

# Hands on: Cloud Computing

ดร. ดำรง ไม้เรียง

ห้องปฏิบัติการเทคโนโลยีชีวภาพทางการแพทย์

ศูนย์พันธุวิศวกรรมและเทคโนโลยีชีวภาพแห่งชาติ (BIOTEC)

# After this session...

- Cloud account setup
- Virtual/Cloud server setup
- Accessing and controlling cloud server
- Upload/Download files  $\longleftrightarrow$  cloud server
- Clean up or Pack up



# Step 0: Quick walkthrough

- I will show you what we will do in under 10 minutes.
- Please just sit and relax
- We will later repeat this together step-by-step



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# What do I need to know...



- You will be able to setup and run the pipeline.
  - User with no or little computer skills (and do not plan to develop one)
  - Few exome sequencing data to be analyzed once in a while (i.e. not routine analysis)
  - NOT sensitive data (i.e. data are not from an identifiable patient)



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# What do I need to know...



- We will explain these slides in details and try to make sure everyone understands.



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# What do I need to know...



- You want to customize the cloud server and/or the pipeline.
  - User with some computer skills
  - Routine analysis of exome sequencing data
  - Sensitive data or require more security
  - Special exome (non-human exome)

# What do I need to know...



- We will briefly explain these slides or provide some hints/links so you may find more information if you want to learn more



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# STEP 1: Cloud account setup

- Choose your cloud service provider

- Amazon web services



- Google cloud platform



- Microsoft Azure



- IBM cloud





# STEP 1: Cloud account setup

- Our Cloud Partner



- Easy-to-use interface
- Simplified cloud images collection
- Competitive pricing




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# STEP 1: Cloud account setup

- Let's setup an account for  **DigitalOcean**
- You will need:
  - Email address
  - Credit card, Debit card or PayPal




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และนวัตกรรม





# STEP 1: Cloud account setup

- Before we start
- Do not setup your own account for  **DigitalOcean** yet if you:
  - Do not have credit card, debit card or PayPal account
  - You want to use “free credits” during trial period, but you do not plan to use it now.
- We are providing a temporary access to our team account during the workshop.



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# STEP 1: Cloud account setup

- Setup with \$100 credits for 60 days
- <https://try.digitalocean.com/performance/?utm=exome>
- <https://goo.gl/bUjtzm>



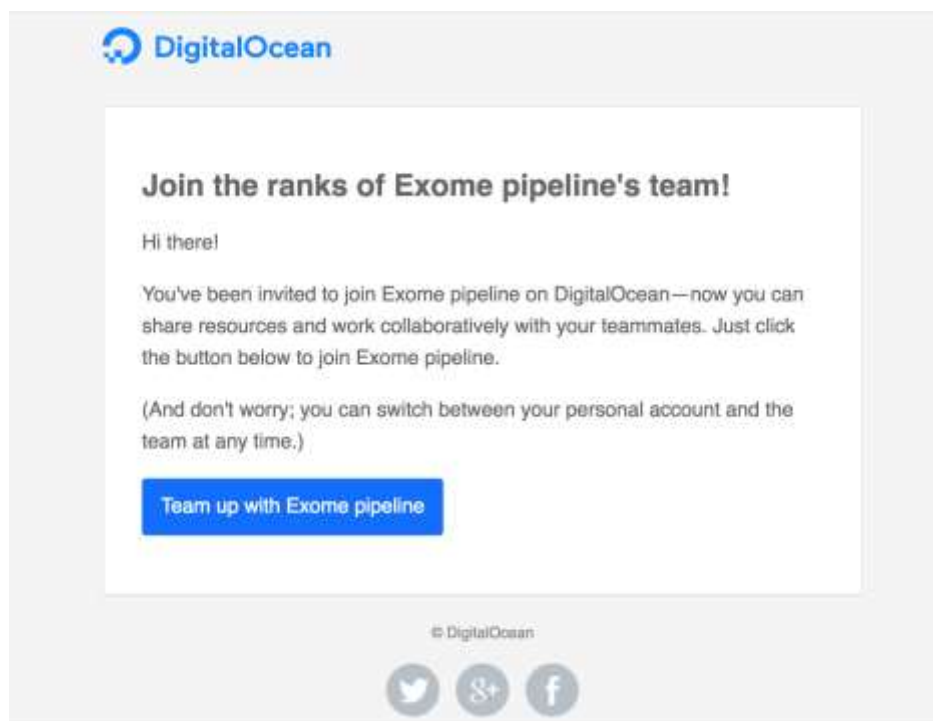
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# STEP 1: Cloud account setup

- For our temporary team account, please click a link in your email.





# STEP 1: Cloud account setup

- Click “Sign up” or log in if your already have an account

Join Exome pipeline  
on DigitalOcean

Log In

Email Address

Password

Log In

Log in with Google

[Forgot password?](#)

Don't have an account? [Sign Up](#)



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# STEP 1: Cloud account setup

- Provide your information and a new password for signing up

Sign Up


You have been invited to join DigitalOcean!  
You will receive \$10 in DigitalOcean credit  
when you create a new account!

Full Name

dumrong\_m@yahoo.com

\*\*\*\*\*

Sign Up

 Sign up with Google



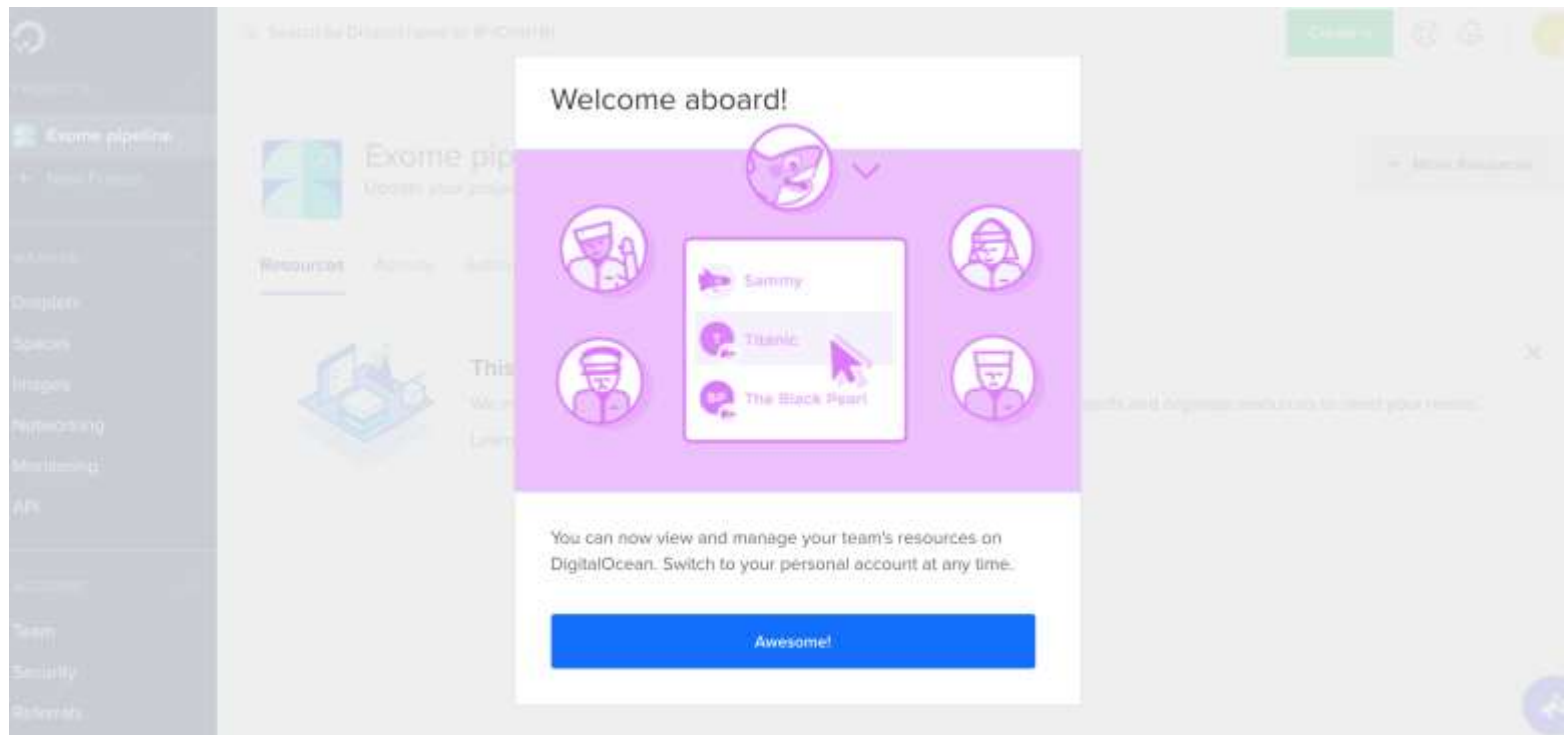
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# STEP 1: Cloud account setup

- You should reach this page



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# STEP 1: Cloud account setup

Can you access  DigitalOcean



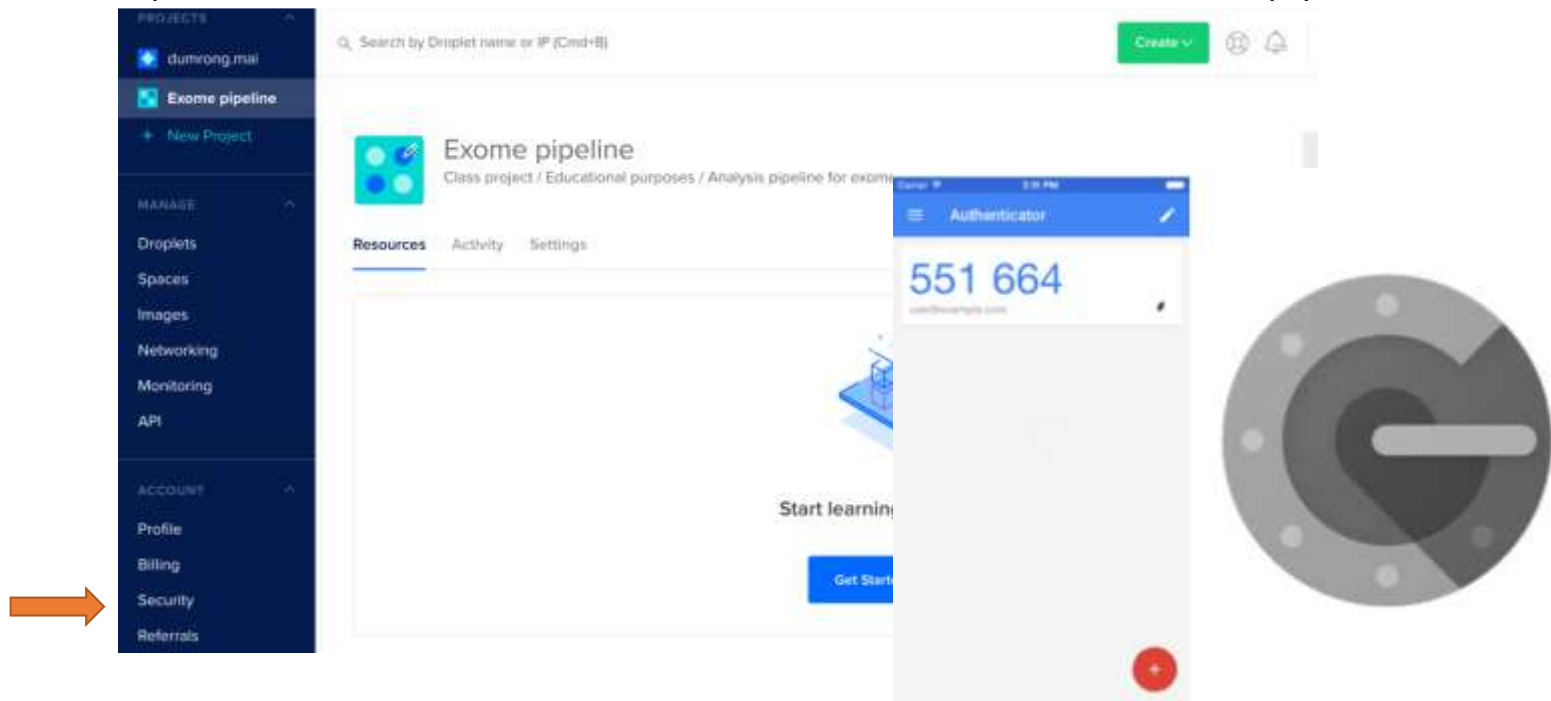
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# STEP 1: Cloud account setup

- Want a more secured account? (Your own account)
- Setup “two-factor” authenticator with Google app





# STEP 1: Cloud account setup

- Want a more secured account? (Your own account)
- Setup “two-factor” authenticator with Google app

The screenshot shows the DigitalOcean account settings page. On the left is a dark blue sidebar with navigation links: 'dumrong.mai', 'Exome pipeline', '+ New Project', 'MANAGE' (with a dropdown arrow), 'Droplets', 'Spaces', 'Images', 'Networking', 'Monitoring', 'API', 'ACCOUNT' (with a dropdown arrow), 'Profile', 'Billing', 'Security' (highlighted), and 'Referrals'. The main content area has a search bar at the top with the text 'Search by Droplet name or IP (Cmd+B)'. To the right of the search bar are a 'Create' button, a 'Credit Remaining' indicator showing '\$98.04', and a 'Google' logo. Below the search bar is a section titled 'Google offers a solution that reduces the number of logins required to access your web apps: Single Sign On (SSO). Users login with their Google credentials, then access third-party applications. No need for an additional username or password. SSO reduces the number of passwords people need to manage.' Below this is a 'Two-factor authentication' section. It has a title 'Two-factor authentication' with an orange arrow pointing to it. Under the title, it says 'Default method: App' and 'When you log in you will be required to enter a code that we will send to an app.' To the right of this text is a green button that says 'Two-factor Authentication Enabled'. Below this is a 'Backup method: Codes' section. It says 'You have 20 backup codes remaining.' and has a link 'Regenerate codes'. To the right of this text is a green button that says 'Backup Method Enabled'. At the bottom of the page is an 'SSH keys' section with a button 'Add SSH Key'.



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## STEP 2: Get essential tools

- If you are using Mac or Linux, you can skip this step.
- If you are using Windows, you will need to install these programs:

- PuTTY 

- WinSCP 



## STEP 2: Get essential tools

- PuTTY is a “Terminal emulator”
- PuTTY connects you to a (cloud) server.
- You can remotely control the server using command lines through PuTTY



## STEP 2: Get essential tools

- Download PuTTY from <https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html>

### Package files

You probably want one of these. They include all the PuTTY utilities.

(Not sure whether you want the 32-bit or the 64-bit version? Read the [FAQ entry](#).)

#### MSI ('Windows Installer')

32-bit: [putty-0.70-installer.msi](#) (or by [FTP](#)) ([signature](#))

64-bit: [putty-64bit-0.70-installer.msi](#) (or by [FTP](#)) ([signature](#))

#### Unix source archive

.tar.gz: [putty-0.70.tar.gz](#) (or by [FTP](#)) ([signature](#))



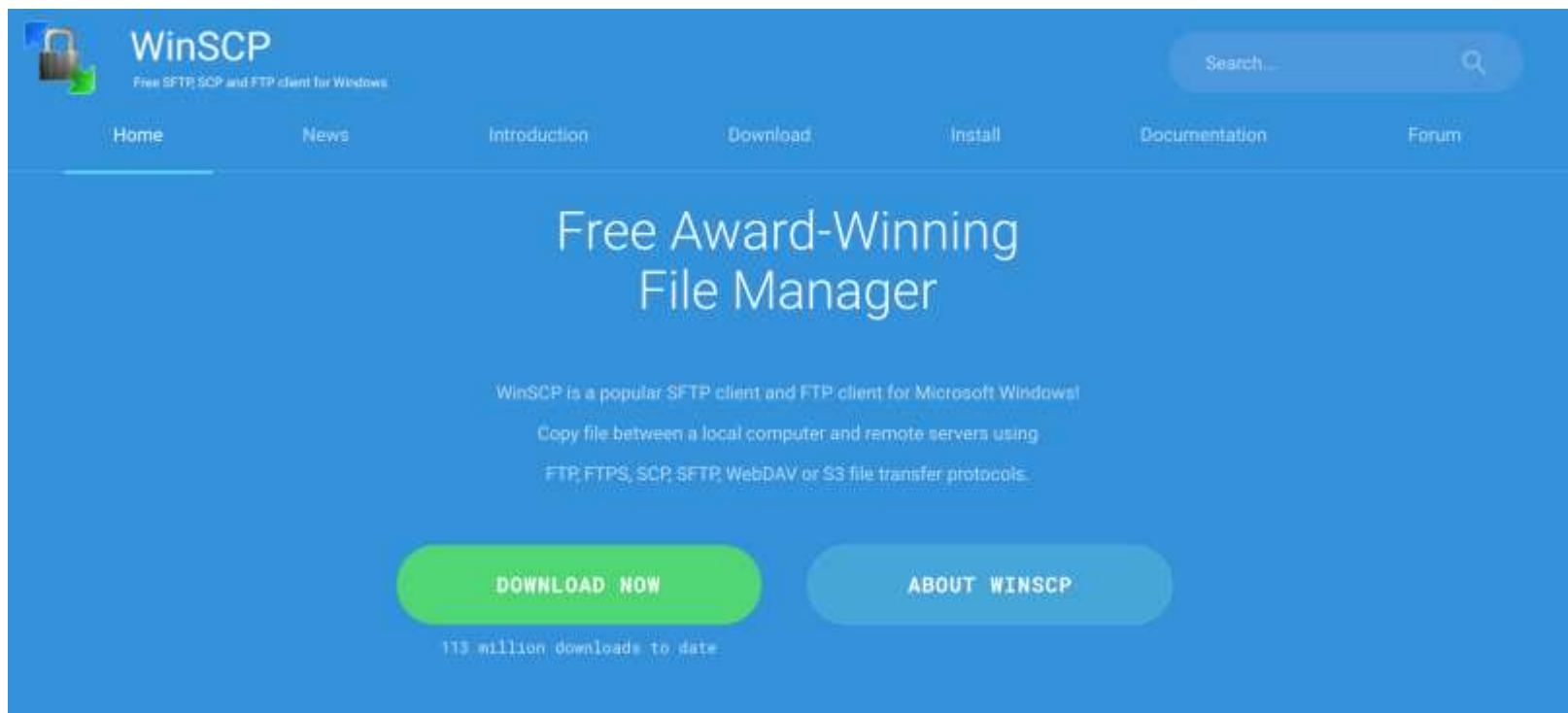
## STEP 2: Get essential tools

- WinSCP = Windows Secure Copy
- WinSCP connects you to a (cloud) server.
- You can upload files from your computer to the server via WinSCP
- You can download files from the server to your computer via WinSCP
- WinSCP help you work with files on the server like you are using Windows/Folder explorer



## STEP 2: Get essential tools

- Download WinSCP from <https://winscp.net/eng/index.php>



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## STEP 2: Get essential tools

Can you install  and  ?



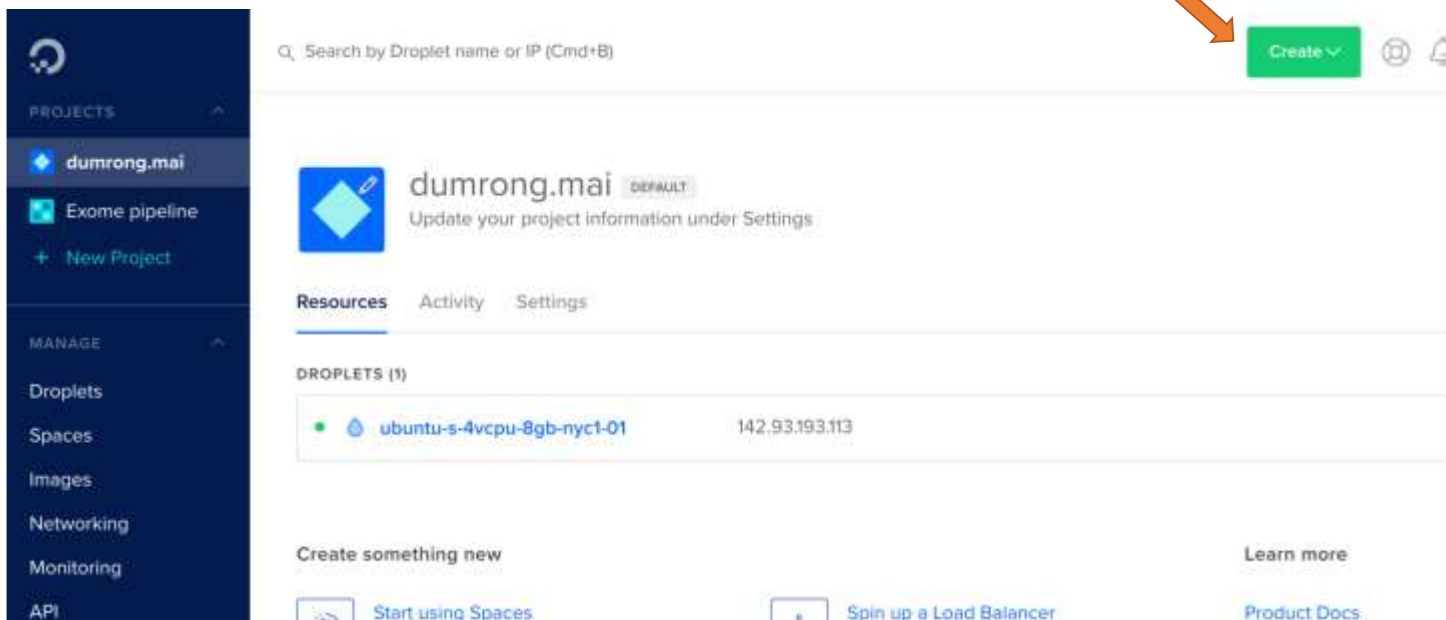
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# STEP 3: Setup your first droplet/virtual server

- Log in to  **DigitalOcean**
- Click Create

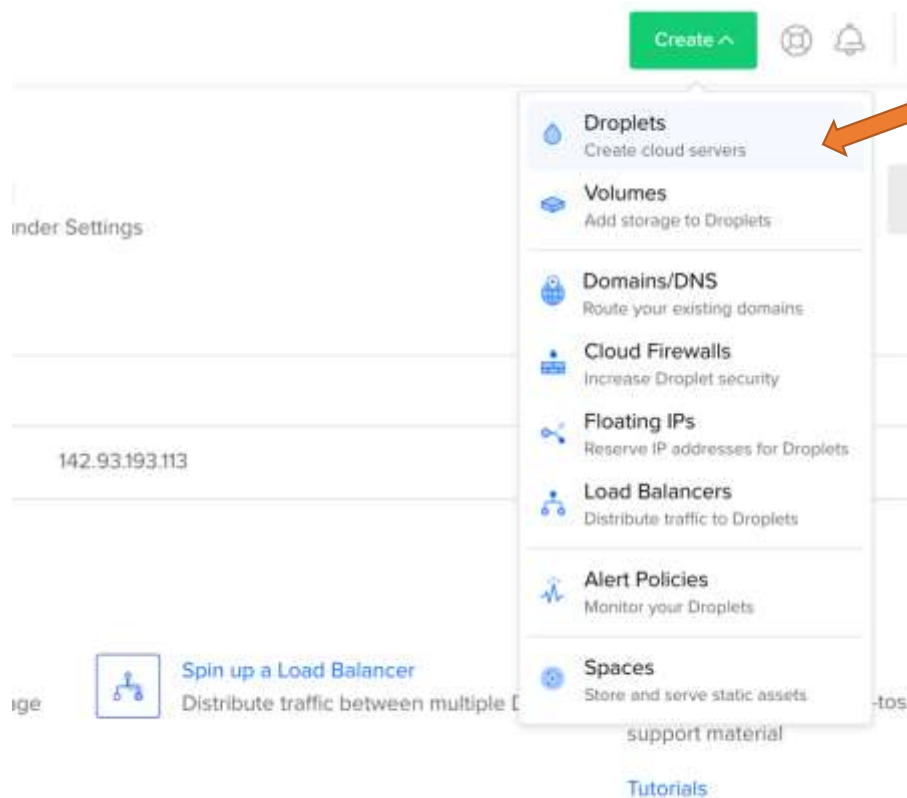


The screenshot shows the DigitalOcean dashboard for a user named 'dumrong.mai'. The left sidebar contains navigation links for PROJECTS, MANAGE, and API. The main content area shows the 'Create' button highlighted with an orange arrow. Below the 'Create' button, there is a search bar and a list of droplets. The list shows one droplet named 'ubuntu-s-4vcpu-8gb-nyc1-01' with an IP address of '142.93.193.113'. At the bottom, there are links for 'Start using Spaces', 'Spin up a Load Balancer', and 'Product Docs'.



## STEP 3: Setup your first droplet/virtual server

- Select “Droplets”





## STEP 3: Setup your first droplet/virtual server

- Select “Ubuntu”

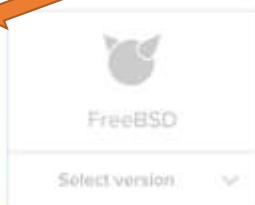
### Create Droplets

Choose an image ?

Distributions

Container distributions

One-click apps





## STEP 3: Setup your first droplet/virtual server

- Select other version of “Ubuntu” here







### Create Droplets

Choose an image ?

Distributions

Container distributions

One-click apps

 Ubuntu 16.04.4 x64 	 FreeBSD Select version 	 Fedora Select version 	 Debian Select version 	 CentOS Select version 
--	--	---	---	---



## STEP 3: Setup your first droplet/virtual server

- Choose an appropriate size of your “droplet”

servers.

MEMORY	vCPUs	SSD DISK	TRANSFER	PRICE
1 GB	1 vCPU	25 GB	1 TB	\$5/mo \$0.007/hr
2 GB	1 vCPU	50 GB	2 TB	\$10/mo \$0.015/hr
3 GB	1 vCPU	60 GB	3 TB	\$15/mo \$0.022/hr
2 GB	2 vCPUs	60 GB	3 TB	\$15/mo \$0.022/hr
1 GB	3 vCPUs	60 GB	3 TB	\$15/mo \$0.022/hr
4 GB	2 vCPUs	80 GB	4 TB	\$20/mo \$0.030/hr
8 GB	4 vCPUs	160 GB	5 TB	\$40/mo \$0.060/hr



MEMORY	DEDICATED vCPUs	SSD DISK	TRANSFER	PRICE
4 GB	2 vCPUs	25 GB	4 TB	\$40/mo \$0.060/hr
8 GB	4 vCPUs	50 GB	5 TB	\$80/mo \$0.119/hr
16 GB	8 vCPUs	100 GB	6 TB	\$160/mo \$0.238/hr
32 GB	16 vCPUs	200 GB	7 TB	\$320/mo \$0.476/hr
64 GB	32 vCPUs	400 GB	9 TB	\$640/mo \$0.952/hr



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## STEP 3: Setup your first droplet/virtual server

- A droplet without extra disk space should be able to handle one exome analysis
- Multiple exome analysis should be run with multiple droplets in parallel
- You should NOT need an extra disk space
- But if somehow you need more space, add an extra disk space by:

**Add block storage** Currently only available in AMS3, BLR1, FRA1, LON1, NYC1, NYC3, SFO2, SGP1 and TOR1.

Block storage lets you add independent storage volumes that can be accessed like local disk and moved from one Droplet to another within the same region.

Add Volume





# STEP 3: Setup your first droplet/virtual server

- If you need more space:

**Add block storage** Currently only available in AMS3, BLR1, FRA1, LON1, NYC1, NYC3, SFO2, SGP1 and TOR1.

Block storage lets you add independent storage volumes that can be accessed like local disk and moved from one Droplet to another within the same region.

\$ ____/mo \$ ____/hour	\$ <b>10</b> /mo \$0.015/hour	\$ <b>25</b> /mo \$0.037/hour	\$ <b>50</b> /mo \$0.074/hour	\$ <b>100</b> /mo \$0.149/hour	\$ <b>200</b> /mo \$0.298/hour
Enter size in GB	100 GB	250 GB	500 GB	1000 GB	2000 GB

**Choose configuration options:**



**Automatically Format & Mount**

We will choose the appropriate default configurations. These settings can be changed later via ssh.



**Manually Format & Mount**

We will still attach the volume. You can then manually format and mount the volume.

Choose a filesystem



Ext4









XFS



Remove Volume





- Choose a datacenter region

 New York	 San Francisco	 Amsterdam	 Singapore	 London	 Frankfurt
1	2	3	1	1	1









 Toronto	 Bangalore
1	1



## STEP 3: Setup your first droplet/virtual server

- Near you (e.g. Singapore) = upload/download your data faster
- Near databases/applications (e.g. USA) = download databases and applications faster

Choose a datacenter region

 New York <div>123</div>	 San Francisco <div>12</div>	 Amsterdam <div>23</div>	 Singapore <div>1</div>	 London <div>1</div>	 Frankfurt <div>1</div>
 Toronto <div>1</div>	 Bangalore <div>1</div>				



## STEP 3: Setup your first droplet/virtual server

- If you want to make sure your droplet is secured, look into “SSH keys” settings
- Otherwise, skip this.

Add your SSH keys ?

New SSH Key



ipgg01



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## STEP 3: Setup your first droplet/virtual server

- Rename your droplet to your name
- Click "Create" to start your droplet

### Finalize and create

#### How many Droplets?

You can only create 1 Droplet with this [configuration](#) at a time.

— 1 Droplet +

#### Choose a hostname

Give your Droplets an identifying name you will remember them by. Your Droplet name can only contain alphanumeric characters, dashes, and periods.

ubuntu-s-4vcpu-8gb-nyc1-01

#### Add Tags

#### Select project

Select an existing project for this Droplet/s to belong to.

◆ dumrong.mai

Create



## STEP 3: Setup your first droplet/virtual server

- You should see this if your droplet is successfully created



dumrong.mai

DEFAULT

Update your project information under Settings

→ Move Resources

Resources

Activity

Settings

DROPLETS (1)

  ubuntu-s-4vcpu-8gb-nyc1-01	142.93.193.113	 
---	----------------	---



## STEP 3: Setup your first droplet/virtual server

- Your password should be sent to you email

Your new Droplet is all set to go! You can access it using the following credentials:

Droplet Name: ubuntu-s-4vcpu-8gb-sgp1-01

IP Address: 178.128.82.41

Username: root

Password: 07595c6860eeaddc716ab96f45

For security reasons, you will be required to change this Droplet's root password when you login. You should choose a strong password that will be easy for you to remember, but hard for a computer to guess. You might try creating an alpha-numerical phrase from a memorable sentence (e.g. "I won my first spelling bee at age 7," might become "Iwm#1sbaa7"). Random strings of common words, such as "Mousetrap Sandwich Hospital Anecdote," tend to work well, too.

As an added security measure, we also strongly recommend adding an SSH key to your account. You can do that here:

<https://cloud.digitalocean.com/settings/security?i=870202>

Once added, you can select your SSH key and use it when creating future Droplets. This eliminates the need for root passwords altogether, and makes your Droplets much less vulnerable to attack.

Happy Coding,

Team DigitalOcean

# STEP 3: Setup your first droplet/virtual server

Can you create a “droplet”?



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## STEP 4: Accessing your droplet

- Before starting your “full-scale” droplet, check your internet connection with the smallest/cheapest droplet.
- Some institutions (e.g. Siriraj) do not allow a connection by SSH to external server
  - VPN or consult your IT





## STEP 4: Accessing your droplet

- Mac and Linux users
- Open your terminal
- Use ssh command

`ssh root@<Droplet IP address>`

Example: `ssh root@123.456.78.90`

- Use a password from email or from SSH key setting to login for the first time



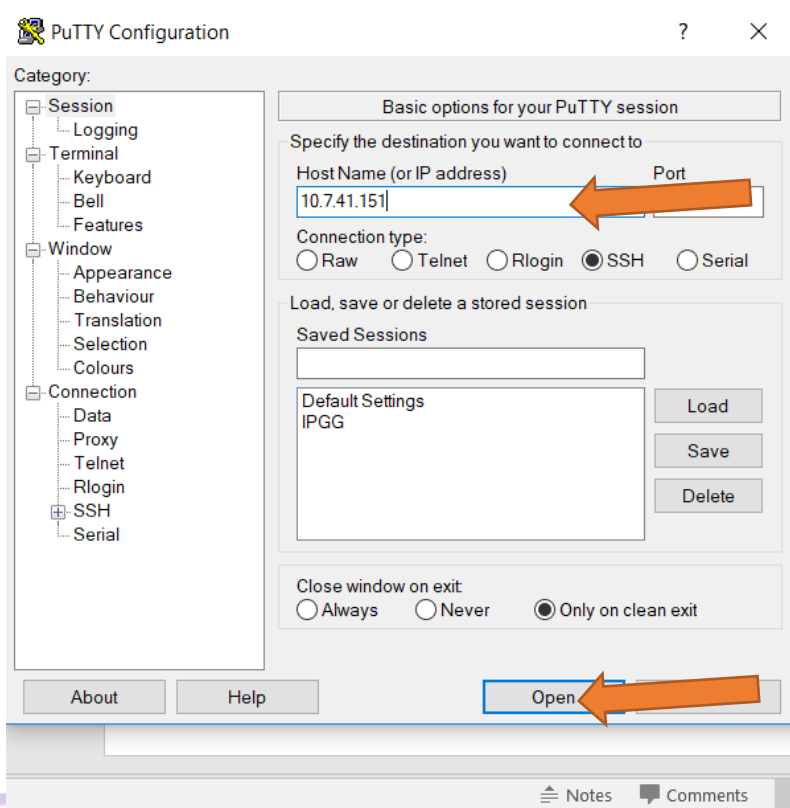
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## STEP 4: Accessing your droplet

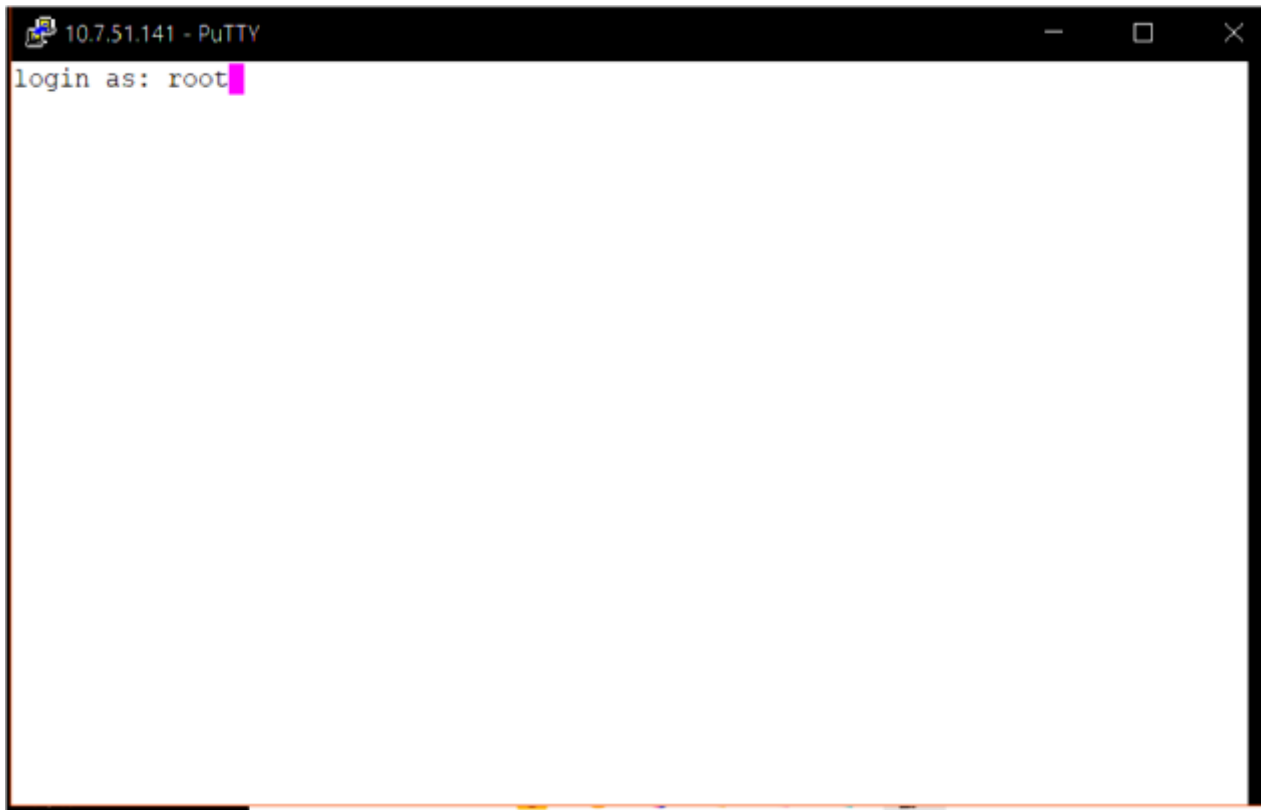
- Windows user: Open PuTTY → enter droplet's IP Address → click “Open”





## STEP 4: Accessing your droplet

- Login = root





## STEP 4: Accessing your droplet

- Password = password from email or SSH key
- Copy → Right click in PuTTY = Paste (You will NOT see any change, but this is OK)





## STEP 4: Accessing your droplet

- First log in → Enter password again
- Copy → Right click in PuTTY = Paste (You will NOT see any change, but this is OK)

```
dumrong@SIA09-IPGG01: ~  
You are required to change your password immediately (root enforced)  
Welcome to Ubuntu 16.04.5 LTS (GNU/Linux 4.4.0-131-generic x86_64)  
  
* Documentation:  https://help.ubuntu.com  
* Management:    https://landscape.canonical.com  
* Support:        https://ubuntu.com/advantage  
  
Get cloud support with Ubuntu Advantage Cloud Guest:  
http://www.ubuntu.com/business/services/cloud  
  
0 packages can be updated.  
0 updates are security updates.  
  
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.  
  
Changing password for root.  
(current) UNIX password: 
```



## STEP 4: Accessing your droplet

- First log in → Enter password again → Set new password

```
dumrong@S/A09-IPGGC1: ~  
* Documentation:  https://help.ubuntu.com  
* Management:    https://landscape.canonical.com  
* Support:        https://ubuntu.com/advantage  
  
Get cloud support with Ubuntu Advantage Cloud Guest:  
http://www.ubuntu.com/business/services/cloud  
  
0 packages can be updated.  
0 updates are security updates.  
  
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.  
  
Changing password for root.  
(current) UNIX password:  
Enter new UNIX password:  
Retype new UNIX password: █
```



## STEP 4: Accessing your droplet

- You should get this:

```
root@ubuntu-s-1vcpu-1gb-sgp1-01:~  
* Documentation:  https://help.ubuntu.com  
* Management:    https://landscape.canonical.com  
* Support:        https://ubuntu.com/advantage  
  
Get cloud support with Ubuntu Advantage Cloud Guest:  
http://www.ubuntu.com/business/services/cloud  
  
0 packages can be updated.  
0 updates are security updates.  
  
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.  
  
Changing password for root.  
(current) UNIX password:  
Enter new UNIX password:  
Retype new UNIX password:  
root@ubuntu-s-1vcpu-1gb-sgp1-01:~#
```



## STEP 4: Accessing your droplet

- If you set “SSH key,” your password used for setting “SSH key” will be used.
- You do not need to change password at the first log in.



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## STEP 4: Accessing your droplet

Can you access your “droplet”?



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## STEP 5: File transfer

- Mac and Linux users
- Open your terminal
- Use scp command

Local → Droplet

```
scp /path/file root@<Droplet IP address>:~/
```

Droplet → Local (current directory)

```
scp root@<Droplet IP address>:~/path/file .
```

- Enter a password



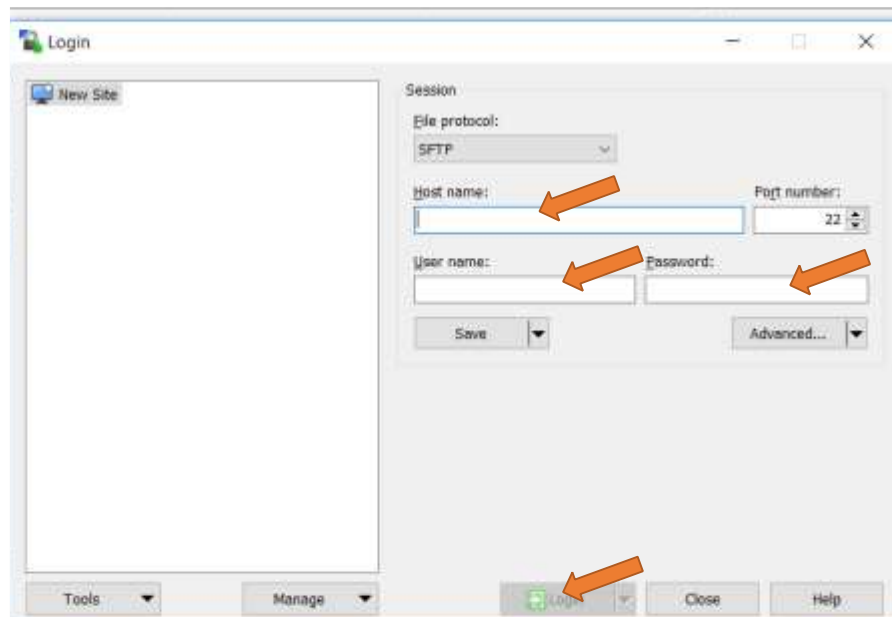
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## STEP 5: File transfer

- Windows user: Open WinSCP → enter droplet's IP Address  
→ Enter username ('root') and password → click "Login"





## STEP 5: File transfer

- You should see this:

The screenshot shows the WinSCP interface with a local Windows drive (C:\Users\BDM\Documents\) on the left and a remote Linux server (/home/dumrong/) on the right. A blue arrow labeled 'Local' points to the left pane, and a blue arrow labeled 'Droplet' points to the right pane.

Name	Size	Type
Custom Office Templa		File folder
R		File folder
Sound recordings		File folder
.Rhistory	1 KB	RHISTORY File
bdm.pptx	232 KB	Microsoft PowerPoint
Hands on cloud comp...	37 KB	Microsoft PowerPoint
Presentation1.pptx	226 KB	Microsoft PowerPoint

Name	Size	Changed
..		5/11/2018 3:27:31 F
SqlCompare		5/31/2018 6:15:01 F
#topol.top.1#	0 KB	5/15/2018 10:32:08
1aki.gro	87 KB	5/15/2018 10:36:01
1aki.pdb	107 KB	5/15/2018 10:35:34
1yy8.pdb	433 KB	5/15/2018 10:29:08
gromacs.simg	104,385 KB	5/15/2018 10:25:44
nyclog.txt	1 KB	8/18/2018 3:24:40 F
posre.itp	31 KB	5/15/2018 10:36:01
topol.top	564 KB	5/15/2018 10:36:01

0 B of 494 KB in 0 of 7      4 hidden      0 B of 103 MB in 0 of 9      10 hidden      SFTP-3      0:00:28



## STEP 5: File transfer

- Test file upload: Local → Droplet
  1. Open notepad/text editor in your computer
  2. Write “Thank you.” in a new text file
  3. Save the file as `thank.txt`
  4. Upload this file to your droplet (WinSCP or scp)
  5. Access your droplet (PuTTY or ssh)
  6. Type  
`ls`  
see if you can see your file
  7. Type  
`nano thank.txt`  
to read the file





## STEP 5: File transfer

- Test file download: Droplet → Local

1. Access your droplet (PuTTY or ssh)
2. Type

```
echo "you are welcome" > yaw.txt
```

1. Connect to your droplet with WinSCP (or use scp)
2. Download `yaw.txt` to you computer
3. Use notepad or word to read the file

## STEP 5: File transfer

Can you complete file upload/download?



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## STEP 6: Linux/Unix command

- Update OS and program

```
apt update
```

- Upgrade OS and program

```
apt upgrade
```

- Install a program

```
apt install <program name>
```

Example: 

```
apt install docker.io
```





## STEP 6: Linux/Unix command

- List files in the current directory

`ls`

`ll`

- Show the current the directory

`pwd`



## STEP 6: Linux/Unix command

- Create a new directory

`mkdir <directory>`

Example: `mkdir projectA`

- Change to directory

`cd <directory>`

Example: `cd projectA`

- Change to “Home” directory

`cd ~`



## STEP 6: Linux/Unix command

- Copy a file

```
cp /path1/file1 path2/
```

```
cp file1 file2
```

- Move a file

```
mv /path1/file1 path2/
```

- Rename a file

```
mv file1 file2
```



## STEP 6: Linux/Unix command

- Delete a file

```
rm file1
```

- Delete a directory

```
rm -r path1/
```

- Exit Linux/Unix

```
exit
```



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## STEP 6: Linux/Unix command

- Screen for running a program in a detached mode
- Create a new screen session

`screen`

- Exit the screen session with out terminating the program

PRESS: Ctrl + a + d

- Resume the screen session

`Screen -r <session ID>`



## STEP 6: Linux/Unix command

- Want to learn more?
- <https://maker.pro/linux/tutorial/basic-linux-commands-for-beginners>
- <http://linuxcommand.org/>



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## STEP 6: Linux/Unix command

Do you have any questions about Linux/Unix commands?



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## STEP 7: Prepare droplet for the pipeline

- Access your droplet with PuTTY or terminal
- Type the following commands:

```
apt update
```

```
apt install docker.io
```

```
apt install unzip
```

```
apt install tabix
```

```
apt install python-all
```





# STEP 7: Prepare droplet for the pipeline

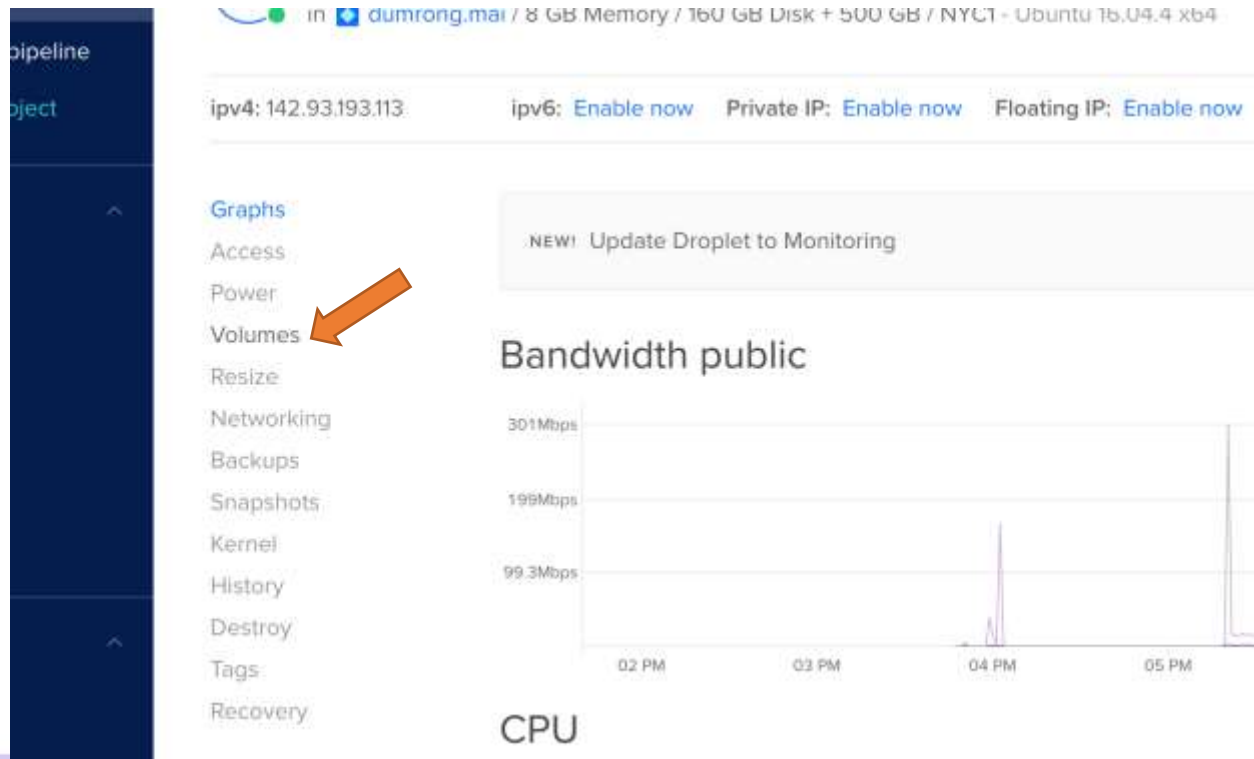
- If an extra disk space is required and attached
- Click ‘...’ → Click ‘View usage’

The screenshot shows the DigitalOcean dashboard. At the top, there are tabs for 'Resources', 'Activity', and 'Settings'. Below these, a section titled 'DROPLETS (1)' contains a single droplet named 'ubuntu-s-4vcpu-8gb-nyc1-01' with IP '142.93.193.113'. To the right of the droplet name is a three-dot menu icon. An orange arrow points to this menu, which is open, showing options: 'Add a domain', 'Access console', 'Resize droplet', 'View usage' (highlighted with another orange arrow), 'Enable backups', 'Add tags', and 'Move to...'. Below the droplet list, there are sections for 'Create something new' and 'Build on what you have', each with several actionable cards like 'Start using Spaces', 'Spin up a Load Balancer', 'Build a Node.js application', and 'Go containerized with Docker'. On the right side, there is a 'Learn more' section with links to 'Product Docs', 'Tutorials', and 'API Docs'.



# STEP 7: Prepare droplet for the pipeline

- Click 'Volumes'





## STEP 7: Prepare droplet for the pipeline

- Click 'More' → Click 'Config Instructions'

Enable now Private IP: Enable now Floating IP: Enable now Console: [View](#)

S [Add Volume](#)

	Size	Created <a href="#">▲</a>	
<b>me-nyc1-01</b> / 500 GB	500 GB	4 hours ago	<a href="#">More ▼</a>

**Storage Basics**

[API docs](#) [Tell us what you think](#)

block storage, and what you can do with volumes. Use block storage volumes via the DigitalOcean API. Submit your feedback

[Resize volume](#)  
[Detach](#)  
[Config instructions](#)  
[Take Snapshot](#)  
[Delete](#)



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# STEP 7: Prepare droplet for the pipeline

- Follow instructions

## Log into the Droplet

```
$ ssh root@142.93.193.113
```

## Format the volume: First time only

**WARNING:** This step will destroy all existing data on the volume. Only run this command on a new volume or if you're sure you want to destroy the existing data.

```
$ sudo mkfs.ext4 -F /dev/disk/by-id/scsi-000_Volume_volume-nyc1-01
```

## Mount the volume

Run the following commands on the Droplet to make your volume accessible:

```
# Create a mount point for your volume:
$ mkdir -p /mnt/volume-nyc1-01

# Mount your volume at the newly-created mount point:
$ mount -o discard,defaults,noatime /dev/disk/by-id/scsi-000_Volume_volume-nyc1-01 /mnt/volume-nyc1-01

# Change fstab so the volume will be mounted after a reboot
$ echo '/dev/disk/by-id/scsi-000_Volume_volume-nyc1-01 /mnt/volume-nyc1-01 ext4
defaults,noatime,discard 0 0' | sudo tee -a /etc/fstab
```

[Copy](#)

Access the volume, write files, and store other data on the volume in the Droplet's /mnt/volume-nyc1-01 directory. The data will persist if you detach the volume and will be available when the volume is reattached to another Droplet.

# STEP 7: Prepare droplet for the pipeline

Can you complete the preparation?



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## STEP 8: Clean up or Pack up

- After your analysis is complete, you must do one of these two options
  1. “Clean up”
  2. “Pack up”



## STEP 8: Clean up or Pack up

- You should select a “Clean up” option if:
  - You are completely satisfied with the results, and will absolutely not reanalysis these data
  - You do NOT plan to analyze another exome in the next 2-3 months
  - You have no/limited budget to maintain the droplet



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## STEP 8: Clean up or Pack up

- “Clean up” = Destroy everything!
  - Make sure you have downloaded the results from the droplet.
  - Make sure you have a copy of your data in your local computer
  - Everything in the droplet will be permanently destroyed





## STEP 8: Clean up or Pack up

- “Clean up” = Destroy everything!
- Click “...” → Click “Destroy”

The screenshot shows the DigitalOcean dashboard. At the top, under 'DROPLETS (1)', there is a single droplet named 'ubuntu-s-4vcpu-8gb-nyc1-01' with IP '142.93.193.113'. Below this, there are sections for 'Create something new' and 'Build on what you have'. On the right, there is a 'Learn more' section. An orange arrow points to the three-dot menu icon next to the droplet. A dropdown menu is open, showing options: 'Add a domain', 'Access console', 'Resize droplet', 'View usage', 'Enable backups', 'Add tags', 'Move to...', and 'Destroy'. Another orange arrow points to the 'Destroy' button at the bottom of the menu.



## STEP 8: Clean up or Pack up

- “Clean up” = Destroy everything!
- Click “Destroy”

1.34    ipv6: [Enable now](#)    Private IP: [Enable now](#)    Floating IP: [Enable now](#)    Console:

### Destroy Droplet

This is irreversible. We will destroy your Droplet and all associated backups. All Droplet data will be scrubbed and irretrievable.



Destroy

### Rebuild Droplet

This will rebuild your Droplet using the image specified and its original configuration parameters. The rebuild process will destroy all data currently on this Droplet, so back up anything you want to keep.

If you select an image with a different operating system than this Droplet, you can break your configuration. Proceed with



## STEP 8: Clean up or Pack up

- You should select a “Pack up” option if:
  - You are not yet satisfied with the results, and might reanalysis these data soon (but not now)
  - You plan to analyze another exome in the next 1-2 months
  - You have some budget to maintain a “snapshot” of the droplet



## STEP 8: Clean up or Pack up

- “Pack up” = Taking a snapshot
  - Make sure you have downloaded the results from the droplet.
  - Make sure you have a copy of your data in your local computer
  - Everything in the droplet will be inaccessible until the droplet is reactivated



## STEP 8: Clean up or Pack up

- Login to the droplet and type:

`poweroff`

- You can skip the shutdown if you want a live snapshot, but there might be inconsistency in the data



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## STEP 8: Clean up or Pack up

- Click the droplet

Resources Activity Settings

DROPLETS (2)

	<b>ubuntu-s-1vcpu-1gb-sgp1-01</b> SGP1 / 1GB / 25GB Disk	178.128.80.34	<a href="#">Add tags</a>		...
	<b>ubuntu-s-4vcpu-8gb-nyc1-01</b>	142.93.193.113			...



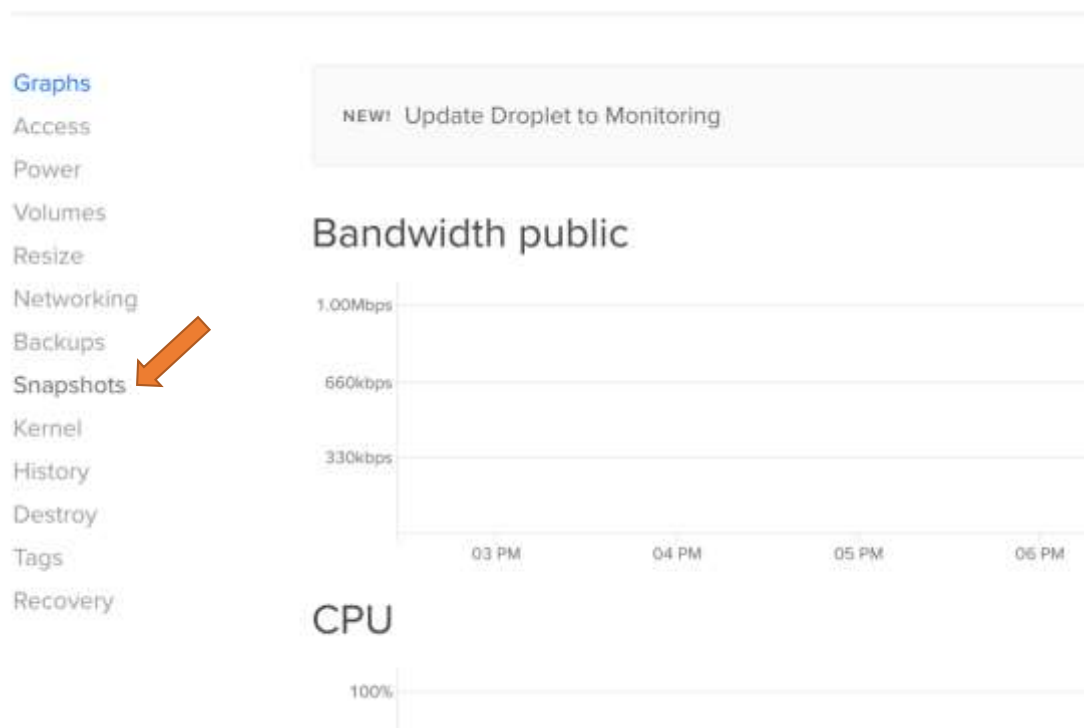
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## STEP 8: Clean up or Pack up

- Click “Snapshot”





## STEP 8: Clean up or Pack up

- Click “Take Snapshot”
- “Destroy” the droplet that you have created a snapshot

### Take snapshot

This may take more than an hour, depending on how much content is on your Droplet and how large the disk is. Snapshots cost is based on space used and charged at a rate of \$0.05/GB/mo

Enter snapshot name

ubuntu-s-1vcpu-1gb-sgp1-01-1534598878836



Take Snapshot



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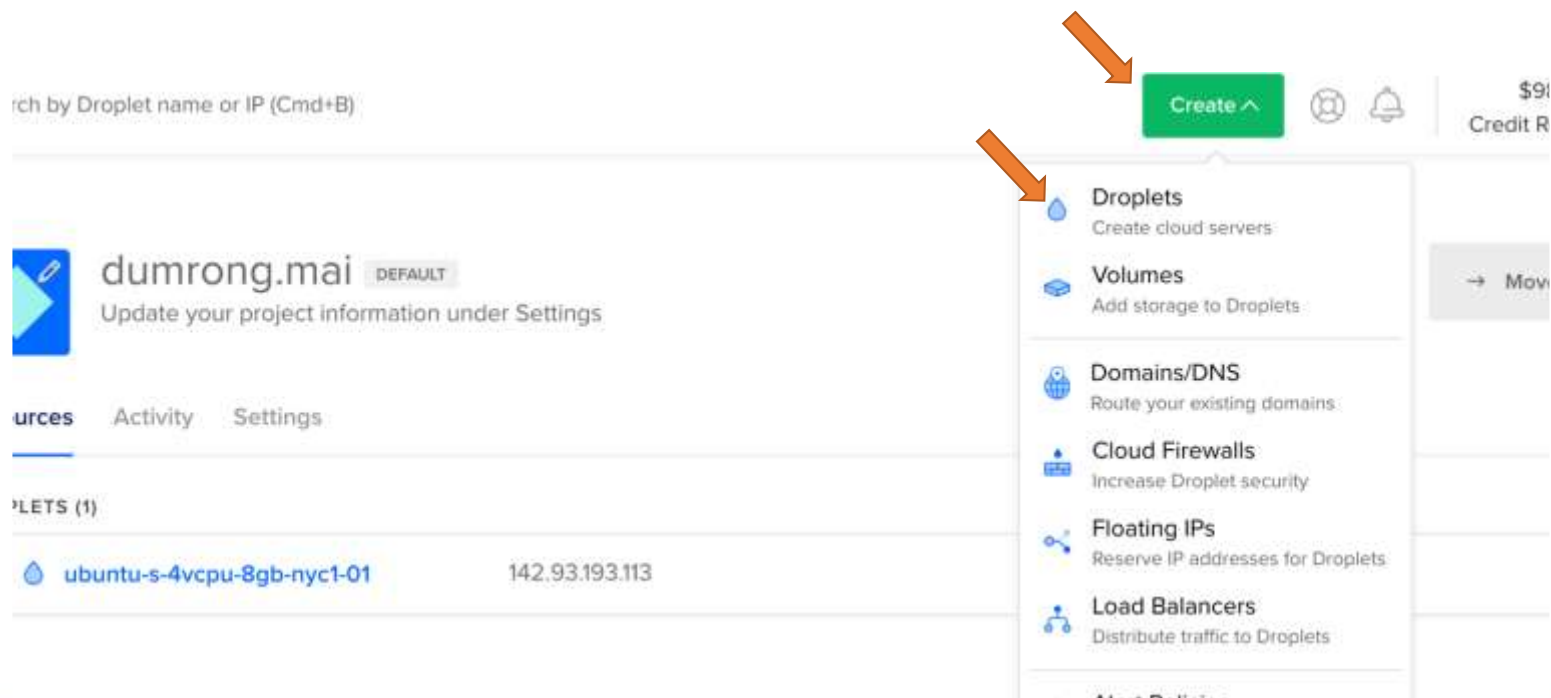






## STEP 8: Clean up or Pack up

- To restore the snapshot
- Click “Create” → Click “Droplet”





## STEP 8: Clean up or Pack up

- Click “Snapshot”

Choose an image ?

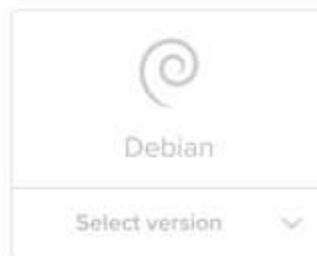
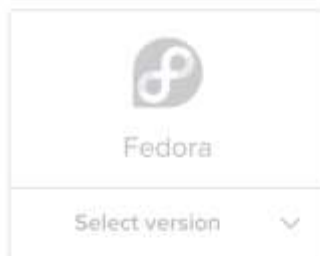
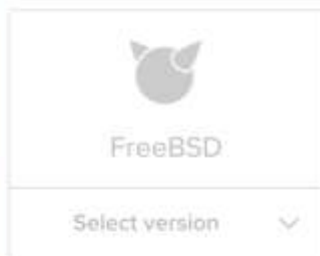


Distributions

Container distributions

One-click apps

Snapshots



Choose a size



## STEP 8: Clean up or Pack up

- Click your “Snapshot”

Choose an image ?

Distributions Container distributions One-click apps **Snapshots**



ubuntu-s-1vcpu-1gb-sgp1-01-1534598878...



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## STEP 8: Clean up or Pack up

- Choose droplet size
- Choose optional configuration (e.g. SSH key, backup, block storage)
- Click “Create” to create a new droplet from a snapshot



## STEP 8: Clean up or Pack up

- To delete a snapshot
- Click “Images”

The screenshot shows the DigitalOcean dashboard for a project named 'dumrong.mai'. On the left sidebar, under the 'MANAGE' section, the 'Images' option is highlighted with an orange arrow. The main content area shows the project details, including a search bar, tabs for Resources, Activity, and Settings, and a list of droplets. One droplet is listed: 'ubuntu-s-4vcpu-8gb-nyc1-01' with IP '142.93.193.113'. At the bottom, there are links to 'Start using Spaces' and 'Spin up a Load Balancer'.



## STEP 8: Clean up or Pack up

- Click “More” → Click “Delete”

### Snapshots

Droplets Volumes

Name	Size	Regions	Created ▲	
 <b>ubuntu-s-1vcpu-1gb-sgp1-01-1534598...</b> Created from ubuntu-s-1vcpu-1gb-sgp1-01	949.84 MB	SGP1	13 minutes ago	<a href="#">More ▼</a>

Rename  
Create Droplet  
Add to region  
Change owner  
Restore Droplet

Delete



## STEP 8: Clean up or Pack up

- If you failed to do “Clean up” or “Pack up”, DigitalOcean will keep charging you for all existing droplets
- Power-off droplet = existing droplet = charged the same rate
- Snapshot is not free, but it is cheaper than maintaining a droplet
- **Do not waste your money!!!**



## STEP 8: Clean up or Pack up

Please take a snapshot of your droplet and destroy both the snapshot and the droplet.



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# STEP 8: Clean up or Pack up

Do you have any question?



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# Next....

- Droplet specification for 1 exome analysis with the pipeline
  - 4 CPU
  - 8 GB RAM
  - 160 GB HDD




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# Next....

- For practicing, we will use cloud server sponsored by



- You may use the server for free until one month after the workshop
- After one month, your data and results in the cloud server may be lost
- After one month, please use  **DigitalOcean** for exome pipeline (you will have \$100 credits for 60 days)



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