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Escola Superior de Tecnologia

ENGENHARIA ELECTROTÉCNICA E DAS TELECOMUNICAÇÕES

INSTALL WEB SERVER ON RASPBERRY

3ºANO – 1º SEMESTRE

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1 SSH CONNECTION TO RASPBERRY

1.1 UTILITY OF SSH

SSH allows you up use the Raspberry Pi without having a monitor and keyboard connected to it.

1.2 HOW TO CONFIGURE SSH

Open the Raspberry Pi Software Configuration Tool:

```
sudo raspi-config
```

You should see a menu like this:

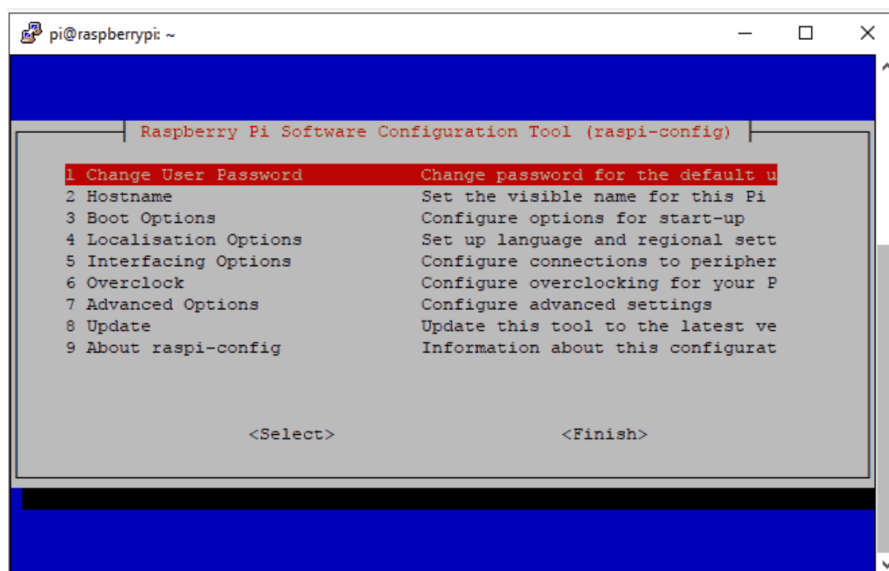


Fig.1 – Raspi-config main menu

Select option 5 INTERFACING OPTIONS:

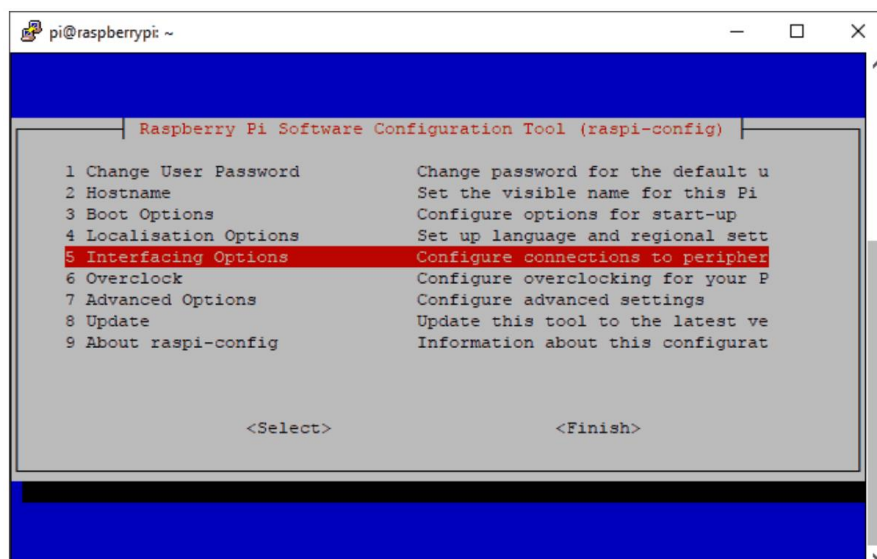
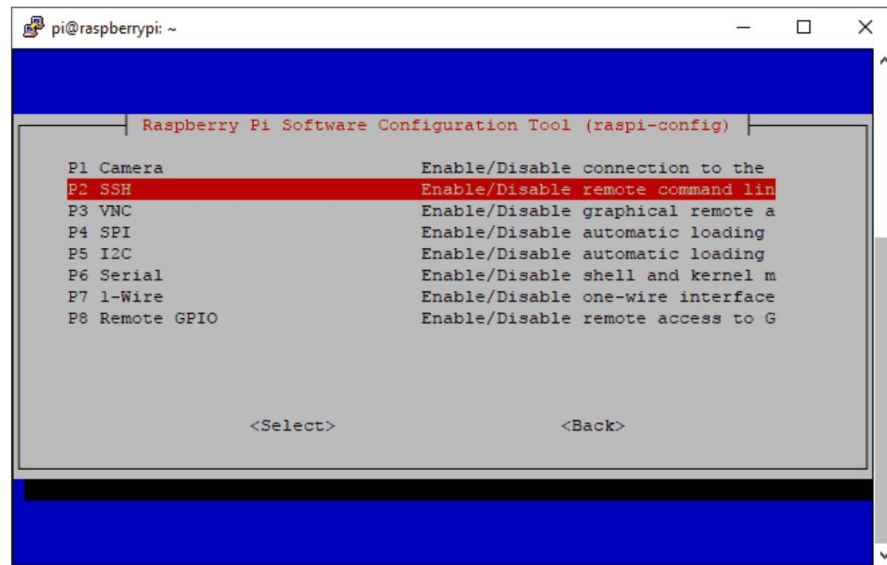


Fig.2 – Raspi-config interfacing options

Select option P2 SSH, to activate SSH:

**Fig.3 – Raspi-config interfacing options menu**

Confirm with YES, to activate SSH:

**Fig.4 – Raspi-config activate SSH**

SSH is now enabled, and you should be in the main menu again.

Select 1 CHANGE USER PASSWORD, and follow the instructions to change the password. Choose a secure password, but something you will remember:

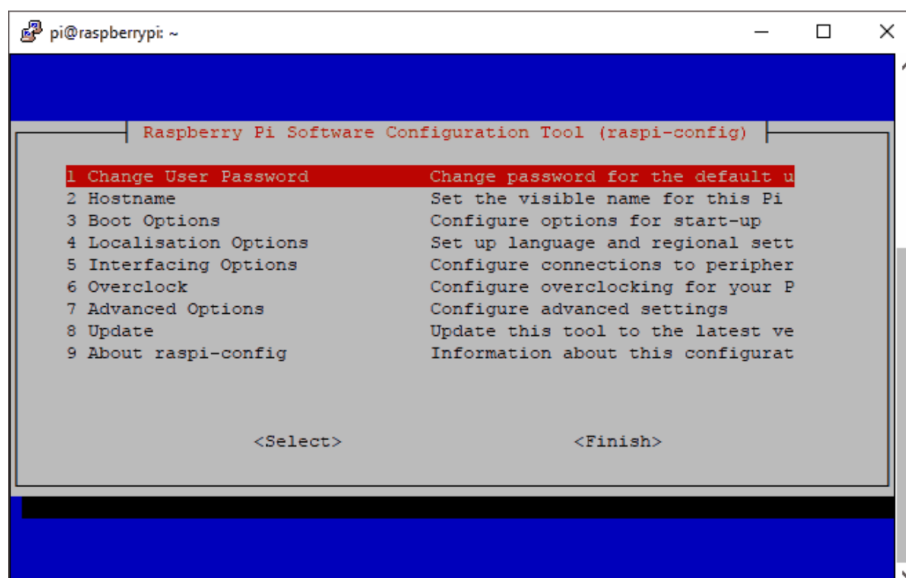


Fig.5 – Raspi-config change user password

You can also change the hostname, go to 2 NETWORK OPTIONS:

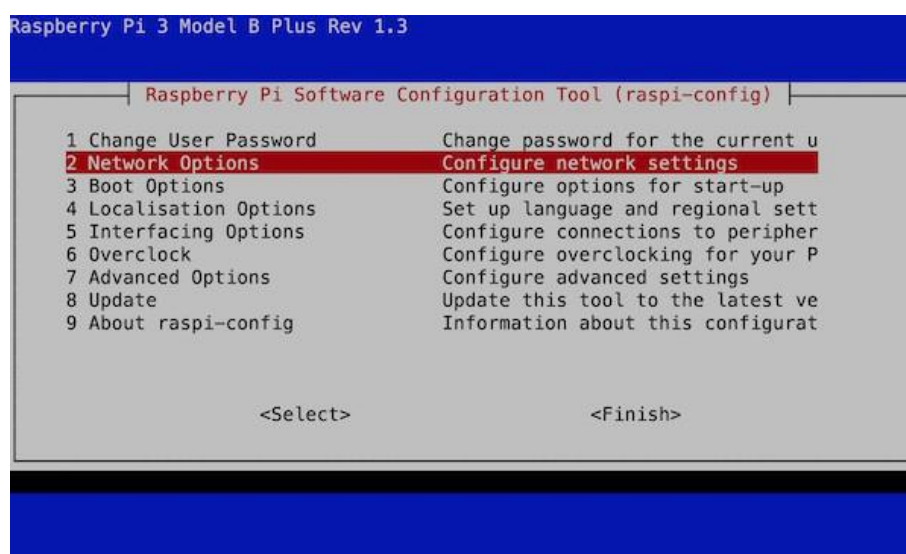


Fig.6 – Raspi-config network options

Select N1 HOSTNAME and write our Hostname:

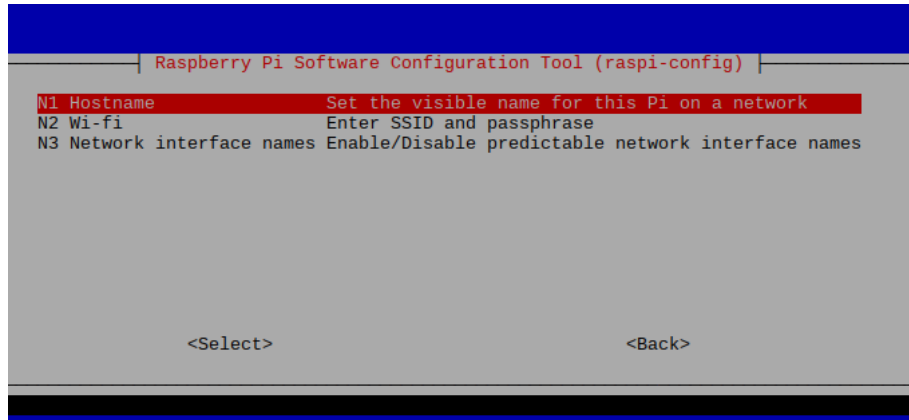


Fig.7 – Raspi-config network options menu

Now we will close the menu and save the changes:

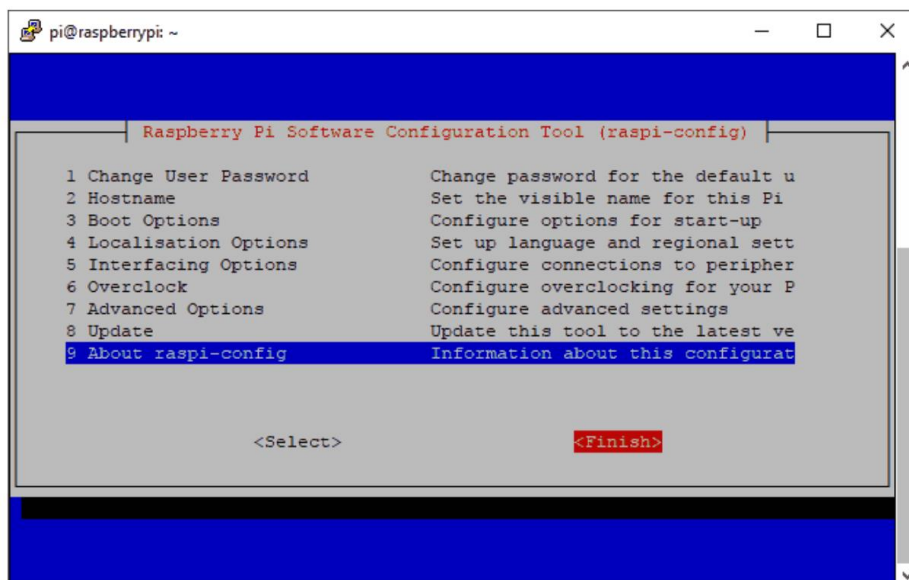


Fig.8 – Raspi-config save changes

When selecting FINISH, you will get the option to reboot. Select YES to reboot the Raspberry Pi.



Fig.9 – Raspi-config reboot

You can now unplug the monitor and keyboard from the Raspberry Pi, and we can log in using our SSH client.

Open PuTTY, type in the IP address for your Raspberry Pi, and click OPEN:

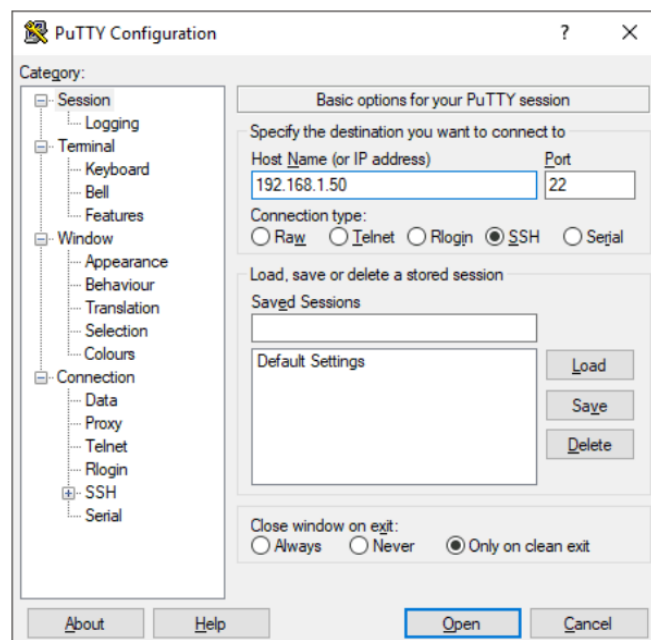


Fig.10 – Putty menu

Log in using the username and the new password you specified.

2 INSTALL APACHE2 SERVER ON RASPBERRY

2.1 UTILITY OF WEB SERVER

Apache it's a web server. It allows the machine to analyze a user's requests (in http form), and return the file corresponding to the request.

2.2 HOW TO INSTALL APACHE2

First, we need to update all the machine. For do that, we need to have admin rights, you can use the `SUDO` command:

```
sudo apt update
```

```
sudo apt upgrade
```

```
sudo apt update
```

Once the Raspberry Pi is updated, we will install the Apache server:

```
sudo apt install apache2
```

we will take this opportunity to give rights to the apache folder which will allow you to easily administer the sites. To do this, run the following commands:

```
sudo chown -R pi:www-data /var/www/html/
```

```
sudo chmod -R 770 /var/www/html/
```

Once the installation is complete, we can test that Apache is working properly by going to the Raspberry address.

You can try to connect on the address `HTTP://127.0.0.1` on the raspberry. You should then get a page with a message.

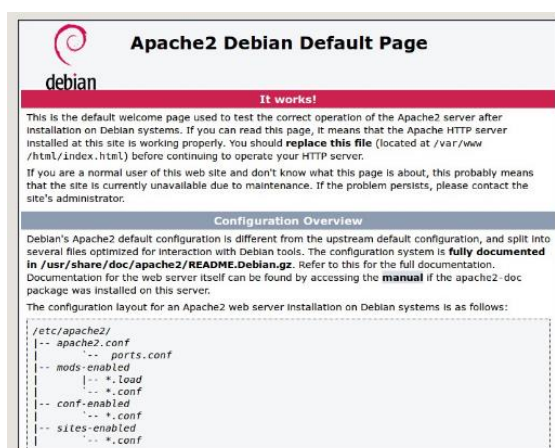


Fig.11 – Apache2 default page

Apache use the repository `/VAR/WWW/HTML` like you own website root. This means that when you call your Raspberry on port 80 (`http`), Apache looks for the file in `/VAR/WWW/HTML`.

Now, you can use your raspberry to do website in HTML, CSS, JavaScript. But if you want to permit interactions between website and user, you need to add PHP language.

3 INSTALL PHP ON RASPBERRY

3.1 UTILITY OF PHP

PHP is a server side scripting language. that is used to develop Static websites or Dynamic websites or Web applications. PHP stands for Hypertext Pre-processor, that earlier stood for Personal Home Pages.

PHP scripts can only be interpreted on a server that has PHP installed.

The client computers accessing the PHP scripts require a web browser only.

3.2 HOW TO INSTALL PHP

We need to have admin rights, you can use the `SUDO` command:

```
sudo apt install php php-mbstring
```

If you want to know if PHP works, you need to delete at first time the file `INDEX.HTML` in the repository `/VAR/WWW/HTML`:

```
sudo rm /var/www/html/index.html
```

Then, create file `index.php` in this repository, with this command line :

```
echo "<?php phpinfo(); ?>" > /var/www/html/index.php
```

You can try to connect on the adress `HTTP://127.0.0.1` on the raspberry. You should then get this page:

<div> <div>PHP Version 5.4.4-14+deb7u7</div>  </div>	
System	Linux ajaniserveur 3.2.0-4-amd64 #1 SMP Debian 3.2.54-2 x86_64
Build Date	Dec 12 2013 08:42:50
Server API	Apache 2.0 Handler
Virtual Directory Support	disabled
Configuration File (php.ini) Path	/etc/php5/apache2
Loaded Configuration File	/etc/php5/apache2/php.ini
Scan this dir for additional .ini files	/etc/php5/apache2/conf.d
Additional .ini files parsed	/etc/php5/apache2/conf.d/10-pdo.ini, /etc/php5/apache2/conf.d/20-gd.ini, /etc/php5/apache2/conf.d/20-mysql.ini, /etc/php5/apache2/conf.d/20-mysqli.ini, /etc/php5/apache2/conf.d/20-pdo_mysql.ini
PHP API	20100412
PHP Extension	20100525
Zend Extension	220100525
Zend Extension Build	API220100525 NTS

Fig.12 – PHP webpage with PHP info

4 INSTALL MYSQL ON A RASPBERRY

4.1 UTILITY OF MYSQL

MySQL is an Oracle-backed open source relational database management system (RDBMS) based on Structured Query Language (SQL). MySQL runs on virtually all platforms, including Linux, UNIX and Windows. Although it can be used in a wide range of applications, MySQL is most often associated with web applications and online publishing.

4.2 HOW TO INSTALL MYSQL

Before we get started with installing MySQL to our Raspberry Pi, we must first update our package list and all installed packages. We can do this by running the following two commands:

```
sudo apt update
```

```
sudo apt upgrade
```

The next step is to install the MySQL server software to your Raspberry Pi. Installing MySQL to the Raspberry Pi is a simple process and can be done with the following command:

```
sudo apt install mariadb-server
```

With the MySQL server software installed to the Raspberry Pi, we will now need to secure it by setting a password for the “**root**” user. By default, MySQL is installed without any password set up meaning you can access the MySQL server without any authentication. Run the following command to begin the MySQL securing process:

```
sudo mysql_secure_installation
```

Just follow the prompts to set a password for the root user and to secure your MySQL installation.

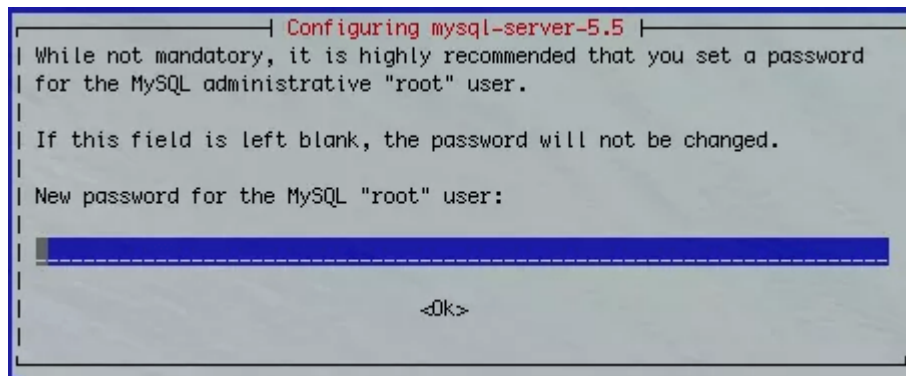


Fig.13 – Mysql password set

For a more secure installation, you should answer “Y” to all prompts when asked to answer “Y” or “N”. These prompts will remove features that allows someone to gain access to the server easier.

Make sure you write down the password you set during this process as we will need to use it to access the MySQL server and create databases and users for software such as WordPress or PHPMyAdmin.

Now if you want to access your Raspberry Pi’s MySQL server and start making changes to your databases, you can enter the following command:

```
sudo mysql -u root -p
```

You will be prompted to enter the password that we just created for MySQL’s root user

You can now enter MYSQL commands to create, alter, and delete databases. Through this interface, you can also create or delete users and assign them the rights to manage any database.

There are two different ways you can quit out of the MYSQL command line, the first of those is to type “**quit**” into the MySQL interface.

The other way of quitting out of the MYSQL command line is to press **Ctrl + D**.

At this point, you will now have successfully setup MySQL on your Raspberry Pi. Our next few sections will go into making better use of this database.

If you intend on using a MySQL database from PHP, you will need to make sure that you have the module installed.

You can install the MySQL connector for PHP to your Raspberry Pi by running the following command.

```
sudo apt install php-mysql
```

5 INSTALL PHPMYADMIN ON A RASPBERRY

5.1 UTILITY OF PHPMYADMIN

PHPMyAdmin is a free software tool written in PHP, intended to handle the administration of MySQL over the Web. Frequently used operations (managing databases, tables, columns, relations, indexes, users, permissions, etc) can be performed via the user interface, while you still have the ability to directly execute any SQL statement.

5.2 HOW TO INSTALL PHPMYADMIN

5.2.1.1 Setting up PHPMyAdmin on the Raspberry Pi

To install the PHPMyAdmin package to our Raspberry Pi, we need to run the command below:

```
sudo apt install phpmyadmin
```

PHPMyAdmin will now begin to install to your Pi. It will require your input on various steps along the way. You will be presented with a screen asking the type of web server you want it to run off.

Select the “**apache2**” option by pressing **SPACE** and then **ENTER**. Select this option even if you are using NGINX as we will configure that ourselves latest on.

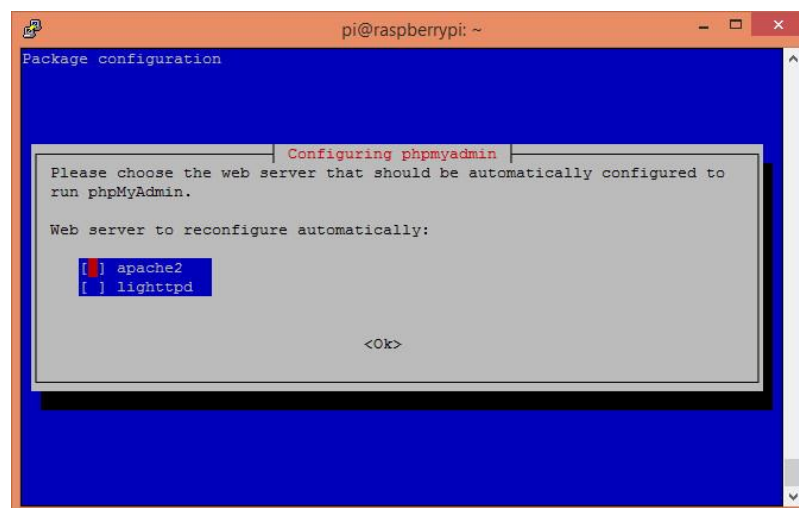


Fig.14 – Web server choice PHPMyAdmin configuration

Next, we will need to configure PHPMyAdmin to connect to our MYSQL server. We will also need set up some details so that we can log in to the PHPMyAdmin software.

To do this select “<Yes>” at the next prompt.

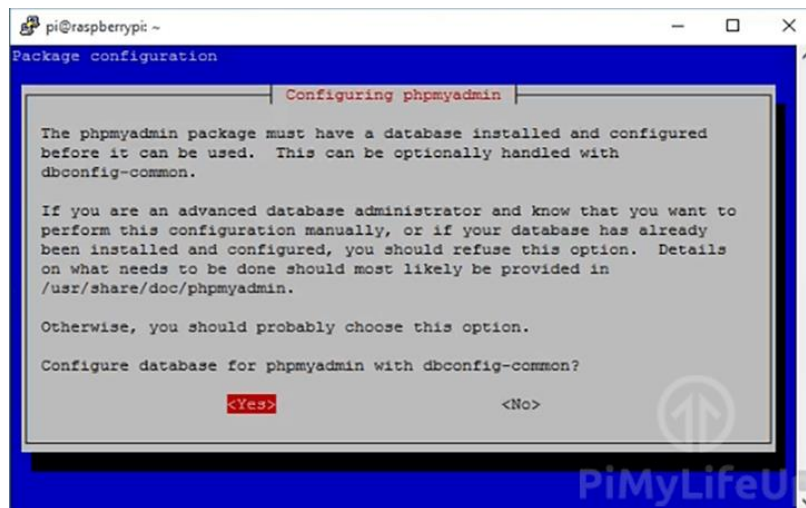


Fig.15 – PHPMyAdmin configuration

It will now ask you to set a password for PHPMyAdmin itself. It is best to set this password to something different to your root SQL password. Doing this will help secure the server.

This password is what PHPMyAdmin will use to connect to the MySQL server

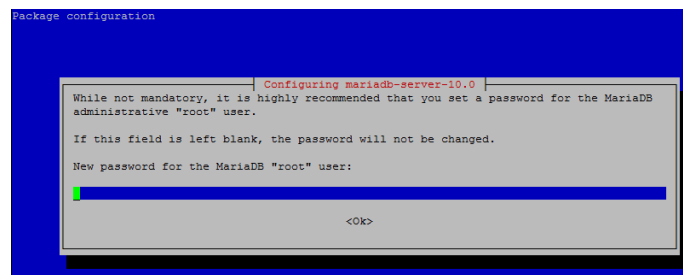


Fig.16 – PHPMyAdmin password configuration

With the PHPMyAdmin installation process complete, there is one last thing we need to do. PHPMyAdmin by default will block you from logging into the PHPMyAdmin interface using the “**root**” user.

Instead, you will need to create a new user if you wish to create and access data tables within PHPMyAdmin.

To do this, we will need to first login to the MySQL command line interface using the “**root**” user with the password you set up :

```
sudo mysql -u root -p
```

Now run the command below to create a user and permit it to access all databases on the MySQL server. Remember the details you enter here as you will use these to log in to PHPMyAdmin

Make sure you replace “**username**” with the **username of your choice**.

Also, replace “**password**” with a **secure password** of your choice.

```
GRANT ALL PRIVILEGES ON *.* TO 'username'@'localhost' IDENTIFIED BY 'password';
```

You can exit out of the MySQL command line interface by typing “**quit**” in the terminal.

5.2.1.2 Configuring Apache for PHPMYAdmin

Before we can load the PHPMYAdmin interface on our Raspberry Pi, we will need to make some configuration changes to Apache.

To get started, we need to edit the “**Apache2.conf**” file, we can do this by entering the following into the terminal.

```
sudo nano /etc/apache2/apache2.conf
```

Now we need to add the following line to the bottom of this file.

This line will include PHPMYAdmin’s configuration and allow it to be loaded in and listened to by Apache.

```
Include /etc/phpmyadmin/apache.conf
```

Once done we can save and exit by pressing CTRL + X and then pressing Y then ENTER.

Now we need to restart the Apache service on our Raspberry Pi by running the command below.

We need to do this to flush out its current configuration and make it load in our modified file.

```
sudo service apache2 restart
```

5.2.1.3 Accessing PHPMYAdmin

You should now be able to access your Raspberry Pi’s PHPMYAdmin interface from a web browser. To test this, go to the following address in your favorite web browser.

Use the user you created earlier on in the tutorial to log in. Do not use your root user as this is disabled by default.

Remember to replace the IP Address with your Raspberry Pi’s IP Address. (If you don’t have it, run the **hostname -I** command on your Raspberry Pi)

```
http://192.168.1.108/phpmyadmin
```

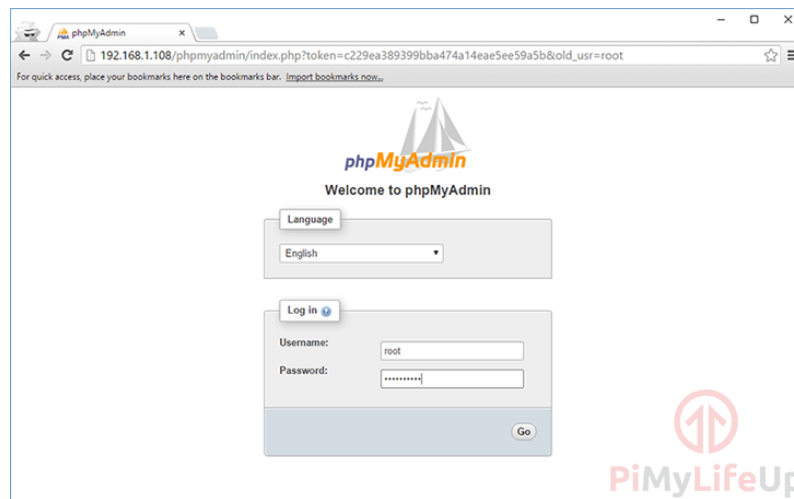


Fig.17 – PHPMyAdmin login page

6 UPLOAD WEB SERVER

6.1 UTILITY OF PORT FORWARDING

The first question we could ask ourselves is why the web server isn't accessible outside our network?

First of all, it is important to know that most equipment connected to the internet use an IP-type address Version 4. It is this address that allows you to access a site, or a machine on the network in general. However, the number of these addresses is limited.

As a result, Access provider have a relatively limited number of addresses to assign given the number of equipment requiring Internet access.

The access providers, therefore provide you with a box, which will allow you to access the internet by connecting your equipment to it, either by cable or by wifi. And only this box have an Ip adress on the internet network. That means that if you try to access your computer via your visible IP address from an external network, you will actually try to access your box. But, as the latter does not have a web server listening, you will then have an error of the server type unreachable.

Here is a small graph of the behavior of a box when requesting your IP from an external network:

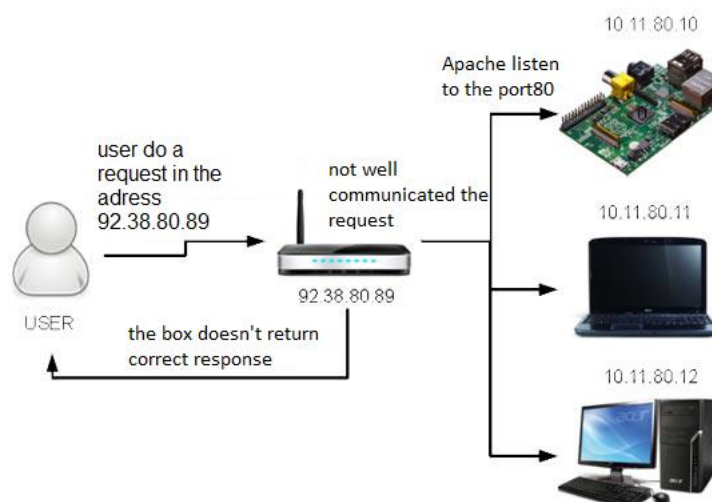


Fig.18 – Behavior of a box when requesting your IP from an external network

The goal is to do port forwarding for redirect directly to the raspberry when you try to access on HTTP, HTTPS, FTP and SSH ports.

By setting up these redirects, you're redirecting web requests, that is, those using HTTP (port 80) and HTTPS (port 443), to your Raspbian system, which runs the Apache2 server. The SSH and FTP is to access of files of raspberry remotely. When your box receives a request, it will redirect it to your Raspberry, or it will be analyzed by Apache, which will return the adapted resources to the client who made the request.

Here is another small diagram of the behavior of your box when requesting your IP from an external network, once the port forwarding have been added.

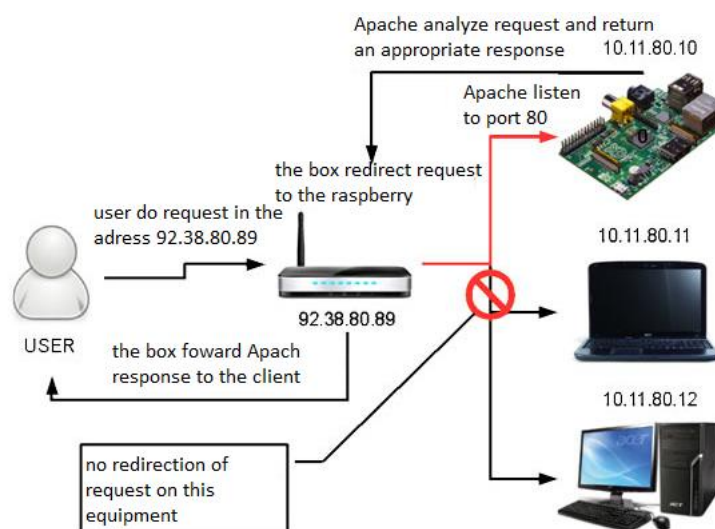


Fig.19 – Behavior of a box when requesting your IP with port forwarding

6.2 HOW TO SET UP PORT FORWARDING

In this procedure, I used the Asus router WL-500G premium V2.

First you need to connect your raspberry to the router and connect to [HTTP://192.168.1.1/](http://192.168.1.1/). The default user and password of Asus router is ADMIN.

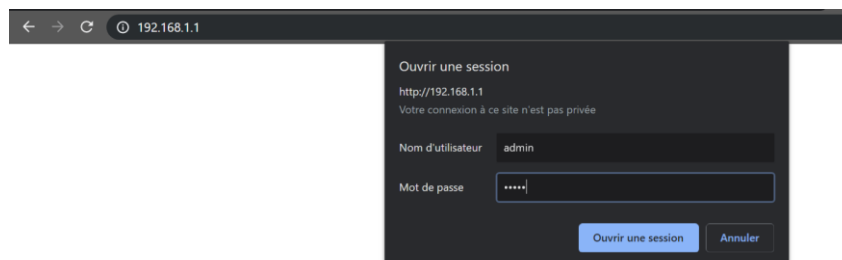


Fig.20 – Connection to the Asus router

In the main page of configuration, click on CLIENT ICON to see all private IP of connected devices. Keep in mind the address of Raspberry. In this exemple, It's 192.168.1.3

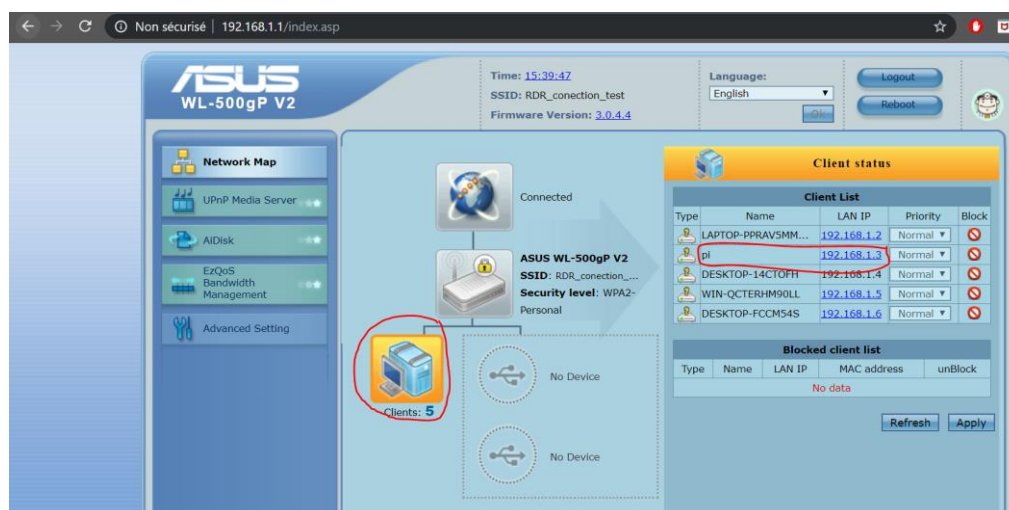


Fig.21 – IP of raspberry in Asus configuration menu

When you are logged to the Asus configuration webportal, you go to ADVANCED SETTINGS -> WAN

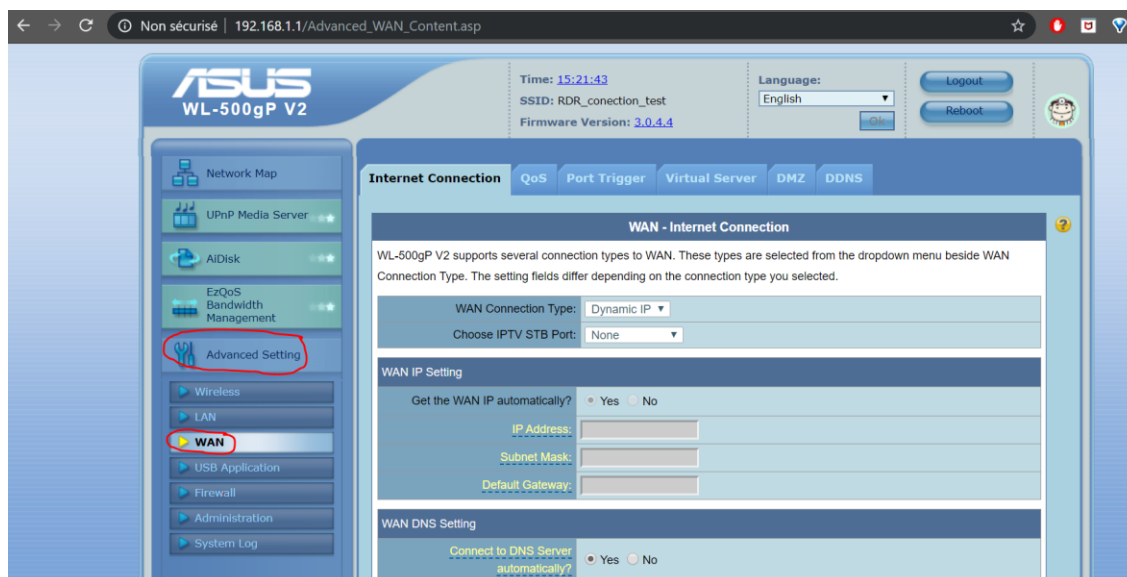


Fig.22 – Path to WAN Asus configuration menu

After that, you go on VIRTUAL SERVER tab. Click to “YES” on ENABLE VIRTUAL SERVER. You’ll add the 4 PORTS to the virtual server list. You need to put the IP of raspberry that I introduced you before. You can keep TCP PROTOCOL for all ports.

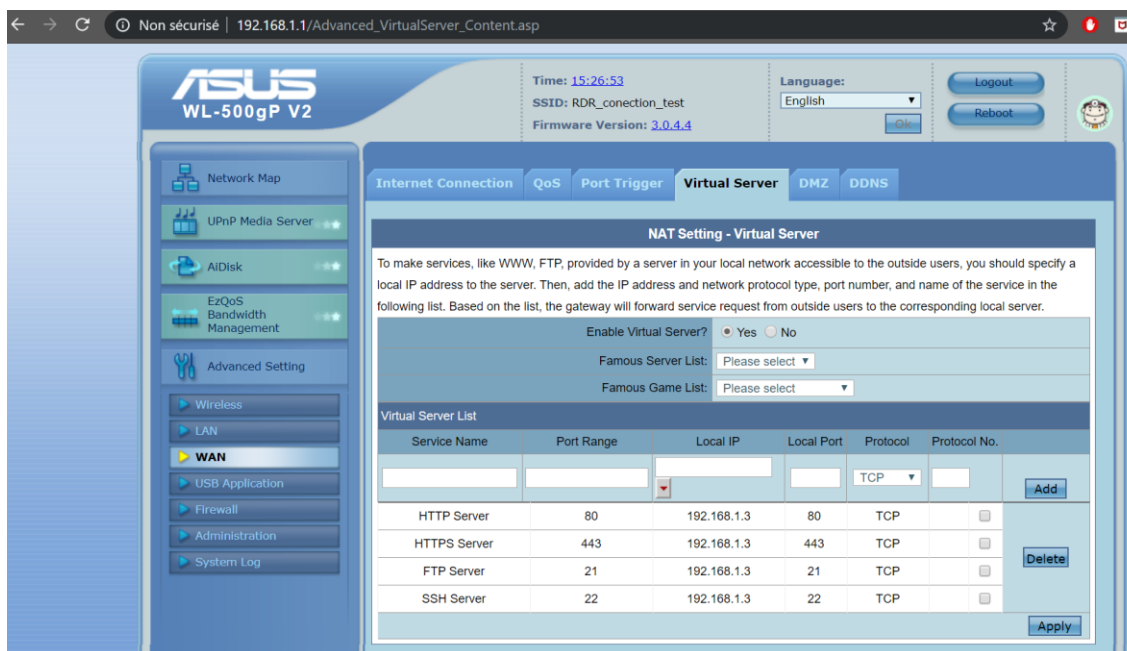


Fig.23 – Port forwarding configuration

When you’re done the addition of ports, you click of APPLY BUTTON to implement changes. You can come back to the main page. Click on WAN ICON to see the WAN IP of the route. In this example it’s 10.6.2.243

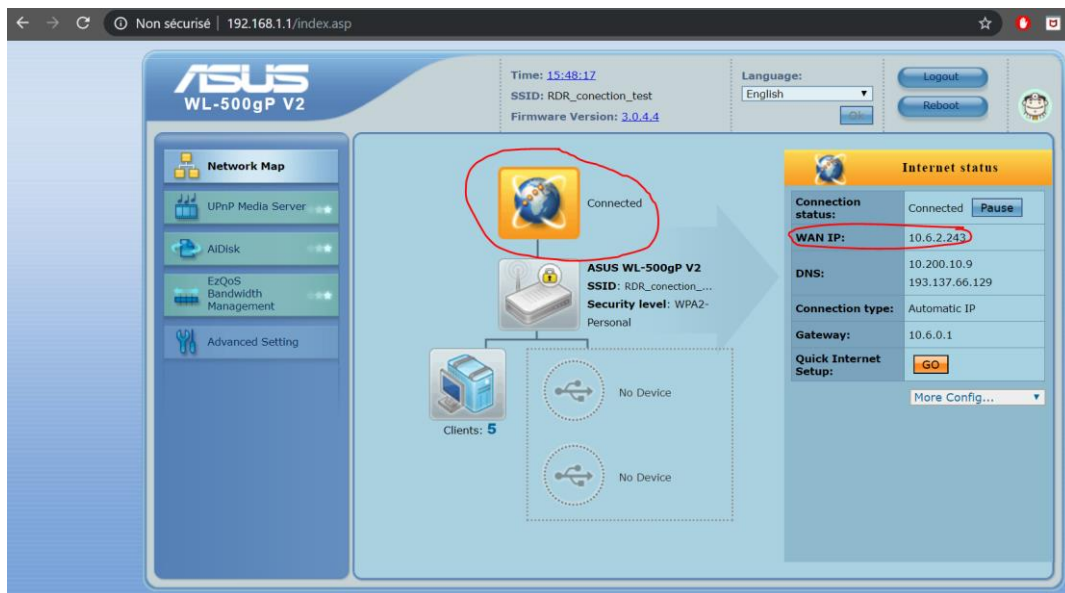


Fig.24 – Wan IP in Asus configuration menu

To see if it's works, you can try to connect to your webpages in your webserver. For example, [HTTP://10.6.2.243/INDEX.PHP](http://10.6.2.243/INDEX.PHP). If you see page, you managed the port forwarding.

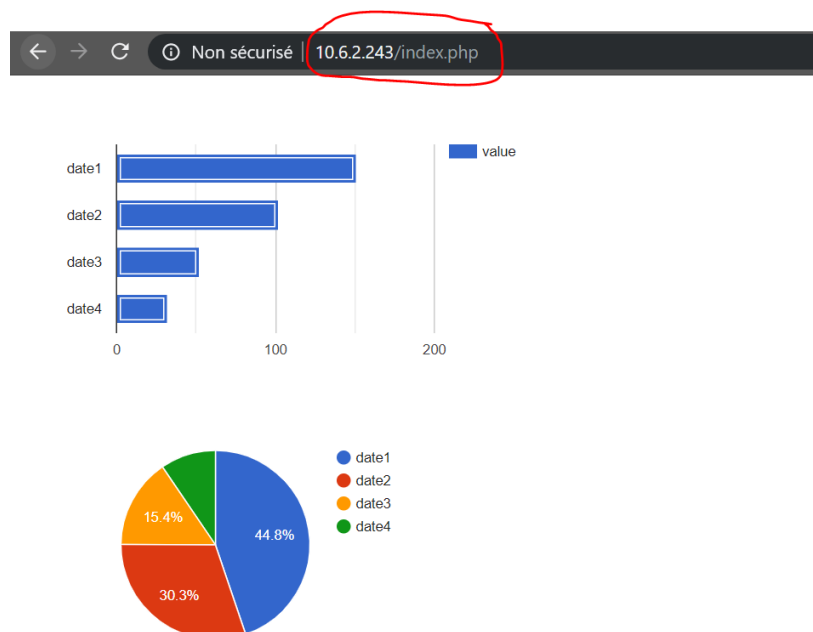


Fig.25 – Main page on Raspberry web server with WAN IP