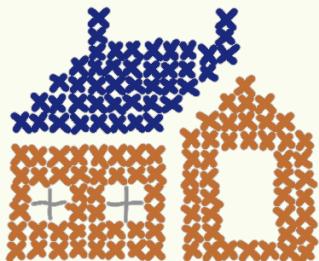


HOST A WEBSITE AT HOME

A hands-on workshop!
Sat, May 11 & May 18

1–4 p.m. at



IBBY
BOOKS

Why host a website at home?

- You control what you post.
- You can definitively take down your website by unplugging it.
- Commercial hosting starts around \$5 per month, so hosting at home may be cheaper in the long run.
- Learning about networking is fun and useful.

In this project you'll learn to set up an Ubuntu-based web server on a single-board computer, using Apache HTTP Server to serve your website. You'll configure Apache the proper way, letting you host multiple websites on the same machine if you wish. Then you'll set up port forwarding on your router to expose your site to the open web. Finally, you'll configure Dynamic DNS (DDNS) with a domain or subdomain, so your website will be accessible even when your ISP changes your home IP address.

The examples in this zine use the Orange Pi Zero 2W, an inexpensive single-board computer that uses very little power. You can buy an OPZ2W with 1 GB of RAM for around \$20, but you'll need some additional hardware to get up and running.

We sell complete home web server kits at Iffy Books. The kit costs \$49 as of May 2024, and includes the following:

- Orange Pi Zero 2W single-board computer w/1 GB of RAM
- 32 GB microSD card
- microSD card reader
- 2 A USB power supply
- USB-C power cable
- Mini HDMI to HDMI adapter
- USB-C to 2x USB-A adapter
- USB-A to Ethernet adapter
- Ethernet cable

Choose a domain

Option 1: Choose a subdomain for a domain you already own.

If you've already registered a domain and you'd like to create a subdomain for this project, the only thing you need to do at this point is decide what subdomain to use. For the examples below we'll use **zinegallery.iffybooks.net**.

Your subdomain can be up to 63 characters long (case insensitive). We'll update your domain records later.

Option 2: Buy a domain

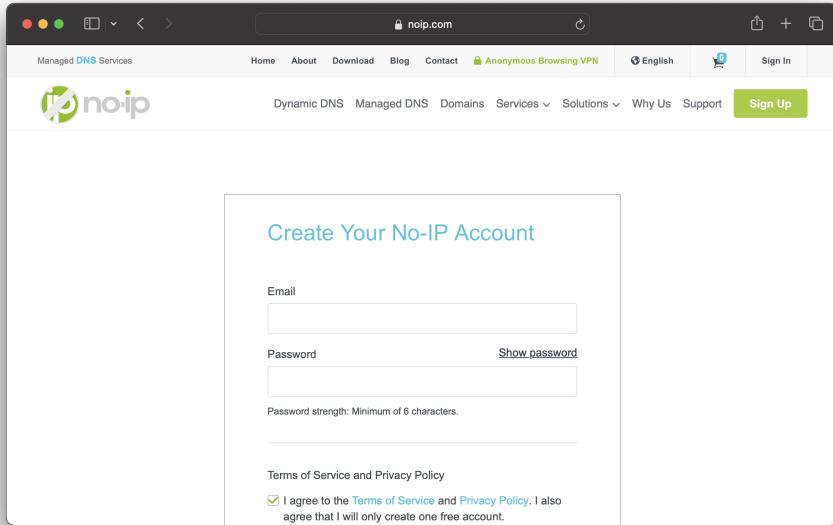
- Go to a domain registry of your choice and pay to register a domain name. You'll need to create an account and enter your credit card info.

The screenshot shows a web browser window with the GoDaddy logo at the top. The search bar contains the text 'zinegallery'. Below the search bar are buttons for 'RESULTS', 'FILTER', 'FAVORITES', and 'HISTORY'. A banner above the main results area says 'Get powerful AI tools with your new domain — [learn more.](#)'. The main result is a circular graphic featuring a group of diverse people with their hands raised, set against a light blue background. To the right of the graphic, the text reads 'Your domain is available!' followed by 'zinegallery.net' in blue. The price is listed as '\$24.99 \$14.99 for first year'. Below this is a teal button with white text that says 'Make It Yours'. To the left of the graphic is a purple button with white text that says 'Contact Us'. On the far right edge of the screen, there are four small checkmark icons.

Option 3: Sign up for a free subdomain from a DDNS provider

-

<https://www.noip.com/sign-up>



Flash Ubuntu to your SD card

- ❑ Next you'll download the Ubuntu OS image for your device. If you're using an Orange Pi Zero 2W, go to the following URL:

<http://www.orangepi.org/html/hardWare/computerAndMicrocontrollers/service-and-support/Orange-Pi-Zero-2W.html>

- ❑ Under **Ubuntu Image**, click **Downloads**.



Ubuntu Image

Downloads

- ❑ That link will direct you to Google Drive. Double click **Linux6.1 kernel version image** to open the directory.

Name	Owner	Last modified
Linux5.4 kernel version image	zhaoyifan.steven.xl	Sep 17, 2023 zhaoyifan.stev...
Linux6.1 kernel version image	zhaoyifan.steven.xl	Sep 17, 2023 zhaoyifan.stev...

- ❑ Double click on the directory **For development boards with 1GB_2GB memory...** to open it.

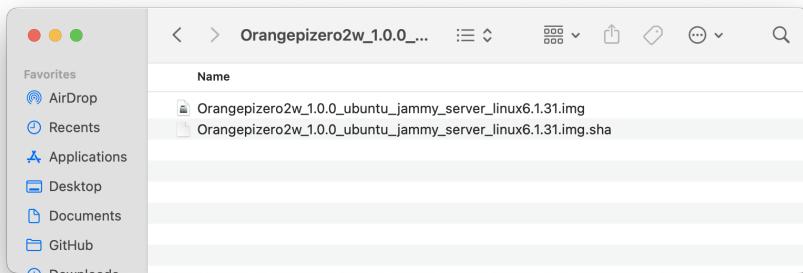
Name	Owner	Last modified
For development boards with 1.5GB memory, pl...	zhaoyifan.steven.xl	Sep 17, 2023 zhaoyifan.stev...
For development boards with 1GB_2GB memor...	zhaoyifan.steven.xl	Sep 17, 2023 zhaoyifan.stev...
For development boards with 4GB memory, ple...	zhaoyifan.steven.xl	Sep 17, 2023 zhaoyifan.stev...

- ❑ Right click the file with **server** in the filename and select **Download** to download the disk image file.

Name	Owner	Last modified
☰ Orangepizero2w_1.0.0_ubuntu_jammy_desktop_xfce_linux6.1.31.7z	zhaoyifan.steven.xl	Sep 20, 2023 zha
☰ Orangepizero2w_1.0.0_ubuntu_jammy_server_linux6.1.31.7z	zhaoyifan.steven.xl	Sep 20, 2023 zha

Open with
Download
Rename
Make a copy

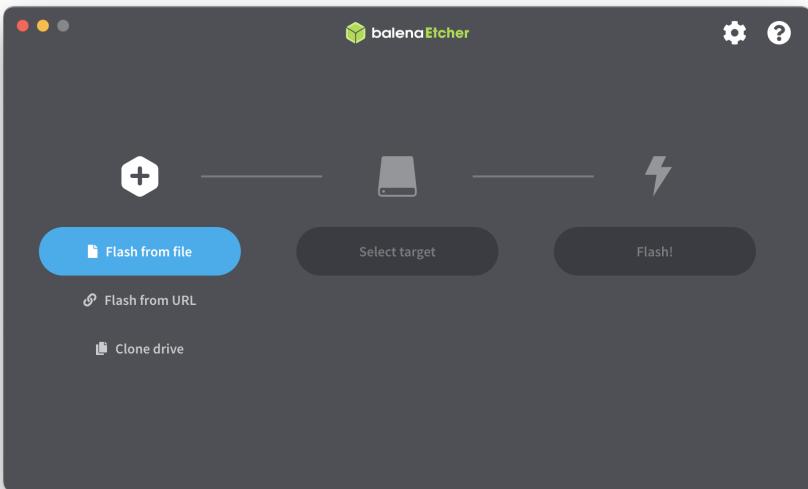
- ❑ Find the file you just downloaded, `Orangepizero2w_1.0.0_ubuntu_jammy_server_linux6.1.31.7z`, in your File Explorer/Finder. Double click the file to extract its contents.
- ❑ You'll end up with a directory containing a disk image file ending with `.img`, along with a `.sha` checksum file.



- ❑ Now go to the following URL and download the program balenaEtcher:

<https://etcher.balena.io>

- ❑ Insert your micro SD card into a USB card reader and plug it into your computer.
- ❑ Open balenaEtcher, click **Flash from file**, and select the `.img` disk image file you just extracted.



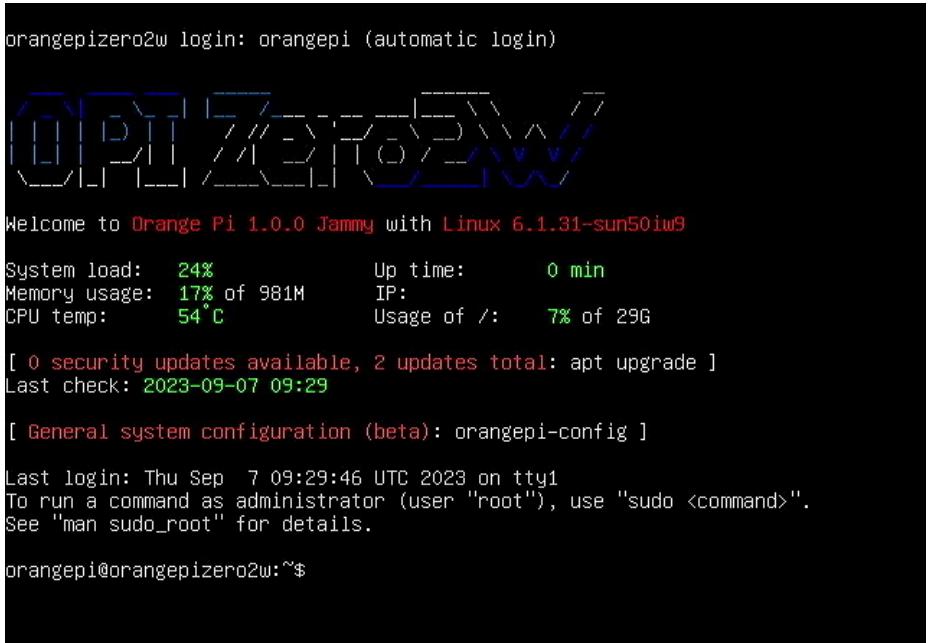
- ❑ In balenaEtcher, click **Select target** and select your SD card.
- ❑ Click **Flash!** to write the Ubuntu disk image to your SD card, which will take 5 minutes or so.

Set up your computer

- ❑ Insert your newly flashed micro SD card into the card slot on your single-board computer.
- ❑ Connect a monitor to your single-board computer. The OPZ2W has a Mini HDMI port, so you'll need an adapter to connect an HDMI cable.
- ❑ Connect a USB keyboard to your computer. With an OPZ2W you'll need to use a USB-C to USB-A adapter.

Turn on your computer

- ❑ Plug a USB-C cable into your computer and connect it to a USB power supply (2 amps or more).
- ❑ After a brief startup sequence, your screen should look like this:



orangepirezero2w login: orangepi (automatic login)

Welcome to **Orange Pi 1.0.0 Jammy** with **Linux 6.1.31-sun50iw9**

System load: 24% Up time: 0 min
Memory usage: 17% of 981M IP:
CPU temp: 54 C Usage of /: 7% of 29G

[0 security updates available, 2 updates total: apt upgrade]
Last check: 2023-09-07 09:29

[General system configuration (beta): orangepi-config]

Last login: Thu Sep 7 09:29:46 UTC 2023 on tty1
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.

orangepi@orangepirezero2w:~\$

(Note: From this point forward we'll invert the colors in screen captures in order to use less printer toner.)

- ❑ First you'll set a password. Type `passwd` at the command prompt, then press enter.

```
orangepirzero2w login: orangepi (automatic login)
```



```
Welcome to Orange Pi 1.0.0 Jammy with Linux 6.1.31-sun50iw9
```

```
System load: 24% Up time: 0 min
Memory usage: 17% of 981M IP:
CPU temp: 54°C Usage of /: 7% of 29G
```

```
[ 0 security updates available, 2 updates total: apt upgrade ]
Last check: 2023-09-07 09:29
```

```
[ General system configuration (beta): orangepi-config ]
```

```
Last login: Thu Sep 7 09:29:46 UTC 2023 on ttym1
To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.
```

```
orangepi@orangepirzero2w:~$ passwd
```

- ❑ For the current password, type `orangepi` and press enter, or `raspberrypi` if you're using a Raspberry Pi. You won't see any characters appear onscreen as you type. Then choose a new password and enter it. Write down your new password and/or store it in a password manager app.

```
orangepirzero2w login: orangepi (automatic login)
```



```
Welcome to Orange Pi 1.0.0 Jammy with Linux 6.1.31-sun50iw9
```

```
System load: 24% Up time: 0 min  
Memory usage: 17% of 981M IP:  
CPU temp: 54°C Usage of /: 7% of 29G
```

```
[ 0 security updates available, 2 updates total: apt upgrade ]  
Last check: 2023-09-07 09:29
```

```
[ General system configuration (beta): orangepi-config ]
```

```
Last login: Thu Sep 7 09:29:46 UTC 2023 on tty1  
To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo_root" for details.
```

```
orangepi@orangepirzero2w:~$ passwd  
Changing password for orangepi.  
Current password:  
New password:  
Retype new password: _
```

❑ You're currently logged in as a user called `orangepi`. Next you'll switch to the `root` user and change its password.

❑ Type `su root` and press enter. At the prompt, enter the default password `orangepi`.

```
orangepi@orangepirzero2w:~$ su root
```

❑ Now type `passwd` and press enter to set a new password for your `root` account.

```
root@orangepizero2w:~# passwd  
New password:  
Retype new password: _
```

- ❑ When you're done, run the command `su orangepi` to switch back to the user `orangepi`.

```
root@orangepizero2w:~# su orangepi
```

Increase the onscreen text size (optional)

If the onscreen text looks too small to read comfortably, follow the steps below to increase the size. Otherwise you can skip to the next step.

- ❑ Run the following command to open the `console-setup` preferences file using the text editor `nano`:

```
sudo nano /etc/default/console-setup
```

```
orangepi@orangepizero2w:~$ sudo nano /etc/default/console-setup
```

- Use the arrow keys on your keyboard to move the cursor to the line beginning with `FONTSIZE=`. Delete the value `8x16` and replace it with `16x32`.

```
GNU nano 6.2
# CONFIGURATION FILE FOR SETUPCON

# Consult the console-setup(5) manual page.

ACTIVE_CONSOLES="/dev/tty[1-6]"

CHARMAP="UTF-8"

CODESET="guess"
FONTFACE="Fixed"
FONTSIZE="16x32"

VIDEOMODE=

# The following is an example how to use a braille font
# FONT='lat9w-08.psf.gz brl-8x8.psf'
```

- When you're finished, press `ctrl + X` on your keyboard to close the file. At the bottom left of your screen you'll see the prompt **"Save modified buffer?"** Type `y` for "yes," then press **enter**.



- Press enter again to confirm the filename.

```
File Name to Write: /etc/default/console-setup  
^G Help  
^C Cancel M-D DOS Format  
M-M Mac Format
```

- ❑ Tip: You can use the command `clear` at any time to clear the whole screen.

```
orangepi@orangepizero2w:~$ clear
```

- ❑ Now run the command `sudo update-initramfs -u` to confirm the new font size.

```
orangepi@orangepizero2w:~$ sudo update-initramfs -u
```

- ❑ Reboot your computer with `sudo reboot`.

```
orangepi@orangepizero2w:~$ sudo update-initramfs -u  
update-initramfs: Generating /boot/initrd.img-6.1.31-sun50iw9  
update-initramfs: Converting to u-boot format  
orangepi@orangepizero2w:~$ sudo reboot
```

When your computer finishes rebooting, the font will be bigger.

Connect to the internet via Ethernet

If you want to use wi-fi temporarily, you can skip to the next section.

- ❑ Connect an Ethernet cable to your home router.
- ❑ Connect the other end of the Ethernet cable to your Ethernet-to-USB adapter.
- ❑ Plug USB end of the Ethernet-to-USB adapter into the open USB port on your single-board computer.

Connect to the internet via wi-fi (discouraged 😊)

If your computer is connected to your router via Ethernet, you can skip this section.

Run the command `sudo orangepi-config` to launch the Orange Pi configuration utility. (On a Raspberry Pi, use `sudo raspi-config` instead.)

```
orangepi@orangepirzero2w:~$ sudo orangepi-config
```

- ❑ You'll see a prompt that reads "**Configuration cannot work properly without a working internet connection.**" Press any key to continue.

```
orangepirzero2w login: orangepi (automatic login)

Welcome to Orange Pi 1.8.0 Jammy with Linux 6.1.31-sun50iw9

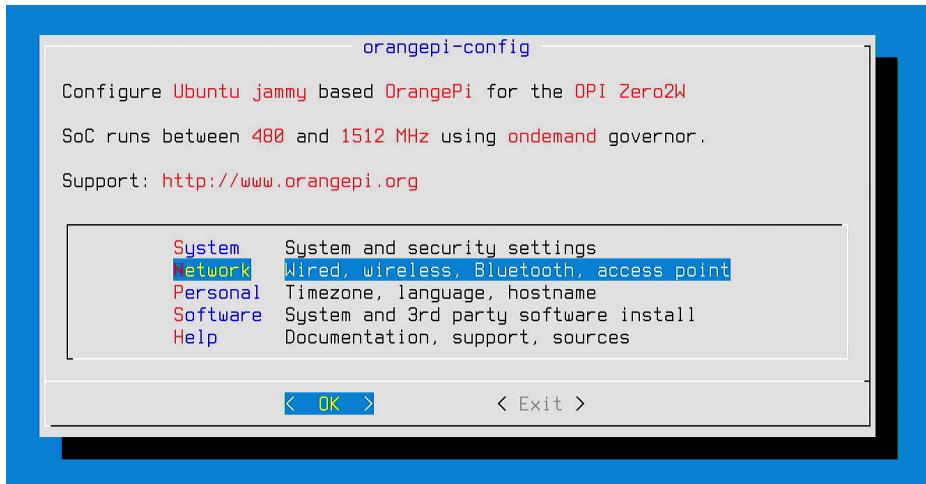
System load: 342 Up time: 0 min
Memory usage: 162 of 981M IP:
CPU temp: 56°C Usage of /: 7% of 296

[ 0 security updates available, 2 updates total: apt upgrade ]
Last check: 2023-09-07 09:43

[ General system configuration (beta): orangepi-config ]

Last login: Thu Sep 7 09:47:07 UTC 2023 on tty50
orangepir0@orangepirzero2w:~$ sudo orangepi-config
[sudo] password for orangepi:
Warning: Configuration cannot work properly without a working internet connection. Press CTRL C to stop or any key to ignore and continue._
```

- ❑ Use the down arrow key to select the Network menu, then press enter.



- ❑ Use the down arrow key to select the WiFi menu, then press enter.

Wired, Wireless, Bluetooth, Hotspot

IP (lo) via IFUPDOWN: 127.0.0.1

Note: This tool can be successful only when drivers are configured properly. If auto-detection fails, you are on your own.

- | | |
|-------------|--|
| IP | Select dynamic or edit static IP address |
| Hotspot | Create WiFi access point |
| IPv6 | Disable IPv6 for APT and system |
| Iperf3 | Enable network throughput tests daemon |
| WiFi | Manage wireless networking |
| Remove IR | Remove IR support |
| BT remove | Remove Bluetooth support |
| BT discover | Discover and connect Bluetooth devices |
| Advanced | Edit /etc/network/interfaces |

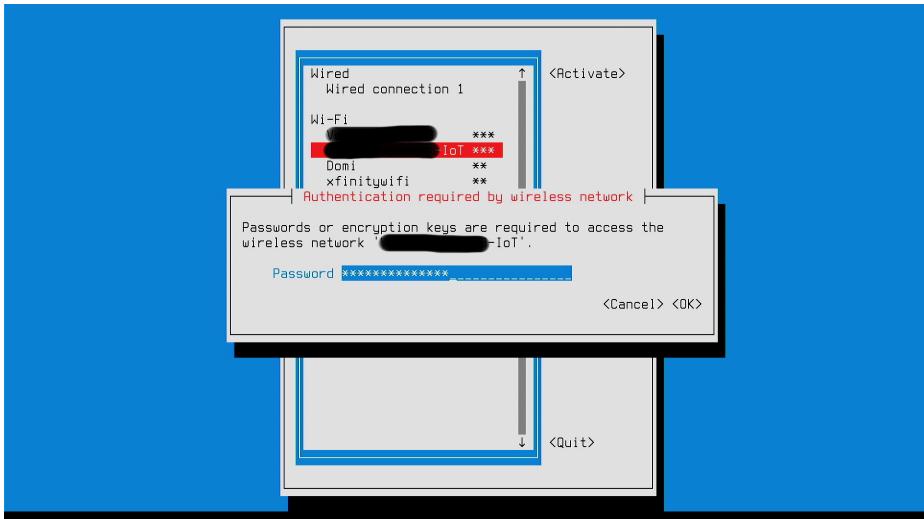
< OK >

< Back >

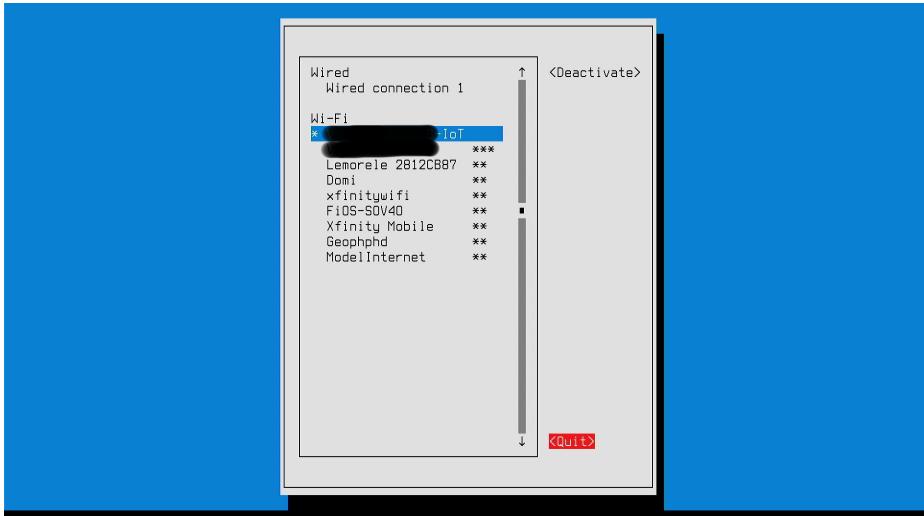
- You'll see a list of available wi-fi networks. Select your home network, then press enter. (Note: Some routers let you create a secondary wi-fi network, intended to keep IoT (Internet of Things) devices like security cameras separate from your primary network. If you're planning to leave your server connected to wi-fi, you may want to use your router's IoT network as a security precaution.)



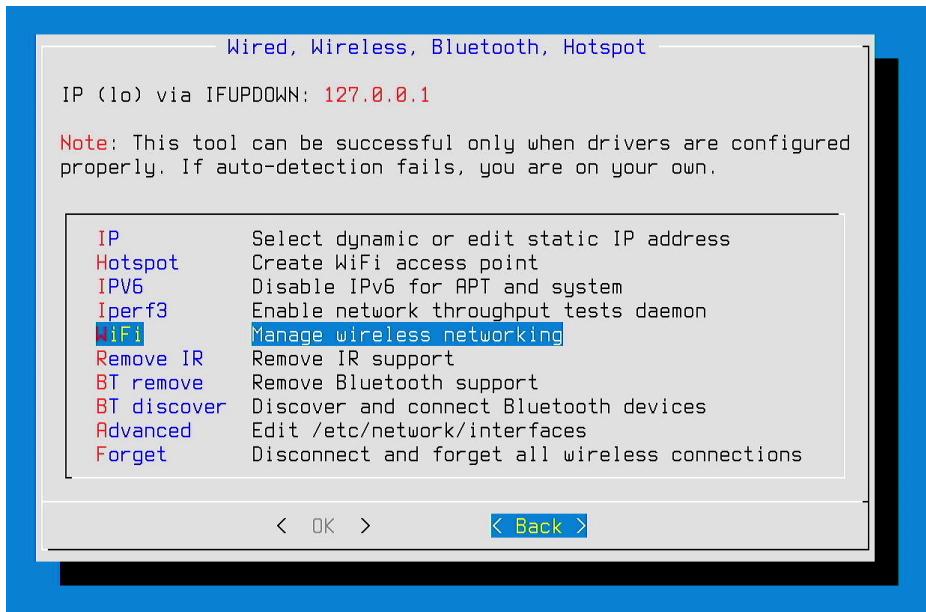
- ❑ Enter your password at the prompt.



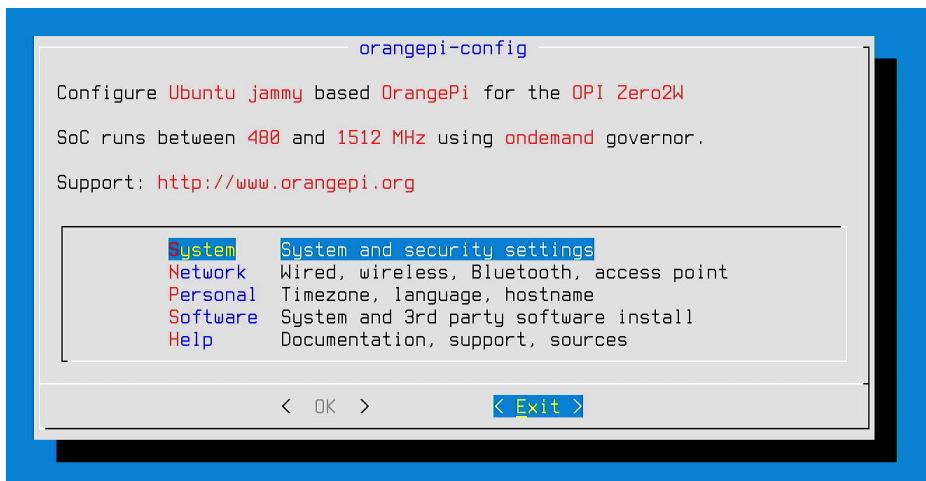
- ❑ Use the arrow keys to select `Quit`, then press enter.



- ❑ Use the arrow keys to select `Back`, then press enter.



- ❑ Now select `Exit`. Then press **enter** to close the configuration menu.



Update your system software

❑ Now that you're connected to the internet, you'll want to update your software packages. This step is important because some packages may need updates for security reasons.

❑ Type the command below (actually two commands separated by `&&`, then press enter.

```
sudo apt update && sudo apt-y upgrade
```

```
orangeipi@orangepizero2w:~$ sudo apt update && sudo apt -y upgrade
```

❑ Enter your password at the prompt and press enter. It may take 10+ minutes for your packages to download and update.

```
orangeipi@orangepizero2w:~$ sudo apt update && sudo apt -y upgrade
[sudo] password for orangeipi:
Hit:1 http://repo.huaweicloud.com/ubuntu-ports jammy InRelease
Get:2 http://repo.huaweicloud.com/ubuntu-ports jammy-security InRelease [110 kB]
Get:3 https://mirrors.aliyun.com/docker-ce/linux/ubuntu jammy InRelease [48.8 kB]
Get:4 http://repo.huaweicloud.com/ubuntu-ports jammy-updates InRelease [119 kB]
Get:5 http://repo.huaweicloud.com/ubuntu-ports jammy-backports InRelease [109 kB]
Get:6 http://repo.huaweicloud.com/ubuntu-ports jammy-security/multiverse armhf Packages [1,201 kB]
Get:7 http://repo.huaweicloud.com/ubuntu-ports jammy-security/restricted armhf Packages [14.8 kB]
Get:8 http://repo.huaweicloud.com/ubuntu-ports jammy-security/multiverse arm64 Packages [24.0 kB]
Get:9 http://repo.huaweicloud.com/ubuntu-ports jammy-security/universe armhf Packages [747 kB]
Get:10 http://repo.huaweicloud.com/ubuntu-ports jammy-security/main arm64 Packages [1,323 kB]
Get:11 http://repo.huaweicloud.com/ubuntu-ports jammy-security/universe arm64 Packages [1,000 kB]
Get:12 http://repo.huaweicloud.com/ubuntu-ports jammy-security/restricted arm64 Packages [1,383 kB]
Get:13 https://mirrors.aliyun.com/docker-ce/linux/ubuntu jammy/stable arm64 Packages [36.7 kB]
Get:14 http://repo.huaweicloud.com/ubuntu-ports jammy-security/main armhf Packages [736 kB]
Get:15 http://repo.huaweicloud.com/ubuntu-ports jammy-updates/multiverse arm64 Packages [28.4 kB]
Get:16 http://repo.huaweicloud.com/ubuntu-ports jammy-updates/restricted armhf Packages [16.0 kB]
Get:17 http://repo.huaweicloud.com/ubuntu-ports jammy-updates/main armhf Packages [999 kB]
Get:18 http://repo.huaweicloud.com/ubuntu-ports jammy-updates/universe arm64 Packages [1,276 kB]
Get:19 http://repo.huaweicloud.com/ubuntu-ports jammy-updates/universe armhf Packages [1,012 kB]
Get:20 http://repo.huaweicloud.com/ubuntu-ports jammy-updates/restricted arm64 Packages [1,402 kB]
Get:21 http://repo.huaweicloud.com/ubuntu-ports jammy-updates/multiverse armhf Packages [3,849 kB]
Get:22 http://repo.huaweicloud.com/ubuntu-ports jammy-updates/main arm64 Packages [1,593 kB]
Get:23 http://repo.huaweicloud.com/ubuntu-ports jammy-backports/universe armhf Packages [31.3 kB]
Get:24 http://repo.huaweicloud.com/ubuntu-ports jammy-backports/main arm64 Packages [80.5 kB]
Get:25 http://repo.huaweicloud.com/ubuntu-ports jammy-backports/universe arm64 Packages [31.3 kB]
Get:26 http://repo.huaweicloud.com/ubuntu-ports jammy-backports/main armhf Packages [80.5 kB]
Fetched 12.2 Mb in 8s (1,535 kB/s)
Reading package lists... 9%
```

Update your hostname

Your **hostname** is a short alphanumeric name for each device on a network, sort of like a nickname. Setting a descriptive hostname will make it easier to tell which device is which (for example, when using your router admin panel).

- To see your current hostname, enter the command `hostname` and press enter. The default hostname is `orangepirzero2w`.

```
orangepi@orangepirzero2w:~$ hostname  
orangepirzero2w  
orangepi@orangepirzero2w:~$ _
```

- Now run the command below, replacing **Zine-Gallery** with a descriptive name for your server (no spaces allowed, but hyphens are OK). You'll be prompted to enter your password.

```
hostnamectl set-hostname Zine-Gallery
```

```
orangepi@orangepirzero2w:~$ hostname  
orangepirzero2w  
orangepi@orangepirzero2w:~$ hostnamectl set-hostname Zine-Gallery
```

Set up a firewall

A firewall is a piece of software that restricts access to your device over the network. In this section you'll install and configure the firewall `ufw`, which will permit or deny each network request (inbound and outbound).

- You'll start by installing `ufw` (short for "Uncomplicated Firewall"). Run the command `sudo apt install ufw`, then follow the prompts.

```
orangepi@orangepizero2w:~$ sudo apt install ufw
```

- ❑ Run the command below to deny incoming network connections by default.

```
sudo ufw default deny incoming
```

```
orangepi@orangepizero2w:/etc/apache2/sites-available$ sudo ufw default deny incoming
```

- ❑ Run the command below to allow outgoing network connections by default.

```
sudo ufw default allow outgoing
```

```
orangepi@orangepizero2w:/etc/apache2/sites-available$ sudo ufw default deny incoming
Default incoming policy changed to 'deny'
(Be sure to update your rules accordingly)
orangepi@orangepizero2w:/etc/apache2/sites-available$ sudo ufw default allow outgoing
```

- ❑ Run the command below to allow incoming TCP connections on port 80:

```
sudo ufw allow 80/tcp
```

```
orangepi@orangepizero2w:/etc/apache2/sites-available$ sudo ufw default deny incoming
Default incoming policy changed to 'deny'
(be sure to update your rules accordingly)
orangepi@orangepizero2w:/etc/apache2/sites-available$ sudo ufw default allow outgoing
Default outgoing policy changed to 'allow'
(be sure to update your rules accordingly)
orangepi@orangepizero2w:/etc/apache2/sites-available$ sudo ufw allow 80/tcp
```

- ❑ Now run the command below to allow incoming TCP connections on port 22. This will make it possible to connect to your server via SSH, which we'll set up in a later section.

```
sudo ufw allow 22/tcp
```

```
orangepi@Zine-Gallery:~$ sudo ufw allow 22/tcp
Rule added
Rule added (v6)
orangepi@Zine-Gallery:~$ _
```

- ❑ Now run the command `sudo ufw enable` to turn on your firewall.

```
orangepi@orangepizero2w:/etc/apache2/sites-available$ sudo ufw default deny incoming
Default incoming policy changed to 'deny'
(be sure to update your rules accordingly)
orangepi@orangepizero2w:/etc/apache2/sites-available$ sudo ufw default allow outgoing
Default outgoing policy changed to 'allow'
(be sure to update your rules accordingly)
orangepi@orangepizero2w:/etc/apache2/sites-available$ sudo ufw allow 80/tcp
Rules updated
Rules updated (v6)
orangepi@orangepizero2w:/etc/apache2/sites-available$ sudo ufw enable
```

Install Apache

Next you'll install Apache HTTP Server, one of the most widely used web server programs. (Note: The term "web server" can refer to a piece of software that serves websites, like Apache. "Web server" can also refer to the computer the software is running on.)

- Run the command below to install Apache. You'll be prompted to enter your password.

```
sudo apt install apache2
```

```
orangepi@orangepizero2w:~$ sudo apt install apache2
```

Now you'll make a directory to store your website files in. The `mkdir` command makes a directory, and the `-p` option creates any parent directories in the path if they don't already exist.

- Type the command below to create the directory you'll use for your website files, replacing `zinegallery.iffybooks.net` with the domain you chose earlier.

```
sudo mkdir -p /var/www/zinegallery.iffybooks.net
```

```
orangepi@orangepizero2w:~$ sudo mkdir -p /var/www/zinegallery.iffybooks.net
```

- Use `chown` to set the current user (`orangepi`) as the owner of the directory you just created. (Replace `zinegallery.iffybooks.net` below with the name of the directory you just created.)

```
sudo chown -R $USER:$USER  
/var/www/zinegallery.iffybooks.net
```

```
orangepi@orangepizero2w:~$ sudo mkdir -p /var/www/zinegallery.iffybooks.net  
orangepi@orangepizero2w:~$ sudo chown -R $USER:$USER /var/www/zinegallery.iffybooks.net/
```

- ❑ Now use `chmod` to set read-write-execute permissions for the directory `/var/www/`. The `755` option means only the owner (`orangepi`) can write to the directory, while all users will have read and execute permissions.

```
sudo chmod -R 755 /var/www/
```

```
orangepi@orangepizero2w:~$ sudo mkdir -p /var/www/zinegallery.iffybooks.net  
orangepi@orangepizero2w:~$ sudo chown -R $USER:$USER /var/www/zinegallery.iffybooks.net/  
orangepi@orangepizero2w:~$ sudo chmod -R 755 /var/www/
```

- ❑ Use `cd` to change your current working directory to the directory you just created. (*Tip: After typing `/var/www/` and the first letter or two of your directory name, press **tab** to autocomplete the rest of the pathname.*)

```
cd /var/www/zinegallery.iffybooks.net/
```

```
orangepi@orangepizero2w:~$ cd /var/www/zinegallery.iffybooks.net/
```

- ❑ Next you'll use the text editor `nano` to create a file called `index.html`. This will be the first page people will see when they visit your website.

```
sudo nano index.html
```

```
orangepi@orangepizero2w:~$ cd /var/www/zinegallery.iffybooks.net/
orangepi@orangepizero2w:/var/www/zinegallery.iffybooks.net$ sudo nano index.html
```

- ❑ Now you'll type out some HTML code for a basic web page, just to use as a test. You can adapt the code below, or do a web search for example web pages.

```
<!DOCTYPE html>
<html>
  <head>
    <title>Zine Gallery</title>
  </head>
  <body>
    <h1>Welcome to the Zine Gallery!</h1>
    <p>(still under construction!)</p>
  </body>
</html>
```

```
GNU nano 6.2                                         index.html *
<html>
  <head>
    <title>Zine Gallery</title>
  </head>
  <body>
    <h1>Welcome to the Zine Gallery!</h1>
    <p>(still under construction!)</p>
  </body>
</html>
```

- ❑ When you're ready to save your file, press **ctrl+X** to exit. Follow the prompts at the bottom of the screen to save the file.

Create Apache configuration file

- Run the command below to change your current working directory to `/etc/apache2/sites-available`.

```
cd /etc/apache2/sites-available/
```

```
orangepi@orangepirzero2w:/var/www/zinegallery.iffybooks.net$ cd /etc/apache2/sites-available/
```

- Type `ls` and press **enter** to see what files are in the current directory.

```
orangepi@orangepirzero2w:/var/www/zinegallery.iffybooks.net$ cd /etc/apache2/sites-available/
orangepi@orangepirzero2w:/etc/apache2/sites-available$ ls
000-default.conf  default-ssl.conf
orangepi@orangepirzero2w:/etc/apache2/sites-available$
```

- Use `cp` to make a copy of the file `000-default.conf`. In the example below, the new file will be called `zinegallery.iffybooks.net.conf`; yours should be the domain you chose earlier followed by `.conf`.

```
sudo cp 000-default.conf zinegallery.iffybooks.net.conf
```

```
orangepi@orangepirzero2w:/var/www/zinegallery.iffybooks.net$ cd /etc/apache2/sites-available/
orangepi@orangepirzero2w:/etc/apache2/sites-available$ ls
000-default.conf  default-ssl.conf
orangepi@orangepirzero2w:/etc/apache2/sites-available$ sudo cp 000-default.conf zinegallery.iffybooks.net.conf
```

- Now you'll use `nano` to open the configuration file you just created.

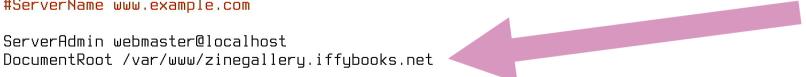
```
sudo nano zinegallery.iffybooks.net.conf
```

```
orangepi@orangepizero2u:/var/www/zinegallery.iffybooks.net$ cd /etc/apache2/sites-available/
orangepi@orangepizero2u:/etc/apache2/sites-available$ ls
000-default.conf  default-ssl.conf
orangepi@orangepizero2u:/etc/apache2/sites-available$ sudo cp 000-default.conf zinegallery.iffybooks.net.conf
orangepi@orangepizero2u:/etc/apache2/sites-available$ sudo nano zinegallery.iffybooks.net.conf
```

- ❑ Use your arrow keys to move the cursor to the line `DocumentRoot /var/www/html`. Delete `html` at the end and replace it with the name of the directory where your website files are located (i.e., the domain you chose). Here's an example:

```
DocumentRoot /var/www/zinegallery.iffybooks.net
```

```
GNU nano 6.2                                     zinegallery.iffybooks.net.conf *
<VirtualHost *:80>
    # The ServerName directive sets the request scheme, hostname and port that
    # the server uses to identify itself. This is used when creating
    # redirection URLs. In the context of virtual hosts, the ServerName
    # specifies what hostname must appear in the request's Host: header to
    # match this virtual host. For the default virtual host (this file) this
    # value is not decisive as it is used as a last resort host regardless.
    # However, you must set it for any further virtual host explicitly.
    #ServerName www.example.com

    ServerAdmin webmaster@localhost
    DocumentRoot /var/www/zinegallery.iffybooks.net

    # Available loglevels: trace8, ..., trace1, debug, info, notice, warn,
    # error, crit, alert, emerg.
    # It is also possible to configure the loglevel for particular
    # modules, e.g.
    #LogLevel info ssl:warn

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

    # For most configuration files from conf-available/, which are
    # enabled or disabled at a global level, it is possible to
    # include a line for only one particular virtual host. For example the
    # following line enables the CGI configuration for this host only
    # after it has been globally disabled with "a2disconf".
    #Include conf-available/serve-cgi-bin.conf
</VirtualHost>
```

At the bottom of the screen, there is a menu bar with the following options: Help (F1), Write Out (F2), Where Is (F3), Cut (F4), Paste (F5), Execute (F6), Justify (F7), Location (F8), Go To Line (F9), Undo (M-U), and Redo (M-E).

- ❑ Create two new lines above the one you just edited, and type out the following options. (If you decide to host more than one website

on your server, you'll update these lines later.) When you're done, press **ctrl + X** and follow the prompts to save the file.

```
ServerName localhost
ServerAlias localhost
```

```
GNU nano 5.2                                     zinegallery.iffybooks.net.conf *
<VirtualHost *:80>
    # The ServerName directive sets the request scheme, hostname and port that
    # the server uses to identify itself. This is used when creating
    # redirection URLs. In the context of virtual hosts, the ServerName
    # specifies what hostname must appear in the request's Host: header to
    # match this virtual host. For the default virtual host (this file) this
    # value is not decisive as it is used as a last resort host regardless.
    # However, you must set it for any further virtual host explicitly.
    #ServerName www.example.com

    ServerAdmin webmaster@localhost
    ServerName localhost
    ServerAlias localhost
    DocumentRoot /var/www/zinegallery.iffybooks.net

    # Available loglevels: trace0, ..., trace1, debug, info, notice, warn,
    # error, crit, alert, emerg.
    # It is also possible to configure the loglevel for particular
    # modules, e.g.
    #LogLevel info ssl:warn

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

    # For most configuration files from conf-available/, which are
    # enabled or disabled at a global level, it is possible to
    # include a line for only one particular virtual host. For example the
    # following line enables the CGI configuration for this host only
    # after it has been globally disabled with "a2disconf".
    #
```

Toolbar:

- H** Help
- X** Exit
- W** Write Out
- R** Read File
- W** Where Is
- R** Replace
- C** Cut
- P** Paste
- E** Execute
- J** Justify
- L** Location
- G** Go To Line
- U** Undo
- R** Redo
- M** Set Mark
- C** Copy

Enable your website

- Run the following command to have Apache enable your website:

```
sudo a2ensite zinegallery.iffybooks.net.conf
```

```
orangepi@orangepizero2w:/etc/apache2/sites-available$ sudo a2ensite zinegallery.iffybooks.net.conf
```

- Next, run this command to disable the site Apache runs by default:

```
sudo a2dissite 000-default.conf
```

```
orangepi@orangepizero2w:/etc/apache2/sites-available$ sudo a2ensite zinegallery.iffybooks.net.conf
Enabling site zinegallery.iffybooks.net.
To activate the new configuration, you need to run:
    systemctl reload apache2
orangepi@orangepizero2w:/etc/apache2/sites-available$ sudo a2dissite 000-default.conf
```

- ❑ Restart Apache with the following command:

```
systemctl reload apache2
```

```
orangepi@orangepizero2w:/etc/apache2/sites-available$ sudo a2ensite zinegallery.iffybooks.net.conf
Enabling site zinegallery.iffybooks.net.
To activate the new configuration, you need to run:
    systemctl reload apache2
orangepi@orangepizero2w:/etc/apache2/sites-available$ sudo a2dissite 000-default.conf
Site 000-default disabled.
To activate the new configuration, you need to run:
    systemctl reload apache2
orangepi@orangepizero2w:/etc/apache2/sites-available$ systemctl reload apache2
```

Set up ports.conf

- ❑ Run the command `cd /etc/apache2/` to change your current working directory to `/etc/apache2/`. Then use `ls` to view the directory's contents.

```
orangepi@orangepizero2w:/etc/apache2/sites-available$ cd /etc/apache2/
orangepi@orangepizero2w:/etc/apache2$ ls
apache2.conf  conf-enabled  magic      mods-enabled  sites-available
conf-available envvars     mods-available ports.conf   sites-enabled
orangepi@orangepizero2w:/etc/apache2$
```

- ❑ Use the following command to open the configuration file `ports.conf` with the text editor `nano`.

```
sudo nano ports.conf
```

```
orangepi@orangezero2w:/etc/apache2$ sudo nano ports.conf
```

- ☐ Find the line beginning with "Listen" and update it to match the line below. This change will expose your Apache website to other devices on your network.

```
Listen 0.0.0.0:80
```

```
GNU nano 6.2                                     ports.conf *
# If you just change the port or add more ports here, you will likely also
# have to change the VirtualHost statement in
# /etc/apache2/sites-enabled/000-default.conf

Listen 0.0.0.0:80

<IfModule ssl_module>
    Listen 443
</IfModule>

<IfModule mod_gnutls.c>
    Listen 443
</IfModule>

# vim: syntax=apache ts=4 sw=4 sts=4 sr noet
```

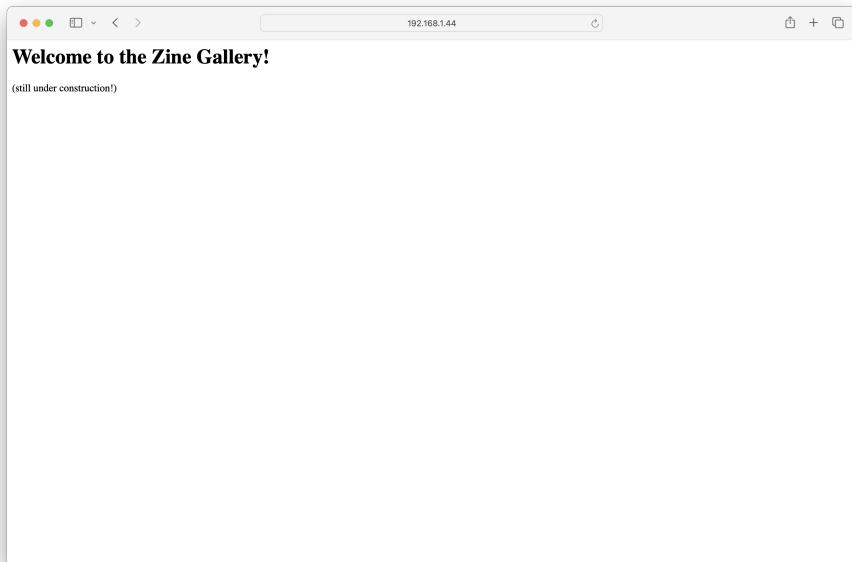
Find your IP address

- ☐ Run the command `ip addr` to find your IP address on the local network. Look for a line beginning with `inet 192.168.`, which will be under `eth0` if you're using ethernet or `wlan0` if you're using wi-fi. In the example below, the server's local IP address is `192.168.1.44`.

```
orangepi@orangepizero2w:/etc/apache2$ ip addr
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    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: eth0: <NO-CARRIER,BROADCAST,MULTICAST,UP> mtu 1500 qdisc fq_codel state DOWN group default qlen 1000
    link/ether 7e:1b:f7:14:5b:e1 brd ff:ff:ff:ff:ff:ff
3: wlan0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 60:52:de:a7:21:d4 brd ff:ff:ff:ff:ff:ff
        inet 192.168.1.44/24 brd 192.168.1.255 scope global dynamic noprefixroute wlan0
            valid_lft 83598sec preferred_lft 83598sec
        inet6 fe80::3e62:e1ff:998d:f61a/64 scope link noprefixroute
            valid_lft forever preferred_lft forever
orangepi@orangepizero2w:/etc/apache2$
```

Test your site on the local network

- On a computer connected to the same network as your server, open a web browser, type the server's IP address in the address bar, and press enter. You should see your test website!



Reboot

Set a static IP address

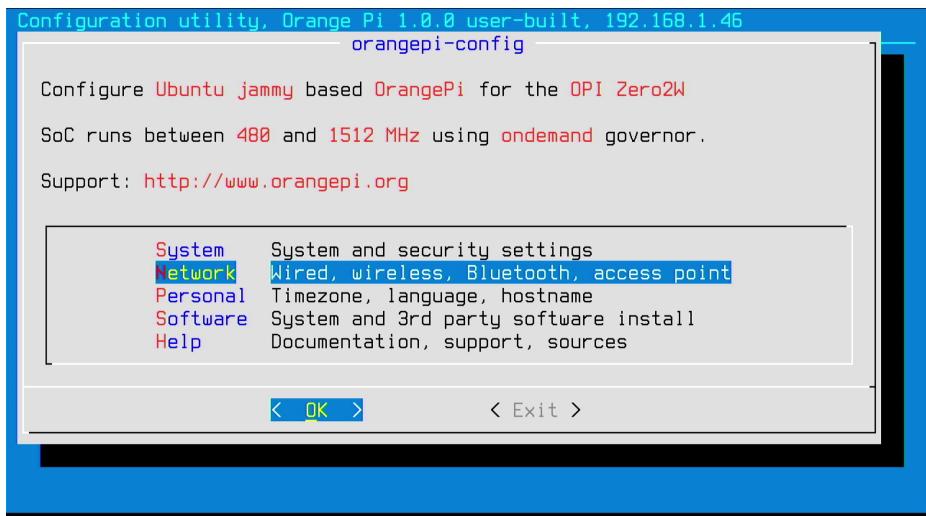
- ❑ Ordinarily, when you connect a computer to a network it's assigned a local IP address by a DHCP server program running on the router. Every time you connect to the network your machine will be given an arbitrary address that isn't already taken, typically beginning with 192.168 .

Alternatively, you can give your computer a static IP address that never changes. In this case, a static IP address is required to set up port forwarding, which we'll cover in a future step.

Run the command `sudo orangepi-config` to launch the Orange Pi configuration utility. (On a Raspberry Pi, use `raspi-config` instead.)

```
orangepi@Zine-Gallery:~$ sudo orangepi-config
```

- ❑ Select the `Network` menu and press enter.



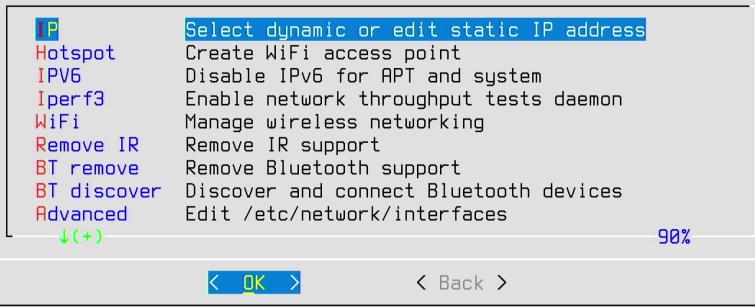
- ❑ Select `IP` and press enter.

Con

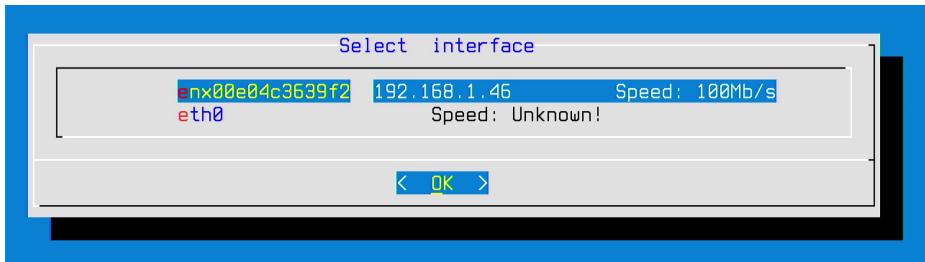
Wired, Wireless, Bluetooth, Hotspot

IP (enx00e04c3639f2) via Network Manager: 192.168.1.46

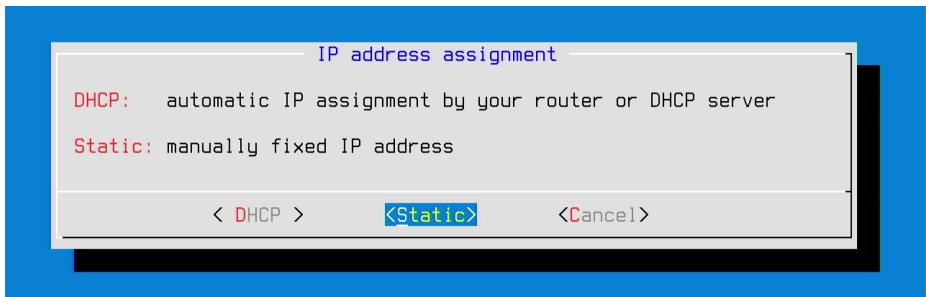
Note: This tool can be successful only when drivers are configured properly. If auto-detection fails, you are on your own.



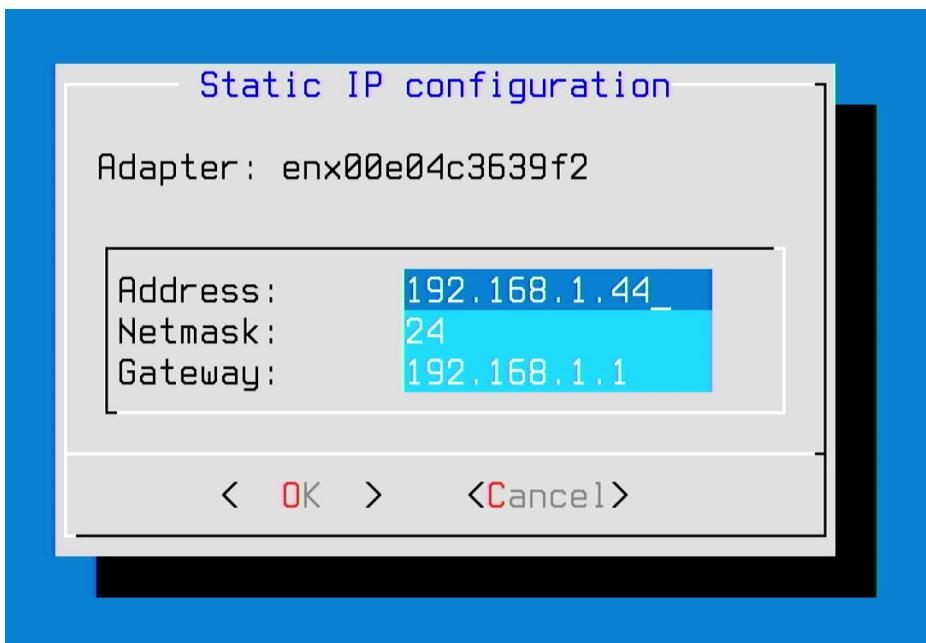
- Select the `eth0` option if your computer is connected via Ethernet, or select the option beginning with `en` if you're using wi-fi. (We recommend using Ethernet if possible, but we're using wi-fi in the example below.)



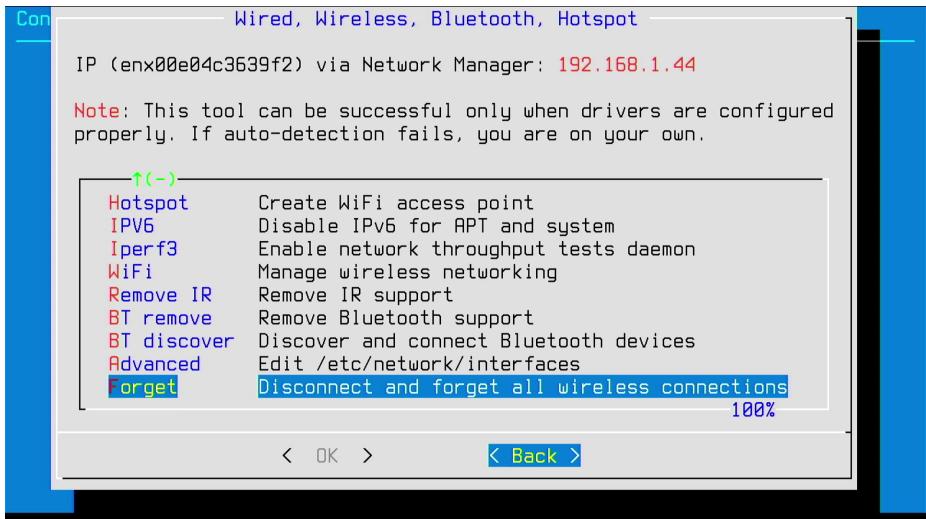
- Select the `Static` option and press enter.



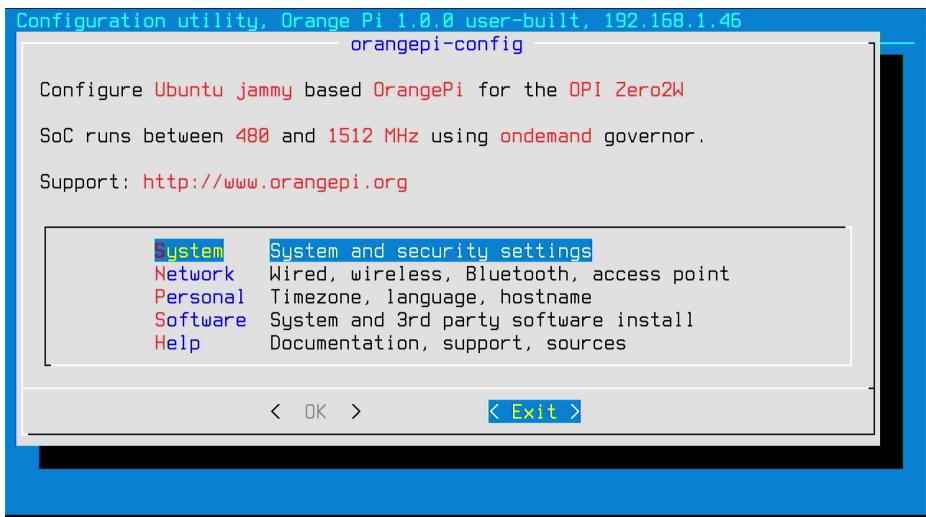
- ❑ Next to **Address**, enter the local IP address you'd like to use. It should begin with **192.168.1.** and end with a number from 2 to 255. You may want to leave this option as-is, because you know your DHCP-assigned IP address isn't being used by another device. Select **OK** and press enter to save your configuration.



- ❑ Select **Back** and press enter.



- Select **Exit** and press enter to close the configuration utility.



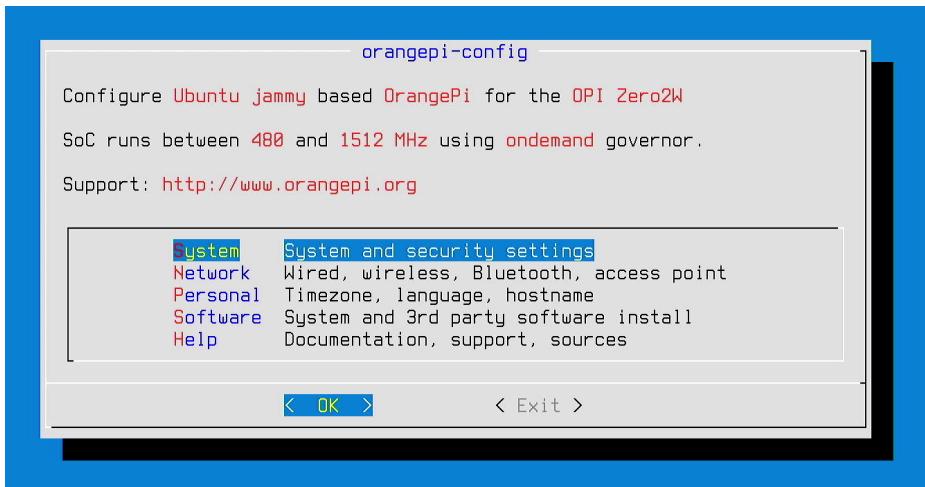
Reboot

Enable local SSH access

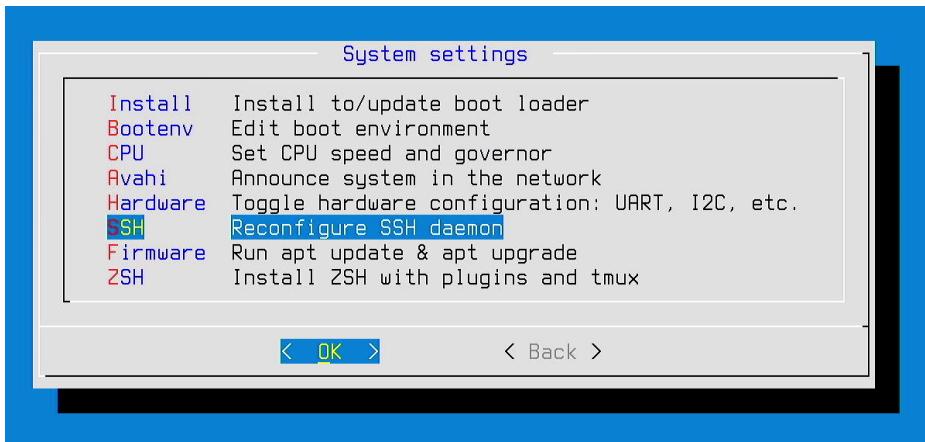
- ❑ Run the command `sudo orangepi-config` to open the Orange Pi configuration utility.

```
orangepi@orangepirzero2w:/etc/apache2/sites-available$ sudo orangepi-config
```

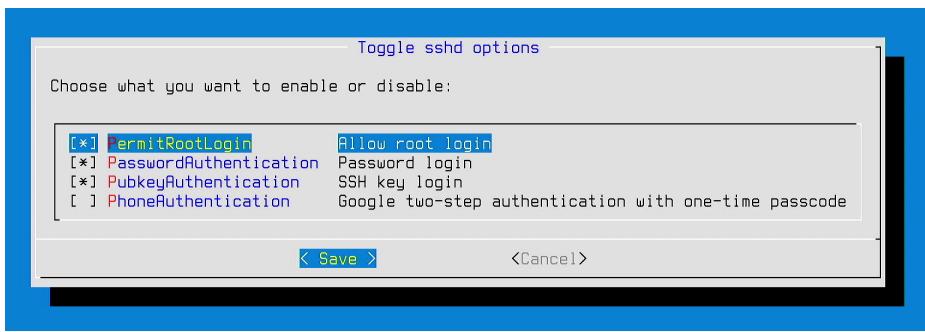
- ❑ Select `System` and press enter.



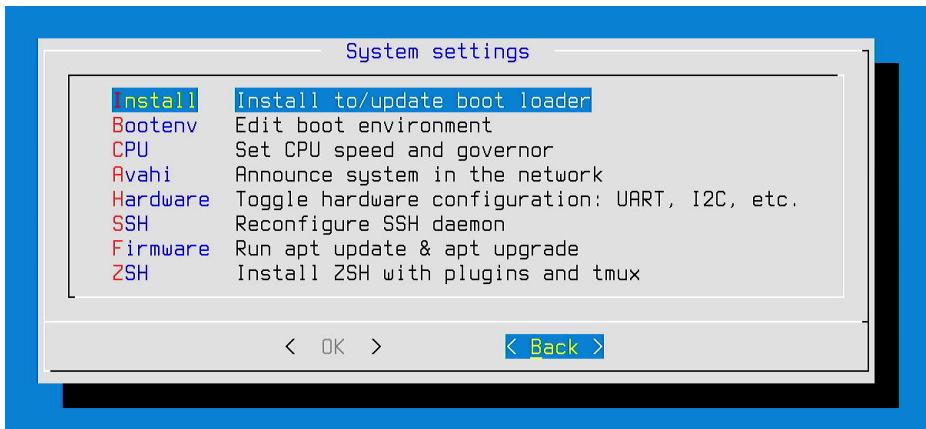
- ❑ Select `SSH` and press enter.



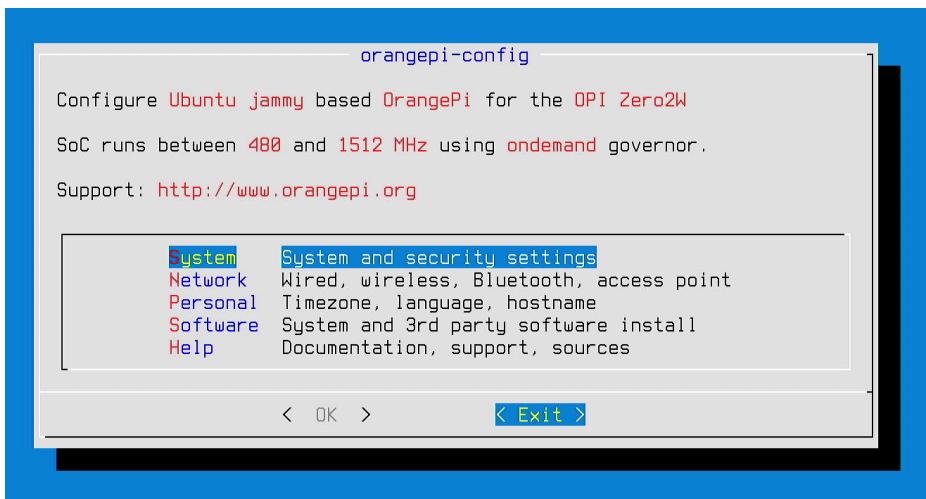
- ❑ The first three options (PermitRootLogin , Password Authentication , and PubkeyAuthentication) should be selected by default. Move your cursor to Save and press enter to enable SSH access.



- ❑ Select Back and press enter.



- ❑ Select `Exit` and press enter to close the configuration utility.



- ❑ Run the command `reboot` to reboot your computer.

```
orangepi@orangepirzero2w:/etc/apache2/sites-available$ reboot
```

Test your SSH connection

![loading-ag-1007](images/Screenshot 2024-05-04 at 15.39.44.png)

![loading-ag-1008](images/Screenshot 2024-05-04 at 15.39.49.png)

![Screenshot 2024-05-04 at 15.40.00.png](images/Screenshot 2024-05-04 at 15.40.00.png)

Update your website from another computer using scp

![Screenshot 2024-05-04 at 15.55.57.png](images/Screenshot 2024-05-04 at 15.55.57.png)

![Screenshot 2024-05-04 at 15.43.08.png](images/Screenshot 2024-05-04 at 15.43.08.png)

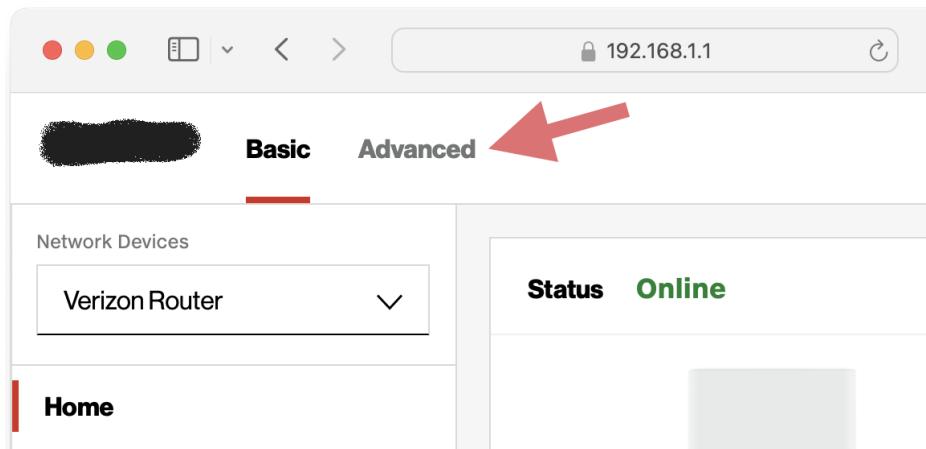
![Screenshot 2024-05-04 at 15.56.17.png](images/Screenshot 2024-05-04 at 15.56.17.png)

![Screenshot 2024-05-04 at 15.57.08.png](images/Screenshot 2024-05-04 at 15.57.08.png)

Set up port forwarding on your router

- Open a web browser on a desktop computer and enter the IP address for your router's admin panel. There's a good chance the IP address is 192.168.1.1. Press enter, then log in with your admin password.

If your ISP is V******, you'll need to click **Advanced** at the top of the window to switch to the advanced admin panel.



- Navigate to **Security & Firewall**, then **Port Forwarding**.

The screenshot shows a web-based interface for managing network devices. At the top, there are tabs for 'Basic' and 'Advanced'. Below this, a dropdown menu shows 'Verizon Router'. On the left, a sidebar lists several options: 'Security & Firewall' (with a red arrow pointing to it), 'General', 'Access Control', 'DMZ Host', 'IPv6 Pinholes', 'Port Forwarding' (with a red arrow pointing to it), 'Port Forwarding Rules', and 'Port Triggering'. The main content area is titled 'Port Forwarding' and includes a sub-section 'Create Rule'. It features fields for 'Application' (with a dropdown menu) and 'Fwd to Addr' (with a dropdown menu set to 'Select').

- Under **Application**, give your server a name. The example is called **Zine Gallery Server**. For **Original Port** and **Forward to Port**, enter **80**. **Protocol** should be set to **TCP**. Under **Fwd to Addr**, type your server's static IP address. When you're done, click **Add to list** to create your port forwarding rule.

Basic Advanced

Network Devices
Verizon Router

General

Access Control

DMZ Host

IPv6 Pinholes

Port Forwarding

Port Forwarding Rules

Port Triggering

Scheduler Rules

Security & Firewall > Port Forwarding

Port Forwarding

Open a tunnel between remote computers and a device port on your Home Network (LAN). Supports gaming, IoT, home security devices and more.

Create Rule

Application	Original Port	Protocol
Zine Gallery Server	80	TCP
Fwd to Addr	Fwd to Port	Schedule
192.168.1.44	80	Always

Add to list

- ☐ To confirm port forwarding works, go to ipchicken.com and find your home IP address.

ipchicken.com



Current IP Address

[REDACTED]

[Add to Favorites](#)

 A Technician Will Answer Your Questions in Minutes. Chat Now. [OPEN >](#)

Advanced

- Name Address: [REDACTED]
- Remote Port: 52920
- Browser: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7)
- AppleWebKit/605.1.15 (KHTML, like Gecko) Version/17.4.1 Safari/605.1.15



ip CHICKEN

Served fresh daily.™

CURRENT IP | SECURITY PORT SCAN | HELP

Current IP Address

[REDACTED]

[Add to Favorites](#)

 A Technician Will Answer Your Questions in Minutes. Chat Now. [OPEN >](#)

Advanced

- Name Address: [REDACTED]
- Remote Port: 52920
- Browser: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/605.1.15 (KHTML, like Gecko) Version/17.4.1 Safari/605.1.15



ip CHICKEN

Served fresh daily.™

CURRENT IP | SECURITY PORT SCAN | HELP

Current IP Address

[REDACTED]

[Add to Favorites](#)

 A Technician Will Answer Your Questions in Minutes. Chat Now. [OPEN >](#)

Advanced

- Name Address: [REDACTED]
- Remote Port: 52920
- Browser: Mozilla/5.0 (Macintosh; Intel Mac OS X 10_15_7) AppleWebKit/605.1.15 (KHTML, like Gecko) Version/17.4.1 Safari/605.1.15

- Copy and paste your home IP address into your URL bar and press enter, and you should see your website.

Set up DDNS for your own domain or subdomain

Note: If you created a subdomain through dynv6 at the beginning of the project, you can skip this step.

Go to **dynv6.com** and create an account. Then go to **My Domains** and click **Add Domain**.

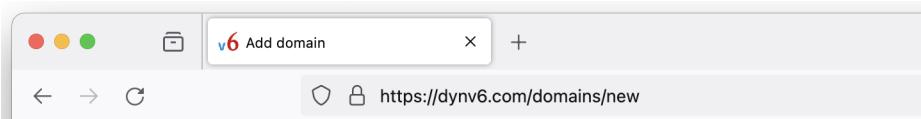
The screenshot shows the top navigation bar of the dynv6 website. It includes the dynv6 logo, links for Documentation and Community, and a dropdown menu for My Zones, My Domains, and an email address (iffybooks@protonmail.com). There is also a green button for '+ Add Domain'.

My Domains

Name	Status	Type
------	--------	------

+ Add Domain

Type your domain or subdomain in the box and click **Add domain**.



Add your delegated domain

Domain

zinegallery.iffybooks.net

Add domain

Next you'll update your domain settings to use the following three name servers for your domain or subdomain:

- ns1.dynv6.com.
- ns2.dynv6.com.
- ns3.dynv6.com.

If you're using a domain you just registered, you can update your domain records on the site where you registered it.

If you're using a subdomain with a domain you're already using, you can update your domain records through your VPS provider or hosting service. On DigitalOcean, for example, you can find domain settings under **Manage > Networking > Domains**.

Create a new **NS** (name server) record for the domain or subdomain you're using, and enter ns1.dynv6.com as the same server. Click **Create Record**.

Create new record Learn 

A AAAA CNAME MX TXT **NS** SRV CAA

NS records specify the servers which are providing DNS services for your domain. You can use these to create subzones if you need to direct part of your traffic to another DNS service.

HOSTNAME Enter @ or hostname zinellibrary	WILL DIRECT TO Enter nameserver ns1.dynv6.com	TTL (SECONDS) Enter TTL 86400	Create Record
---	---	-------------------------------------	----------------------

zinellibrary.ifyfbooks.net

Repeat the previous step two more times, creating **NS** records that point to ns2.dynv6.com and ns3.dynv6.com.

Install ddclient

- ❑ Go to dynv6.com on your desktop computer. Click **My Zones** and select your domain/subdomain from the dropdown menu.

Click on **Instructions**, then scroll down to the section titled **ddclient**. Keep this browser window open so you can access the password in a few steps.

ddclient

Use the following snippet in your ddclient.conf of **ddclient**:

```
protocol=dyndns2
server=dynv6.com
login=None
password='████████████████████████████████████████'
zinegallery.iffybooks.net
```

Additionally you also need to specify the interface to use, like `use=if, if=eth0`

On your single-board computer, run the command below to install **ddclient**. Type `y` at the prompt and press enter to confirm.

```
sudo apt install ddclient
```

```
orangepi@Zine-Gallery:/var/www/zinegallery.iffybooks.net$ sudo apt install ddclient
```

Run this command to install a required dependency:

```
sudo apt install libio-socket-ssl-perl
```

Once **ddclient** is installed, a setup wizard will launch.

[New screen captures needed starting here.]

Select **other** from the list of service providers.

Dynamic DNS service you are using. If the service you use is not listed, choose "other".

Dynamic DNS service provider:

no-ip.com
freedns.afraid.org
duckdns.org
domains.google
www.dyndns.com
www.easydns.com
www.dsreports.com
www.zoneedit.com
other

<Ok>

- Choose dyndns2 from the list of protocols. Then type `dynv6.com` for your DDNS server.

Under **Username** type `none`. Select `Ok`.

Username (or other type of account identifier) to use with the dynamic DNS service.

Username:

<Ok>

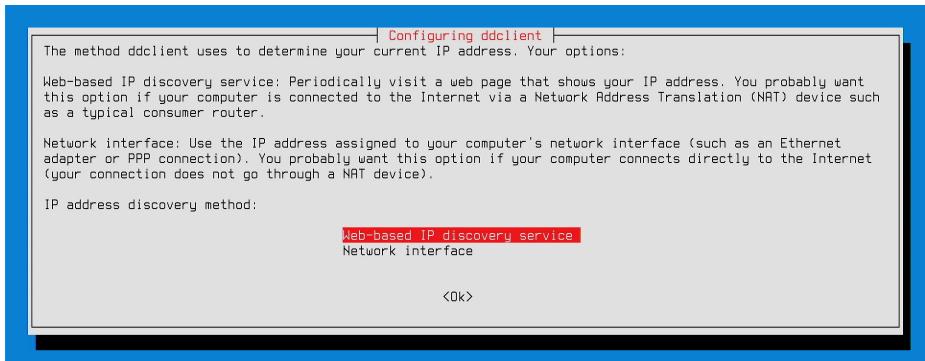
Enter the password from the `dynv6.com` website. You'll be prompted to enter it again to confirm.

Password, API key, or token to use with the dynamic DNS service.

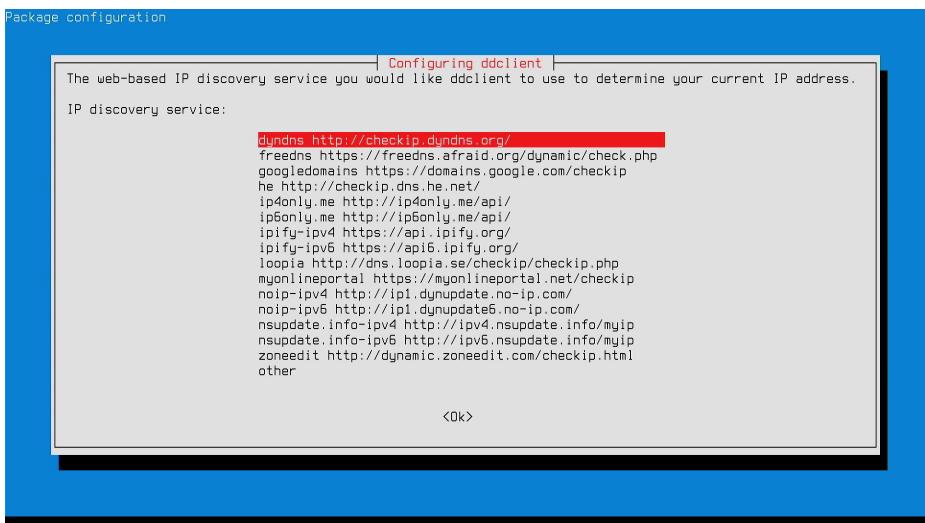
Password:

<Ok>

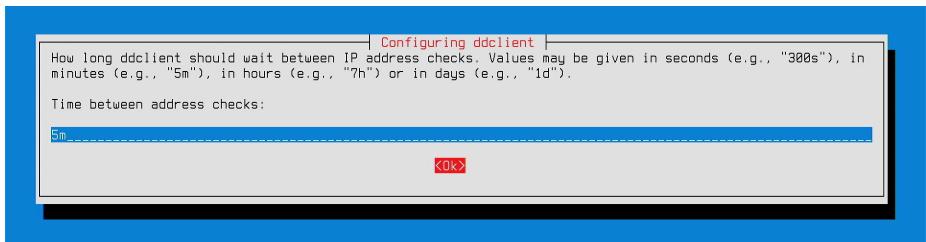
Select **Web-based IP discovery service**, then **Ok**.



Select any option from the list of IP discovery services, then **Ok**.



Set how frequently your server should check its IP address. The default is 5 minutes.



You can choose select your domain name from a list or enter it manually. Select **Ok**.



Finally, run this command to have `ddclient` check your current IP address every 5 minutes.

```
sudo ddclient -daemon 5m
```

Now go to a browser on your desktop computer and enter your domain or subdomain in the URL bar. You should see your website! If not, wait a few minutes for DNS settings to update and try again.