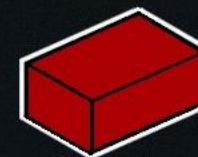


# Building a Web Server

For fun, profit and [REDACTED]



**Redbrick**  
DCU's Networking Society

# A word on conduct...

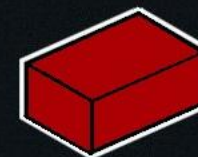
## DON'T:

- Touch anyone else's shell. Seriously.
- Host anything illegal, offensive or otherwise immoral on your shiny new server.
- Intentionally disrupt or interrupt the talk.  
Raise a hand or wait for a pause to ask questions!

## DO:

- Bring friends, roommates, pet rocks... All are welcome!
- Ask questions! Don't be shy, we're here to help you!
- Work together! Two heads are (often) better than one.
- Be respectful to us and those around you, everyone is here to have fun.

In short: *Be excellent to each other.*



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If you are not already booted into linux you should do that now



# GitHub Developer Pack

GitHub Education

Stories Events Student pack Classroom Community Contact us

TEACH AND LEARN  
BETTER, TOGETHER




Request a discount

STUDENT DEVELOPER PACK

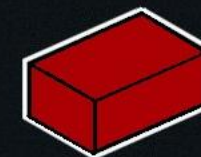
Get the Student Developer Pack

Dozens of free resources from great companies to help students learn.

Get the pack

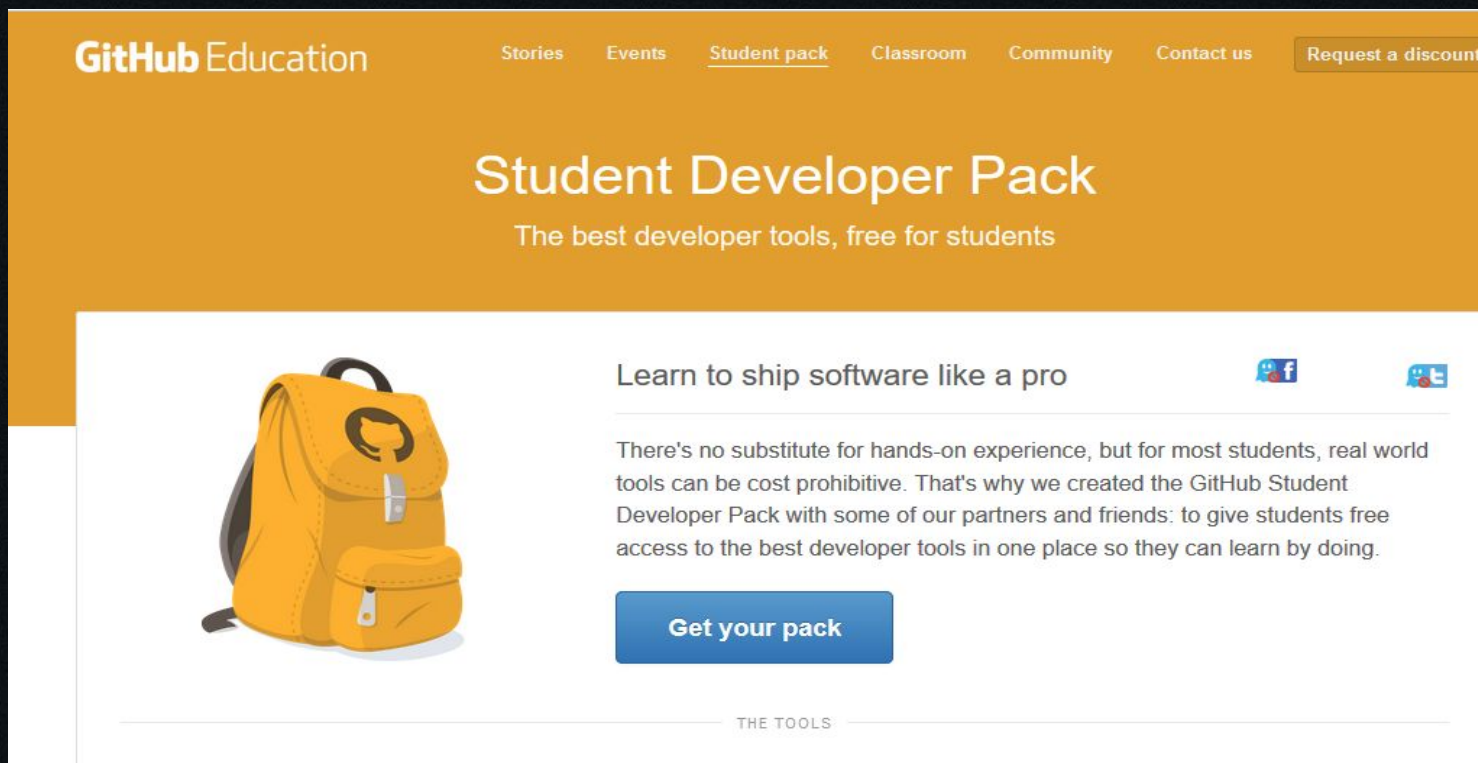


STORIES



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# Did you git yours?




The screenshot shows the GitHub Education website's landing page for the Student Developer Pack. The page has a dark blue header with the GitHub logo and 'Education' text. Navigation links include 'Stories', 'Events', 'Student pack' (which is underlined), 'Classroom', 'Community', 'Contact us', and a 'Request a discount' button. The main heading is 'Student Developer Pack' with the subtext 'The best developer tools, free for students'. Below this is a white content area featuring a yellow backpack with the GitHub logo on the left. To the right of the backpack, the text reads 'Learn to ship software like a pro' with social media icons for Facebook and Twitter. A paragraph explains that the pack provides free access to developer tools for students. A blue 'Get your pack' button is positioned below the text. At the bottom of the white area, the text 'THE TOOLS' is centered between two horizontal lines.

GitHub Education

Stories Events Student pack Classroom Community Contact us Request a discount

## Student Developer Pack

The best developer tools, free for students



### Learn to ship software like a pro

There's no substitute for hands-on experience, but for most students, real world tools can be cost prohibitive. That's why we created the GitHub Student Developer Pack with some of our partners and friends: to give students free access to the best developer tools in one place so they can learn by doing.

[Get your pack](#)

THE TOOLS



# Find dis one! Click request

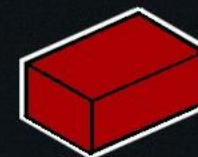


Simple cloud hosting, built for developers

**DETAILS** \$50 in platform credit for new users

Request [your offer code](#) to get access

🔗 Help available at [DigitalOcean support](#)



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# Copy code for later. Click on the website



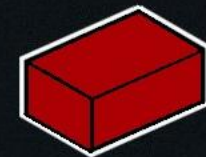
Simple cloud hosting, built for developers

**DETAILS** \$50 in platform credit for new users

Use your offer code on the [DigitalOcean website](#)

Your code:

[Help](#) available at [DigitalOcean support](#)



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# Follow the steps

Create an account and enter the promo code when asked for card details.

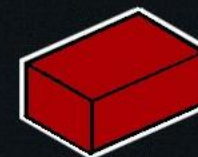


# Ssh keys

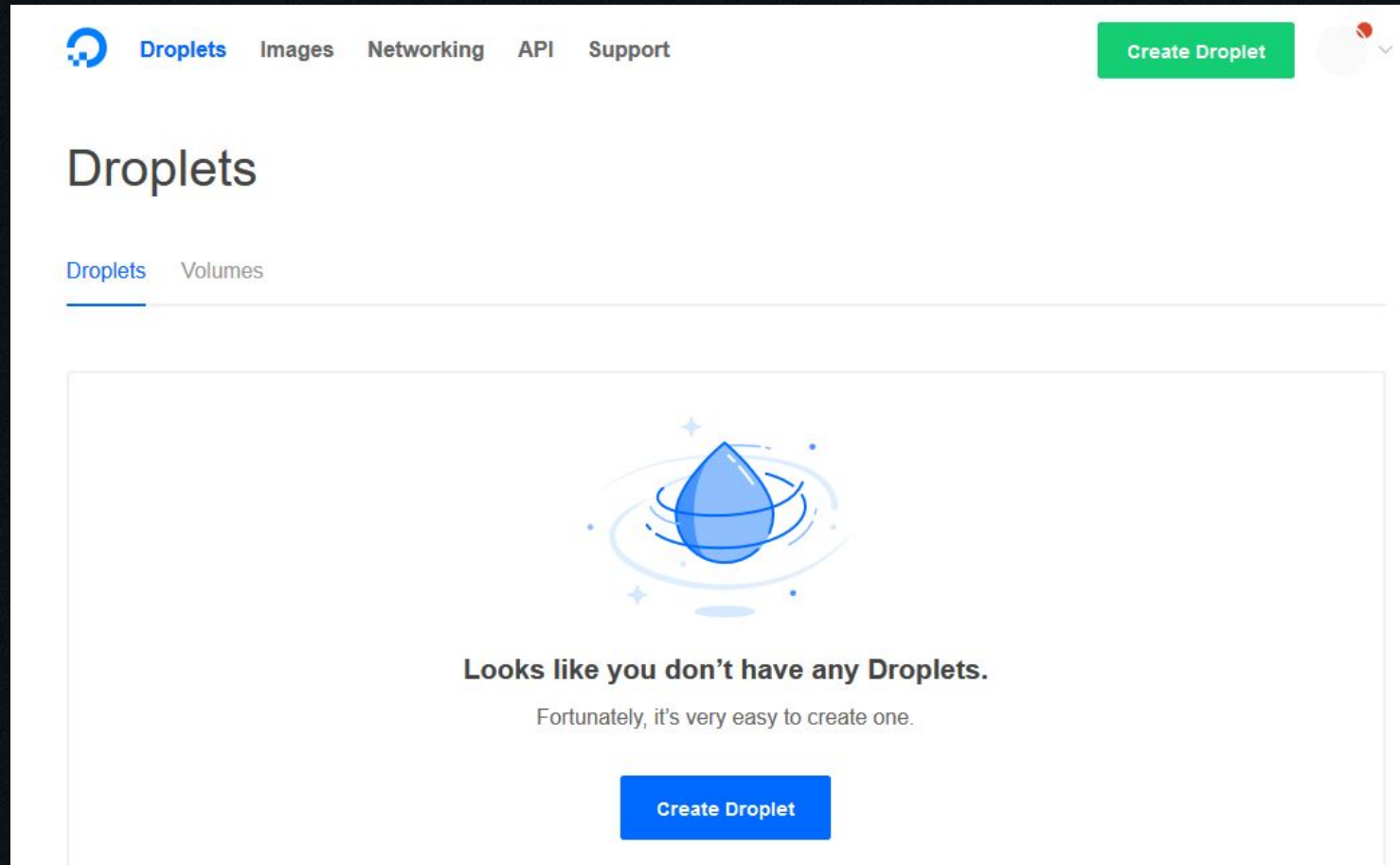
So before we go any further lets create an ssh key.  
P.s If you have one already this step can be skipped

```
ssh-keygen -t rsa -C "your_email@example.com"
```

- You'll be prompted to enter a passphrase if you'd like
- Two files are generated: 1) {nameyouchose} and 2) {nameyouchose}.pub
- We will need these later



# Now lets make a server

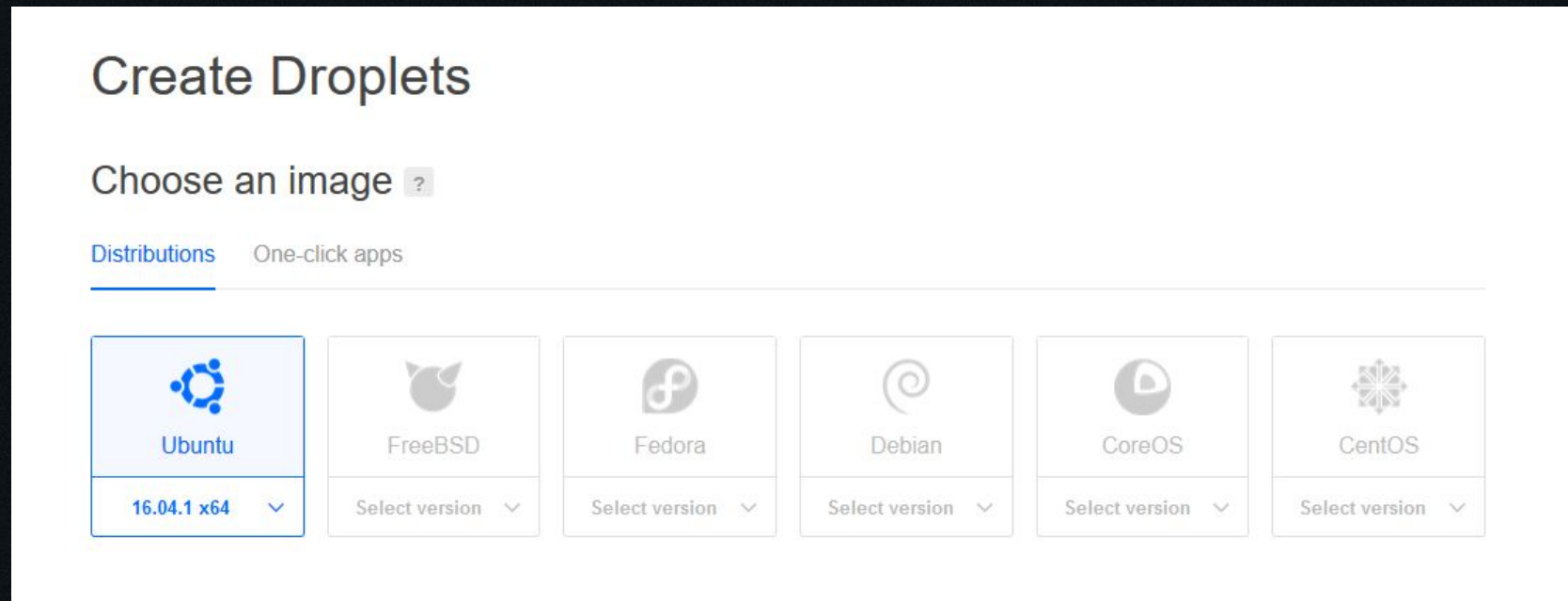


The screenshot shows the Redbrick Droplets dashboard. At the top, there is a navigation bar with links for 'Droplets', 'Images', 'Networking', 'API', and 'Support'. A green 'Create Droplet' button is located in the top right corner. Below the navigation bar, the main heading is 'Droplets'. Underneath, there are two tabs: 'Droplets' (which is active) and 'Volumes'. The main content area features a large blue droplet icon with a circular motion effect. Below the icon, the text reads: 'Looks like you don't have any Droplets. Fortunately, it's very easy to create one.' At the bottom of this section, there is a blue 'Create Droplet' button.

# Choose an operating system

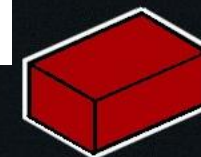
Today we are going to go with Ubuntu because we know it well

There are others operating systems available feel free to experiment later :D



The screenshot shows the 'Create Droplets' interface. At the top, it says 'Create Droplets'. Below that, there is a section 'Choose an image' with a help icon. There are two tabs: 'Distributions' (selected) and 'One-click apps'. Below the tabs, there is a row of six operating system options, each with a logo, name, and a version selector dropdown:

Operating System	Version Selector
Ubuntu	16.04.1 x64
FreeBSD	Select version
Fedora	Select version
Debian	Select version
CoreOS	Select version
CentOS	Select version





# Big and shiny!

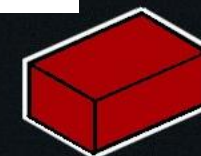
Chose any setting you like. Beware: the more money you spend per month the less time that free \$50 will last you.

We opted for the \$5/month, we don't need anything huge.

Choose a size

[Standard](#) [High memory](#)

<b>\$ 5/mo</b> \$0.007/hour	<b>\$ 10/mo</b> \$0.015/hour	<b>\$ 20/mo</b> \$0.030/hour	<b>\$ 40/mo</b> \$0.060/hour	<b>\$ 80/mo</b> \$0.119/hour	<b>\$ 160/mo</b> \$0.238/hour
512 MB / 1 CPU 20 GB SSD disk 1000 GB transfer	1 GB / 1 CPU 30 GB SSD disk 2 TB transfer	2 GB / 2 CPUs 40 GB SSD disk 3 TB transfer	4 GB / 2 CPUs 60 GB SSD disk 4 TB transfer	8 GB / 4 CPUs 80 GB SSD disk 5 TB transfer	16 GB / 8 CPUs 160 GB SSD disk 6 TB transfer











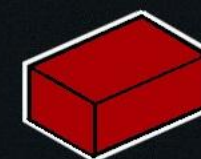
**Redbrick**  
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# Give your server a home

The Further away it is the longer it will take to connect!

Choose a datacenter region

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



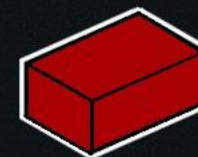
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# Remember those keys we made earlier

- Click add SSH keys
- Copy the contents of the .pub part of your SSH keys
- Click save

Add your SSH keys ?

New SSH Key



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# Naming things is hard

## Finalize and create

### How many Droplets?

Deploy multiple Droplets with the same [configuration](#).

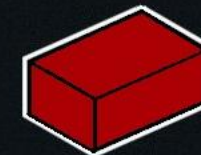
—	1 Droplet	+
---	-----------	---

### 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.


[Add Tags](#)

Create



# And now we wait!


Droplets Volumes

Name	IP Address	Created ▲	Tags
 <b>adminland</b> 512 MB / 20 GB Disk / LON1 - Ubuntu 16.04.1 x64		<div style="width: 50%;"></div>	More ▼

# Well that was quick!

**Droplets**

[Droplets](#) [Volumes](#)

Name	IP Address	Created ▲	Tags
 <b>adminland</b> 512 MB / 20 GB Disk / LON1 - Ubuntu 16.04.1 x64	178.62.25.184	Happy coding!	<a href="#">More ▼</a>



Is anyone totally lost?



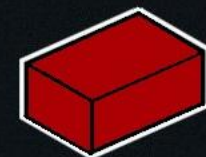
**Redbrick**  
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# Now, onto the fun stuff!

First, let's login:

Replace 1.2.3.4 with your ip address from digital ocean.

```
ssh -i ~/.ssh/our_new_key root@1.2.3.4
```



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# I don't like this root name I want my own

# Add new user "zergless"

```
sudo adduser zergless
```

# Copy our installed SSH key to the new user so we can login as them

```
sudo cp -R .ssh/ /home/zergless/
```

# Change ownership of evan's SSH directory so he actually has permission to access it

```
sudo chown -R zergless:zergless /home/zergless/.ssh
```

# Add zergless to the sudoers (admin) group so he can execute important commands later

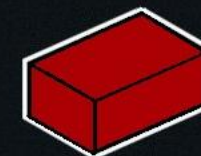
```
sudo usermod -a -G sudo zergless
```

# Disable root login via password

```
sudo passwd -l root
```

# Disable root login via SSH

```
sudo rm -rf /root/.ssh
```



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# Now let's start installing things!

# Update our package listing (apt-get is a package manager for ubuntu/debian systems)

```
sudo apt update
```

# Install all necessary packages for a LAMP server

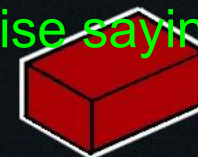
```
sudo apt install lamp-server^ libapache2-mod-python
```

# You'll be asked to choose a MySQL password

# Make sure MySQL is installed securely

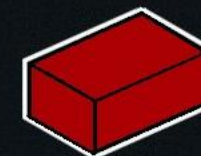
```
mysql_secure_installation
```

#For the password plugin if you plan on using this server I would advise saying yes and then answer yes to everything else.



This was in the space of **1 second**.

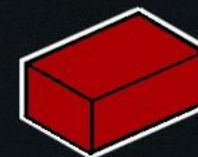
```
Feb 13 06:38:17 paphos sshd[10739]: Failed password for root from 116.31.116.34 port 62458 ssh2
Feb 13 06:38:17 paphos sshd[10733]: Failed password for root from 116.31.116.34 port 48839 ssh2
Feb 13 06:38:17 paphos sshd[10745]: Failed password for root from 116.31.116.34 port 54107 ssh2
Feb 13 06:38:17 paphos sshd[10743]: Failed password for root from 116.31.116.34 port 18585 ssh2
Feb 13 06:38:17 paphos sshd[10734]: Failed password for root from 116.31.116.34 port 22850 ssh2
```



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# But does it *do* anything?

Let's process some requests...  
...with python!



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# Python 3

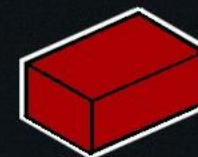
# If python 2.7 is installed, delete it

```
sudo rm /usr/bin/python
```

# Make python3 the default for when we type the "python"

# command

```
sudo ln -s /usr/bin/python3 /usr/bin/python
```



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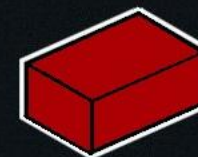
# Pip - A python dependency manager

# Install pip

```
sudo apt-get install python3-pip
```

# Use pip to install the MySQL interface for python

```
sudo pip3 install pymysql
```



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# Put yo scripts in places!

# Make a directory to hold all our python scripts

```
sudo mkdir /var/www/python_scripts
```

# Disable bad Python multithreading and enable CGI

```
sudo a2dismod mpm_event
```

```
sudo a2enmod mpm_prefork cgi
```

# Copy the default config and make a backup

```
sudo cp /etc/apache2/sites-available/000-default.conf  
/etc/apache2/sites-available/000-default.conf.backup
```





```
VirtualHost *:80>
# Our files will be located in /var/www/python_scripts
DocumentRoot /var/www/python_scripts

# Our server admin's email is zergless@redbrick.dcu.ie
ServerAdmin zergless@redbrick.dcu.ie

# The following directives ONLY APPLY to the /var/www/python_scripts directory
<Directory /var/www/python_scripts>
# Enable Common Gateway Interface execution
Options +ExecCGI

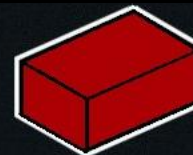
# If "index.py" is present, that's taken as the primary file to load first
DirectoryIndex index.py

# Allow everyone to access the scripts in this folder
Require all granted

AddHandler mod_python .py
PythonHandler mod_python.publisher
PythonDebug On
</Directory>

ErrorLog ${APACHE_LOG_DIR}/error.log
CustomLog ${APACHE_LOG_DIR}/access.log combined

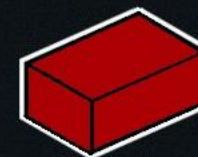
</VirtualHost>
```



Now let's enable our site!

**# Reload apache's configuration**

```
sudo systemctl apache2 reload
```



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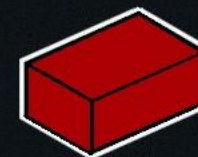
...maybe we should check if it works.

#Create a file 'index.py' to test our server

```
sudo vim /var/www/python/index.py
```

#A simple test request:

```
1 def index(req);  
2     return "Hello, World! I am a python script!";
```



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# So let's recap

We made some SSH keys

We installed our server

We added our own user

We installed a lamp stack and hardened our mysql

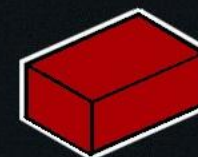
Installed python 3

Installed pip

Made a directory for our python scripts

Allowed apache to execute our scripts

And tested it and if all goes well that should work



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**IT'S OVER**

**IT'S DONE**

quickmeme.com



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# Well not quite

- We want to secure Apache and PHP
- Then we'll talk about SSL
- some useful programs
- DNS



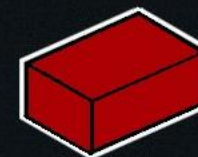
# Securing apache

# conf-available is where the modular configuration of apache happens  
(not related to domains/subdomains)

```
cd /etc/apache2/conf-available
```

# Edit the security.conf file

```
sudo vim security.conf
```

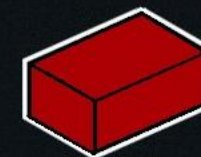


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```
# Stop returning OS and version number
ServerSignature Off
ServerTokens Prod
```

Some other things to take look at later

```
# Some optional things to think of including (I'd advise googling these, I'd only confuse you with my explanations)
Timeout
KeepAliveTimeout
LimitRequestBody
LimitRequestFields
LimitRequestFieldSize
LimitRequestLine
LimitXMLRequestBody
```



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```
# Edit apache's core configuration
```

```
cd /etc/apache2/
```

```
sudo vim apache2.conf
```

```
# We'll add a domain name to the core of our server
```

```
DocumentRoot /var/www/html
```

```
<Directory /var/www/html>
```

```
# Disable directory listings, following symbolic links and executing CGI scripts
```

```
Options -Indexes -FollowSymLinks -ExecCGI
```

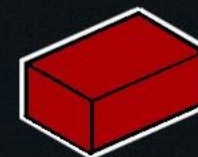
```
# Don't let .htaccess files override configuration
```

```
AllowOverride none
```

```
# Let everyone access the files in /var/www/html through apache
```

```
Require all granted
```

```
</Directory>
```

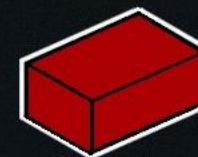


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# Securing PHP

```
# Open up the php config for apache  
cd /etc/php5/apache2  
sudo vim php.ini
```



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; Restrict PHP Information Leakage (i.e. don't send PHP info in HTTP request headers)

```
expose_php = Off
```

; Disable Remote Code Execution

```
allow_url_fopen = Off
```

```
allow_url_include = Off ; This one should be off by default but make sure
```

; Disabling Dangerous PHP Functions - These are just a list of things we disable by default on our servers

```
disable_functions =
```

```
exec, passthru, shell_exec, system, proc_open, popen, curl_exec, curl_multi_exec, show_source, pcntl_alarm, pcntl_fork, pcntl_waitpid, pcntl_wait, pcntl_wifexited, pcntl_wifstopped, pcntl_wifsignaled, pcntl_wexitstatus, pcntl_wtermsig, pcntl_wstopsig, pcntl_signal, pcntl_signal_dispatch, pcntl_get_last_error, pcntl_strerror, pcntl_sigprocmask, pcntl_sigwaitinfo, pcntl_sigtimedwait, pcntl_exec, pcntl_getpriority, pcntl_setpriority
```

; Limit PHP execution to the following directories

; i.e. Any PHP script anywhere else does not get executed, ever

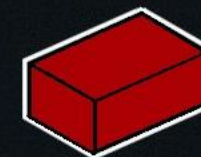
```
open_basedir = "/var/www/html"
```

; Set some limits

```
upload_max_filesize = 2M ; Maximum 2MB of file size a user can upload
```

```
max_execution_time = 30 ; 30 seconds execution time
```

```
max_input_time = 60 ; 60 seconds to parse POST or GET data from request
```



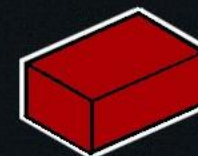
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# Some useful programs

```
sudo apt-get install fail2ban iotop htop iftop screen logwatch
```

- **fail2ban**: Manages IP banning for your server. The settings out of the box are generally pretty awesome and deflect something like 5% of all Netsoc's requests.
- **iotop**: For tracking input/output
- **htop**: For tracking CPU processes and a good overview of the system (load on CPUs + memory)
- **iftop**: For tracking Network traffic
- **screen**: Used to create multiple terminal windows server-side. Great for leaving unattended/long-running programs going (EG: weechat or some IRC client)
- **logwatch**: Processes your logs and will email you some of the highlights and things you should look out for. You should have a look through the config for yourself, it's different for everyone. What you will have to do is create a cronjob for this to run and email you every so often. (we run it nightly)





# LetsEncrypt: Free SSL for everyone!

<https://letsencrypt.org/> < find all the docs you want here

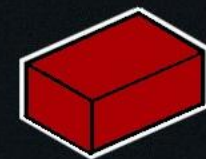
# IP addresses are ugly, so...?

You will need to buy a domain or get a free one from one of the links below!

<http://www.freenom.com/en/index.html?lang=en>

Namecheap.com

The github education pack gives you a free DNS provider too!



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