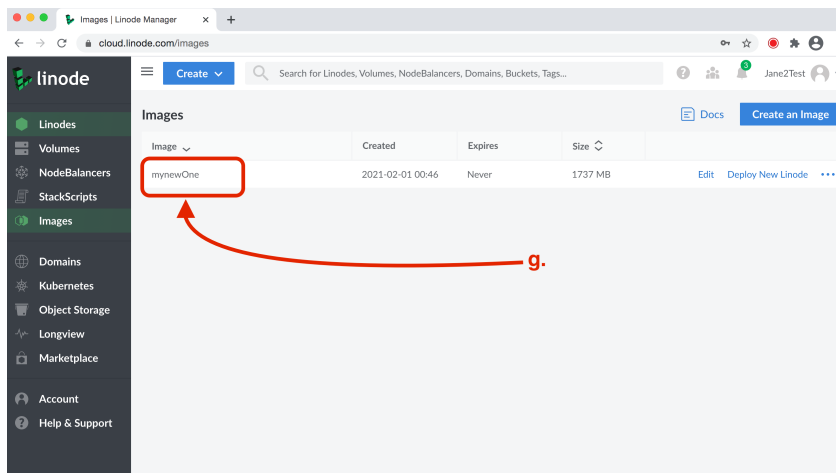
d. select **Debian 10 Disk**

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

f. click on the blue **Create** button

Wait until your Image is created.

This might take a little while — you will see “**Creating: xx%**” while it is working on it, if you close the pop up window.



g. the **Label** you typed in { **pop up menu: e.** } appears on the **Images** list with **Edit / Deploy New Linode / ...** options shown to the right once your Image has been created.

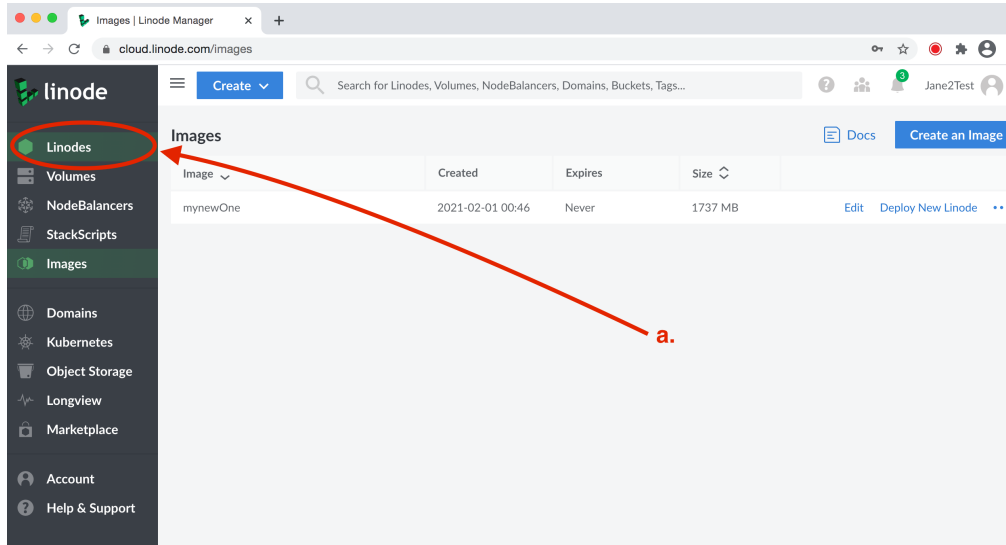
You now have an Image of a server with the latest release of jacktrip installed.

The next very important step is to **Shutdown** and **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 New Linode** using the **Image** you just created and select whatever **Region** and **CPU Plan** you want.

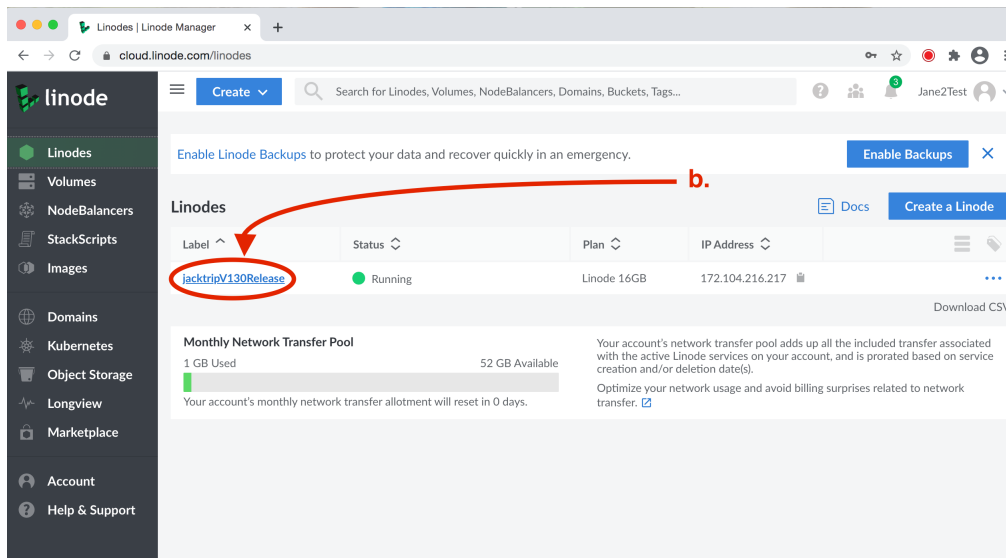
6. Power Down and Delete the remote Linode cloud via the Linode website

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.

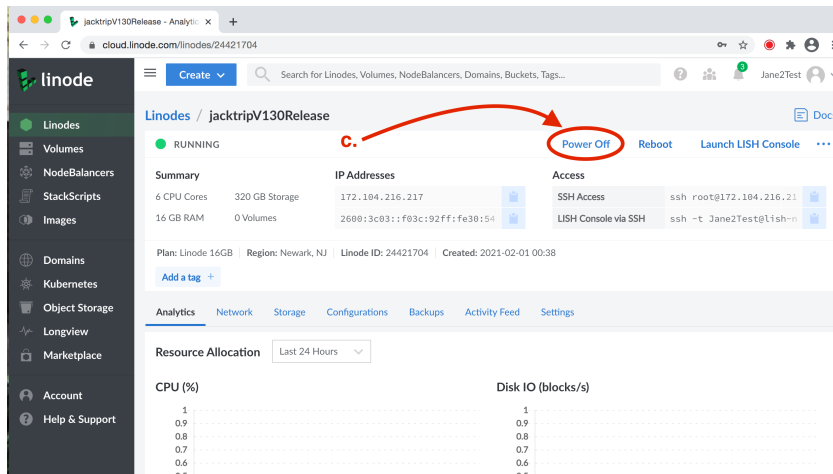


[The **Linodes** page should appear]

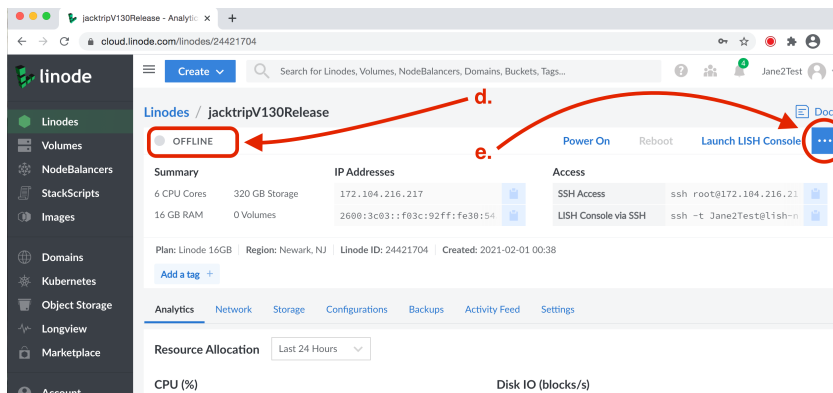
b. Click on the **Label** for your remote **Linode Cloud Server**



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



c. Click on **Power Off**
[you might have to expand the window to see **Power Off**]

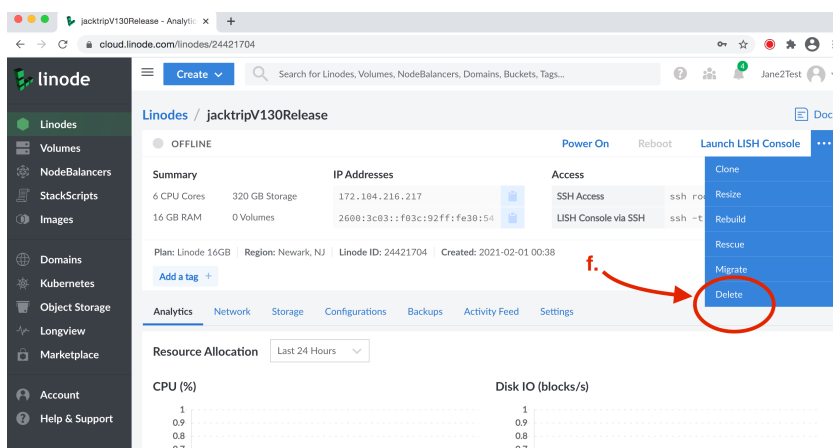


d. Wait until the status reads **OFFLINE**

e. Click on ... -> *
to see the
more options
pop up menu

* when the cursor hovers over the blue dots, the dots turn white and are highlighted in blue

[the more options pop up menu should appear]



f. 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 and you can also double check your messages (the bell icon, upper right)

