

Lab #5
Pi-Hole Network Deployment
Week #10/11

NACT-262 Fundamentals of System Administration
2025-2026 Fall Semester

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Due by November 9, 2025
Professor Mark Jeremy

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Lab #5 – Pi-hole Network Deployment

OBJECTIVE

Set up a Raspberry Pi 3 B+ as a network DNS sinkhole using Pi-hole to block ads/trackers and provide local name resolution.

NETWORK DIAGRAM

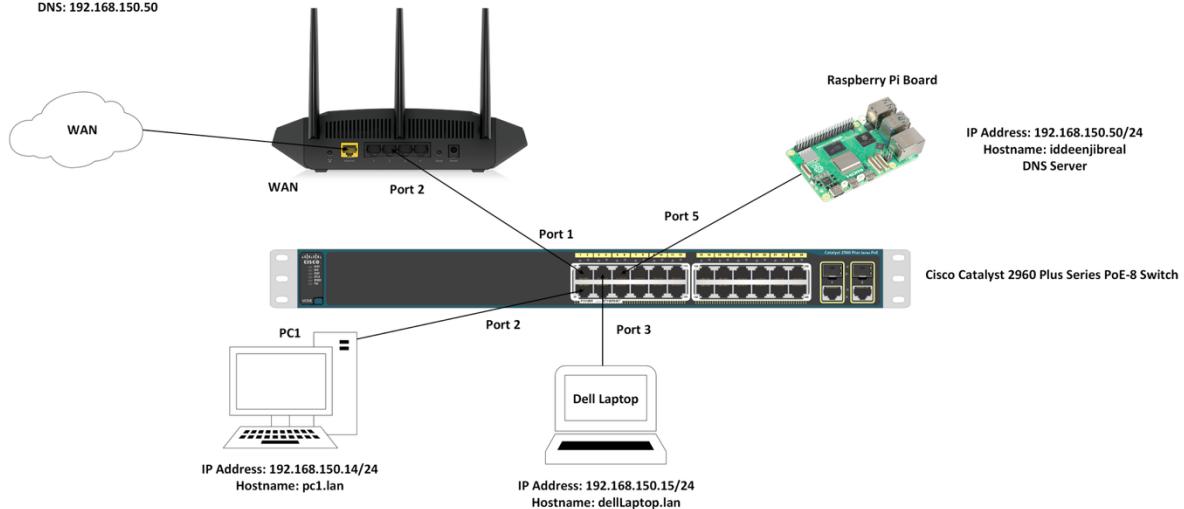


Lab 5 – Pi-hole Network Deployment
NACT-262 Fundamentals of Systems Administration
November 8, 2025

Professor Jeremy
By Jibreal Id-deen

Gateway: 192.168.150.254
DNS: 192.168.150.50

Netgear AX1800 Wi-Fi Router
WAN IP Address: DHCP
LAN IP Address: 192.168.150.254/24
Hostname: router.lan



Hostname	IddeenJibreal
Virtual Machine or Physical?	Physical
Operating System	Raspberry Pi OS Lite
RAM size	8GB
HD size	8GB
Ethernet #1 IP Address (if none – remove line)	192.168.150.50
Ethernet Gateway IP Address (if none – remove line)	192.168.150.254
Primary DNS IP Address (if none – remove line)	192.168.150.50
Network Services (if none – remove line)	DNS Server, Web Admin

PROCEDURE

NETGEAR® AX1800 WiFi Router R6700AX

Admin Account Settings

The admin password is used to log in to your router's web interface. Secure your Network by changing the admin password.

Username	New Password
admin	<input type="password"/> 
	Confirm New Password
	<input type="password"/>

FIGURE 1 - CREATE AN ADMINISTRATOR PASSWORD

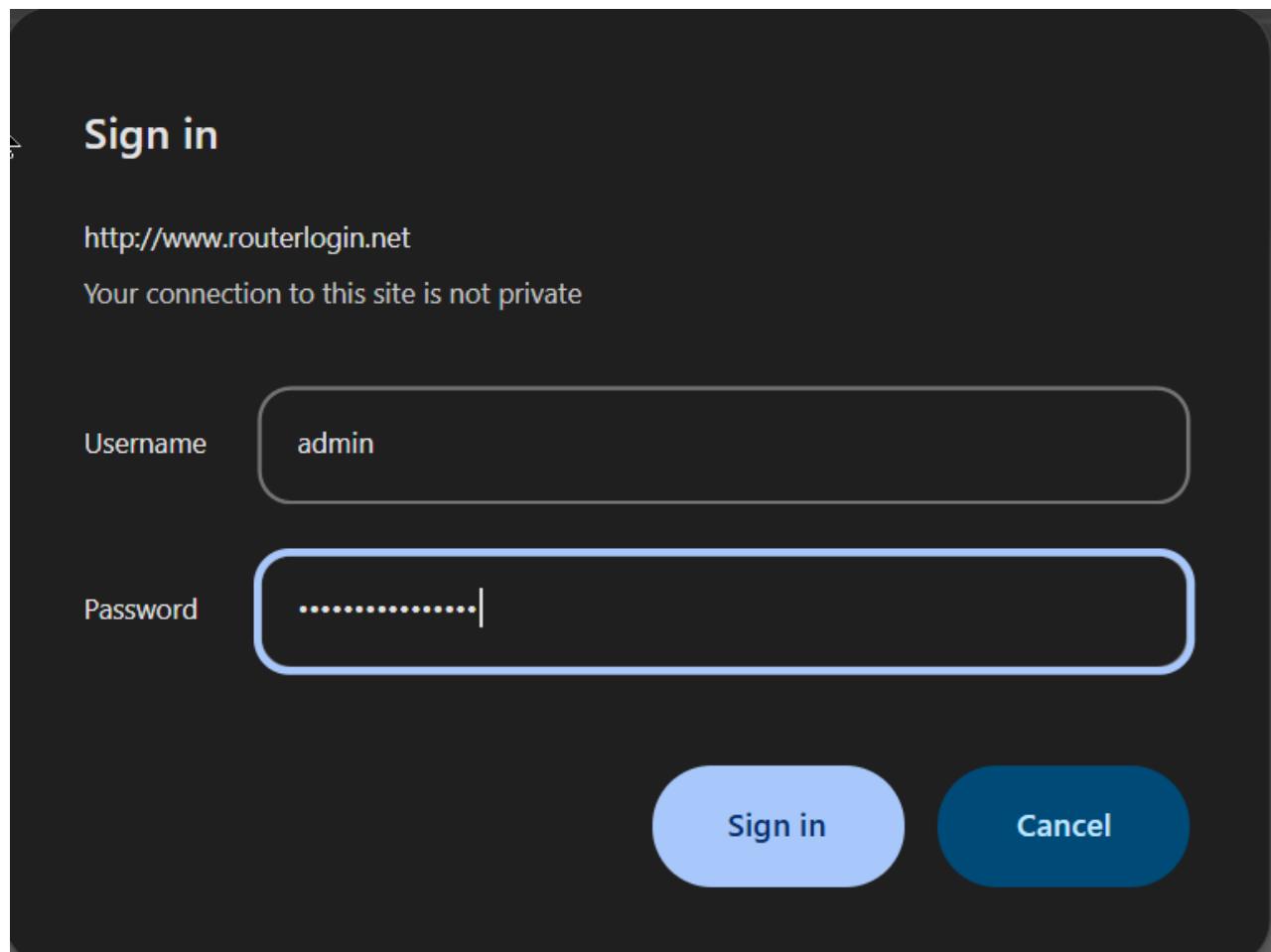


FIGURE 2 - LOG IN THE ADMIN ACCOUNT

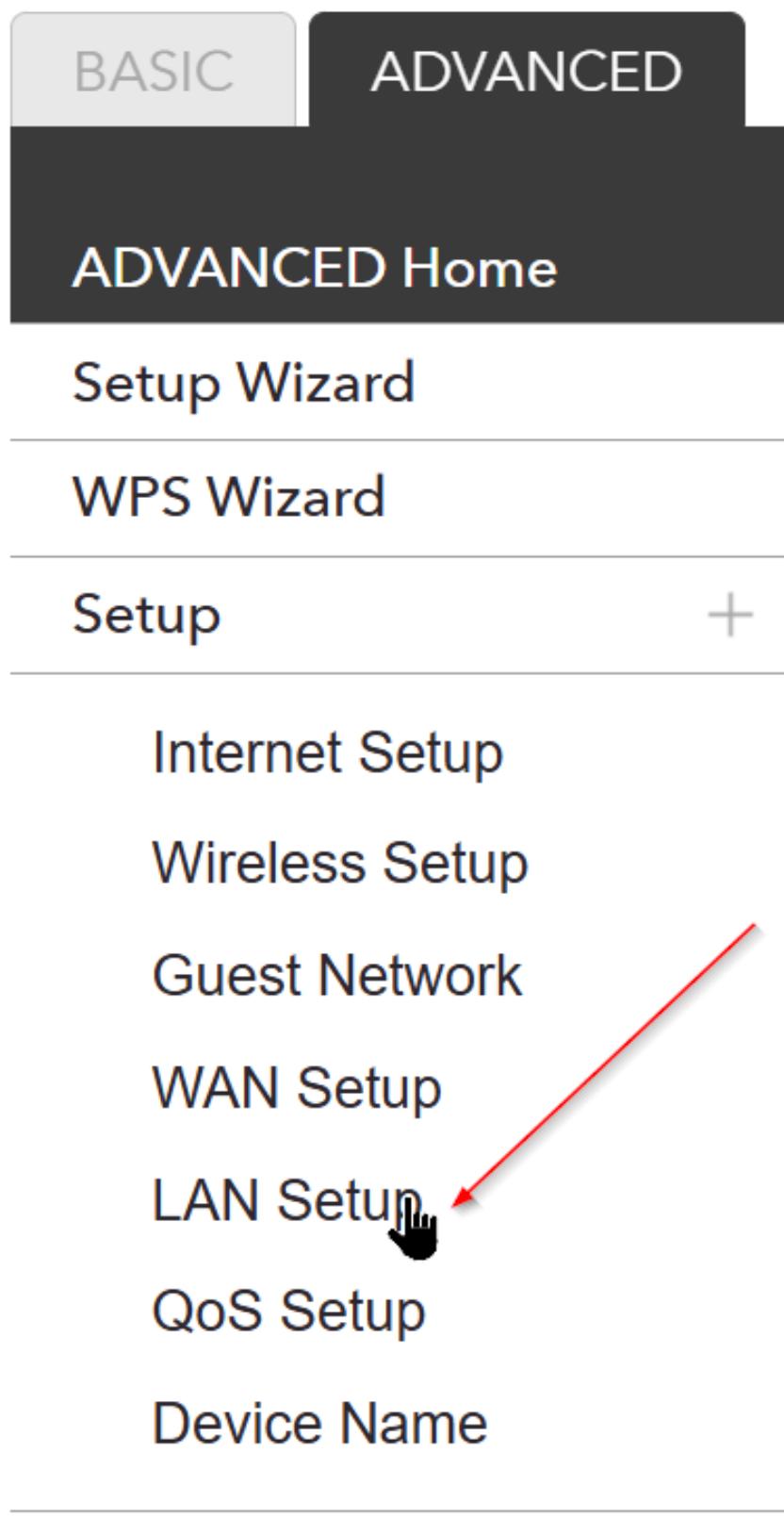


FIGURE 3 - CLICK "LAN SETUP"

IP Address:

192.168.150.254



IP Subnet Mask:

255.255.255.0

FIGURE 4 - CHANGE THE REQUIRED NETWORK MANUALLY FOR THE ROUTER

Use Router as DHCP Server

Starting IP Address:

192.168.150.2

Ending IP Address:

192.168.150.254

FIGURE 5 - DISABLE THE DHCP SERVER

Wireless Network (5GHz 802.11a/n/ac/ax)

Enable SSID Broadcast

Name (SSID):

NETGEAR54-5G

FIGURE 6 - DISABLE THE WI-FI 5GHz



Wireless Network (2.4GHz b/g/n/ax)

- Enable SSID Broadcast
- Enable 20/40 MHz Coexistence



FIGURE 7 - DISABLE THE WI-FI 2.4GHZ NETWORK

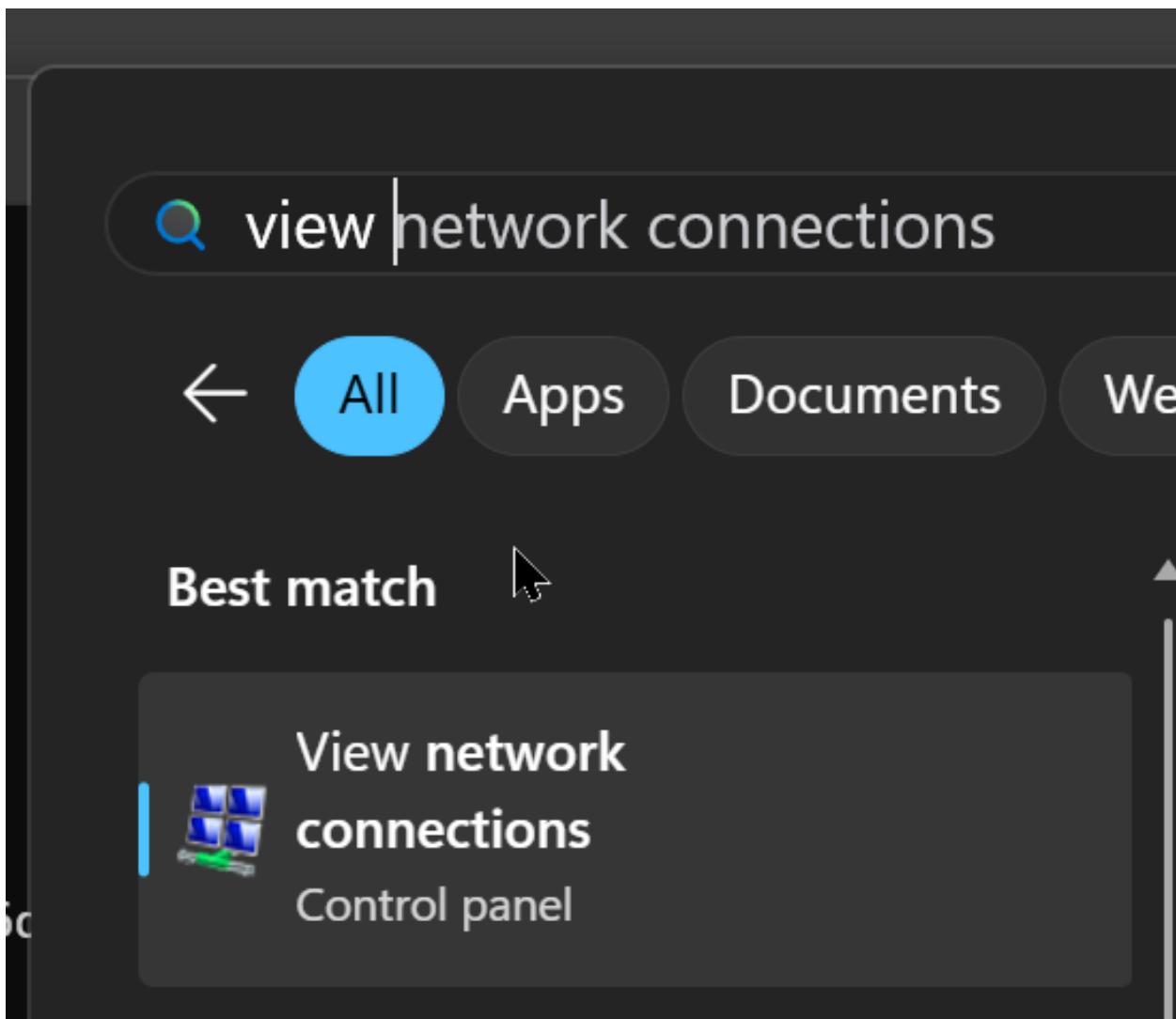


FIGURE 8 - VIEW NETWORK CONNECTIONS

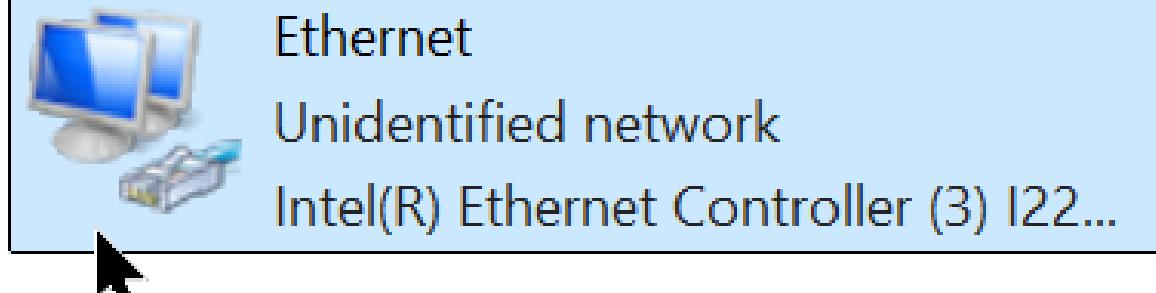


FIGURE 9 - CLICK "ETHERNET"

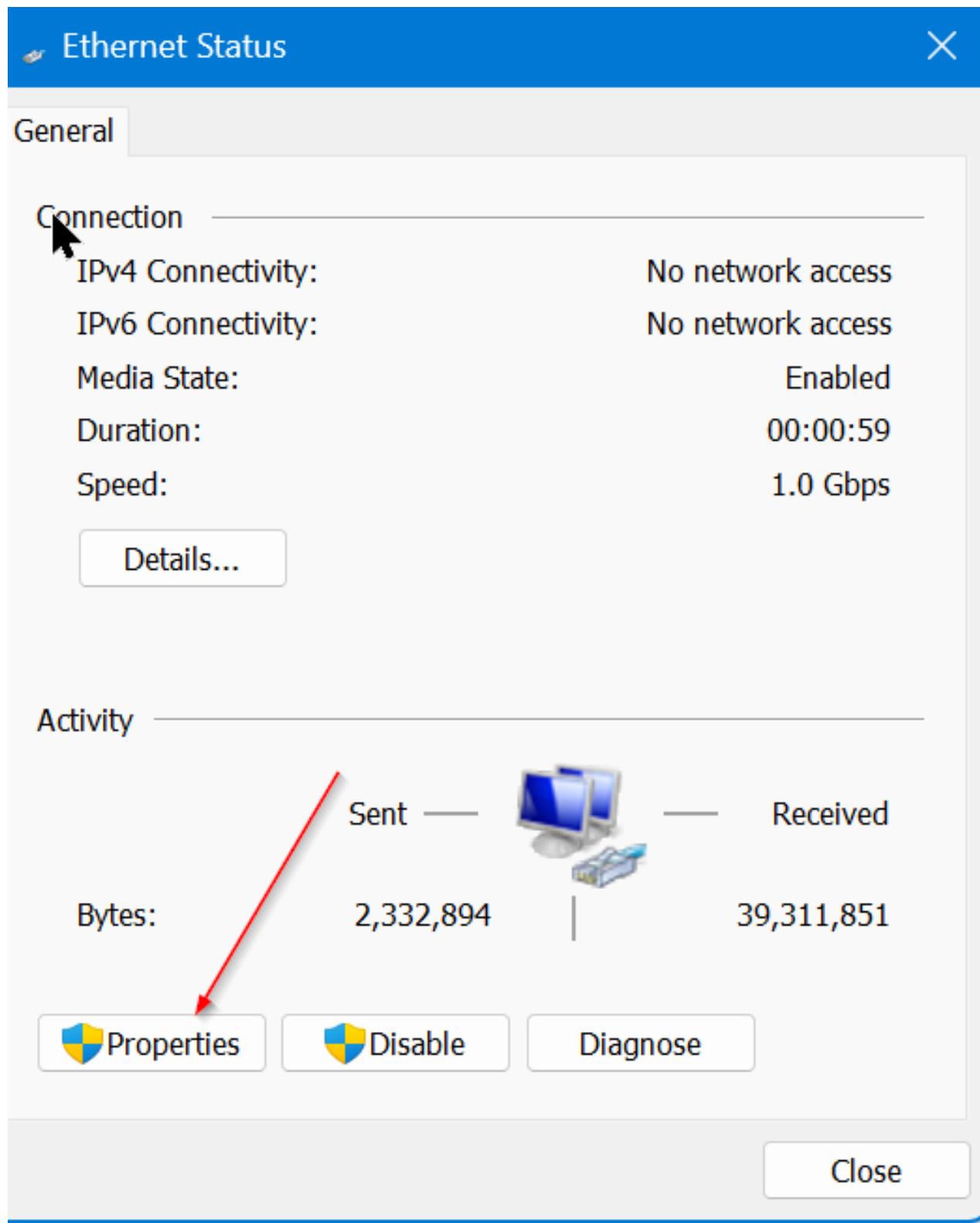


FIGURE 10 - CLICK "PROPERTIES"

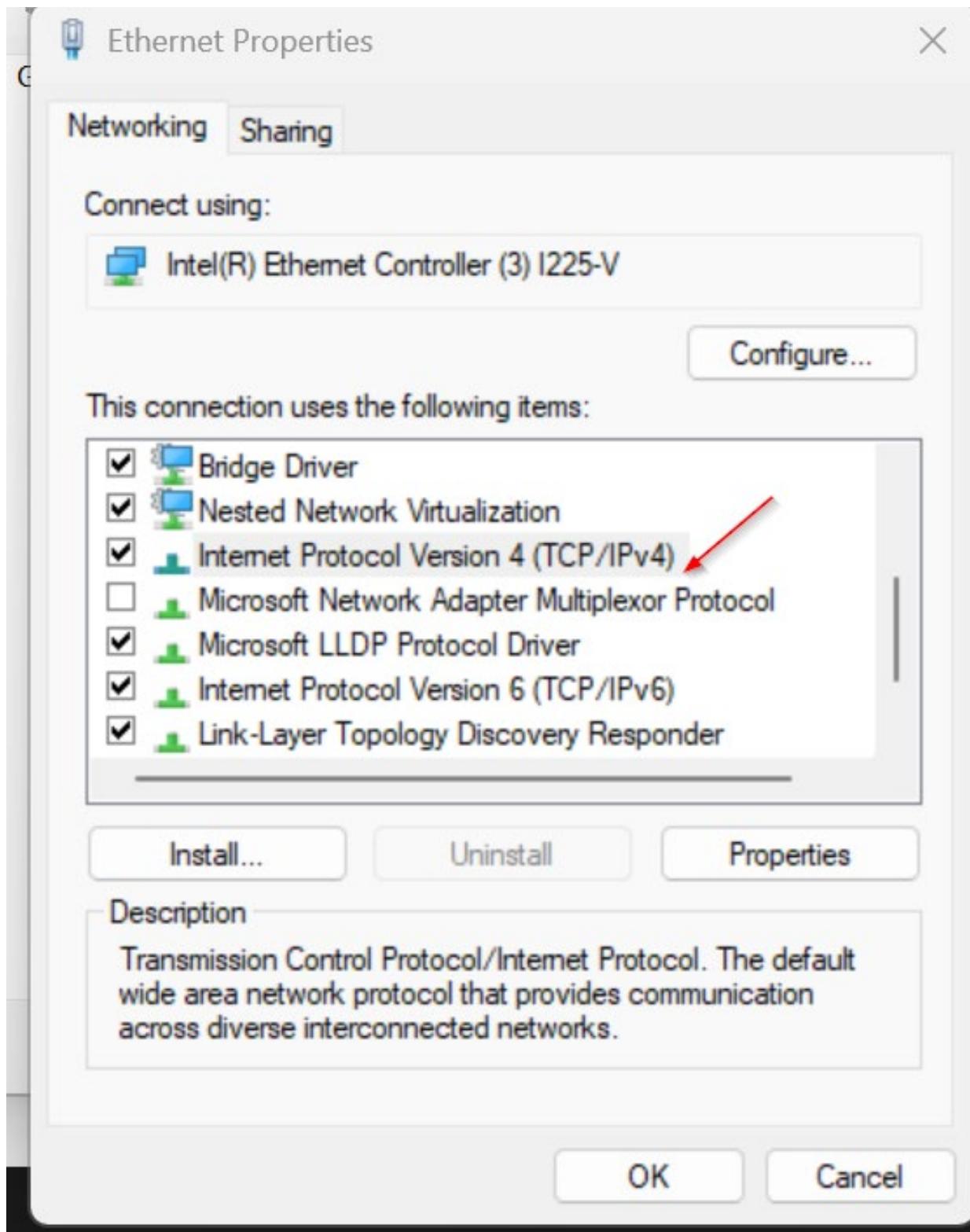


FIGURE 11 - CLICK IPv4 SETTINGS

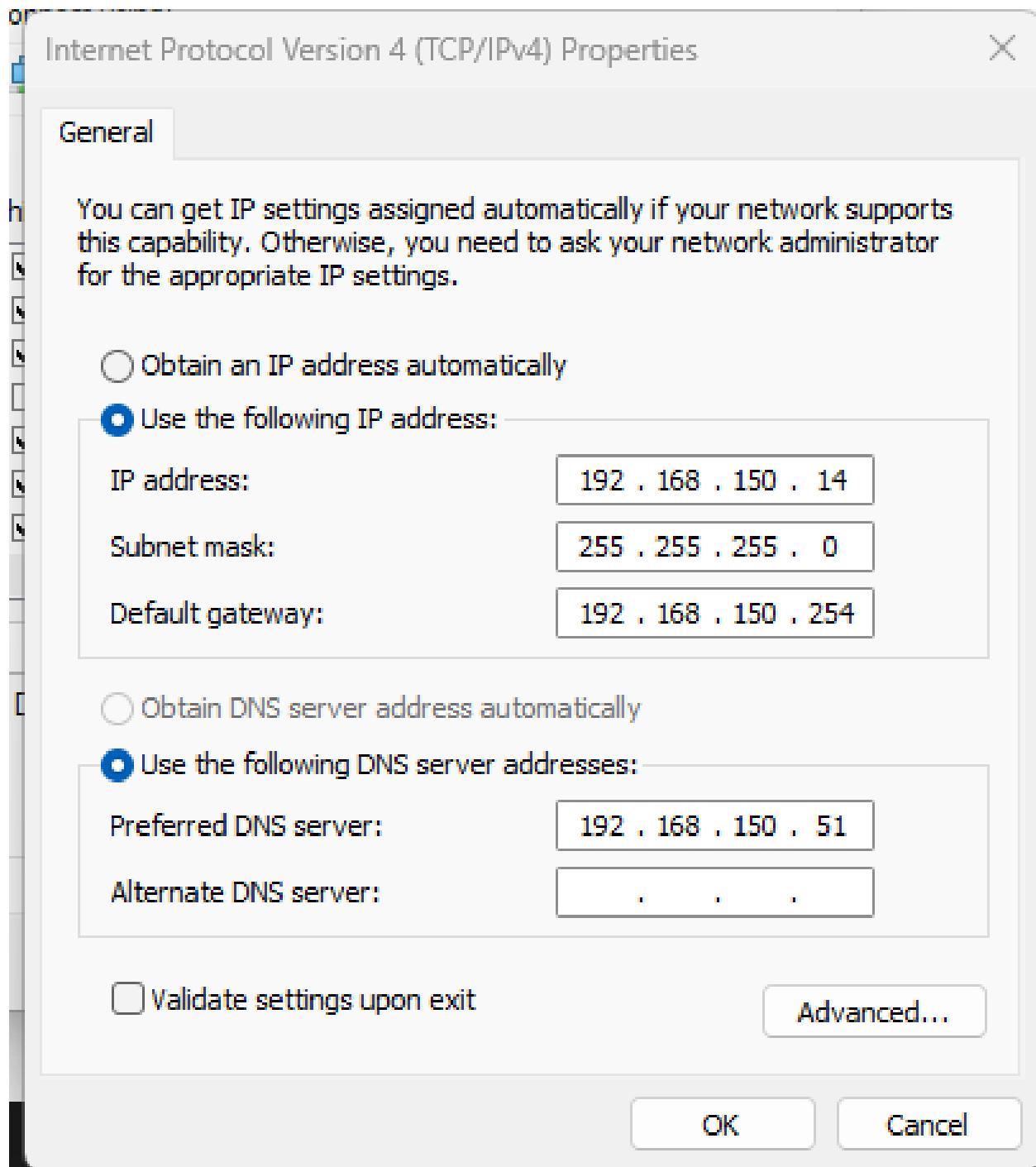


FIGURE 12 - SET THE REQUIRED NETWORK MANUALLY FOR PC1

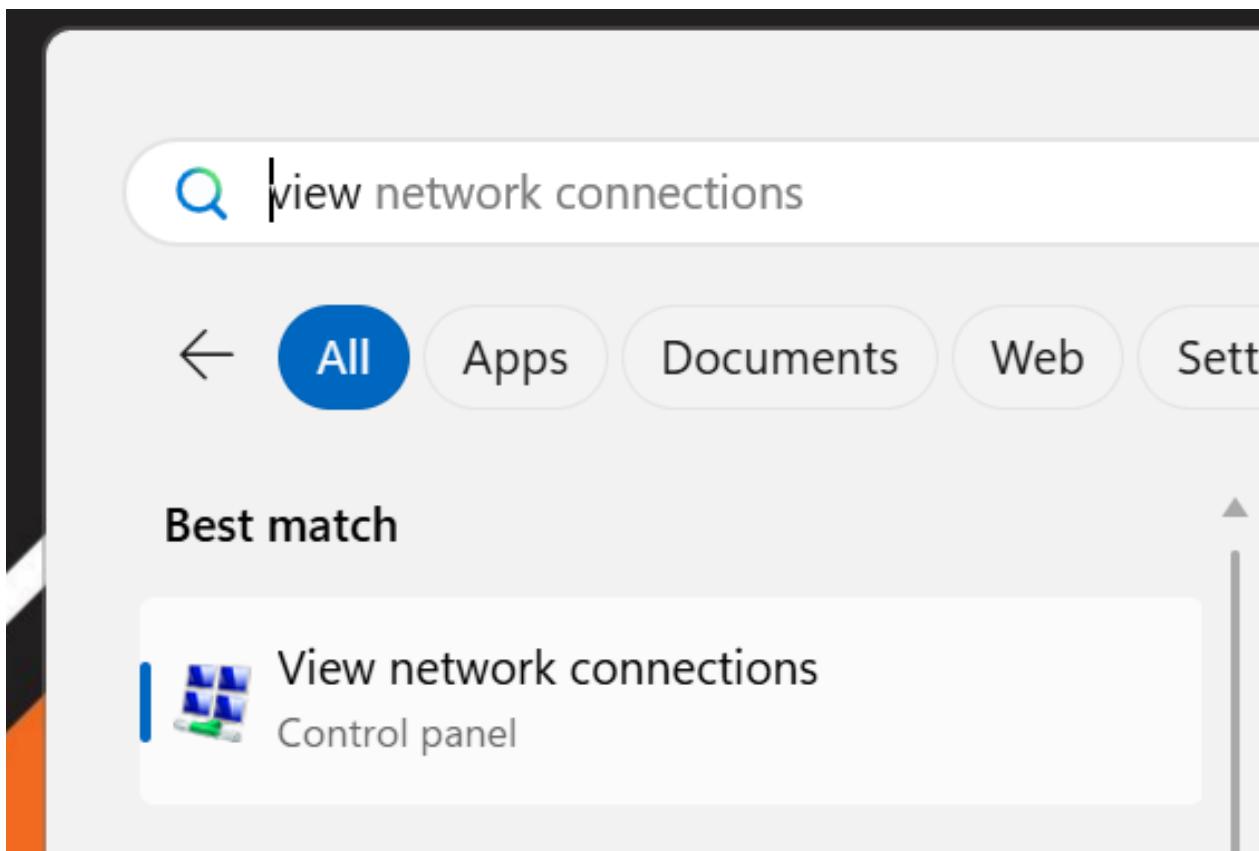


FIGURE 13 - ON DELL LAPTOP, VIEW NETWORK CONNECTIONS

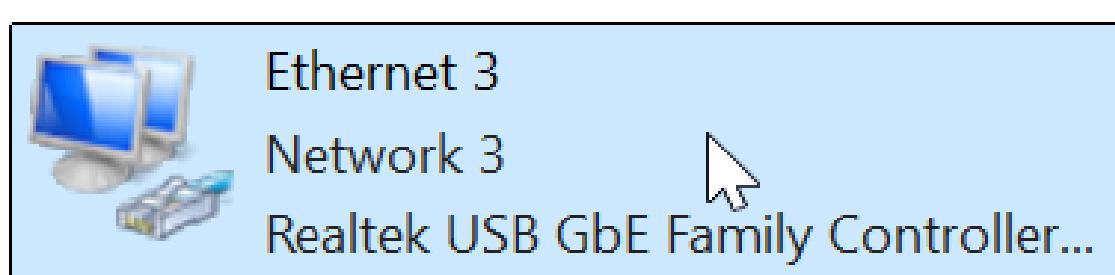


FIGURE 14 - CLICK "ETHERNET 3"

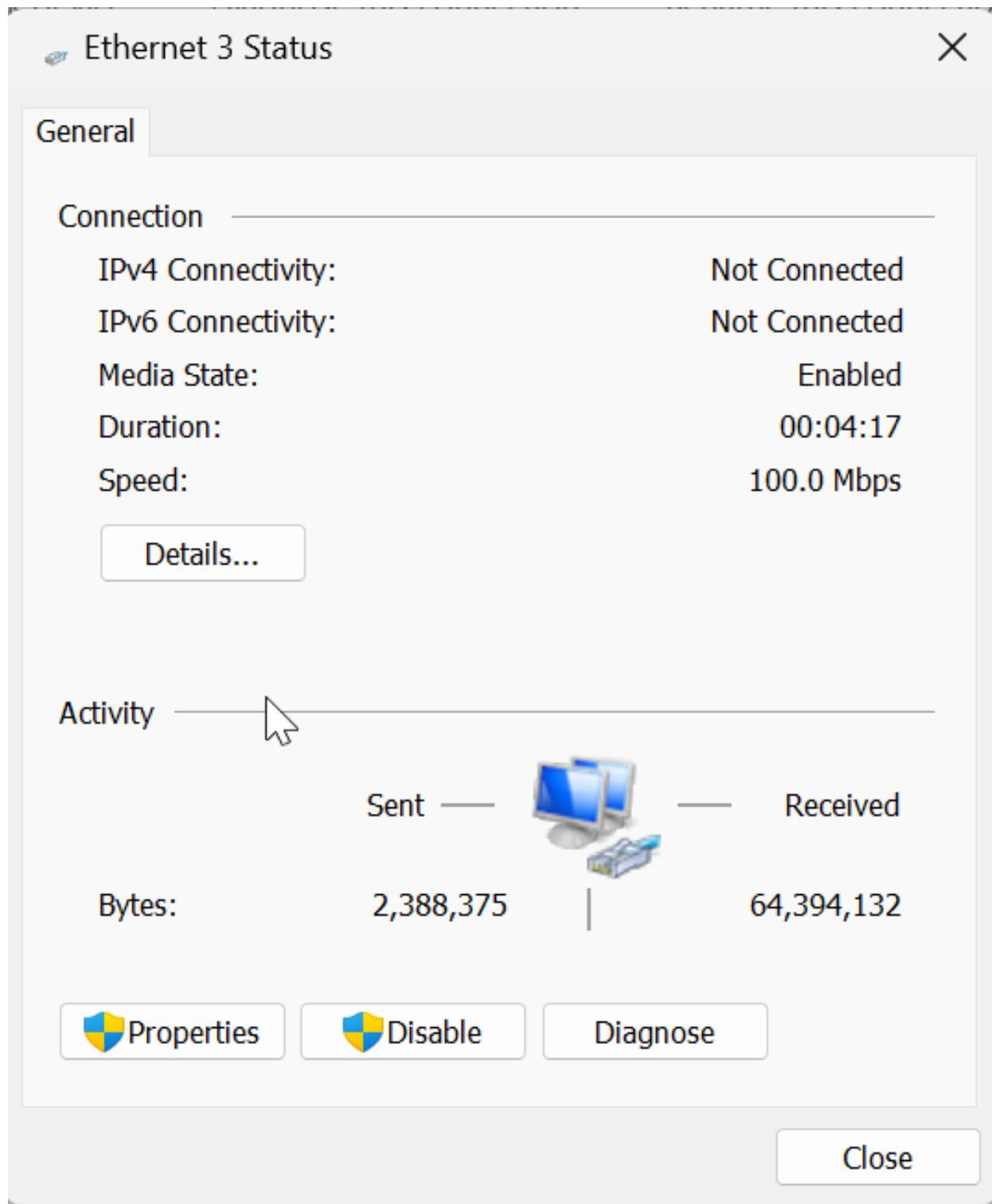


FIGURE 15 - CLICK "PROPERTIES"

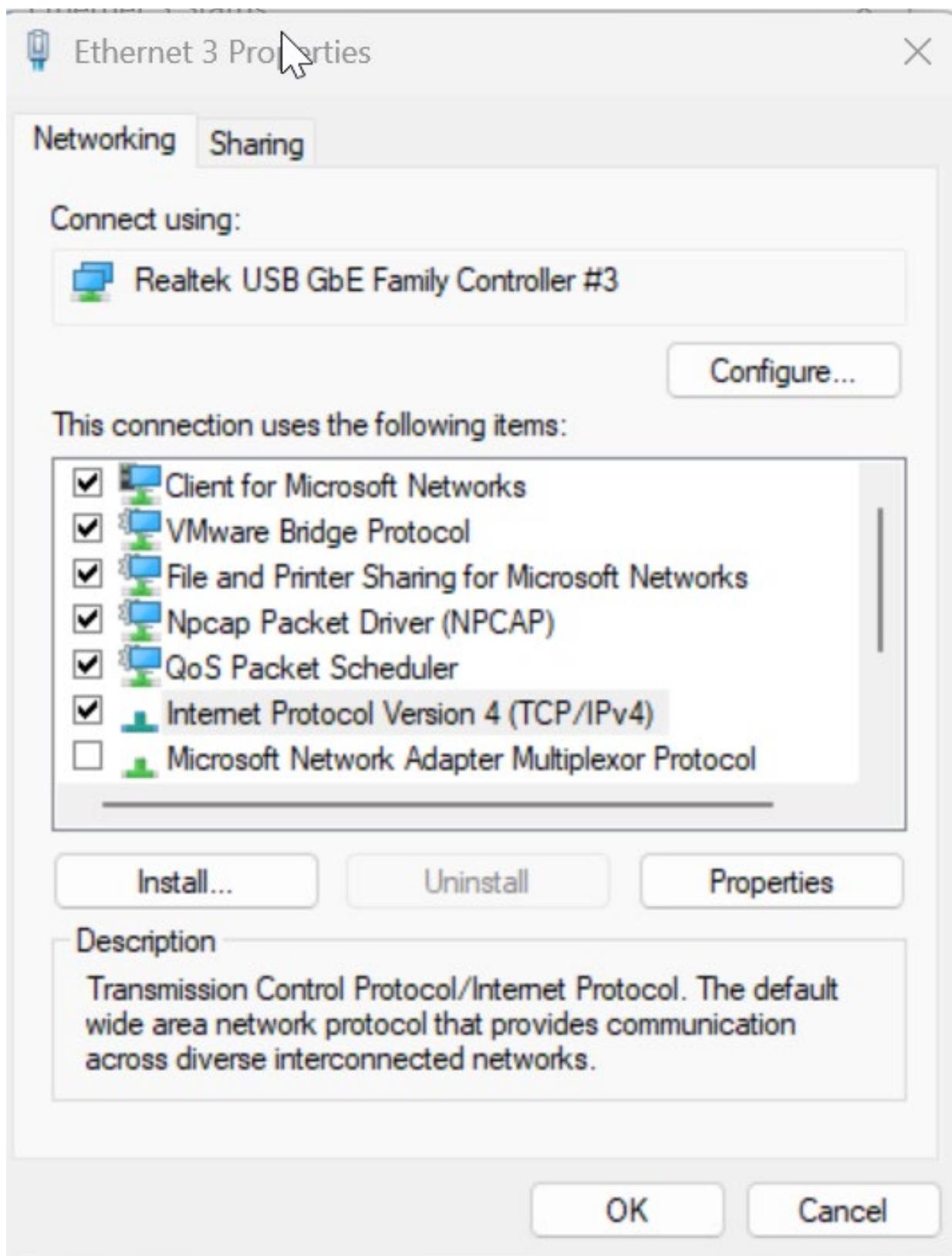


FIGURE 16 - CLICK IPV4 SETTING

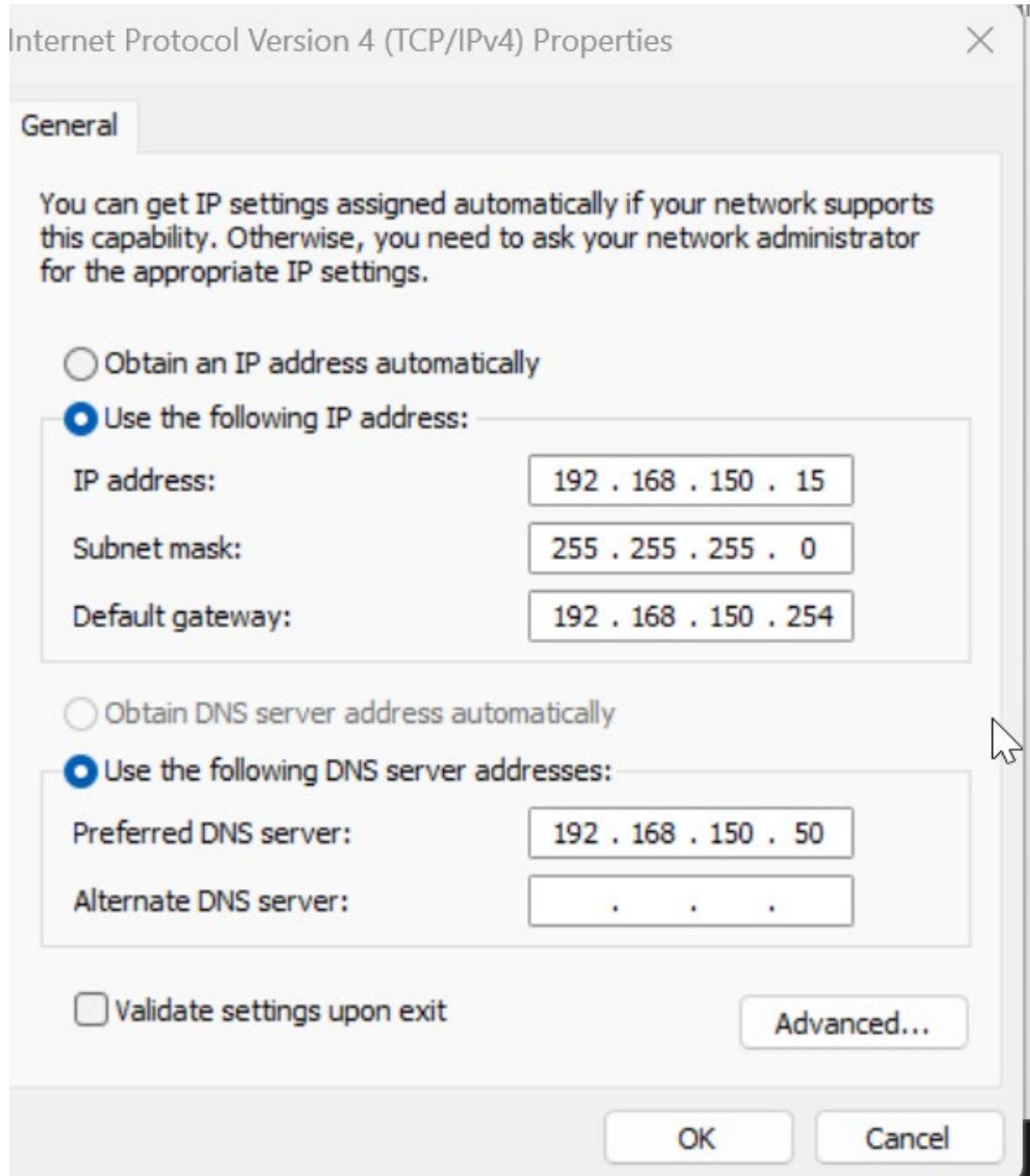


FIGURE 17 - SET THE REQUIRED NETWORK MANUALLY FOR DELL LAPTOP

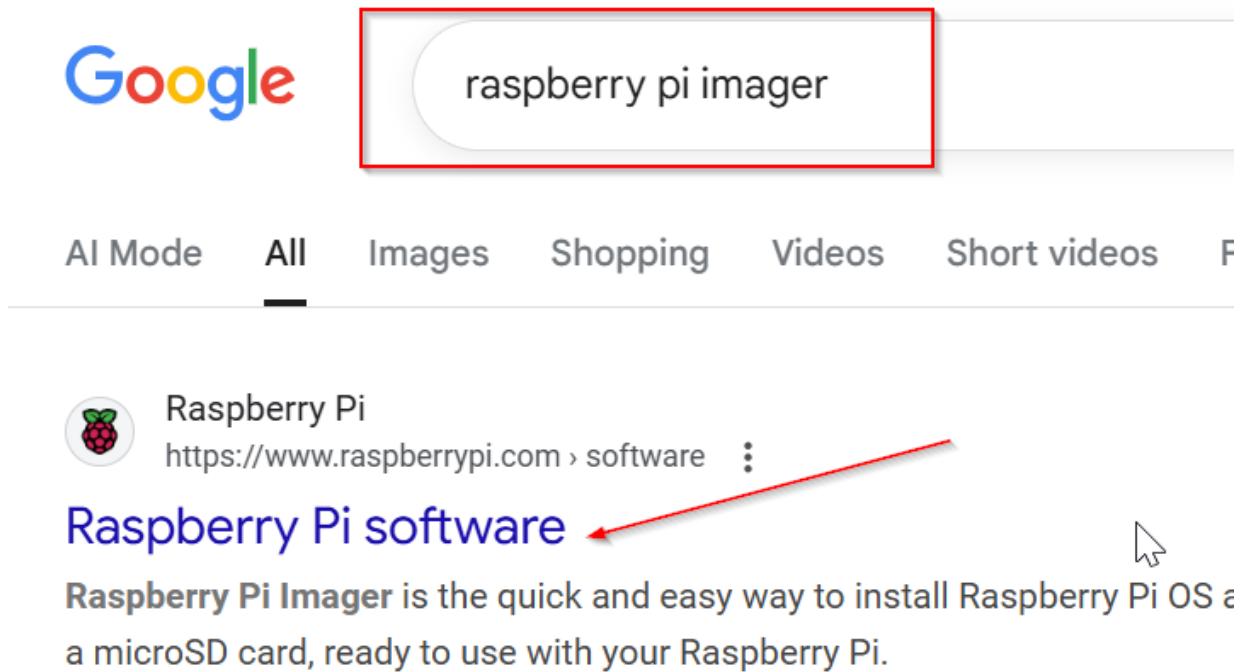


FIGURE 18 - TYPE THE "RASPBERRY PI IMAGER" ON GOOGLE AND CLICK THAT LINK

Raspberry Pi Imager



Raspberry Pi Imager is the quick and easy way to install **Raspberry Pi OS** and other operating systems to a microSD card, ready to use with your Raspberry Pi.

Download and install Raspberry Pi Imager on a computer with an SD card reader. Insert the microSD card you'll use with your Raspberry Pi into the reader and run Raspberry Pi Imager.



[Download for Windows](#)



[Download for macOS](#)

[Download for Debian or Ubuntu \(x86_64\)](#)

FIGURE 19 - DOWNLOAD RASPBERRY PI IMAGER

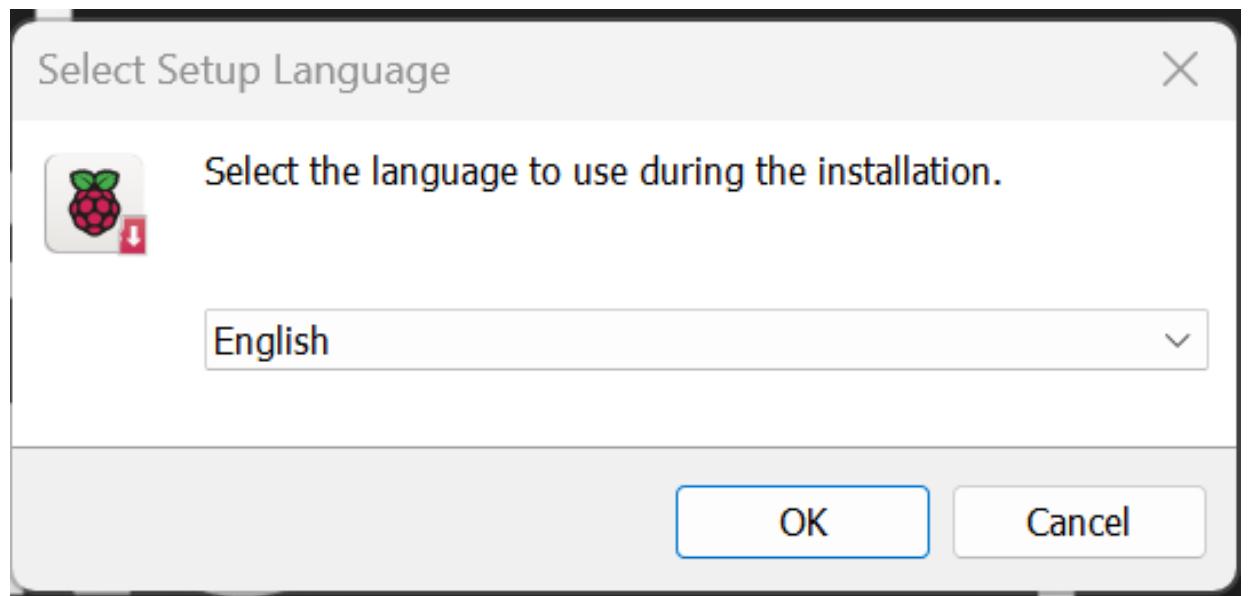


FIGURE 20 - PROCCED THE INSTALLATION

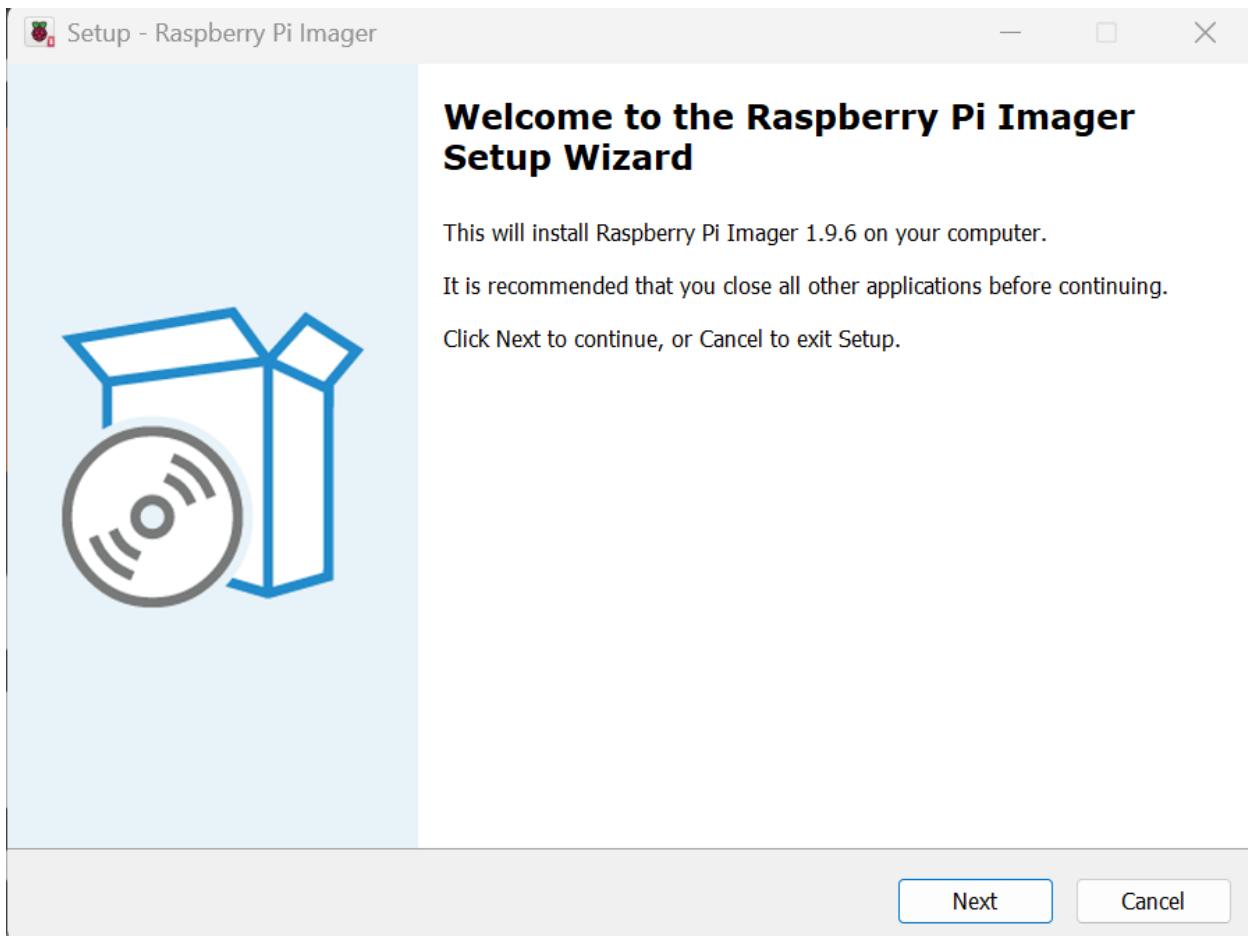


FIGURE 21 - SETUP WIZARD

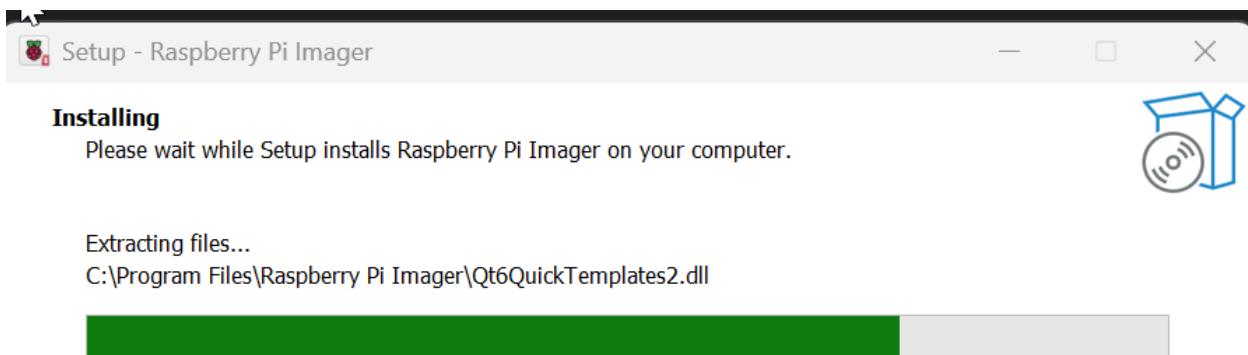


FIGURE 22 – INSTALLING

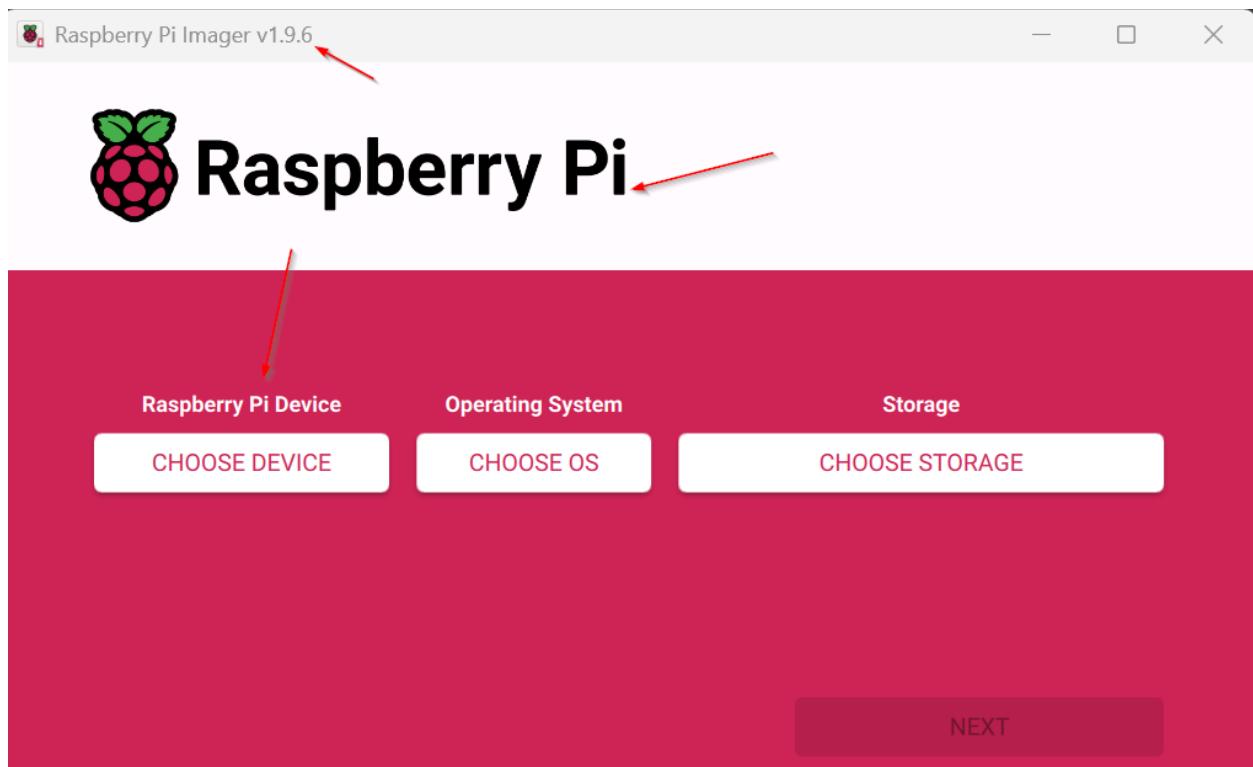


FIGURE 23 - CHOOSE DEVICE FOR PI

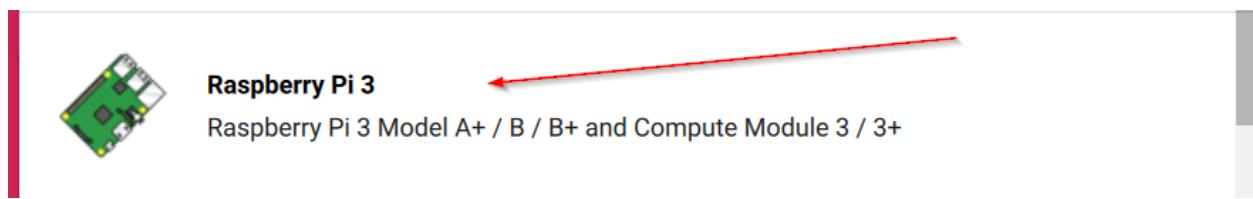


FIGURE 24 - CHOOSE THE TYPE OF MODEL FOR PI

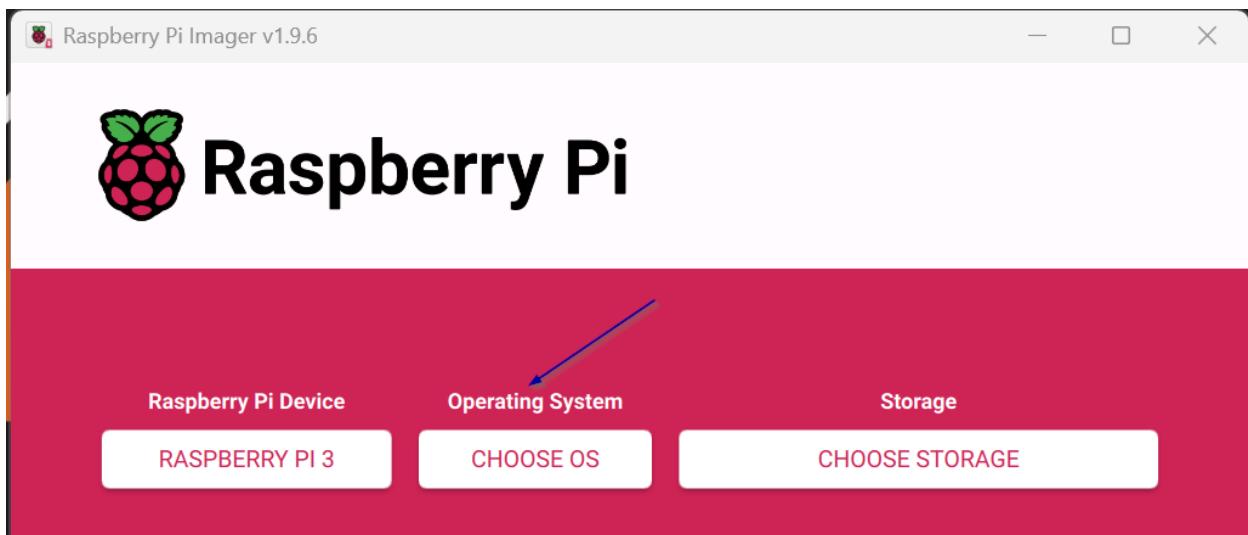


FIGURE 25 - CHOOSE OS

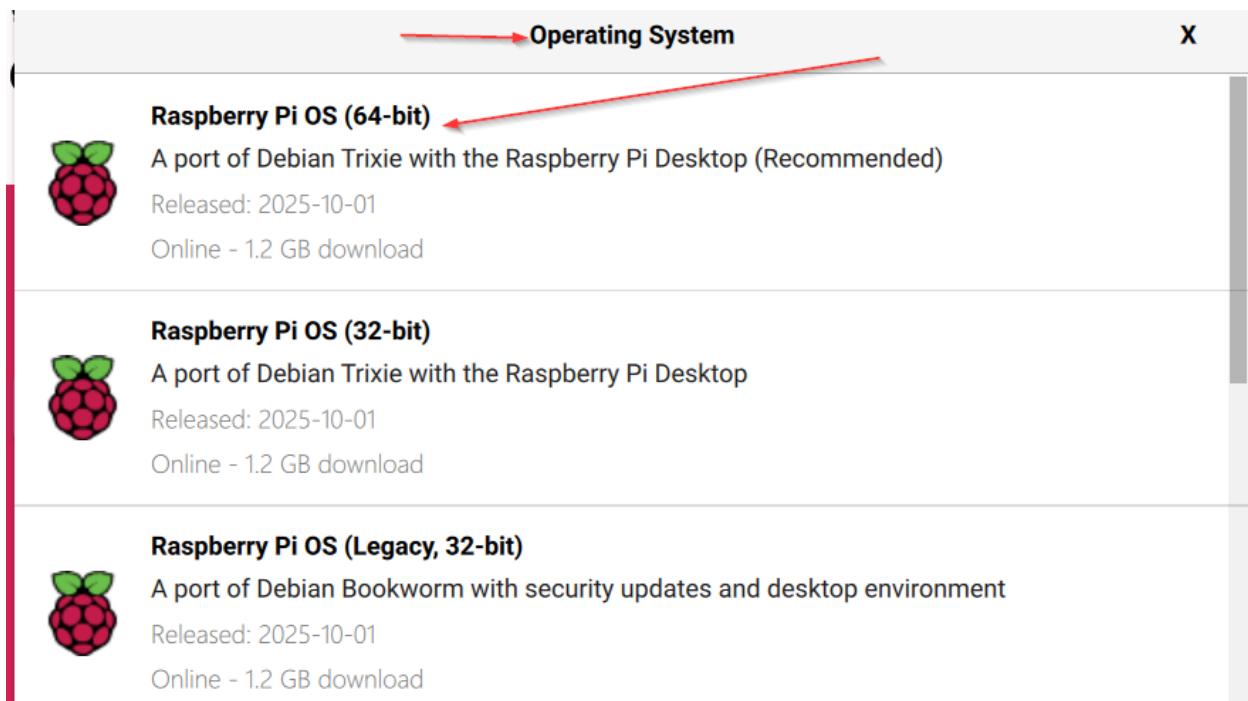


FIGURE 26 - CHOOSE THE PI OS DESKTOP

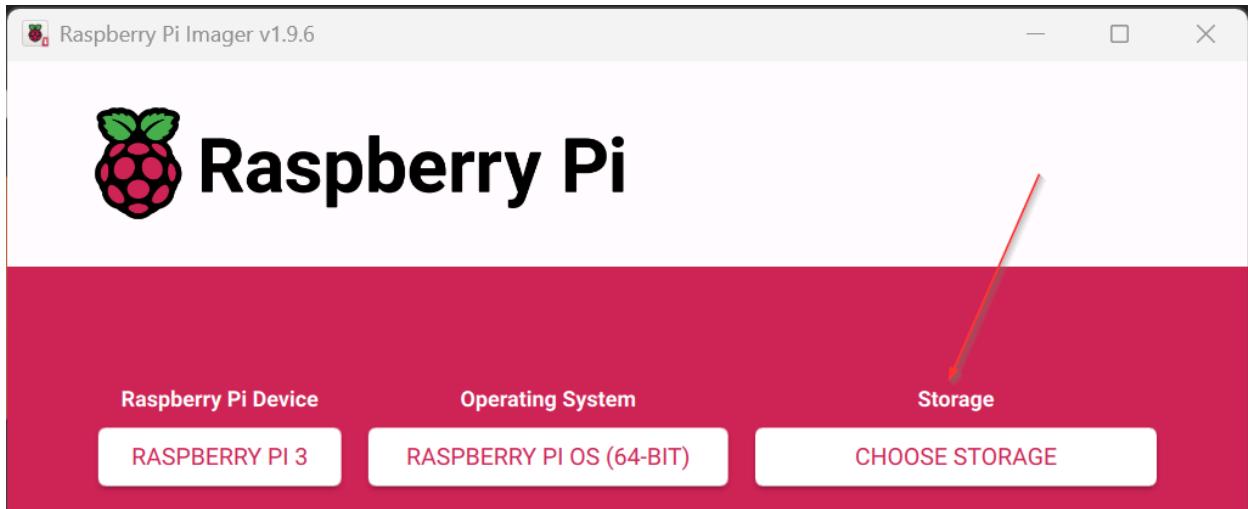


FIGURE 27 - CHOOSE STORAGE

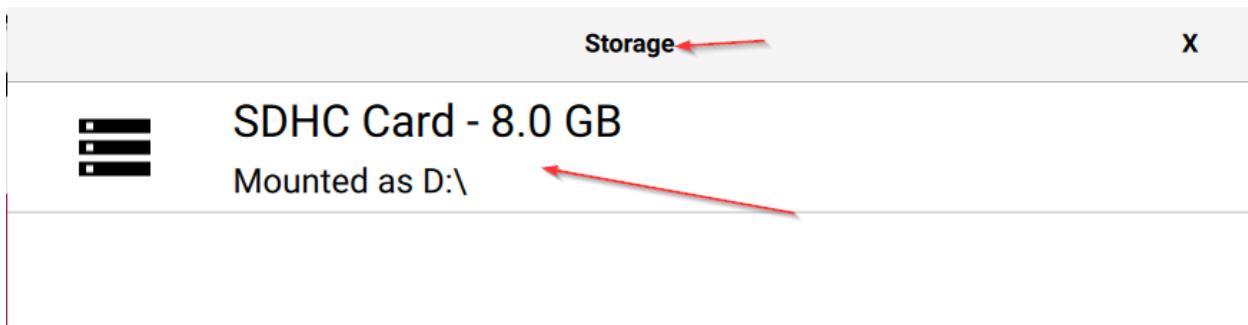


FIGURE 28 - CHOOSE THAT STORAGE

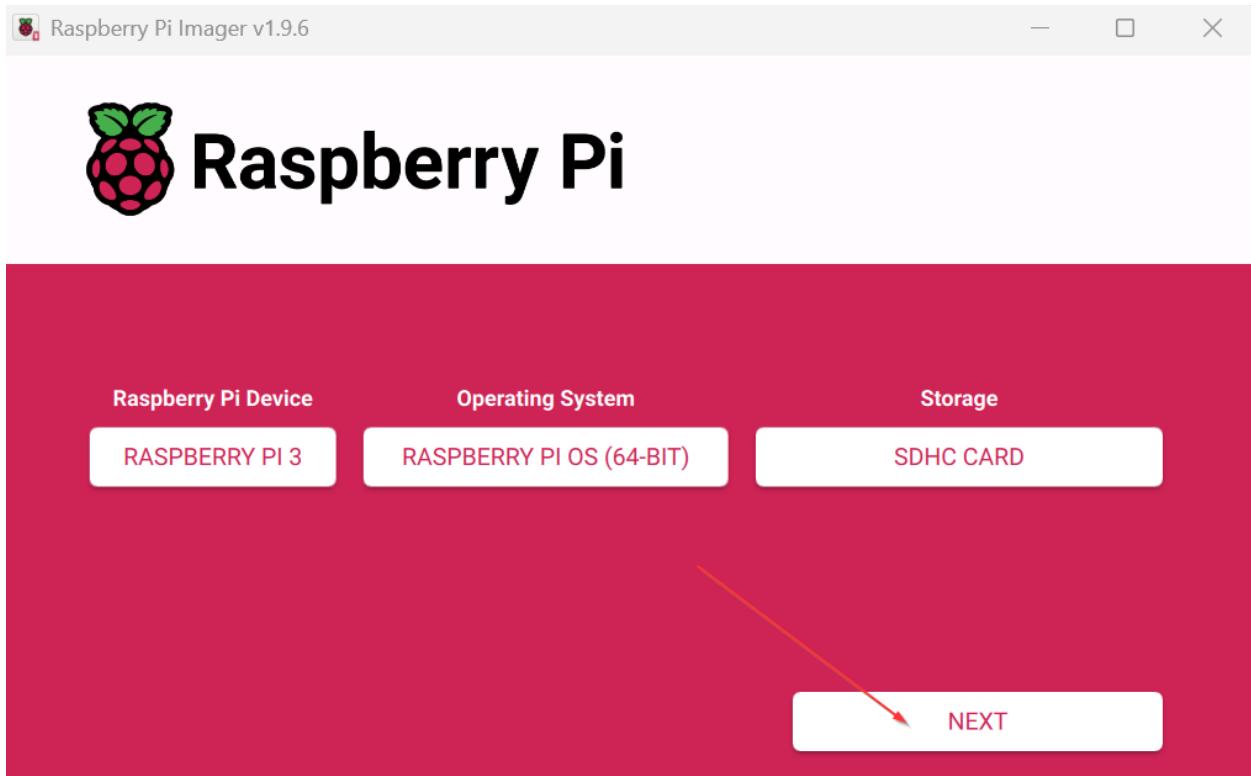


FIGURE 29 - CLICK "NEXT"

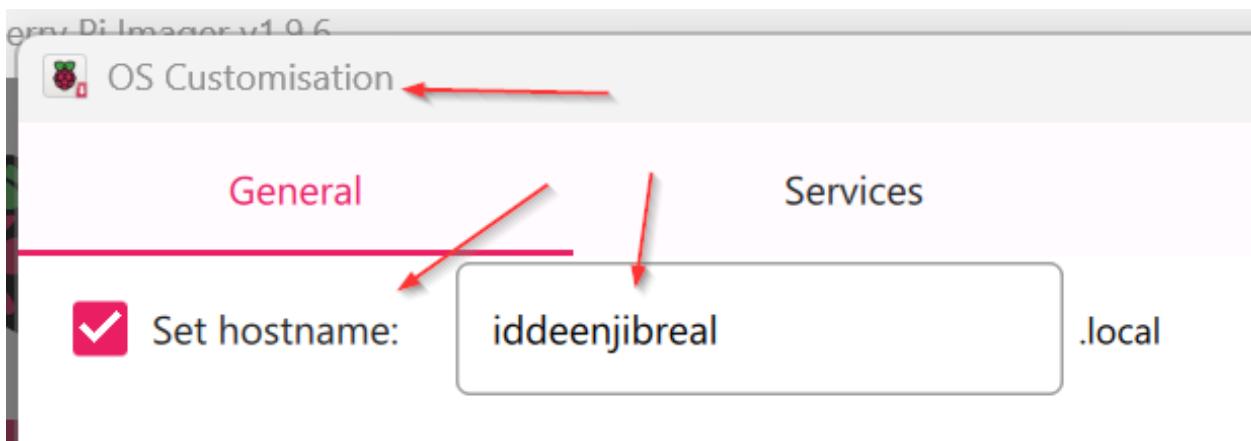


FIGURE 30 - SET THE HOSTNAME

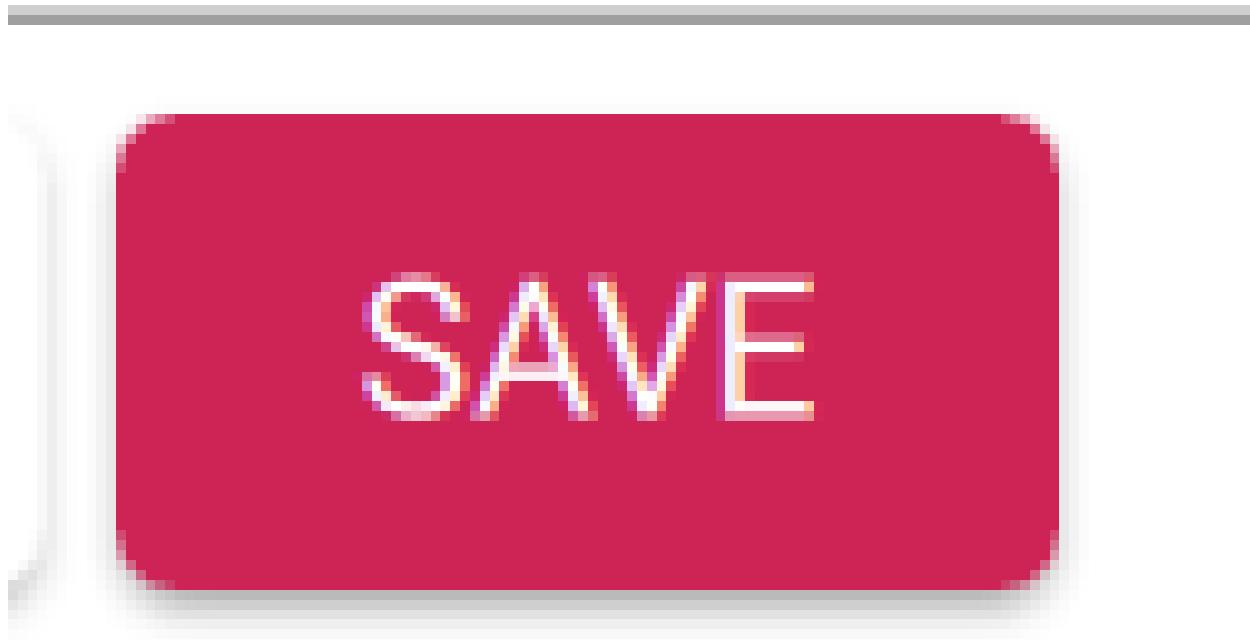


FIGURE 31 - SAVE IT

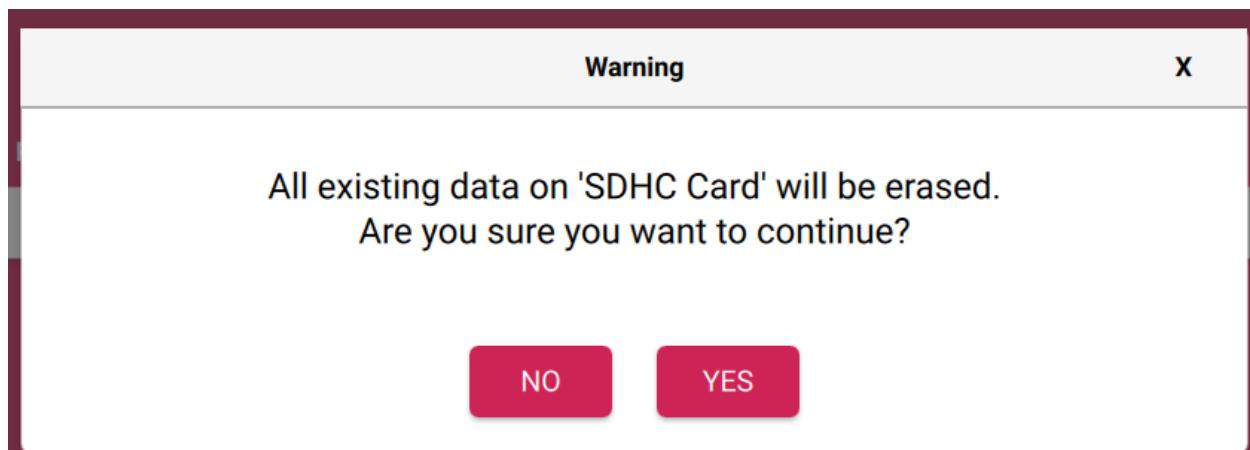


FIGURE 32 - ERASE THE CARD

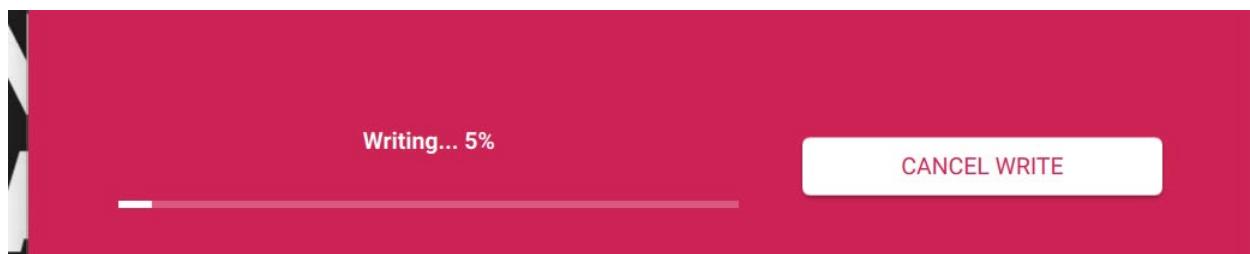


FIGURE 33 - WRITING...

Write Successful

X

Raspberry Pi OS (64-bit) has been written to SDHC Card

You can now remove the SD card from the reader

CONTINUE

FIGURE 34 - DONE!

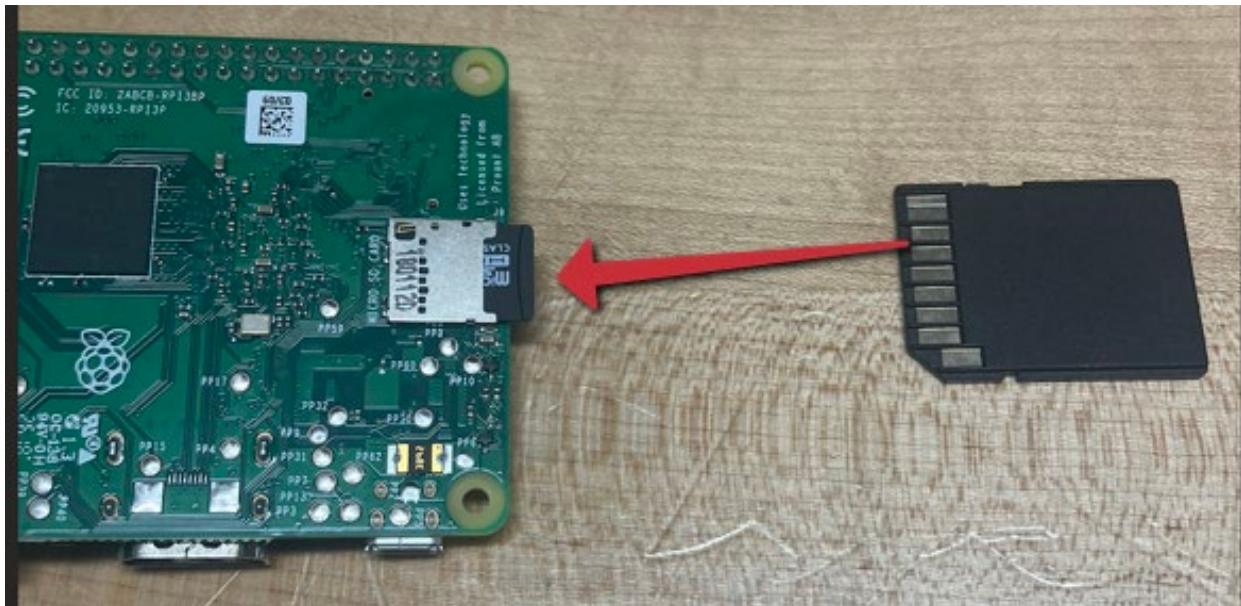


FIGURE 35 - PUT THE SSD CARD TO THE READER CARD



FIGURE 36 - THE SHOWCASE OF THE PI DESKTOP

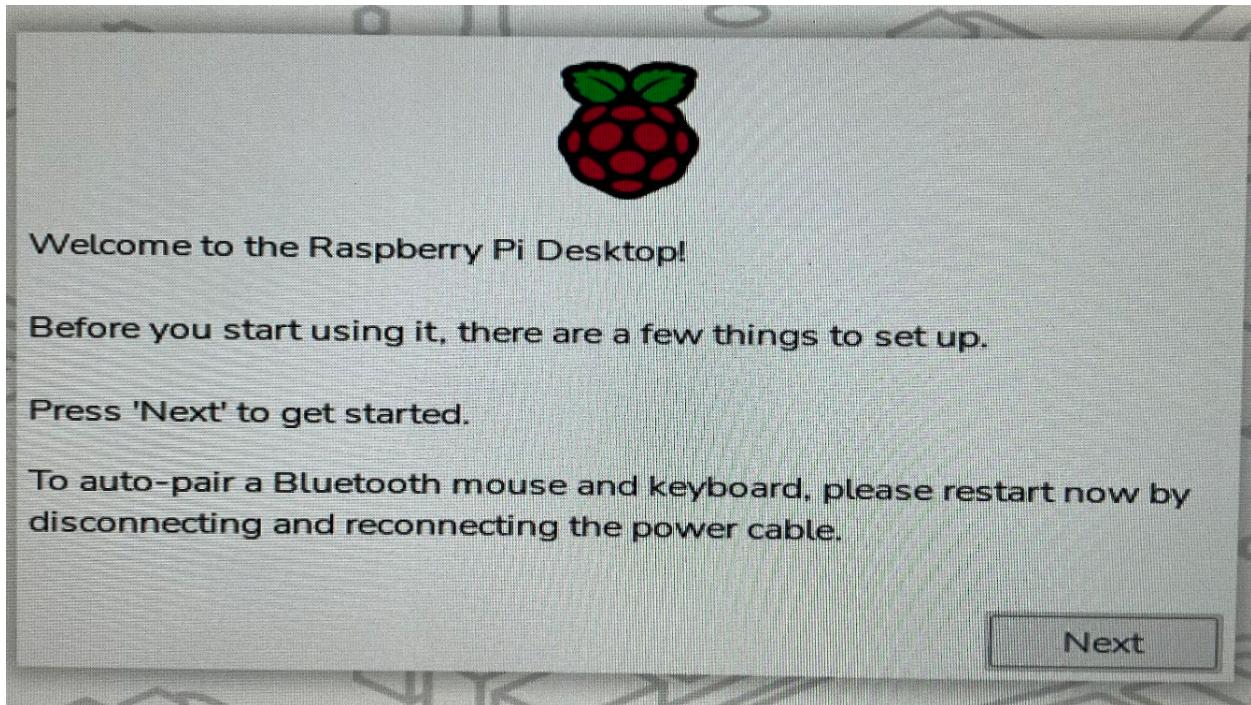


FIGURE 37 - PRESS IT TO GET STARTED

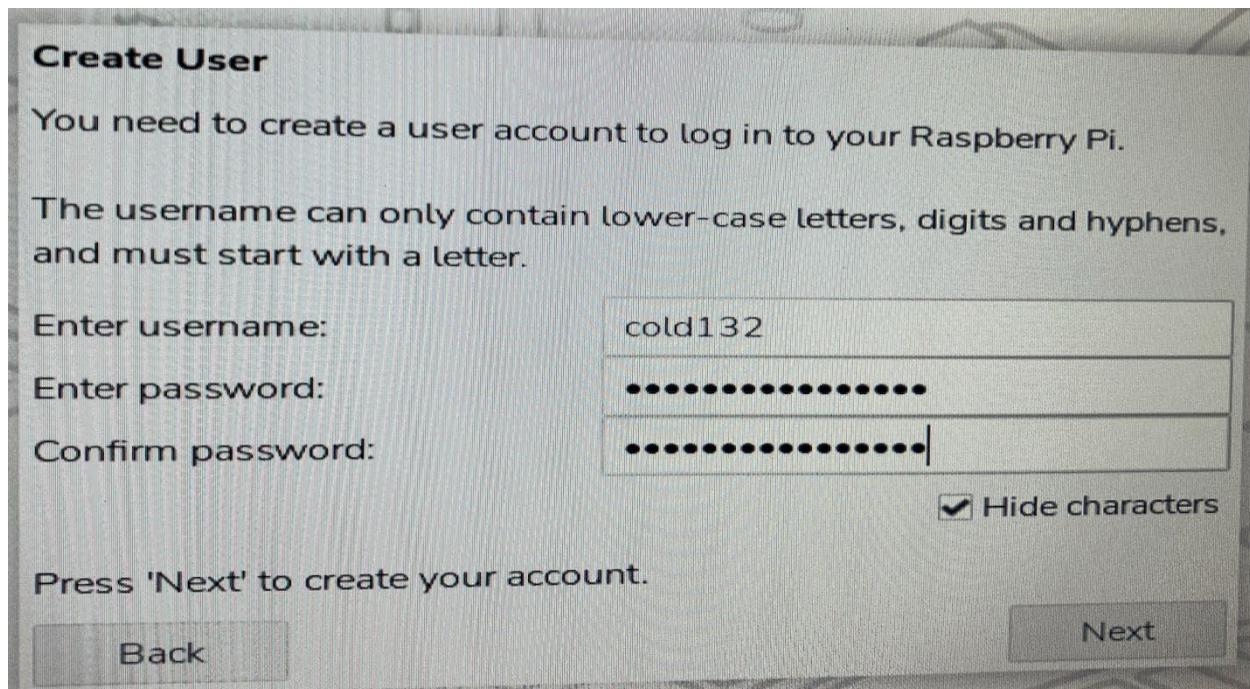


FIGURE 38 - CREATE AN USER FOR PI

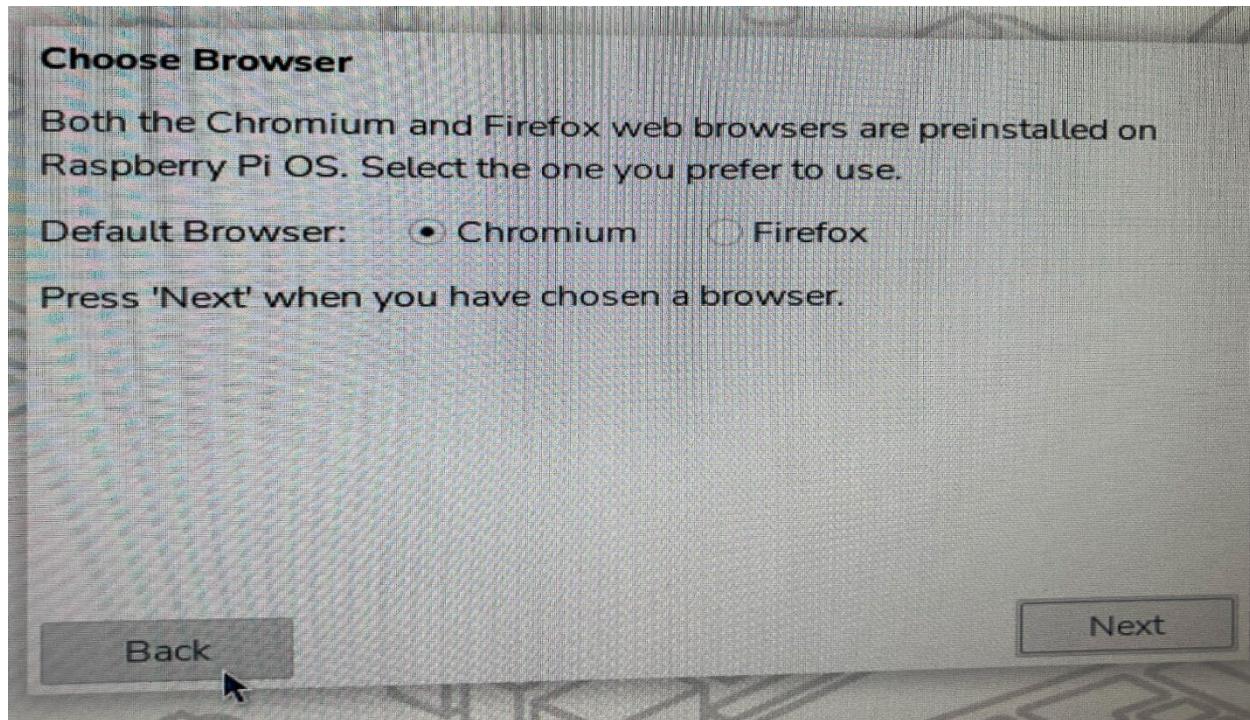


FIGURE 39 - CHOOSE BROWSER

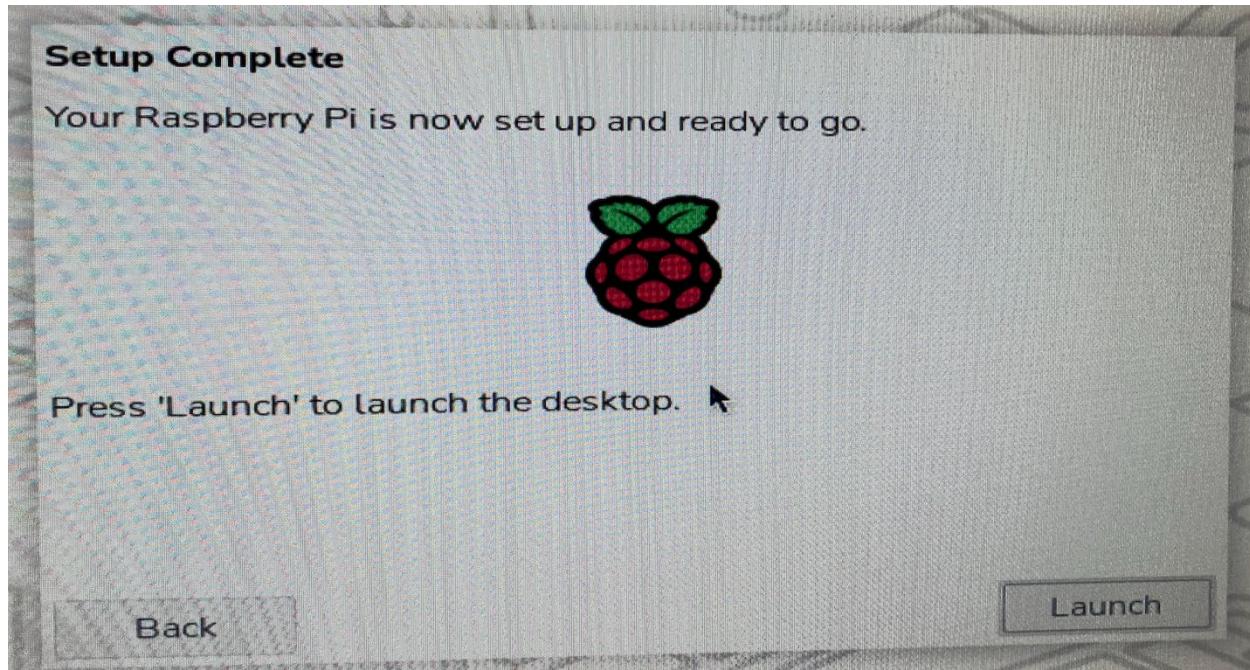


FIGURE 40 - READY!

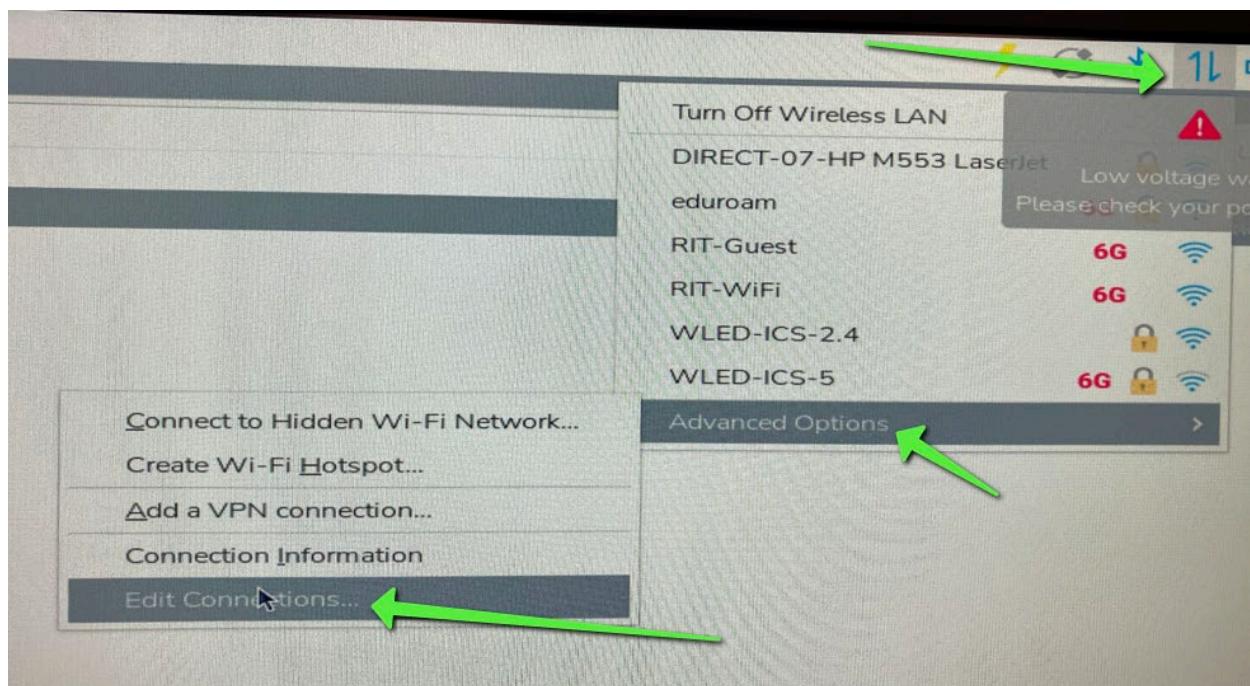


FIGURE 41 - EDIT CONNECTIONS

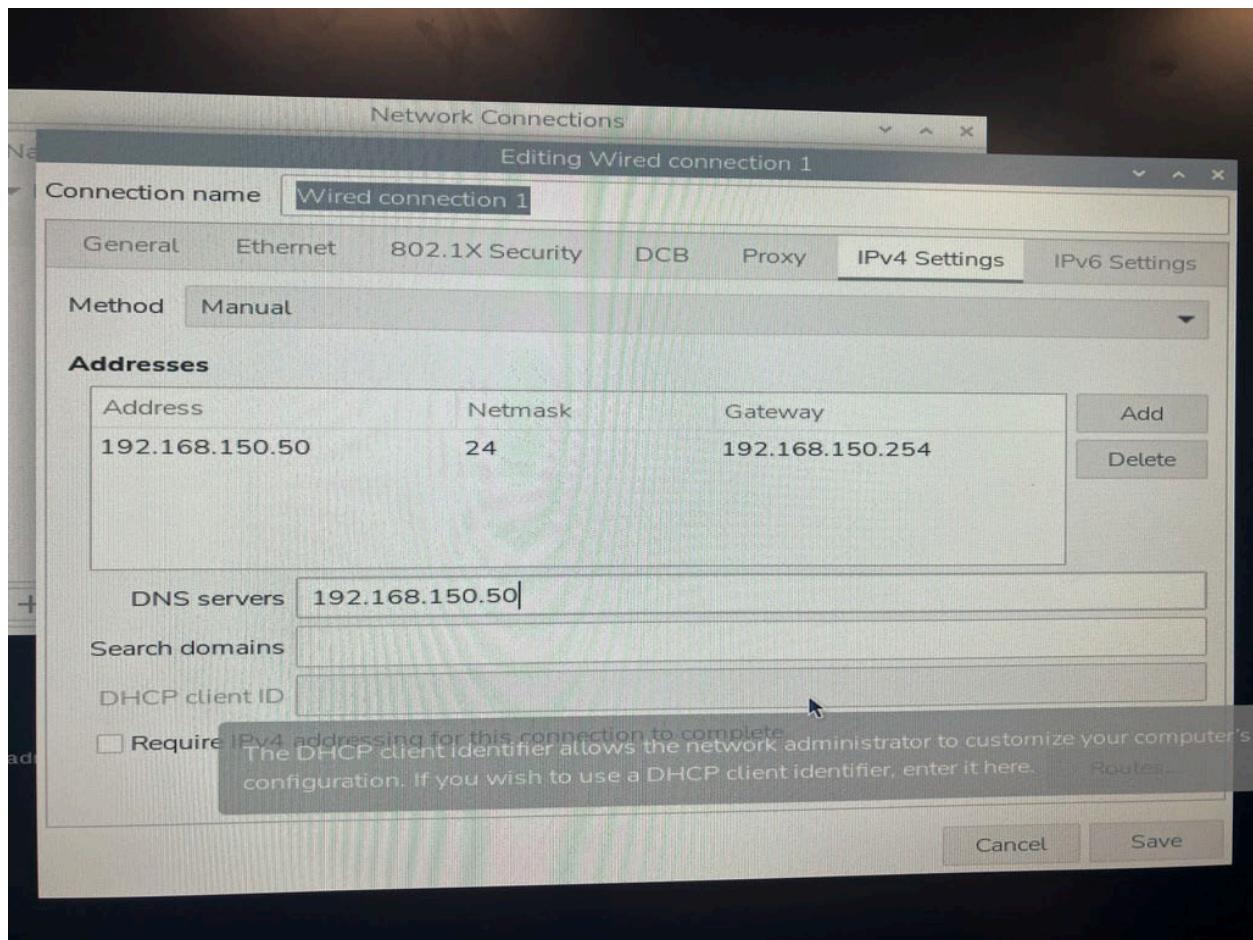


FIGURE 42 - SET THE REQUIRED NETWORK MANUALLY FOR PI

```
File Edit Tabs Help
ld132@iddeenjibreal:~ $ whoami
ld132
ld132@iddeenjibreal:~ $ curl -sSL https://install.pi-hole.net | bash
```

A red arrow points to the command 'curl -sSL https://install.pi-hole.net | bash' in the terminal window.

FIGURE 43 - TYPEE THE REQUIRED COMMAND

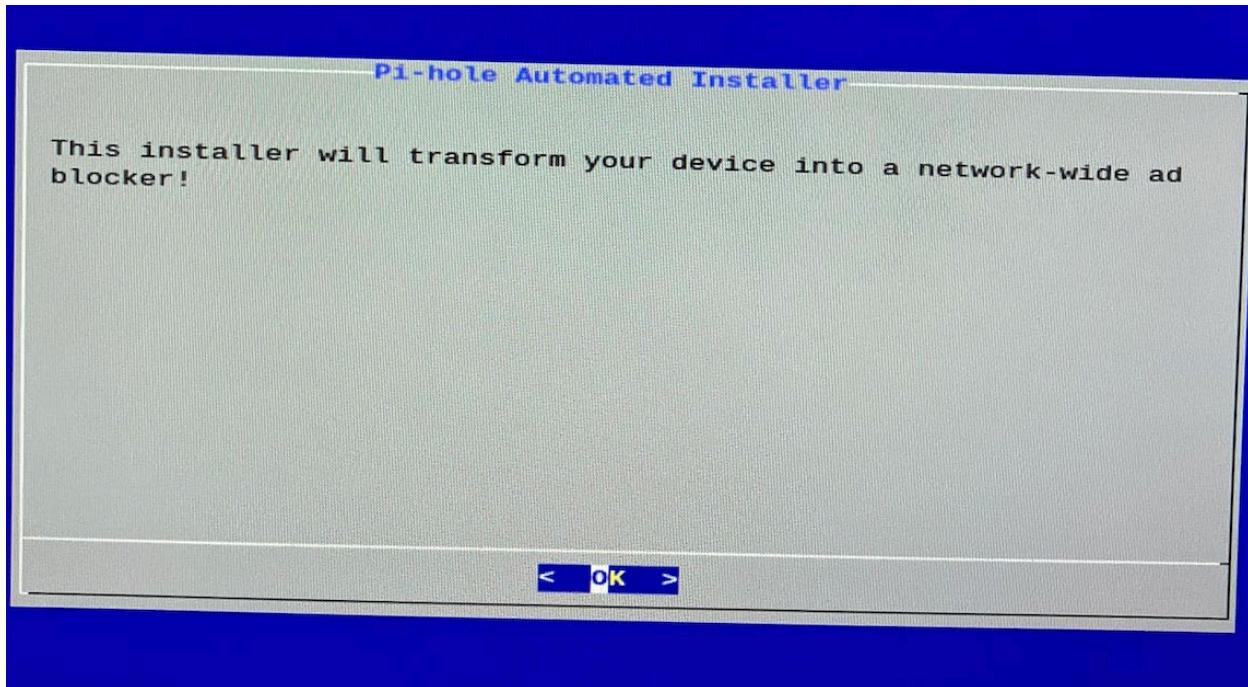


FIGURE 44 - CLICK "OK"

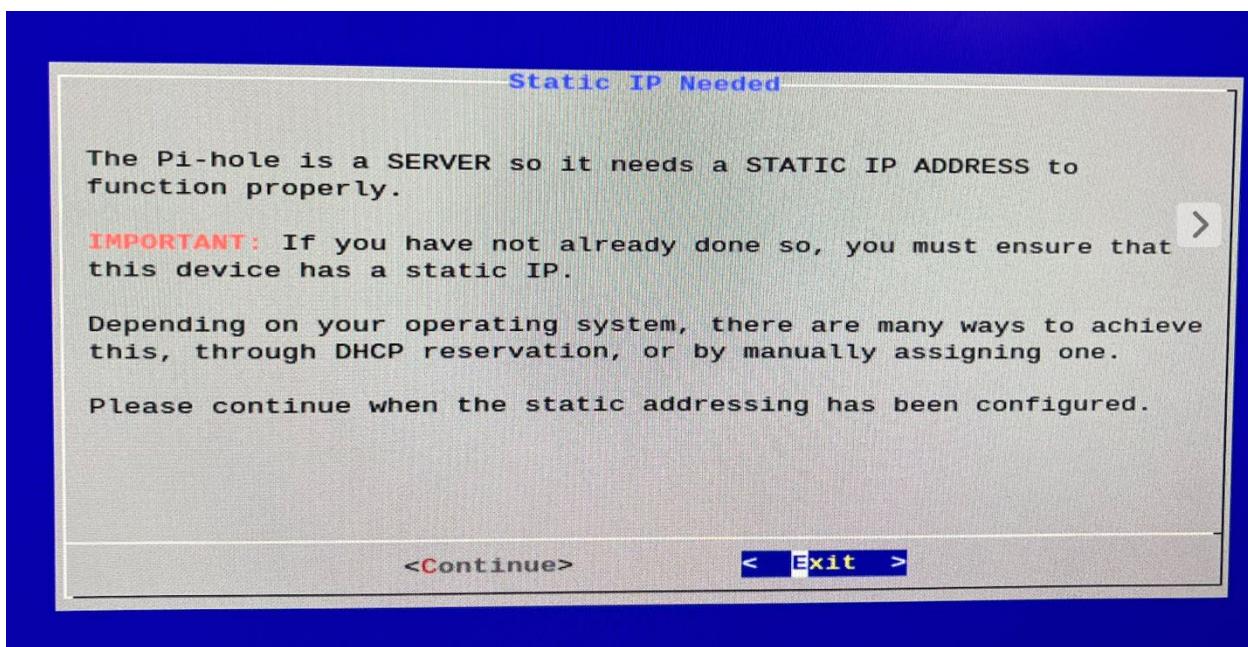
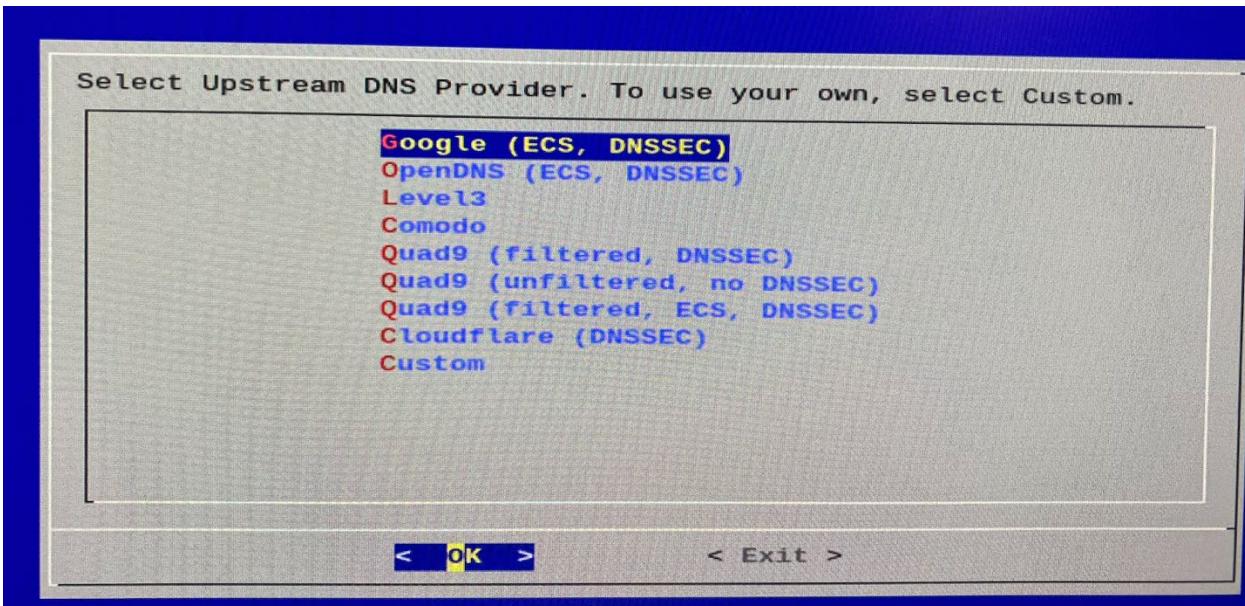
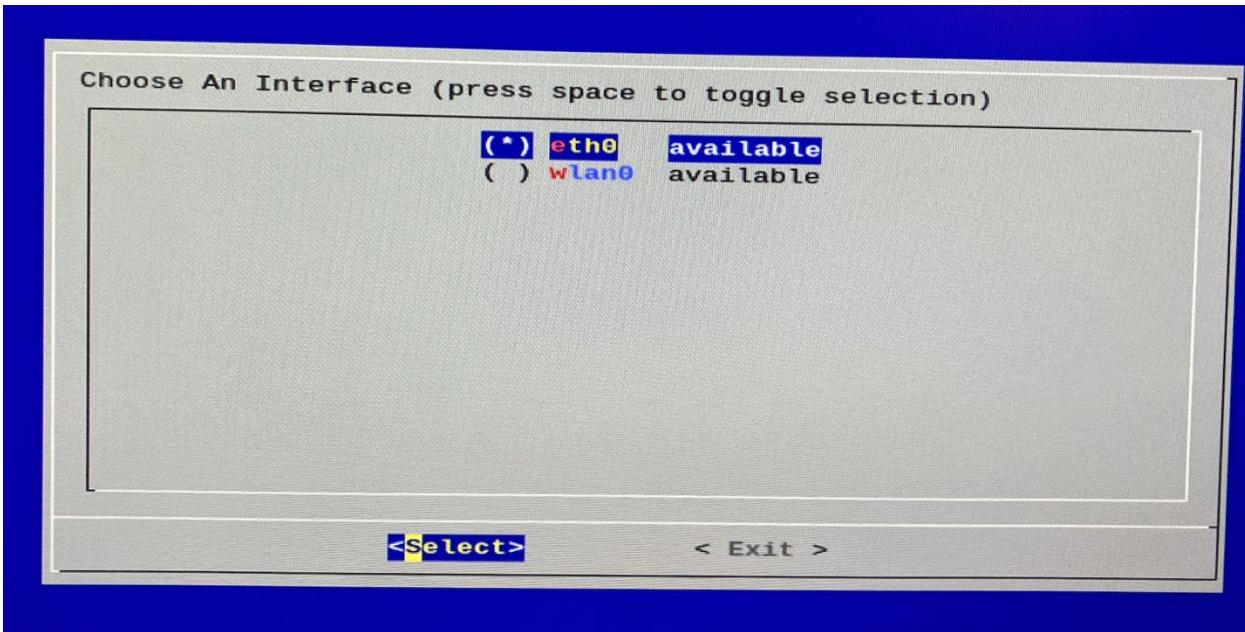


FIGURE 45 - CLICK "CONTINUE"



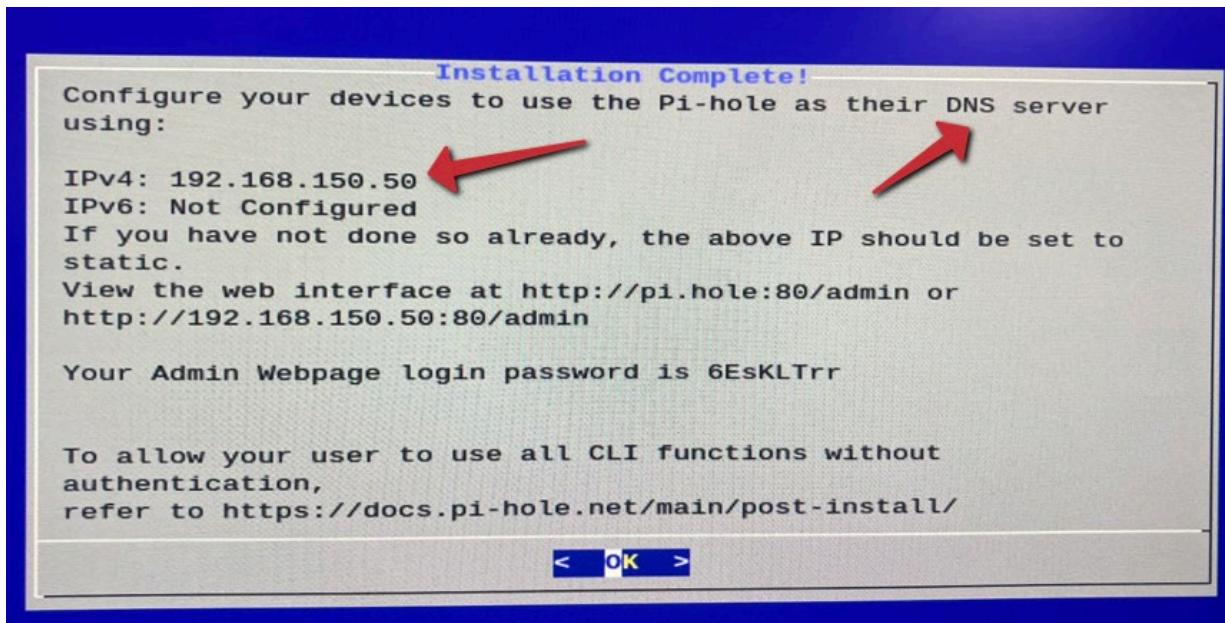
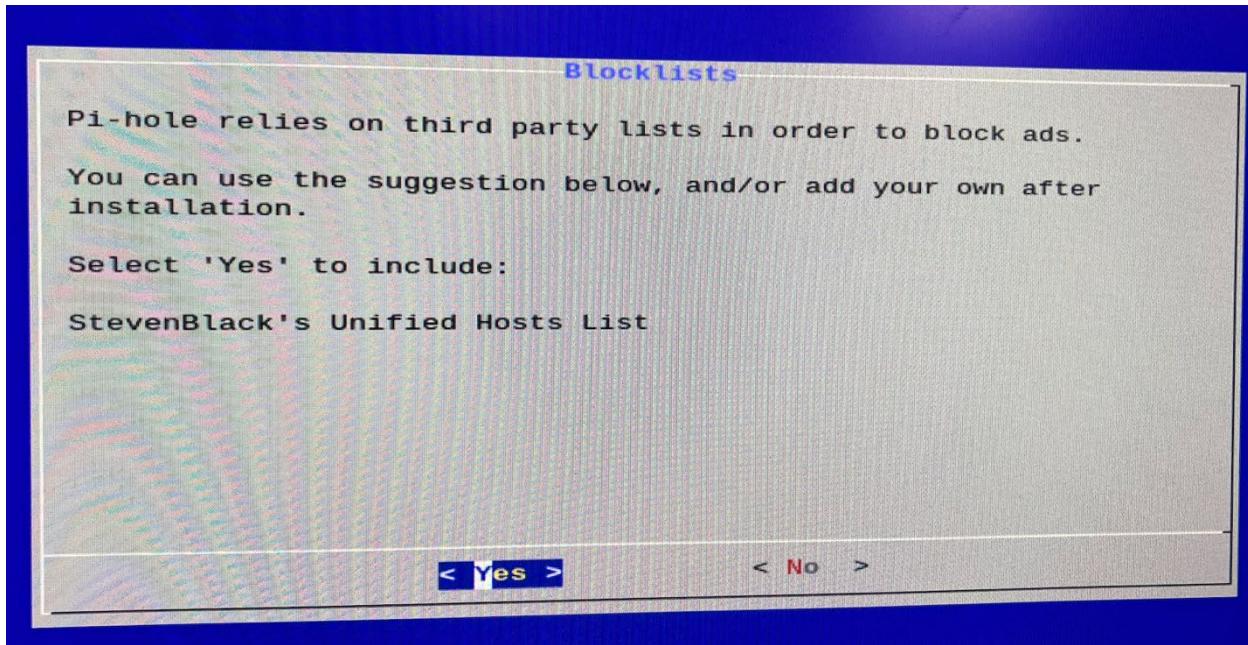


FIGURE 46 - UNTIL HERE, MAKE SURE TO CONFIGURE YOUR DNS SERVER BEFORE PROCCED THIS



FIGURE 47 - TYPE THE DNS IP ADDRESS ON THE URL

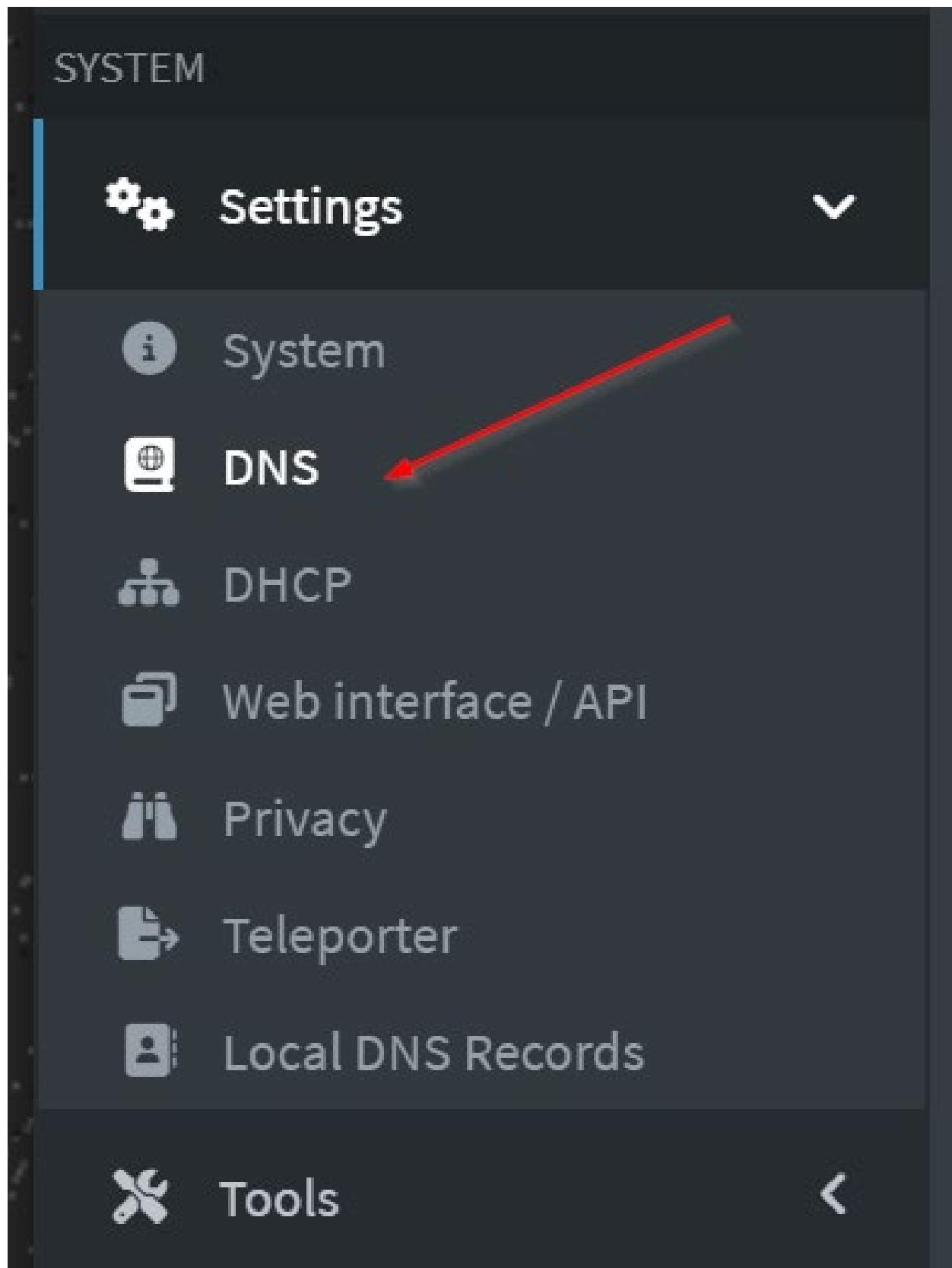


FIGURE 48 - SHOWCASE OF THE WEBSITE, THEN CLICK "DNS"

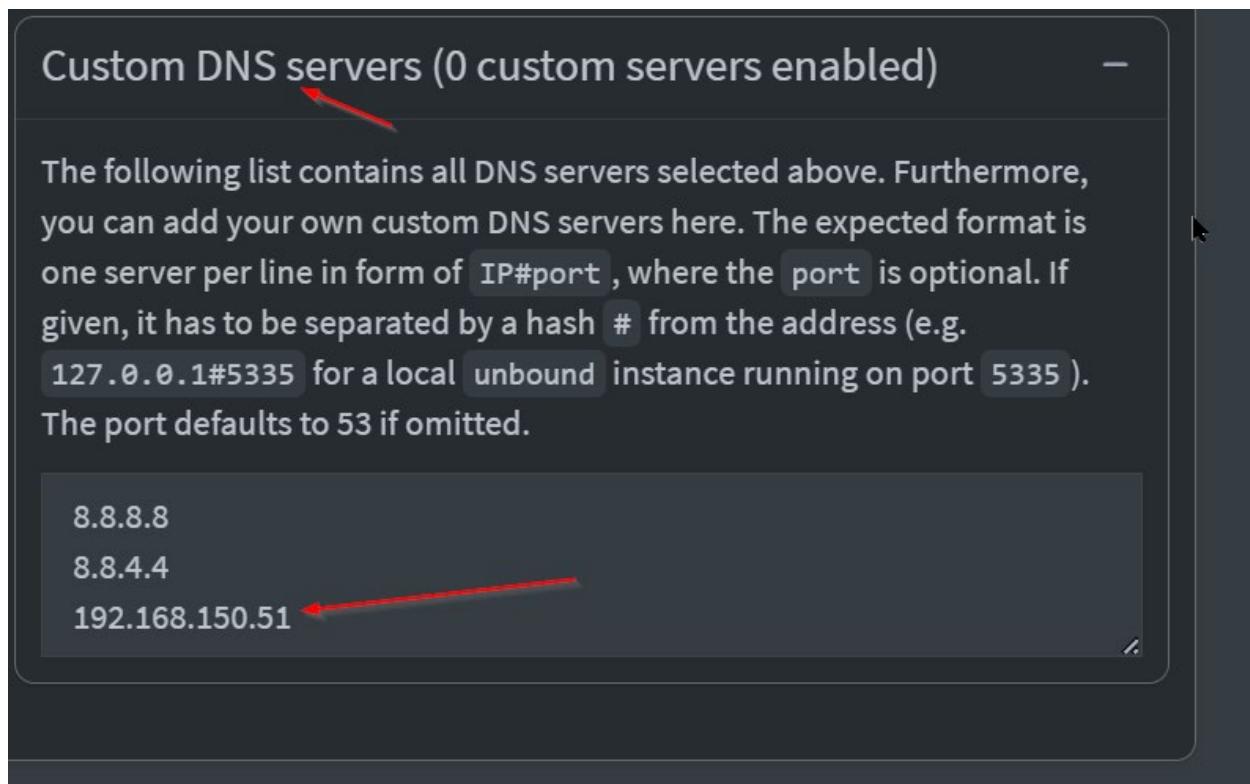


FIGURE 49 - SET YOUR OWN DNS SERVER ON IT

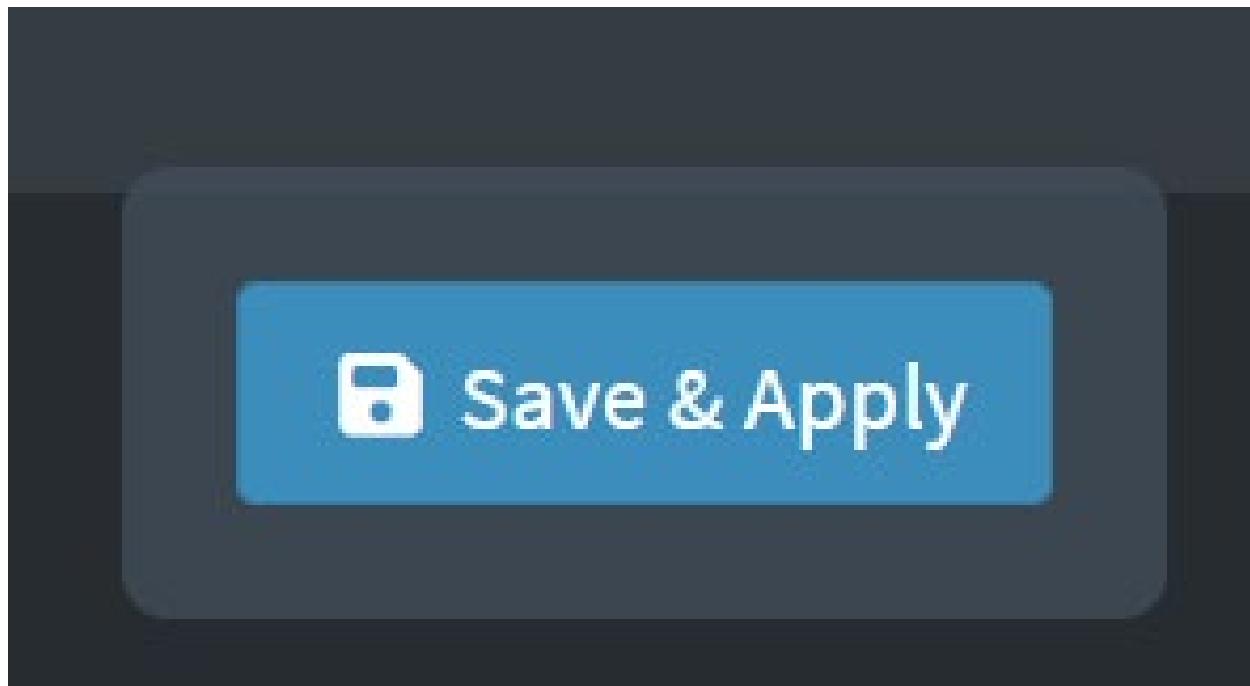


FIGURE 50 - SAVE AND APPLY IT

```
C:\Users\Student01>nslookup 192.168.150.51
Server: pi.hole
Address: 192.168.150.51

Name: pi.hole
Address: 192.168.150.51
```

FIGURE 51 - CHECK THE NSLOOKUP TO THE EXTERNAL DNS

```
C:\Users\Student01>ping 192.168.150.51

Pinging 192.168.150.51 with 32 bytes of data:
Reply from 192.168.150.51: bytes=32 time<1ms TTL=64

Ping statistics for 192.168.150.51:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

FIGURE 52 - PING THE DNS SERVER

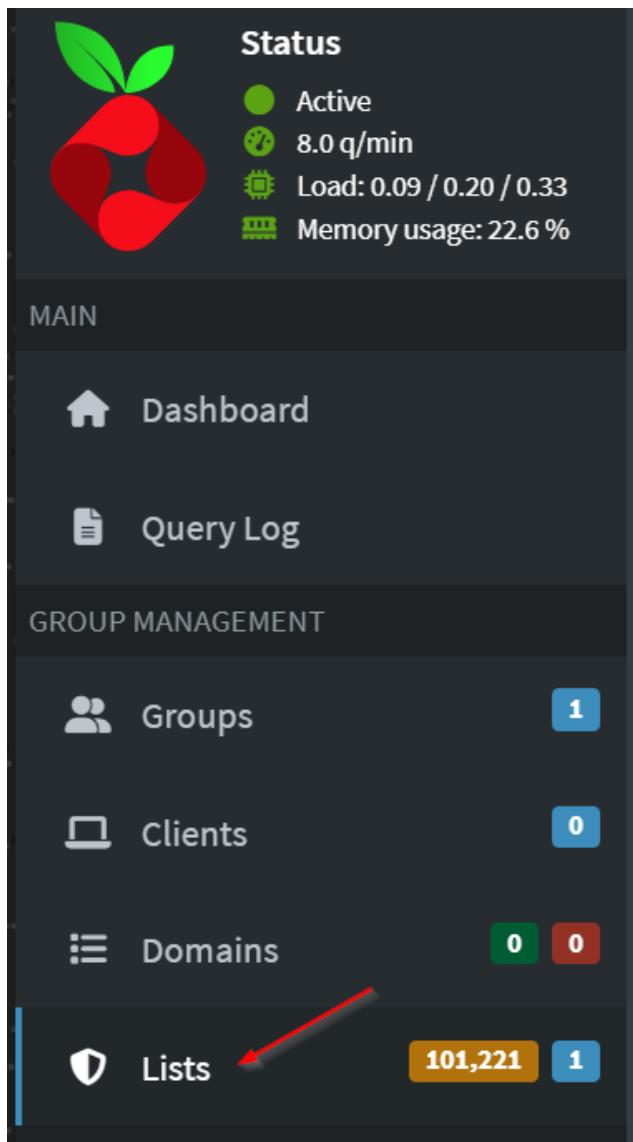


FIGURE 53 - CLICK "LISTS"

This screenshot shows the 'Add a new subscribed list' form. It has fields for 'Address' (containing 'nytimes.com'), 'Comment' (with placeholder 'List description (optional)'), and 'Group assignment' (set to 'Default'). Below these are 'Hints' with instructions: 1. Run 'pihole -g' or update online. 2. Add multiple URLs separated by space or comma. 3. Click icons for more info. At the bottom are 'Add blocklist' (red button) and 'Add allowlist' (green button).

FIGURE 54 - TYPE THE CUSTOM WEBSITE TO ADD BLOCKLIST FOR IT

Subscribed lists						
Show	10	entries	Search:			
				Previous	1	Next
<input type="checkbox"/>			Address	Status	Comment	Group assignment
<input type="checkbox"/>			https://raw.githubusercontent.com/StevenBlack/hosts/master/hosts	Enabled	Migrated from /etc/pihole	Default ▾
<input type="checkbox"/>			https://www.nytimes.com	Enabled		Default ▾

FIGURE 55 - MAKE SURE TO SEE IF IT IS ACTIVE

The New York Times homepage featuring a collage of four images: Tiger Woods celebrating, a woman dancing, Zendaya in a black dress, and Roger Federer cheering. The page includes a search bar, navigation links (U.S., International, Canada, Español, 中文), and a login account section. The date is Monday, November 10, 2025.

FIGURE 56 - ON DELL LAPTOP, CHECK THE CNN WEBSITE

2025-10-28 16:33:38	🚫	A	a.et.nytimes.com	192.168.150.15
2025-10-28 16:33:38	🚫	HTTPS	a.et.nytimes.com	192.168.150.15
2025-10-28 16:33:38	🚫	HTTPS	a.et.nytimes.com	192.168.150.15
2025-10-28 16:37:29	🚫	A	a.et.nytimes.com	192.168.150.15
2025-10-28 16:37:29	🚫	HTTPS	a.et.nytimes.com	192.168.150.15
2025-10-28 16:37:29	🚫	A	a.et.nytimes.com	192.168.150.15
2025-10-28 16:37:30	🚫	A	a.et.nytimes.com	192.168.150.15
2025-10-28 16:37:30	🚫	HTTPS	a.et.nytimes.com	192.168.150.15

FIGURE 57 - THE ADS FOR NYTIMES HAS BEEN BLOCKED!

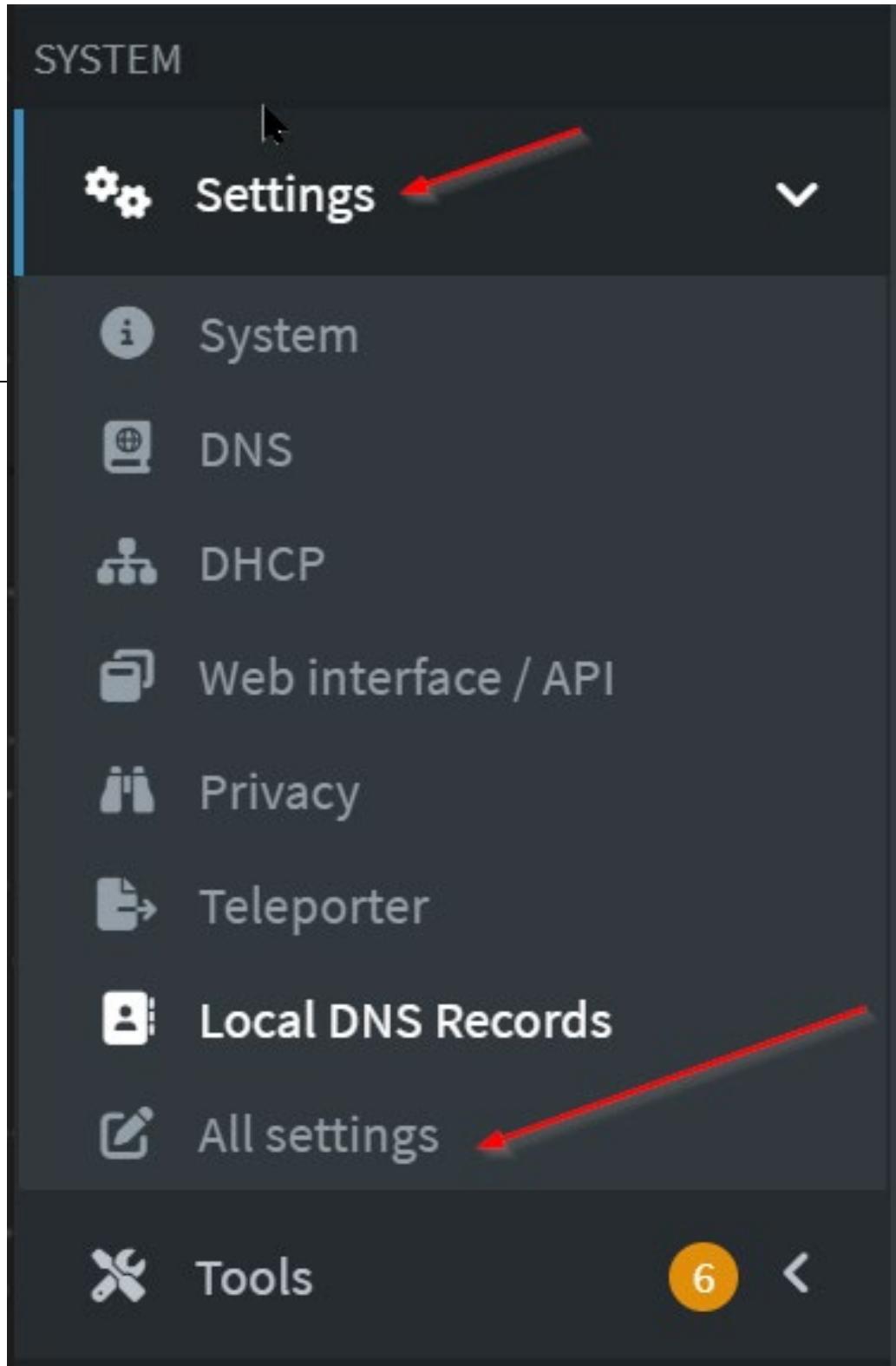


FIGURE 58 - CLICK "ALL SETTINGS"

Local DNS records	
List of local DNS records	
Show <input type="button" value="10"/> entries	Search:
	<input type="button" value="Previous"/> 1 <input type="button" value="Next"/>
Domain	IP
DellLaptop	192.168.150.15
PC1	192.168.150.14
pihole	192.168.150.51
router	192.168.150.254
<input type="text" value="Domain"/>	<input type="text" value="Associated IP"/>
	<input type="button" value="+"/>
	<input type="button" value="Previous"/> 1 <input type="button" value="Next"/>

FIGURE 59 - CREATE AN LIST OF DNS RECORDS FOR FORWARD

DNS domain settings ⚙️ ⏪

Pi-hole domain name

Domain	lan
--------	-----

The DNS domains for your Pi-hole. This DNS domain is purely local. FTL may answer queries from its local cache and configuration but *never* forwards any requests upstream *unless* you have configured a dns.revServer exactly for this domain. If no domain is specified and you are using Pi-hole's DHCP server, then any hostnames with a domain part (i.e., with a period) will be disallowed. If a domain is specified, then hostnames with a domain parts matching the domain here are allowed. In addition, when a suffix is set then hostnames without a domain part have the suffix added as an optional domain part.

Expand hostnames

If set, the domain is added to simple names (without a period) in /etc/hosts in the same way as for DHCP-derived names.

FIGURE 60 - SET THE DNS DOMAIN NAME

```
C:\Users\Student01>nslookup router.lan
Server: pi.hole
Address: 192.168.150.51
Name: router.lan
Address: 192.168.150.254
```

```
C:\Users\Student01>nslookup 192.168.150.254
Server: pi.hole
Address: 192.168.150.51

Name: router.lan
Address: 192.168.150.254
```

```
C:\Users\Student01>nslookup pc1.lan
Server: pi.hole
Address: 192.168.150.51

Name: pc1.lan
Address: 192.168.150.14
```

```
C:\Users\Student01>nslookup 192.168.150.14
Server: pi.hole
Address: 192.168.150.51

Name: pc1.lan
Address: 192.168.150.14
```

```
C:\Users\Student01>nslookup dellLaptop.lan
Server: pi.hole
Address: 192.168.150.51

Name: dellLaptop.lan
Address: 192.168.150.15
```

```
C:\Users\Student01>nslookup 192.168.150.15
Server: pi.hole
Address: 192.168.150.51

Name: delllaptop.lan
Address: 192.168.150.15
```

```
C:\Users\Student01>nslookup piHole.lan
Server: pi.hole
Address: 192.168.150.51

Name: piHole.lan
Address: 192.168.150.51
```

```
C:\Users\Student01>nslookup 192.168.150.51
Server: pi.hole
Address: 192.168.150.51

Name: pi.hole
Address: 192.168.150.51
```

FIGURE 61 - NSLOOK UP ON THE IP ADDRESS, DNS NAME

```
[✓] Done.
cold132@iddeenjibreal:~ $ sudo tree /etc/dnsmasq.d/05-reverse-192.168.150.conf >/dev/n
net/ null
cold132@iddeenjibreal:~ $ sudo tree /etc/dnsmasq.d/05-reverse-192.168.150.conf >/dev/null/ << 'EOF'
> [
```

FIGURE 62 - TYPE THE REQUIRED COMMAND

```
bash: /dev/null/: Is a directory
cold132@iddeenjibreal:~ $ sudo tee /etc/dnsmasq.d/05-reverse-192.168.150.conf >/dev/null << 'EOF'
> ptr-record=254.150.168.192.in-addr.arpa,router.lan
> ptr-record=51.150.168.192.in-addr.arpa,piHole.lan
> ptr-record=15.150.168.192.in-addr.arpa,dellLaptop.lan
> ptr-record=14.150.168.192.in-addr.arpa,pc1.lan
> EOF
cold132@iddeenjibreal:~ $
```

FIGURE 63 - SET THE PTR IP ADDRESS RECORDS ON THAT

QUESTIONS AND ANSWERS

1. What is the purpose of Pi-hole in a network?
 - A local DNS sinkhole that blocks ads/trackers/malware by domain, improving privacy and speed.
2. Why is it recommended to assign a static IP to the Pi-hole server?
 - Clients must always reach the same DNS. If the Pi IP changes, name resolution fails.
3. Explain how Pi-hole blocks ads at the DNS level.
 - When a blocked domain is requested, Pi-hole returns 0.0.0.0/NXDOMAIN, so the ad server is never contacted.
4. What role does the Cisco PoE switch play in this lab?
 - Provides wired connectivity and power for the PI and connects all lab devices on the same LAN.
5. If your PC cannot resolve domain names after setting Pi-hole as DNS, what steps would you take to troubleshoot?
 - Check PC DNS, then check Pi-hole Query Log, confirm Pi has internet and verify upstream DNS in Pi-hole. Then verify gateway IP Address on the Pi, pihole restarts.
6. How would you add a custom blocklist to Pi-hole?
 - List, then type the custom website then click Add to blocklist.
7. If the Raspberry Pi loses connectivity, what impact does it have on the network, and how can you mitigate it?
 - DNS breaks for clients. Mitigate by adding a secondary DNS, or running a second Pi-hole, or temporarily pointing clients to a public DNS.

OBSERVATIONS

It was easy to understand, so it made things easier, and I learned that blocking ads can be easier thing to do when you use PI!