

# Basic Unix and Web Server setup

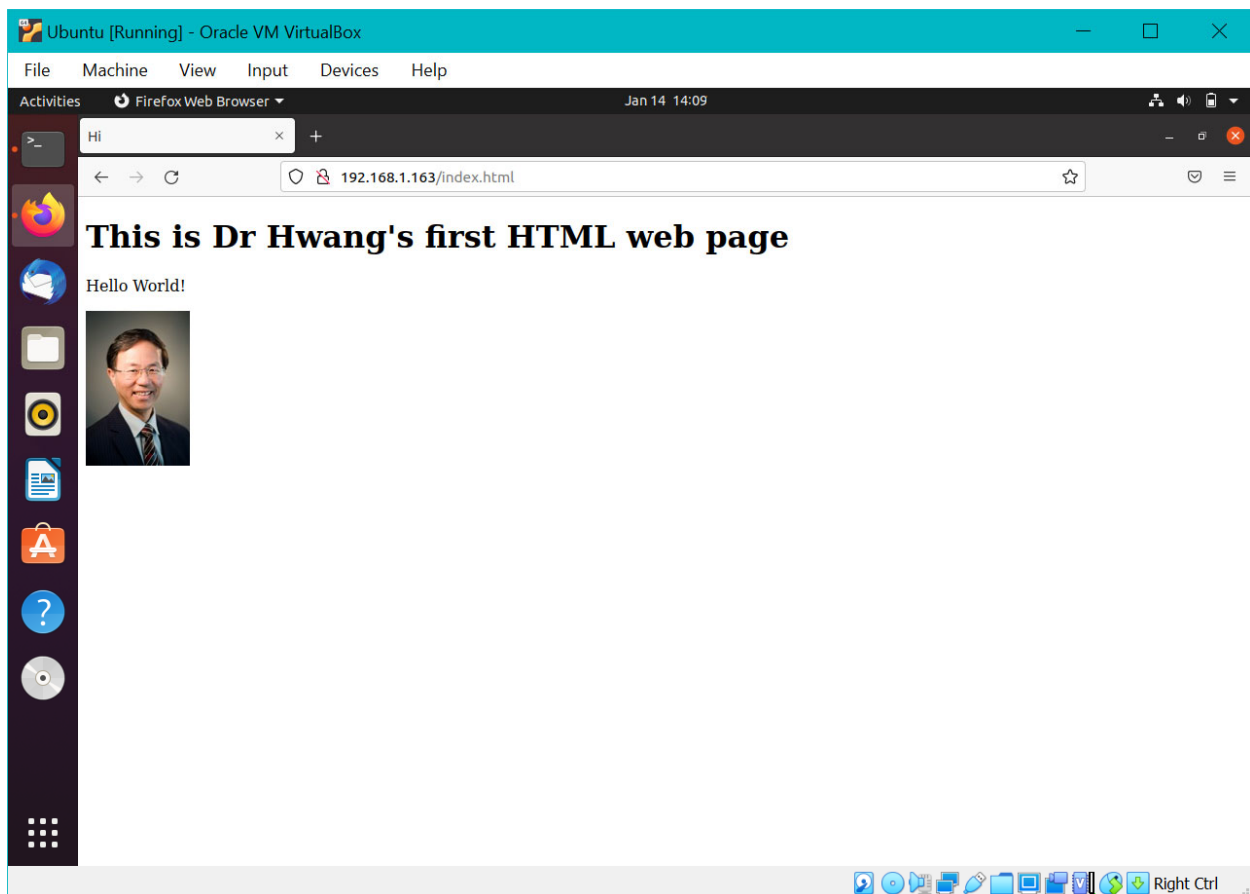
We will be using Apache for our web server. The Apache web server is among the most popular web servers in the world. It is well documented, and has been in wide use for much of the history of the web, which makes it a great default choice for hosting a website.

Follow the LAMP document instructions to install Apache if you have not already done so.

## Global web pages

Global web pages (i.e. web pages not associated with a user account) are stored in the directory **/var/www/html**.

To browse to these web pages, type in a browser's address bar the ip address of the web server followed by the name of the webpage you want to access separated by slashes /. For example the URL address **192.168.1.163/index.html** accesses the **index.html** webpage on the server whose ip address is **192.168.1.163**. If you do not specify a webpage name and just enter the ip address, the default webpage to load is index.html.



If you put web pages in subdirectories under `/var/www/html` then you need to specify the path to the web page in the address, for example, **192.168.1.163/products/orange.html**, will retrieve the webpage **orange.html** under the **products** directory.

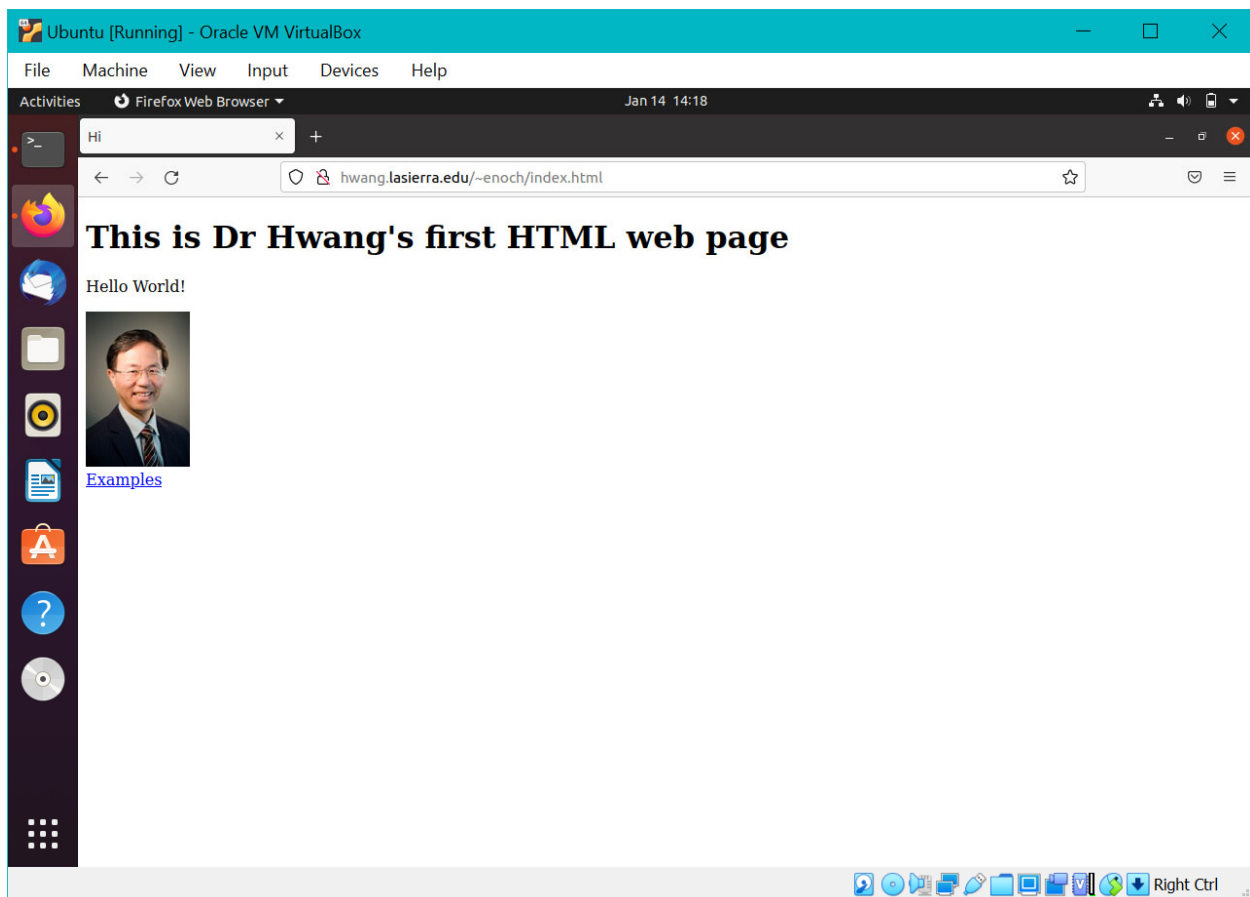
## User web pages

User web pages are stored in the user's home directory under **public\_html**.  
To enable this, execute the **a2enmod** command and then restart apache

```
$ sudo a2enmod userdir
$ sudo systemctl restart apache2
```

To enable PHP files stored in `public_html`, edit the file `/etc/apache2/mods-enabled/php7.4.conf` (replace the version number with the installed version number). At the end of the file, comment out the lines from `<IfModule ...>` to `</IfModule>`. Restart apache with the `systemctl` command shown above.

Browsing to the address **hwang.lasierra.edu/~enoch/index.html** will bring up the webpage **index.html** in the directory **public\_html** in user **enoch** on server **hwang.lasierra.edu**. Again the file name `index.html` is optional. The full path to this file is `/home/enoch/public_html/index.html`.



Refer to the table at the end of this document for a list of the commonly used Unix commands. In your Ubuntu system open up a terminal window.

# Creating your first web page

Change directory to /var/www/html.

Create a html file named MyFirstHTML.html

```
$ cd /var/www/html
$ sudo nano MyFirstHTML.html
```

Type in the following html code in the file and save it.

```
<!DOCTYPE html>
<html>
<head>
    <title>Hi</title>
</head>

<body>
    <h1>This is Dr Hwang's first HTML web page</h1>
    <p>Hello World!</p>
    
    
</body>
</html>
```

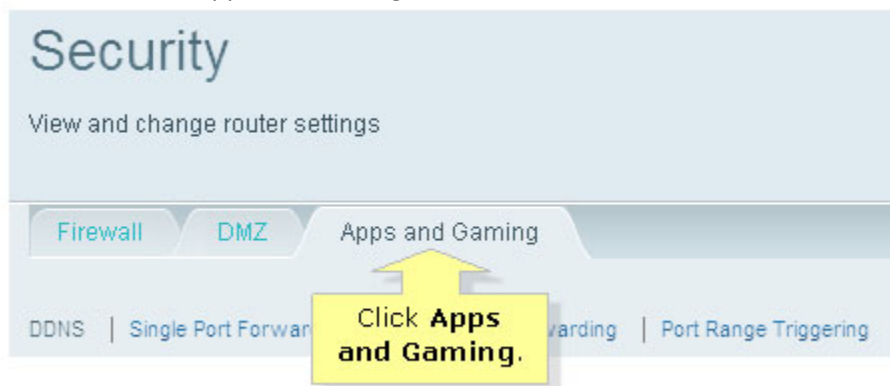
Browse to this webpage with the address 192.168.1.163/MyFirstHTML.html. Replace the ip address with your ip address. You will see that the image has a broken link because the file Enoch.jpg does not exist in your directory.

# Port forwarding through router

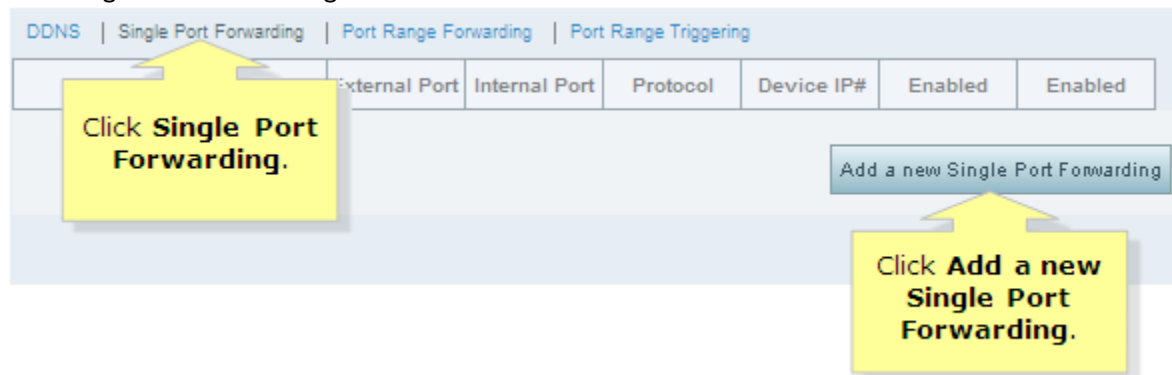
With your current setup, you can only browse to your webpages from inside your router/home. If you connect to the internet from outside your router you will not be able to get through your router's firewall and to your server. For example, from where I am, I can't browse to your webpages. A quick way to see that is to turn off the wifi on your phone and just use your cellular data, and try to browse to your webpage from your phone. You wouldn't be able to get to the webpage. But if you turn your wifi back on then you should be able to browse to it. (Do you know why that is so?)

What you need to do is to do a port forwarding on your router to open a port through the firewall. Every router's setup user interface is different and I can't cover all cases, but the idea is the same. The following instruction is for a Linksys router.

1. Browse to your router's webpage. The ip address is usually 192.168.1.1.
2. Enter the router's admin username and password. The default username is blank and the default password is **admin**. For other routers, just google for the default username and password for your brand.
3. Go to the Settings page.  
For other routers just find where Port Forwarding is, or google for Port Forwarding instructions for your router and continue with step 8 below.
4. Click on the Security tab.
5. Click on the Apps and Gaming tab.



6. Click Single Port Forwarding.



7. Click Add a new single port forwarding
8. Enter in the correct port you want to forward. The information that you need to enter in is the same for all router brands.
  - Application name: type in any name you like, for example, **web**
  - External port: **80**.<sup>1</sup>
  - Internal port: **80**.
  - Protocol: **Both** UDP and TCP. If it doesn't give you the **Both** option, then you need to add two lines, one for UDP and one for TCP.
  - Device IP: the ip address of your server. In my case it'll be 192.168.1.163

Make sure you save the changes.

Firewall DMZ Apps and Gaming

DDNS | Single Port Forwarding | Port Range Forwarding | Port Range Triggering

| Application name | External Port | Internal Port | Protocol | Device IP#   | Enabled                             |             |
|------------------|---------------|---------------|----------|--------------|-------------------------------------|-------------|
| ftp              | 21            | 21            | Both     | 192.168.1.27 | <input checked="" type="checkbox"/> | Save/Cancel |

Add a new Single Port Forwarding

Click Save.

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<sup>1</sup> Port 80 is the default port for web browsing. If you use another number then you need to configure Apache to listen to this other number.

# Port forwarding through VirtualBox

Reference: <https://nsrc.org/workshops/2014/btnog/raw-attachment/wiki/Track2Agenda/ex-virtualbox-portforward-ssh.htm>

Port forwarding through your VirtualBox from your host machine (Windows) to your virtual Ubuntu machine is only needed if in your router's port forwarding setup page you cannot directly enter in the ip address of your Ubuntu virtual machine. Instead you are only given a list of devices that you can select from and the Ubuntu virtual machine doesn't show up in the list. Only your host Windows machine shows up in the list. By port forwarding from your host machine to your virtual machine, you can select your host Windows machine from the list, and the traffic will be sent to your virtual machine.

Turn off your virtual Ubuntu machine

Select your Ubuntu machine.

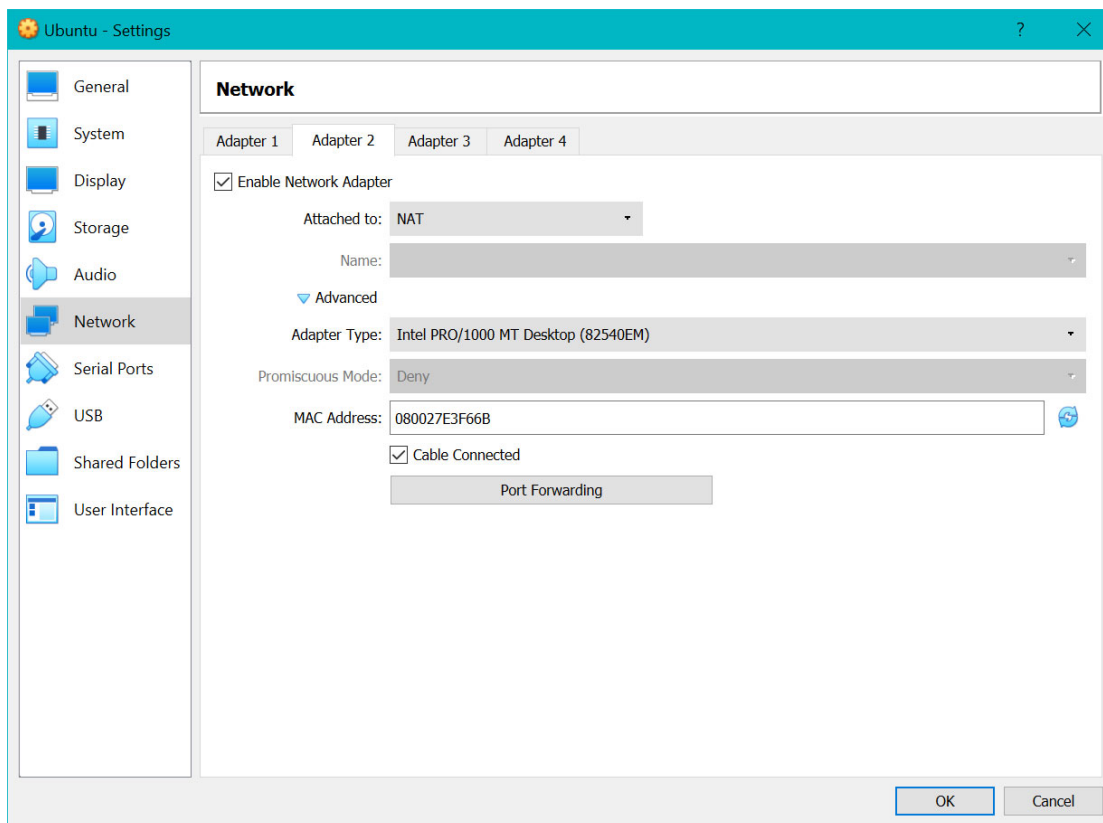
Select **Settings | Network**

Fill in the page as shown below

Select **Adapter 2**

Check **Enable Network Adapter**

Select **NAT** for Attached to:



Click on **Advanced**

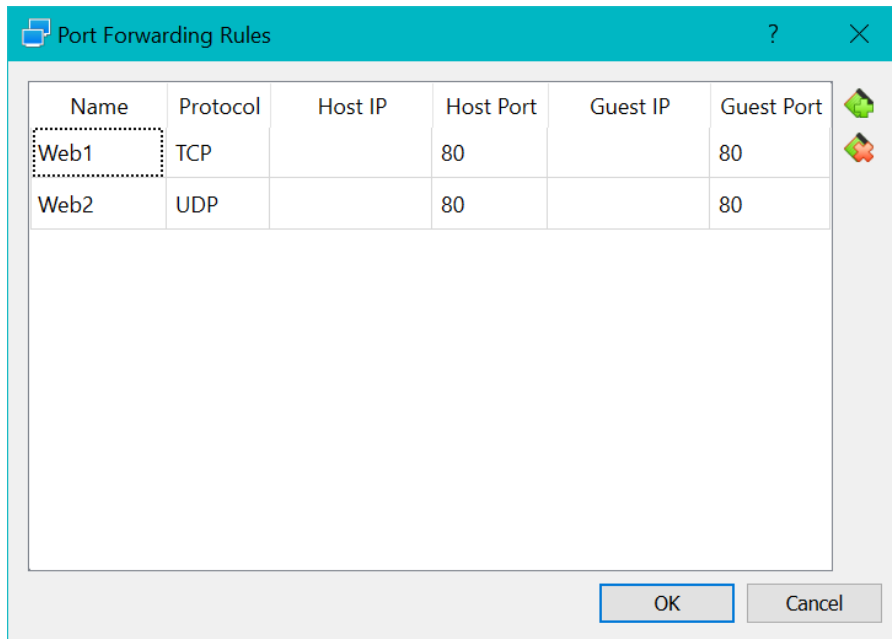
Click on **Port Forwarding**

Click on the green plus sign and add the first rule shown below

- Name: Web1
- Protocol: TCP
- Host Port: 80
- Guest Port: 80

Click on the green plus sign a second time and add the second rule shown below

- Name: Web2
- Protocol: UDP
- Host Port: 80
- Guest Port: 80



Click OK to save and exit

Start the virtual machine.

Now you should be able to browse to your Ubuntu web server using either your Windows host ip address or your Ubuntu guest web server ip address.

To find your Windows' ip address, open a **cmd** window. Type in the command **ipconfig**. As shown below my Windows' IPv4 ip address is 192.168.1.104

```
C:\Windows\System32\cmd.exe
Wireless LAN adapter Local Area Connection* 1:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Wireless LAN adapter Local Area Connection* 2:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix  . : vc.shawcable.net
    IPv6 Address. . . . . : 2604:3d08:7283:2b00::8342
    IPv6 Address. . . . . : 2604:3d08:7283:2b00:413:6d4c:f89:b372
    Temporary IPv6 Address. . . . . : 2604:3d08:7283:2b00:e0da:d060:b2c7:a631
    Link-local IPv6 Address . . . . . : fe80::226:86ff:fedd:dcca%23
    IPv4 Address. . . . . : 192.168.1.104
    Subnet Mask . . . . . : 255.255.255.0
    Default Gateway . . . . . : fe80::226:86ff:fedd:dcca%23
                               192.168.1.1

Ethernet adapter Bluetooth Network Connection:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

C:\Windows\system32>
```

To find your Ubuntu's ip address, open a **terminal** window. Type in the command **ip addr**. As shown below my Ubuntu's IPv4 ip address is 192.168.1.63

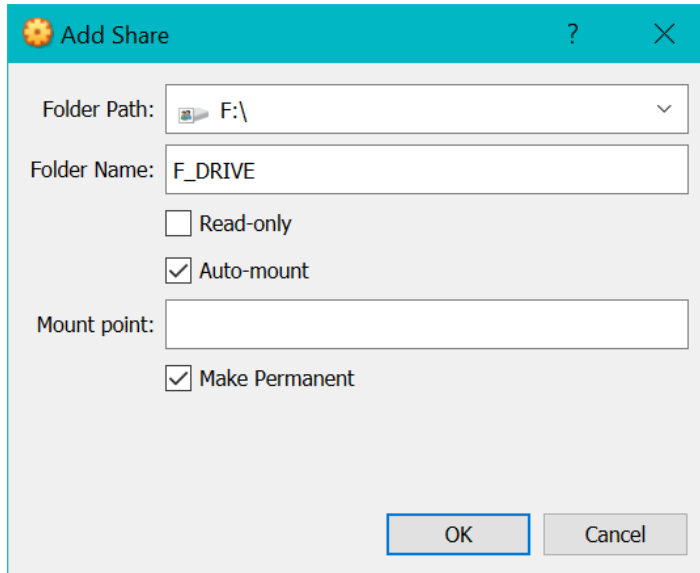
```
enoch@enoch-VirtualBox: ~
enoch@enoch-VirtualBox:~$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:04:d4:7c brd ff:ff:ff:ff:ff:ff
    inet 192.168.1.63/24 brd 192.168.1.255 scope global dynamic noprefixroute enp0s3
        valid_lft 172780sec preferred_lft 172780sec
    inet6 2604:3d08:7283:2b00::bb10/128 scope global dynamic noprefixroute
        valid_lft 604782sec preferred_lft 604782sec
    inet6 2604:3d08:7283:2b00:98b7:1d93:e482:5236/64 scope global temporary dynamic
        valid_lft 298sec preferred_lft 298sec
    inet6 2604:3d08:7283:2b00:fd23:6c25:6187:390/64 scope global dynamic mngtmpa
        valid_lft 298sec preferred_lft 298sec
    inet6 fe80::7712:2031:c4b4:36d8/64 scope link noprefixroute
        valid_lft forever preferred_lft forever
```



# VirtualBox Shared Folders

From the VirtualBox menu, select **Devices | Shared Folders | Shared Folders Settings**

Click on the **Add new shared folder** icon. Select the Folder Path you want to share. Check **Auto-mount** and **Make Permanent**.



The screenshot shows the 'Add Share' dialog box. The 'Folder Path' is set to 'F:\'. The 'Folder Name' is 'F\_DRIVE'. The 'Mount point' field is empty. The 'Read-only' checkbox is unchecked, 'Auto-mount' is checked, and 'Make Permanent' is checked. The 'OK' and 'Cancel' buttons are at the bottom right.

## SSH Server

The Secure SHell (SSH) allows you to use a terminal to remotely login to your server. After you login, you will be able to work on your server from a remote computer as if you are directly using the server. In order to use SSH, you first need to install the SSH server on your Ubuntu machine by executing the following commands:

```
$ sudo apt update
$ sudo apt install openssh-server
```

To verify that SSH is active and running

```
$ sudo systemctl status ssh
```

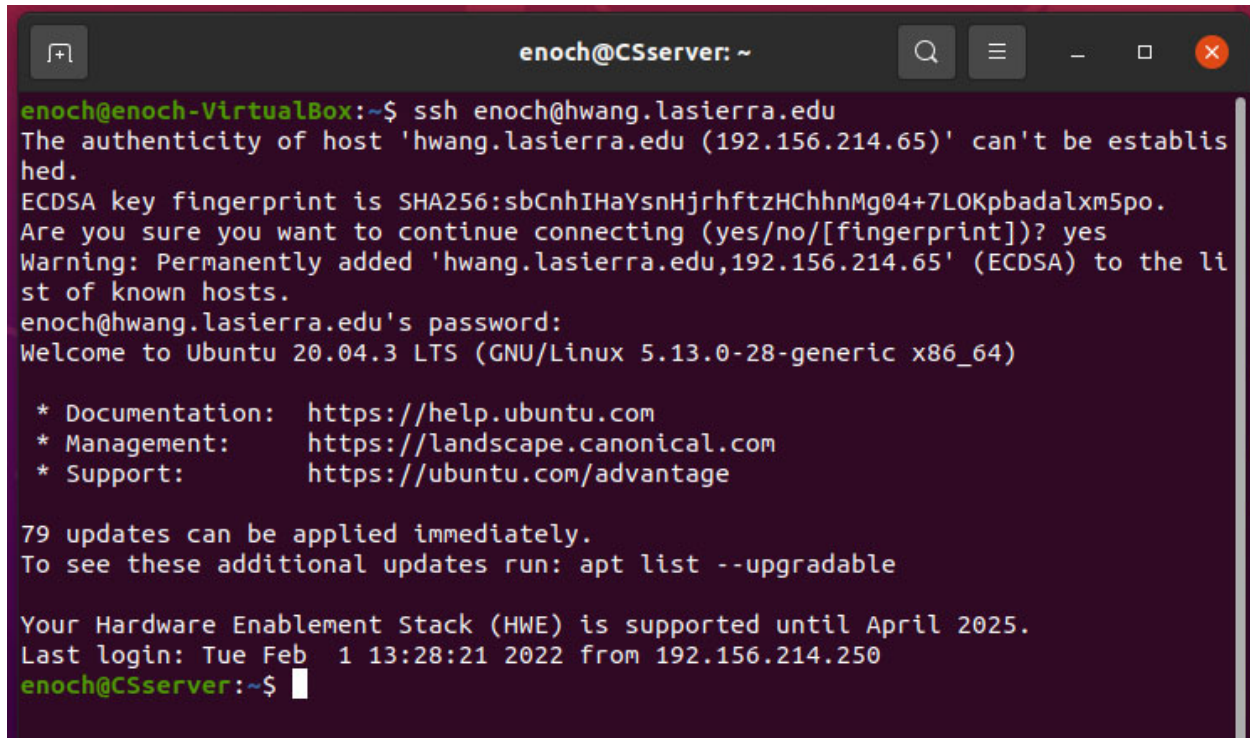
Open the SSH port through the firewall to allow traffic through

```
$ sudo ufw allow ssh
```

## SSH Client

*Remote Ubuntu or Mac machine*

From a remote Ubuntu machine open a terminal window and type `ssh account@server_address` at the prompt to connect to the server.

A terminal window titled 'enoch@CSserver: ~' with standard window controls. The terminal shows a user running 'ssh enoch@hwang.lasierra.edu' from a 'VirtualBox' prompt. It displays the host's authenticity warning, the user's confirmation to proceed, the addition of the host to the known hosts list, the password prompt, and the Ubuntu 20.04.3 LTS login banner. The banner includes links for documentation, management, and support, as well as update information and the last login time. The session ends at the 'enoch@CSserver:~\$' prompt.

```
enoch@enoch-VirtualBox:~$ ssh enoch@hwang.lasierra.edu
The authenticity of host 'hwang.lasierra.edu (192.156.214.65)' can't be established.
ECDSA key fingerprint is SHA256:sbCnhIHaYsnHjrhftzHChhnMg04+7LOKpbadalxm5po.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'hwang.lasierra.edu,192.156.214.65' (ECDSA) to the list of known hosts.
enoch@hwang.lasierra.edu's password:
Welcome to Ubuntu 20.04.3 LTS (GNU/Linux 5.13.0-28-generic x86_64)

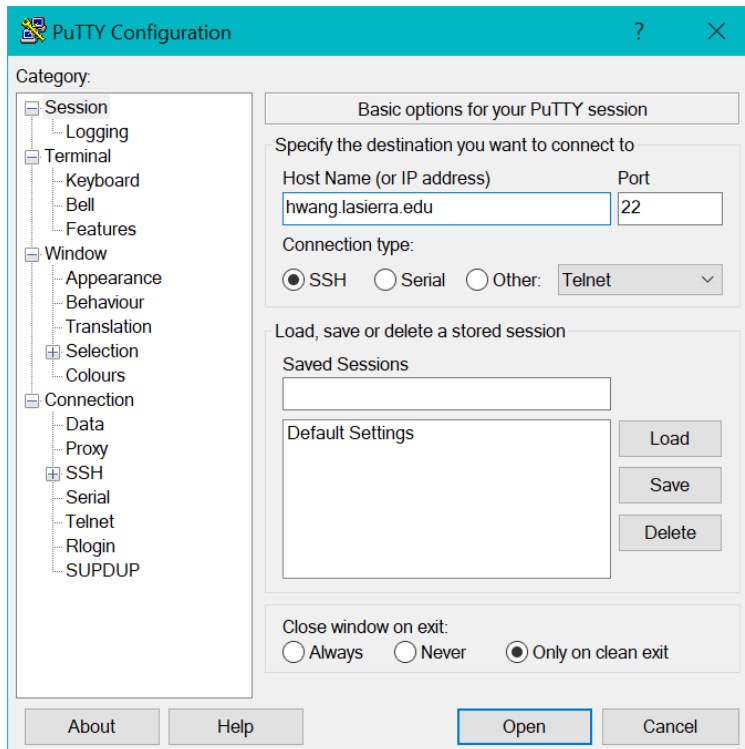
 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:       https://ubuntu.com/advantage

79 updates can be applied immediately.
To see these additional updates run: apt list --upgradable

Your Hardware Enablement Stack (HWE) is supported until April 2025.
Last login: Tue Feb  1 13:28:21 2022 from 192.156.214.250
enoch@CSserver:~$
```

## *Remote Windows machine*

From a remote Windows machine you need to first download **PuTTY** from **putty.org** and install it. Run the program. In the PuTTY Configuration window, type in the server address **hwang.lasierra.edu** and click Open.



After the connection is established with a terminal window, you will need to login with your user account and password.

```
enoch@CSserver: ~  
login as: enoch  
enoch@hwang.lasierra.edu's password:  
Welcome to Ubuntu 20.04.3 LTS (GNU/Linux 5.13.0-28-generic x86_64)  
  
* Documentation:  https://help.ubuntu.com  
* Management:    https://landscape.canonical.com  
* Support:        https://ubuntu.com/advantage  
  
79 updates can be applied immediately.  
To see these additional updates run: apt list --upgradable  
  
Your Hardware Enablement Stack (HWE) is supported until April 2025.  
Last login: Tue Feb  1 12:56:24 2022 from 192.156.214.250  
enoch@CSserver:~$ ls  
Desktop    Downloads  Pictures   public_html  Templates  
Documents  Music      Public     snap          Videos  
enoch@CSserver:~$
```

## SCP

Secure copy a file from Windows to Linux. To use scp, you need to have installed SSH. From a Windows' cmd window, type the **scp** command. The syntax of the command is **scp fromFile toFile**. The following are three examples of copying the file Enoch.jpg in the root directory of the C: drive to the directory public\_html using the same name.

```
C:\>scp c:/Enoch.jpg enoch@hwang.lasierra.edu:public_html/Enoch.jpg

C:\>scp c:/Enoch.jpg enoch@hwang.lasierra.edu:public_html/.

C:\>scp c:/Enoch.jpg
      enoch@hwang.lasierra.edu:/home/enoch/public_html/Enoch.jpg
```

## FTP

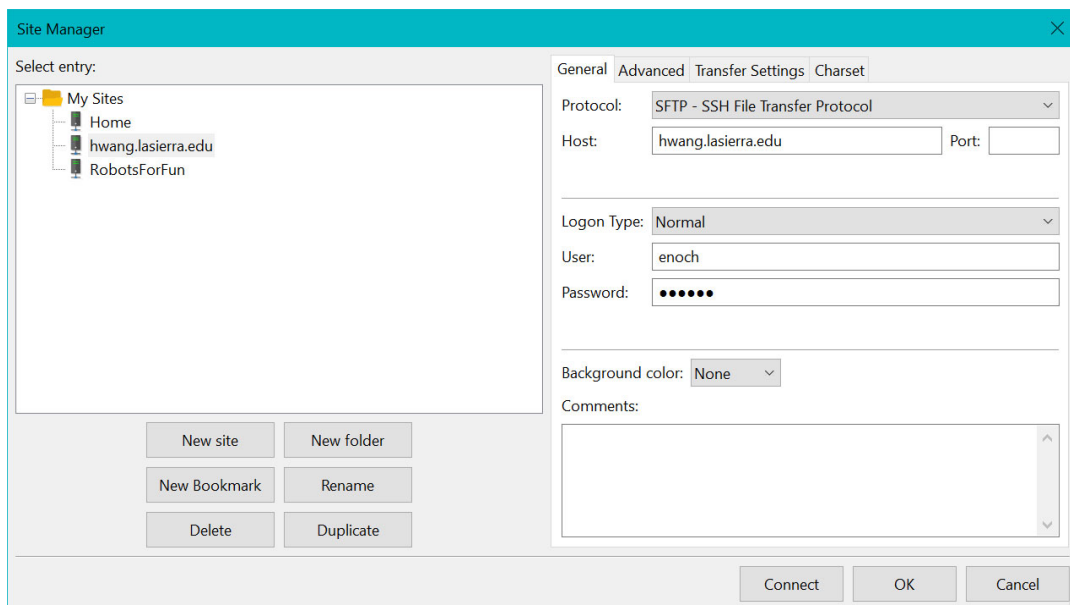
The File Transfer Protocol (FTP) is for copying files from one computer to another computer. In order to use FTP, you first need to install the FTP server **vsftpd** on your Ubuntu machine by executing the following commands:

```
$ sudo apt update
$ sudo apt install vsftpd
```

Reference: <https://linuxize.com/post/how-to-setup-ftp-server-with-vsftpd-on-ubuntu-20-04/>

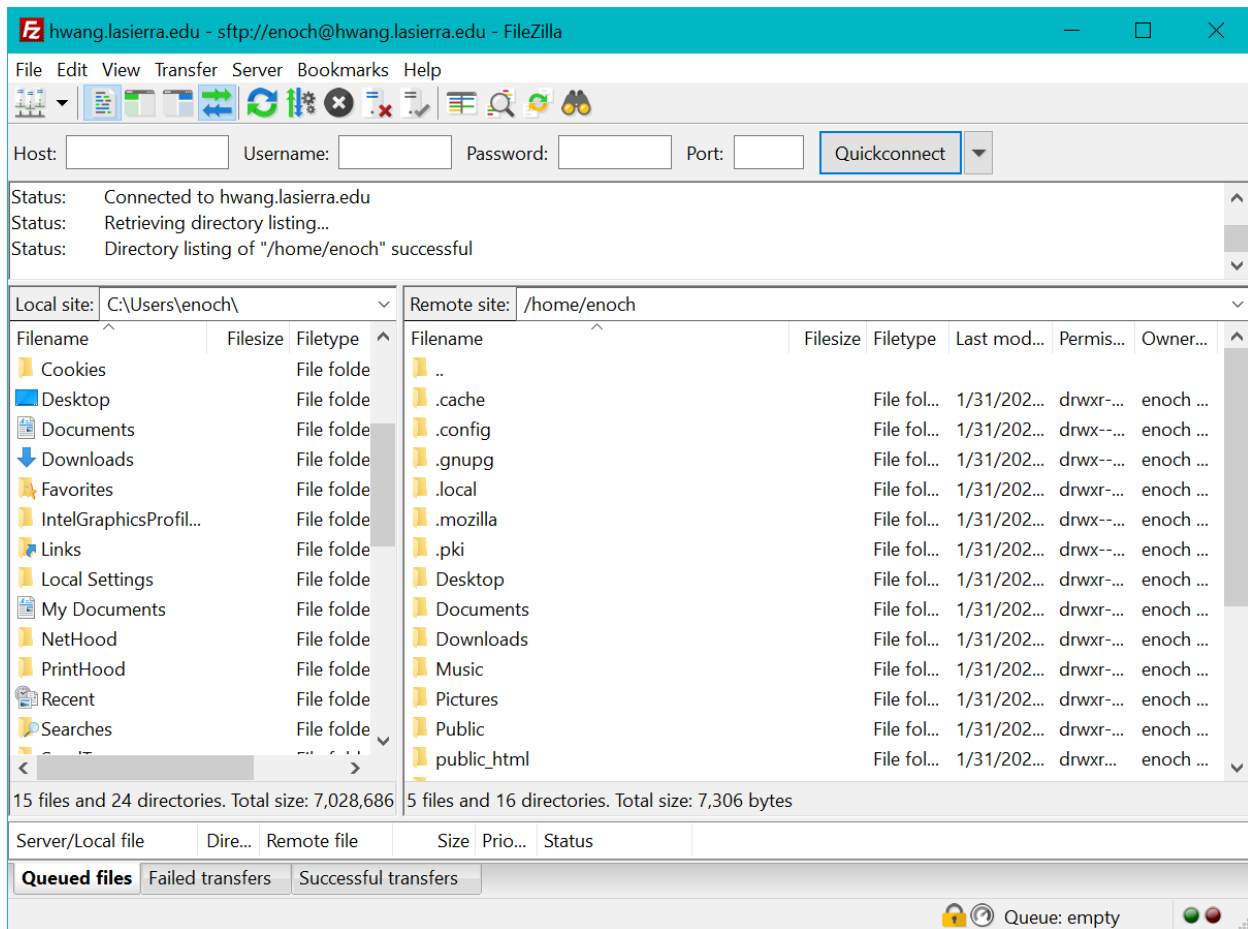
To use FTP to copy a file from a remote computer, such as your Windows computer, to your Ubuntu computer, you run a FTP client program on your Windows computer. A popular free FTP client program is FileZilla. Download the FileZilla client program from <https://filezilla-project.org/>.

In the FileZilla Site Manager window, create a new site and fill in the host address, user name and password. Select SFTP for the Protocol.



Click OK to save

Click Connect to connect to the server.



## (Optional) Configure Apache to listen to another port

Port 80 is the default port for web browsing. If you want to use another port number you need to configure Apache to listen to this new number.

1. Edit /etc/apache2/ports.conf
2. Change the line **Listen 80** to **Listen 8081** where 8081 is the new port number that you want.
3. Edit /etc/apache2/sites-enabled/000-default.conf
4. Change the line **<VirtualHost \*:80>** to **<VirtualHost \*:8081>**
5. Restart Apache.

```
$ systemctl restart apache2
```

6. To check that Apache is using the new port number

```
$ sudo apt install net-tools
$ sudo netstat -tlpn | grep apache
```

It should print out a line that says 8081 apache2

To browse to your web server you now need to specify the port as part of the URL address in your browser. For example, **192.168.1.163:8081/index.html** will use port 8081. If you don't specify the port 8081, it will default to port 80 and the Apache web server will not respond.

## Unix/Linux/Ubuntu Common Commands

Here are some Unix commands that you will commonly use. Unix commands **are** case sensitive. The first word is the command and the following words are parameters to the command.

| Command            | Operation                                                     | Example              |
|--------------------|---------------------------------------------------------------|----------------------|
| cd                 | Go to your home directory                                     | cd                   |
| cd /var/www/html   | Change directory to /var/www/html                             | cd /var/www/html     |
| cd ..              | Go up one level                                               | cd ..                |
| pwd                | Show current directory                                        | pwd                  |
| cp fromfile tofile | Copy fromfile to tofile                                       | cp in.txt index.html |
| mv fromfile tofile | Move/Rename fromfile to tofile                                | mv in.txt index.html |
| mkdir directory    | Make (create) directory                                       | mkdir images         |
| rm filename        | Remove (delete) file                                          | rm in.txt            |
| rm -r directory    | Remove (delete) directory and everything inside it            | rm -r images         |
| chmod per file     | Change read/write/execute permissions for a file or directory | chmod 777 index.html |
| nano file          | Edit file                                                     | nano index.html      |
| passwd             | Change your account password                                  | passwd               |
| clear              | Clear the terminal screen                                     | clear                |
|                    |                                                               |                      |
| ping ip_address    | Check connection to computer with given ip address            | ping -4 google.com   |
| ip addr            | Get ip address of computer                                    | ip addr              |
| netstat            | See what ports computer is listening on                       | netstat -a           |

Get more details on the commands [here](#).