

PI-HOLE

A LAN-WIDE AD BLOCKER THAT RUNS ON A RASPBERRY-PI



ABOUT ME – DON ARROWSMITH

- I used my first computer in 1961, a Bendix G-15, which had a whole 2KB of rotating drum memory! I have a BSEE from Lehigh and am retired from working at a US Navy facility collecting data from aircraft engines via computers.
- I am currently the President of the Philadelphia Area Computer Society and am a past APCUG advisor for Region 3. I maintain several web sites that I have coded in PHP and MySQL.

WHAT WE'LL COVER

- What is a Pi-hole and why would I want one?
- What are the hardware requirements and how do I assemble it?
- What operating system will I be using, where do I get it and how do I install it?
- How do I get Pi-hole software and install it?
- How do I configure it to work with my network?
- How do I maintain Pi-hole?
- How do I troubleshoot it?

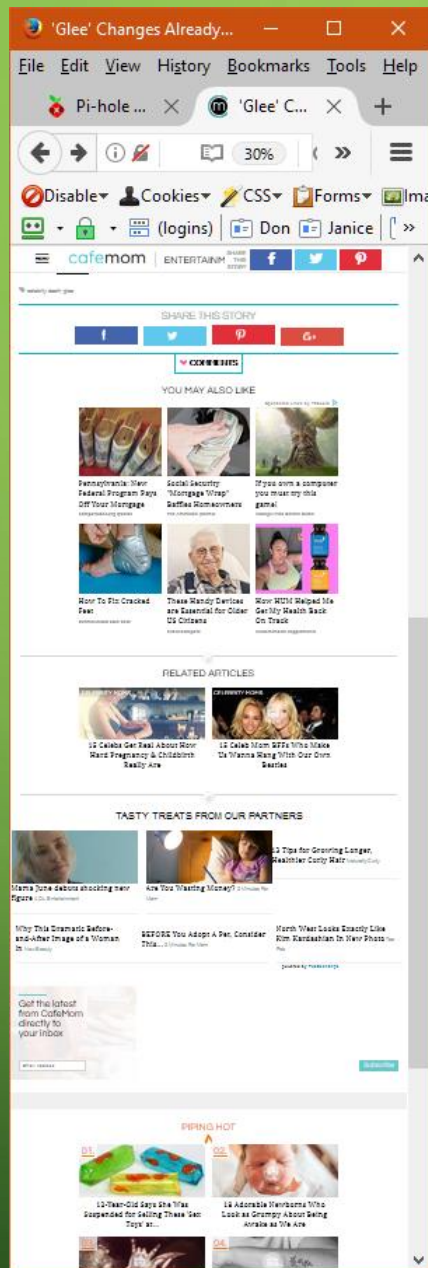


PI-HOLE™: A BLACK HOLE FOR INTERNET ADVERTISEMENTS

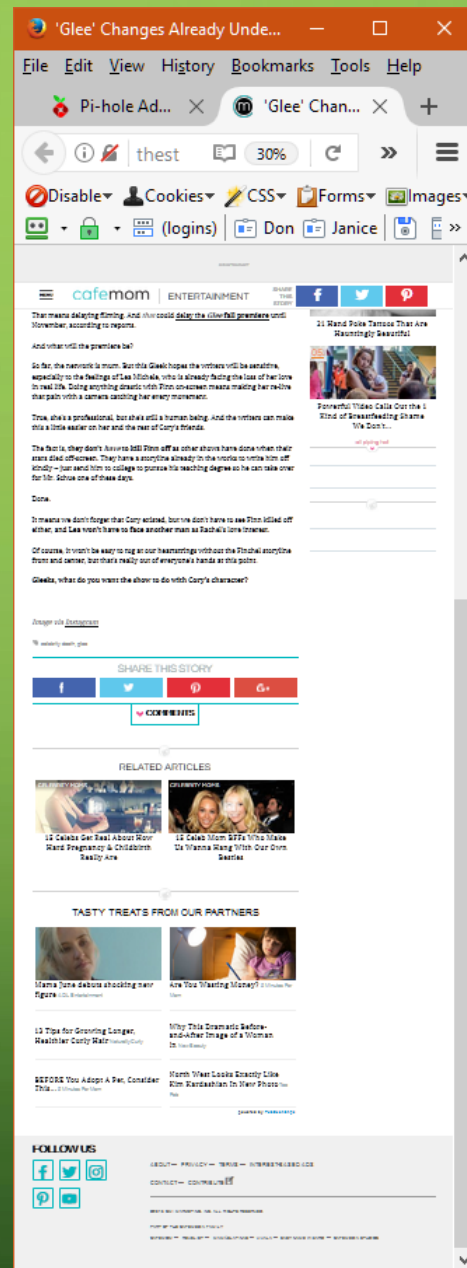
`curl -sSL https://install.pi-hole.net | bash`

- 
- 
- 
- 
- Block Over 100,000 Ad-serving Domains
 - Block Advertisements On All Devices
 - Improve Overall Network Performance
 - Faster web page loading
 - Reduce Cellular Data Usage
 - Monitor Performance And Statistics
 - Protect against malware-tainted ads

Before



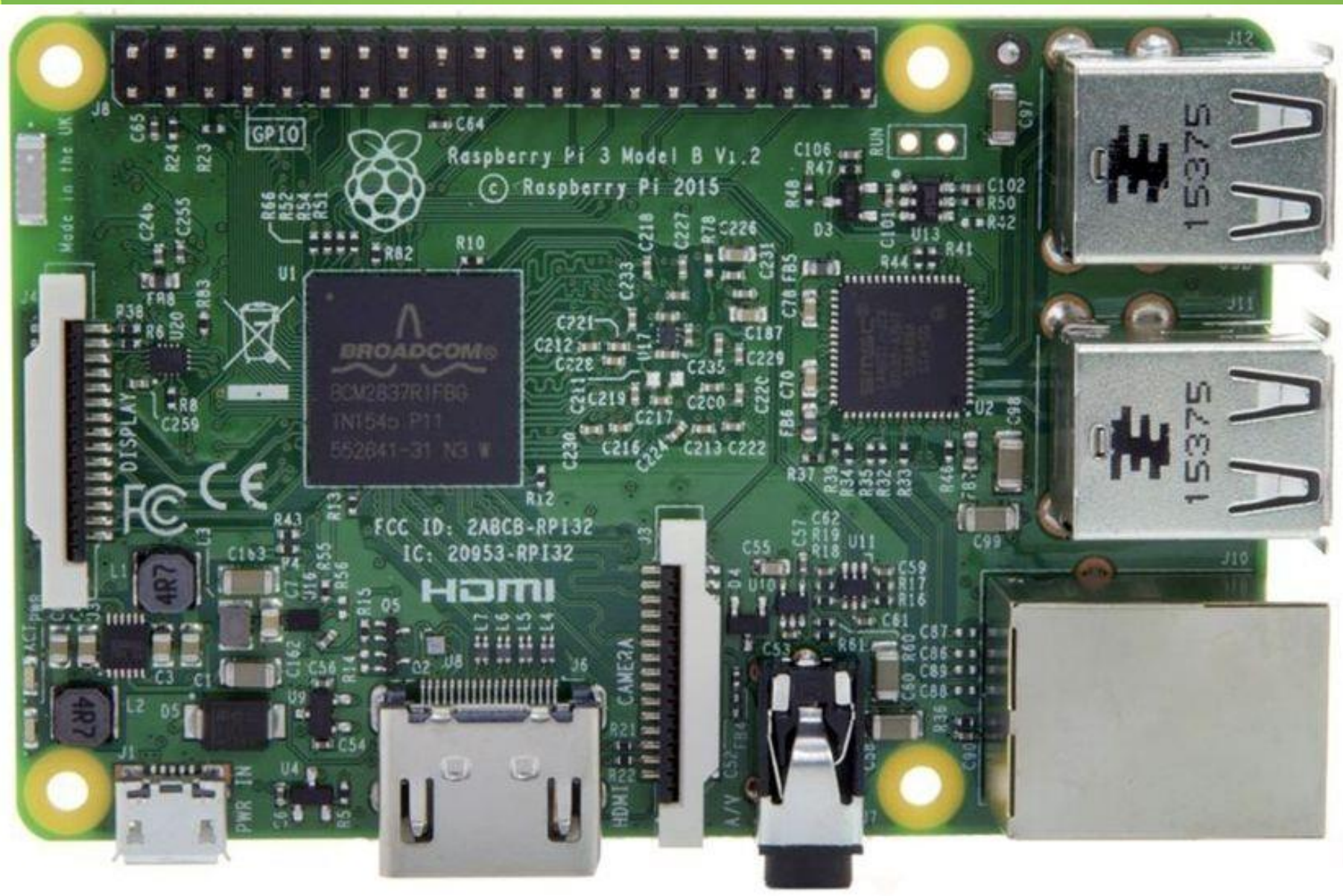
After

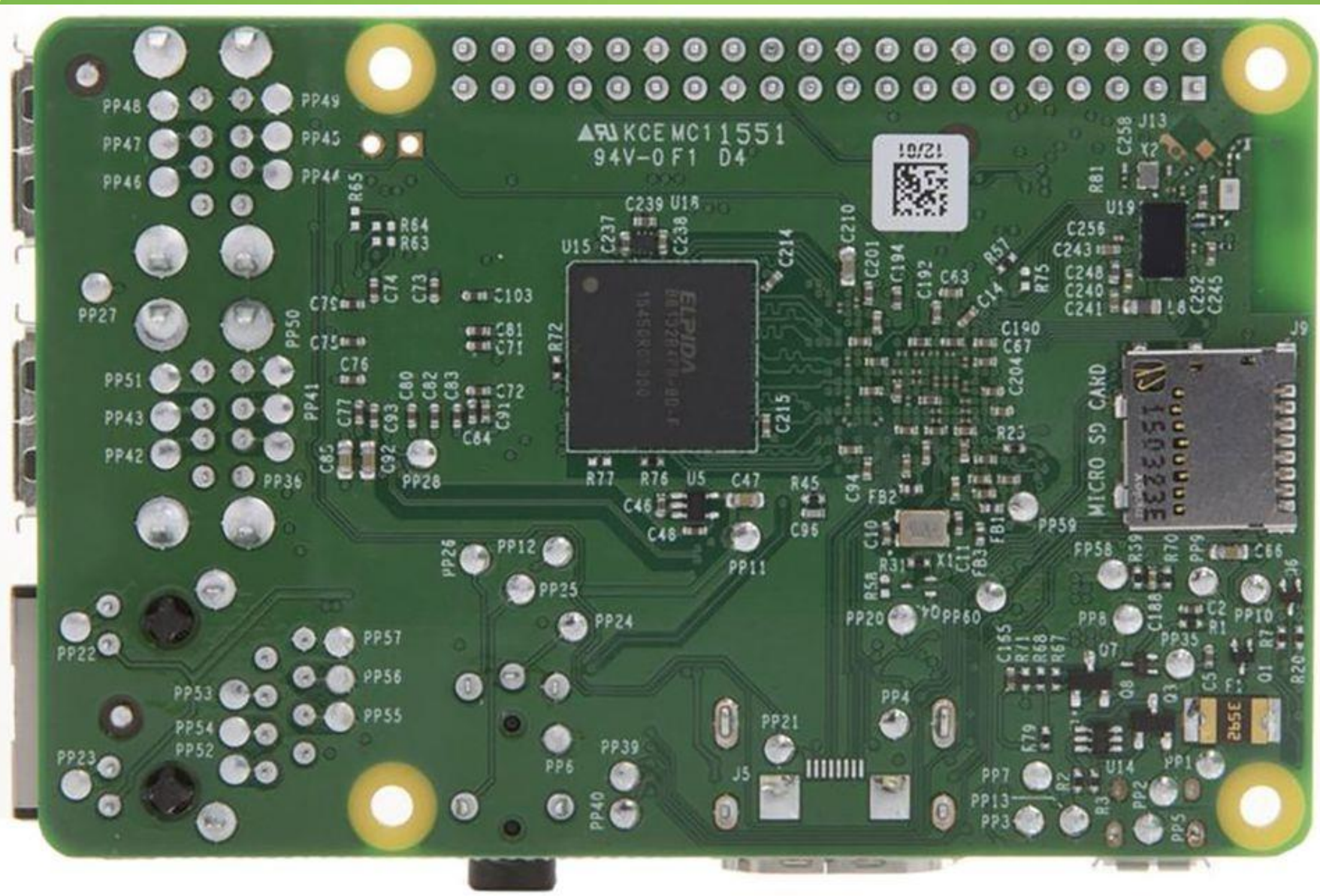


- The 'pi' part of the name comes from Raspberry-Pi, a small, single-board computer about the size of a deck of cards. There are a series of Pi's - developed in the United Kingdom by the Raspberry Pi Foundation to promote the teaching of basic computer science in schools and in developing countries.
- There will be many opportunities to make alternate choices with this project. I'll describe the choices I made for my system. You may make different choices to construct your unique system.
- I chose to use a Raspberry Pi 3B. The Pi-hole software will also run on other models, including the much cheaper Pi 0.
- I chose to use Raspbian Linux; Pi-hole will also run on many others.

- The Pi 3B includes: a Broadcom BCM2837 SoC with a 1.2 GHz 64-bit quad-core ARM Cortex-A53 processor, with 512 KB shared L2 cache
- 1 GB RAM LPDDR2 (900 MHz)
- Micro SD card slot (recommended minimum 8 GB class 4) [class refers to speed]
- 10/100 MBps Ethernet port
- 4 USB 2.0 ports
- Full-size HDMI video port
- 802.11n 2.4 GHz Wireless LAN
- Bluetooth 4.1 & Low Energy (BLE)
- 40 GPIO (General Purpose Input Output) pins
- Combined 3.5 mm audio jack and composite video
- Camera serial interface (CSI) and Display serial interface (DSI)
- VideoCore IV 3D graphics core
- Micro USB connector for 5v power (2.5 a supply recommended)























SHOPPING LIST:


- Raspberry Pi 3B - \$29.99
- 32GB micro SD card, class 10 - \$12.99
- Raspberry Pi Case - \$8.99
- 2.5A microUSB power supply - \$10.99

Typical prices at MicroCenter (March 2017)

ASSEMBLING THE UNIT

- Use good practice when putting the parts together as these are electrostatic sensitive devices. I recommend wearing an anti-static wrist guard that's properly grounded.
- You should avoid touching any of the gold-plated contacts on all connectors and handle the Pi only by the edges.

FORMAT YOUR SD CARD

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SD Card Formatter 4.0 for SD/SDHC/SDXC

This software formats all SD memory cards, SDHC memory cards and SDXC memory cards. SD Card Formatter provides quick and easy access to the full capabilities of your SD, SDHC and SDXC memory cards.

The SD Card Formatter was created specifically for memory cards using the SD/SDHC/SDXC standards. It is strongly recommended to use the SD Card Formatter instead of formatting utilities provided with operating systems that format various types of storage media. Using generic formatting utilities may result in less than optimal performance for your memory cards.

The SD/SDHC/SDXC memory cards have a "Protected Area" on the card for the SD standard's security function. The SD Card Formatter does not format the "Protected Area". Please use appropriate application software or SD-compatible device that provides SD security function to format the "Protected Area" in the memory card.

System Requirements

Operating Systems:

	SD/SDHC	SDXC
Windows	Windows 8 Windows 7 Windows Vista	Windows 8 Windows 7 Windows Vista (SP1 or later)

<https://www.sdcard.org/downloads/index.html>

100%

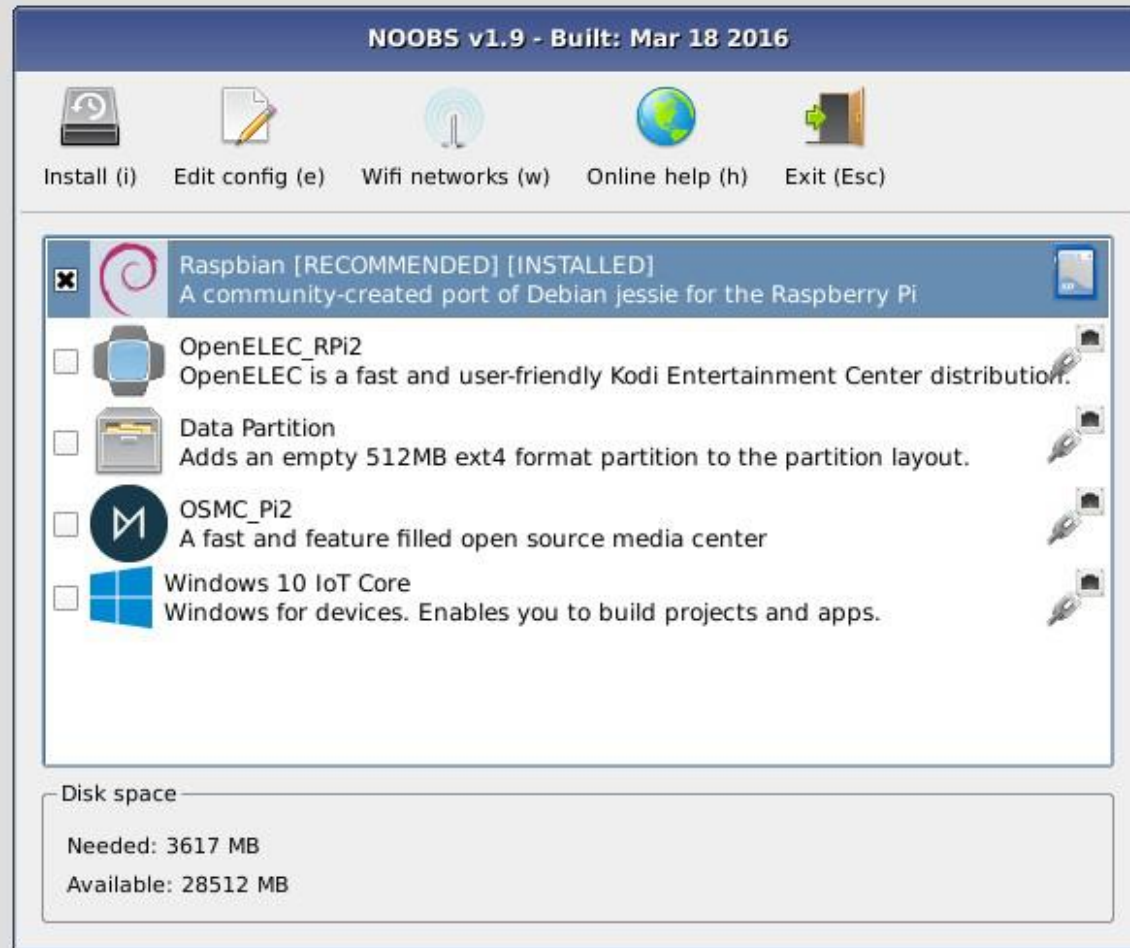
GET THE OS


- Download NOOBS (New Out Of the Box Software) offline Zip file at the Raspberry Pi site
- Save the file on your PC then unzip the files (about 1.1 GB)
- Copy the files to the SD card
- Other options: Buy a card preloaded with NOOBS; Download Raspbian only; Buy a card preloaded with Raspbian.

INSTALL THE OS

- Put the SD card into the Pi and connect the keyboard, mouse, video and network cable. Lastly, connect the power supply and power on.
- The Pi will boot and display the NOOBS menu.
- Select Raspbian as the OS to install. Expect around 15 minutes for this phase.
- When that's finished and you are at the desktop, start a terminal session by clicking on the terminal icon in the taskbar.

NOOBS (NEW OUT OF BOX SOFTWARE)



Language (l):  English (UK) Keyboard (9): gb

CLEANUP AFTER RASPBIAN INSTALLATION

- `sudo apt-get update`
- `sudo apt-get dist-upgrade`
- `sudo apt-get autoremove`

CONFIGURE RASPBIAN

- **Sudo `raspi-config`** at the terminal to:
 - Change the default password
 - Set hostname to RaspberryPi (or other)
 - Localization: Set locale to en-US
 - Localization: Change time zone to Eastern US
 - Localization: Set Wi-Fi country to US
 - Interfacing: Enable SSH
 - Interfacing: Enable VNC

pi@RaspberryPi: ~

Raspberry Pi Software Configuration Tool (raspi-config)

- | | |
|------------------------|-----------------------------------|
| 1 Change User Password | Change password for the default u |
| 2 Hostname | Set the visible name for this Pi |
| 3 Boot Options | Configure options for start-up |
| 4 Localisation Options | Set up language and regional sett |
| 5 Interfacing Options | Configure connections to peripher |
| 6 Overclock | Configure overclocking for your P |
| 7 Advanced Options | Configure advanced settings |
| 8 Update | Update this tool to the latest ve |
| 9 About raspi-config | Information about this configurat |

<Select>

<Finish>



pi@RaspberryPi: ~



Please enter a hostname

RaspberryPi

<Ok>

<Cancel>



pi@RaspberryPi: ~



Raspberry Pi Software Configuration Tool (raspi-config)

- | | |
|-------------------------|-----------------------------------|
| I1 Change Locale | Set up language and regional sett |
| I2 Change Timezone | Set up timezone to match your loc |
| I4 Change Wi-fi Country | Set the legal channels used in yo |

<Select>

<Back>

pi@RaspberryPi: ~

Package configuration

Configuring locales

Locales are a framework to switch between multiple languages and allow users to use their language, country, characters, collation order, etc.

Please choose which locales to generate. UTF-8 locales should be chosen by default, particularly for new installations. Other character sets may be useful for backwards compatibility with older systems and software.

Locales to be generated:

```
[ ] en_US ISO-8859-1
[ ] en_US.ISO-8859-15 ISO-8859-15
[*] en_US.UTF-8 UTF-8
[ ] en_ZA ISO-8859-1
[■] en_ZA.UTF-8 UTF-8
```

<Ok>

<Cancel>

pi@RaspberryPi: ~

Raspberry Pi Software Configuration Tool (raspi-config)

P1 Camera	Enable/Disable connection to the
P2 SSH	Enable/Disable remote command lin
P3 VNC	Enable/Disable graphical remote a
P4 SPI	Enable/Disable automatic loading
P5 I2C	Enable/Disable automatic loading
P6 Serial	Enable/Disable shell and kernel m
P7 1-Wire	Enable/Disable one-wire interface
P8 Remote GPIO	Enable/Disable remote access to G

<Select>

<Back>

INSTALL PI-HOLE

- `curl -sSL https://install.pi-hole.net | bash`
- Record the web login password that is shown to you

READY TO GO!

- You can now turn off the Pi by: `sudo shutdown -h now`
- Disconnect the power, keyboard, mouse and video.
- The Pi will be now be accessed either by the Pi-hole web interface, the desktop via VNC (Virtual Network Computing) or a terminal session via SSH (Secure Shell).
- On Windows, I use PuTTY to make an SSH session. [Key pairs are supported to eliminate using passwords.]
- An SFTP (Secure File Transfer Protocol) server is also enabled to allow you to transfer files.
- Access the web page via `http://<IP address>/admin/` and use the password that was provided during installation.

**912**

DNS Queries Blocked Today

**14,191**

DNS Queries Today

**6.4%**

Of Today's Queries Were Blocked

**106,964**

Domains Being Blocked

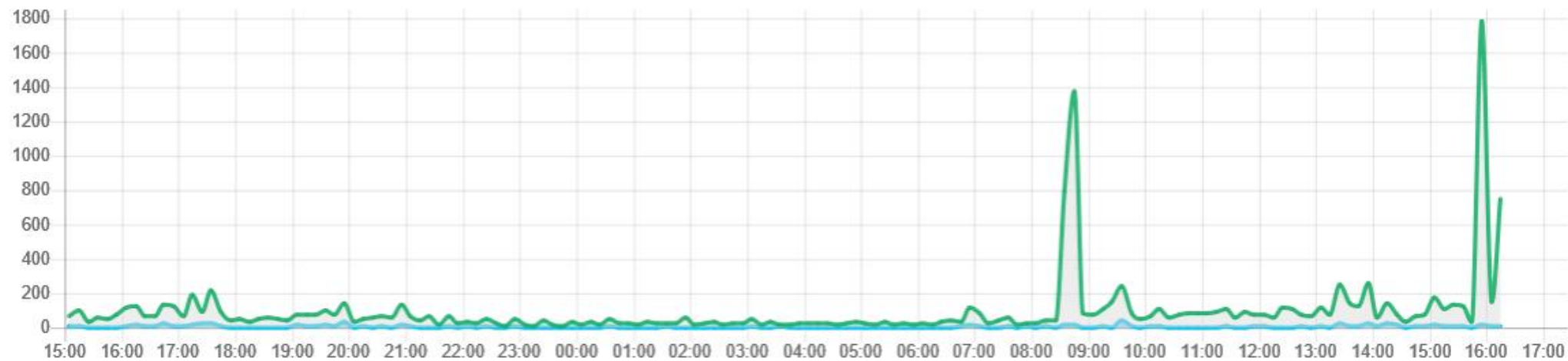


Queries over last 24 hours

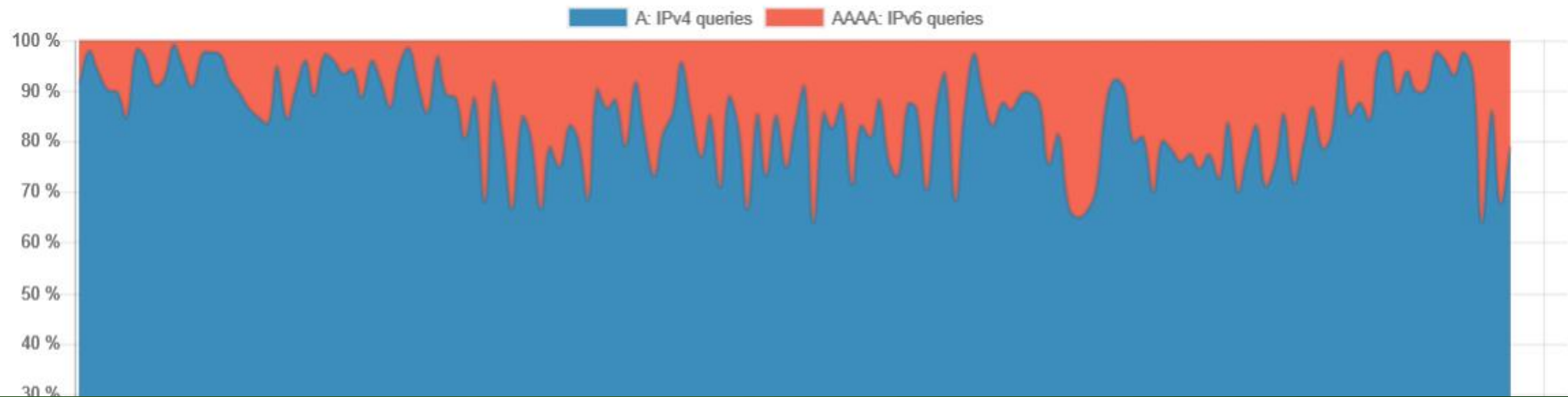
1800
1600
1400
1200
1000
800



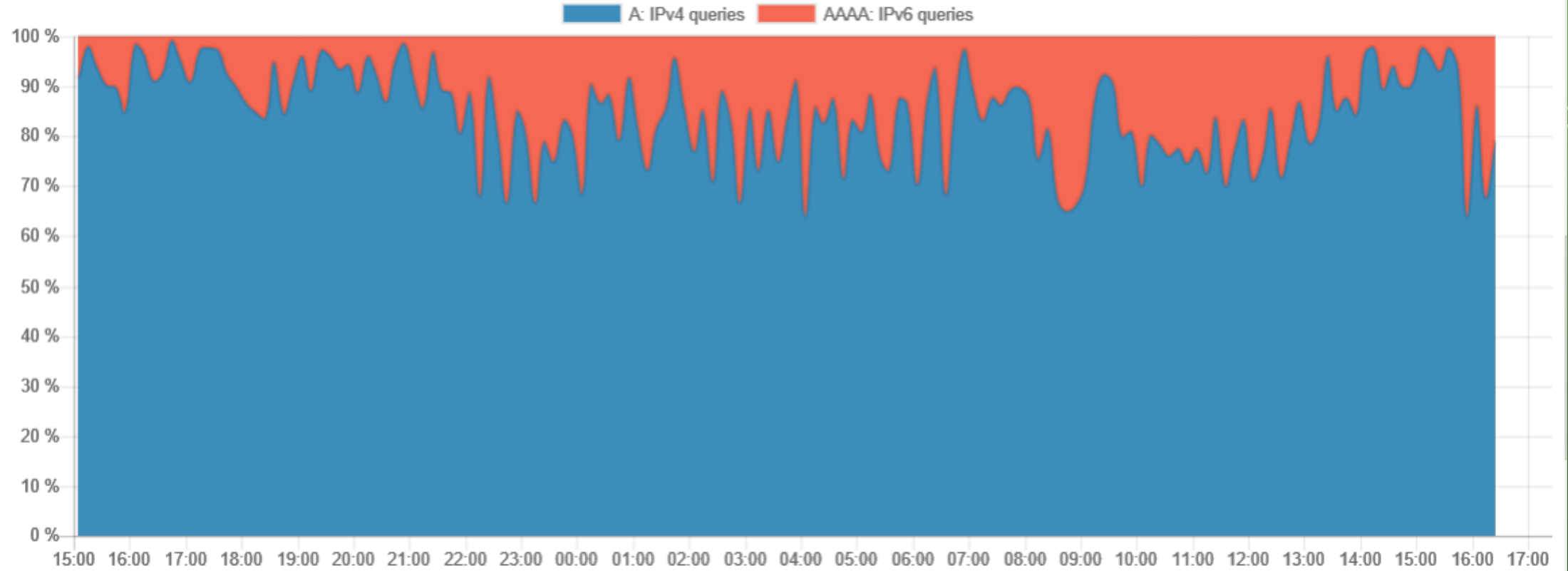
Queries over last 24 hours



Query Types over Time



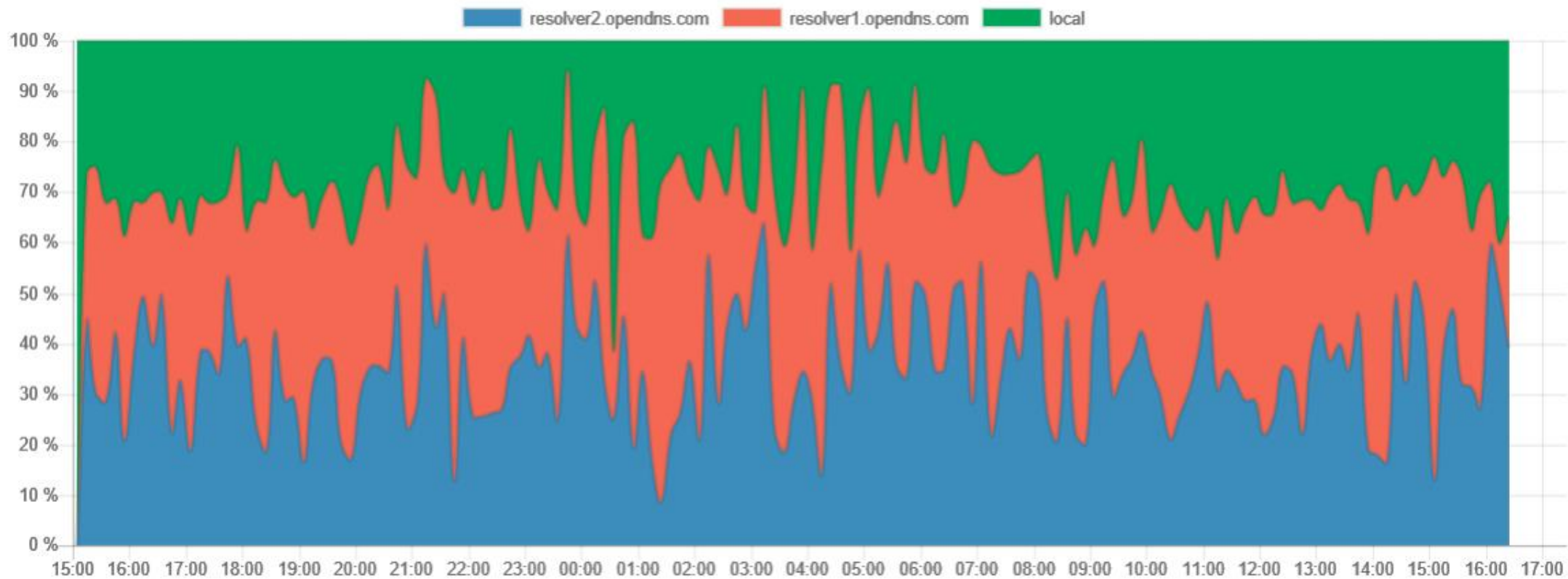
Query Types over Time



Forward Destinations over Time



Forward Destinations over Time



Top Domains

Domain	Hits	Frequency
www.google.com	773	<div><div></div></div>
weather.wapp.wii.com	342	<div><div></div></div>

Top Advertisers

Domain	Hits	Frequency
settings-win.data.microsoft.com	176	<div><div></div></div>
et.nytimes.com	48	<div><div></div></div>

Top Domains

Domain	Hits	Frequency
www.google.com	773	<div><div></div></div>
weather.wapp.wii.com	342	<div><div></div></div>
v10.vortex-win.data.microsoft.com	235	<div><div></div></div>
v20.vortex-win.data.microsoft.com	207	<div><div></div></div>
b.googlemail.l.google.com	202	<div><div></div></div>
googlemail.l.google.com	198	<div><div></div></div>
dyndns.domains.live.com	182	<div><div></div></div>
news.wapp.wii.com	172	<div><div></div></div>
imap.gmail.com	154	<div><div></div></div>
arrowsmith.homeserver.com	153	<div><div></div></div>

Top Advertisers

Domain	Hits	Frequency
settings-win.data.microsoft.com	176	<div><div></div></div>
et.nytimes.com	48	<div><div></div></div>
vortex-win.data.microsoft.com	47	<div><div></div></div>
c.go-mpulse.net	45	<div><div></div></div>
www.googletagservices.com	44	<div><div></div></div>
ssl.google-analytics.com	35	<div><div></div></div>
ads.flurry.com	31	<div><div></div></div>
www.googleadservices.com	30	<div><div></div></div>
sb.scorecardresearch.com	29	<div><div></div></div>
googleads.g.doubleclick.net	25	<div><div></div></div>

Top Clients

Client	Requests	Frequency
192.168.15.1	14359	<div><div></div></div>
localhost	2	<div><div></div></div>

Domain	Hits	Frequency
www.google.com	773	<div><div></div></div>
weather.wapp.wii.com	342	<div><div></div></div>
v10.vortex-win.data.microsoft.com	235	<div><div></div></div>
v20.vortex-win.data.microsoft.com	207	<div><div></div></div>
b.googlemail.l.google.com	202	<div><div></div></div>
googlemail.l.google.com	198	<div><div></div></div>
dyndns.domains.live.com	182	<div><div></div></div>
news.wapp.wii.com	172	<div><div></div></div>
imap.gmail.com	154	<div><div></div></div>
arrowsmith.homeserver.com	153	<div><div></div></div>

Domain	Hits	Frequency
settings-win.data.microsoft.com	176	<div><div></div></div>
et.nytimes.com	48	<div><div></div></div>
vortex-win.data.microsoft.com	47	<div><div></div></div>
c.go-mpulse.net	45	<div><div></div></div>
www.googletagservices.com	44	<div><div></div></div>
ssl.google-analytics.com	35	<div><div></div></div>
ads.flurry.com	31	<div><div></div></div>
www.googleadservices.com	30	<div><div></div></div>
sb.scorecardresearch.com	29	<div><div></div></div>
googleads.g.doubleclick.net	25	<div><div></div></div>

Top Clients

Client	Requests	Frequency
192.168.15.1	14359	<div><div></div></div>
localhost	2	<div><div></div></div>



Recent Queries (showing all queries within recent 10 minutes, [show all](#))

Search:

Show 10 entries

Previous

1

2

3

4

5

...

76

Next

Time	Type	Domain	Client	Status	Action
2017-05-25 16:19:12	IPv4	cdn.content.prod.cms.msn.com	192.168.15.1	OK (forwarded)	Blacklist
2017-05-25 16:18:22	IPv4	settings-win.data.microsoft.com	192.168.15.1	Pi-holed	Whitelist
2017-05-25 16:18:19	IPv4	play.google.com	192.168.15.1	OK (forwarded)	Blacklist
2017-05-25 16:18:19	IPv4	play.google.com	192.168.15.1	OK (cached)	Blacklist
2017-05-25 16:18:19	IPv4	play.l.google.com	192.168.15.1	OK (cached)	Blacklist
2017-05-25 16:18:19	IPv6	play.l.google.com	192.168.15.1	OK (forwarded)	Blacklist
2017-05-25 16:18:19	IPv6	play.l.google.com	192.168.15.1	OK (forwarded)	Blacklist
2017-05-25 16:18:02	IPv4	imageresizer.azurewebsites.net	192.168.15.1	OK (forwarded)	Blacklist
2017-05-25 16:17:26	IPv4	chatenabled.mail.google.com	192.168.15.1	OK (cached)	Blacklist
2017-05-25 16:17:26	IPv4	chatenabled.mail.google.com	192.168.15.1	OK	Blacklist



Whitelist

Note that the ad list domains are automatically added to the whitelist so that a list can never get blocked by another list.

Add

Note: Whitelisting a subdomain of a wildcard blocked domain is not possible.

Some of the domains shown below are domains of the adlists sources, which are automatically added in order to prevent adlists being able to blacklist each other. See [here](#) for the default set of adlists.

raw.githubusercontent.com



mirror1.malwaredomains.com



sysctl.org



zeustracker.abuse.ch



s3.amazonaws.com



hosts-file.net



libs.coremetrics.com



dev.visualwebsiteoptimizer.com





Blacklist

Add a domain (example.com or sub.example.com)

Add (exact)

Add (wildcard)



Your Blacklist is empty!



Blacklist

Add a domain (example.com or sub.example.com)

Add (exact)

Add (wildcard)



Your Blacklist is empty!



■ Permanently

🕒 For 10 seconds

🕒 For 30 seconds

🕒 For 5 minutes

🕒 Custom time

[Donate](#) if you found this useful.

Pi-hole Version v3.0.1 Web Interface Version v3.0.1a FTL Version v2.7.3



Update list of ad-serving domains

Update Lists



- Update Lists
- Query adlists
- Tail pi-hole.log
- Tail pi-hole-FTL.log
- Generate debug log



Find Ad Domain In Lists

Domain to look for (example.com or sub.example.com)

Search partial match

Search exact match



Update Lists



Query adlists



Tail pi-hole.log



Tail pi-hole-FTL.log



Generate debug log



Output the last lines of the pihole.log file (live)

☒ Automatic scrolling on update

```
May 25 16:21:38 dnsmasq[695]: query[A] ocpv.verisign.com from 192.168.15.1
May 25 16:21:38 dnsmasq[695]: forwarded ocpv.verisign.com to 208.67.220.220
May 25 16:21:38 dnsmasq[695]: forwarded ocpv.verisign.com to 208.67.222.222
May 25 16:21:38 dnsmasq[695]: query[A] ocpv.verisign.com from 192.168.15.1
May 25 16:21:38 dnsmasq[695]: forwarded ocpv.verisign.com to 208.67.220.220
May 25 16:21:38 dnsmasq[695]: reply ocpv.verisign.com is <CNAME>
May 25 16:21:38 dnsmasq[695]: reply ocpv-ds.ws.symantec.com.edgekey.net is <CNAME>
May 25 16:21:38 dnsmasq[695]: reply e8218.dscb1.akamaiedge.net is 23.52.155.27
May 25 16:21:38 dnsmasq[695]: reply ocpv.verisign.com is <CNAME>
May 25 16:21:38 dnsmasq[695]: reply ocpv-ds.ws.symantec.com.edgekey.net is <CNAME>
May 25 16:21:38 dnsmasq[695]: reply e8218.dscb1.akamaiedge.net is 23.52.155.27
```

Update Lists

Query adlists

Tail pihole.log

Tail pihole-FTL.log

Generate debug log

[Donate](#) if you found this useful.

Pi-hole Version v3.0.1 Web Interface Version v3.0.1a FTL Version v2.7.3



Networking

Pi-hole Ethernet Interface



eth0

Pi-hole IPv4 address



192.168.15.5

Pi-hole IPv6 address



Pi-hole hostname



RaspberryPi

Pi-hole DHCP Server

☐ DHCP server enabled

Range of IP addresses to hand out

From

192.168.15.201

To

192.168.15.251

Router (gateway) IP address



Pi-hole DHCP Server

☐ DHCP server enabled

Range of IP addresses to hand out

From 192.168.15.201

To 192.168.15.251

Router (gateway) IP address

Router 192.168.15.1

Advanced DHCP settings

☐ Enable IPv6 support (SLAAC + RA)

Pi-hole domain name

Domain local

DHCP lease time

Lease time in hours 24

Hint: 0 = infinite, 24 = one day, 168 = one week, 744 = one month, 8760 = one year

DHCP leases

DHCP leases

Currently active DHCP leases

MAC address	IP address	Hostname	
-------------	------------	----------	--

Static DHCP leases configuration

MAC address	IP address	Hostname	
<input type="text"/>	<input type="text"/>	<input type="text"/>	

Specifying the MAC address is mandatory and only one entry per MAC address is allowed. If the IP address is omitted and a host name is given, the IP address will still be generated dynamically and the specified host name will be used. If the host name is omitted, only a static lease will be added.

Save

Upstream DNS Servers

Upstream DNS Servers

IPv4		IPv6		Name
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Google
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OpenDNS

UPSTREAM DNS SERVERS

- The Pi-hole will need to know where to get DNS resolution for domains that are not blocked. You should enter either your ISP's DNS addresses or public servers that you might be using (Google, OpenDNS, etc.) as the 'upstream servers'.

Upstream DNS Servers

Upstream DNS Servers

IPv4		IPv6		Name
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Google
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	OpenDNS
<input type="checkbox"/>	<input type="checkbox"/>			Level3
<input type="checkbox"/>	<input type="checkbox"/>			Norton
<input type="checkbox"/>	<input type="checkbox"/>			Comodo
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	DNS.WATCH

Custom 1 (IPv4)

☐

Custom 2 (IPv4)

☐

Custom 3 (IPv6)

☐

Custom 4 (IPv6)

☐

Advanced DNS settings

Advanced DNS settings

- ☒ never forward non-FQDNs
- ☒ never forward reverse lookups for private IP ranges

Note that enabling these two options may increase your privacy slightly, but may also prevent you from being able to access local hostnames if the Pi-hole is not used as DHCP server

- ☐ Use DNSSEC

Validate DNS replies and cache DNSSEC data. When forwarding DNS queries, Pi-hole requests the DNSSEC records needed to validate the replies. Use Google or Norton DNS servers when activating DNSSEC. Note that the size of your log might increase significantly when enabling DNSSEC. A DNSSEC resolver test can be found [here](#).

Interface listening behavior

- ☐ Listen on all interfaces, but allow only queries from devices that are at most one hop away (local devices)
- ☒ Listen only on interface eth0
- ☐ Listen on all interfaces, permit all origins (make sure your Pi-hole is firewalled!)

Save

Query Logging (size of log 3.31 MB)

Current status: Enabled (recommended)

Note that disabling will render graphs on the web user interface useless

Query Logging (size of log 3.31 MB)

Current status: Enabled (recommended)

Note that disabling will render graphs on the web user interface useless

Flush logs

Disable query logging

Pi-Hole's Block Lists +

API

Top Lists

Exclude the following domains from being shown in

Top Domains / Top Advertisers

Enter one domain per line








Top Clients

Enter one IP address or host name per line

Privacy settings (Statistics / Query Log)

Pi-Hole's Block Lists

Lists used to generate Pi-hole's Gravity

- ☒ <https://raw.githubusercontent.com/StevenBlack/hosts/master/hosts>

- ☒ <https://mirror1.malwaredomains.com/files/justdomains>

- ☒ <http://sysctl.org/cameleon/hosts>

- ☒ <https://zeustracker.abuse.ch/blocklist.php?download=domainblocklist>

- ☒ https://s3.amazonaws.com/lists.disconnect.me/simple_tracking.txt

- ☒ https://s3.amazonaws.com/lists.disconnect.me/simple_ad.txt

- ☒ https://hosts-file.net/ad_servers.txt


Enter one URL per line to add new ad lists

Save

Save and Update

API

Top Lists

Exclude the following domains from being shown in

Top Domains / Top Advertisers

Enter one domain per line

Top Clients

Enter one IP address or host name per line

Privacy settings (Statistics / Query Log)

☒ Show permitted domain entries

☒ Show blocked domain entries

Privacy mode

☐ Don't show origin of DNS requests in query log

Show API token

Save

Web User Interface

Web User Interface

Interface appearance

☐ Use boxed layout (helpful when working on large screens)

CPU Temperature Unit

- ☐ Celsius
☐ Kelvin
☒ Fahrenheit

Save

System Administration

Restart system

Restart DNS server

Flush logs

Pi-hole FTL (Running)



Pi-hole Teleporter



Pi-hole FTL (Running) -

FTL version: v2.7.3

Process identifier (PID): 1566

Time FTL started: May 22

User / Group: pihole / pihole

Total CPU utilization: 0.0%

Memory utilization: 0.3%

Used memory: 2.71 MB

Pi-hole Teleporter -

Export your Pi-hole lists as downloadable ZIP file

Export

Import ...

- ☒ Whitelist
- ☒ Blacklist (exact)
- ☒ Blacklist (wildcard)


File input

Browse...


Upload only Pi-hole backup files.

Import

Pi-hole




Status

● Active  Temp: 120.9 °F

● Load: 0.14 0.05 0.01

● Memory usage: 12.2 %

MAIN NAVIGATION

 Dashboard

Help center

Header

Top left: Status display

Shows different status messages:

- Status: Current status of the Pi-hole - Active (●), Offline (●), or Starting (●)
- Temp: Current CPU temperature
- Load: load averages for the last minute, 5 minutes and 15 minutes, respectively. A load average of 1 reflects the full workload of a single processor on the system. We show a red icon if the current load exceeds the number of available processors on this machine (which is 4)
- Memory usage: Shows the percentage of memory actually blocked by applications. We show a red icon if the memory usage exceeds 75%

Top right: About

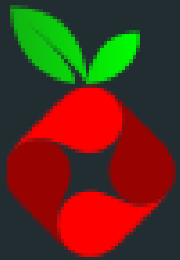
- GitHub: Link to the Pi-hole repository
- Details: Link to Jacob Salmela's blog with some more details, describing also the concept of the Pi-hole
- Updates: Link to list of releases
- Update notifications: If updates are available, a link will be shown here.
- Session timer: Shows the time remaining until the current login session expires.

Dashboard


On the dashboard, you can see various Pi-hole statistics:

- Summary: A summary of statistics showing how many total DNS queries have been blocked today, what percentage of DNS queries have been blocked, and how many domains are in the compiled ad list. This summary is updated every 10 seconds.

Pi-hole




Status


● Active  Temp: 120.9 °F

● Load: 0.14 0.05 0.01

● Memory usage: 12.2 %

MAIN NAVIGATION























 Donate

 Help

RASPBERRY PI IP ADDRESS

- The Pi-hole needs to have a fixed IP address on your LAN so either make a DHCP reservation or assign an address outside of the router's DHCP range.
- I use Verizon FiOS and my router supports DHCP reservations. I can use the router's web interface and convert the normal DHCP assignment into a static address.

DHCP RESERVATION

						Minutes	
STB-LR1	192.168.15.200	00:25:2e:e9:a3:ac	Static	Arrowsmith	Active	10738 Minutes	  
STB-LR2	192.168.15.201	00:21:be:71:4e:3c	Static	Arrowsmith	Active	10738 Minutes	  
Wii	192.168.15.147	00:23:31:71:34:c1	Static	Arrowsmith	Expired		  
Wii-wired	192.168.15.148	00:24:49:01:08:e7	Static	Arrowsmith	Expired		  
HP8740	192.168.15.2	a0:8c:fd:5c:7e:d0	Static	Arrowsmith	Active	10738 Minutes	  
Carrier	192.168.15.3	00:23:a7:5e:5c:8d	Static	Arrowsmith	Active	1199 Minutes	  
RaspberryPi	192.168.15.5	b8:27:eb:ab:58:61	Static	Arrowsmith	Expired		  
New Static Connection							

Press the **Refresh** button to update the data.

Close

Refresh

CONFIGURE PI-HOLE TO BE YOUR DNS SERVER

- Configure your router's options to route client requests to the Pi-hole as their DNS server to make Pi-hole function network wide without any changes to individual devices.
- or manually configure each device to use the Pi-hole as their DNS server.
- There are usually two DNS addresses entered. I have Pi-hole as the primary and OpenDNS as the secondary (backup) DNS server. This allows me to remove the Pi, reboot it, etc. and keep my network functioning (but slower).

MTU: Automatic 1500











Internet Protocol Use the Following IP Address

IP Address: 192 . 168 . 15 . 1

Subnet Mask: 255 . 255 . 255 . 0

Bridge Hardware Acceleration ☐ Enabled

Bridge

Name	VLANs	Status	STP	Action
 Arrowsmith	Disabled 	Connected		
<input checked="" type="checkbox"/>  Ethernet/Coax	Disabled 	Connected	<input checked="" type="checkbox"/>	
<input type="checkbox"/>  Broadband Connection (Ethernet/Coax)		Connected	<input type="checkbox"/>	
<input checked="" type="checkbox"/>  Wireless Access Point	Disabled 	Connected	<input type="checkbox"/>	

DNS Server Use the Following DNS Server Addresses

Primary DNS Server: 192 . 168 . 15 . 5

Secondary DNS Server: 208 . 67 . 220 . 220

IP Address Distribution DHCP Server

Start IP Address: 192 . 168 . 15 . 2

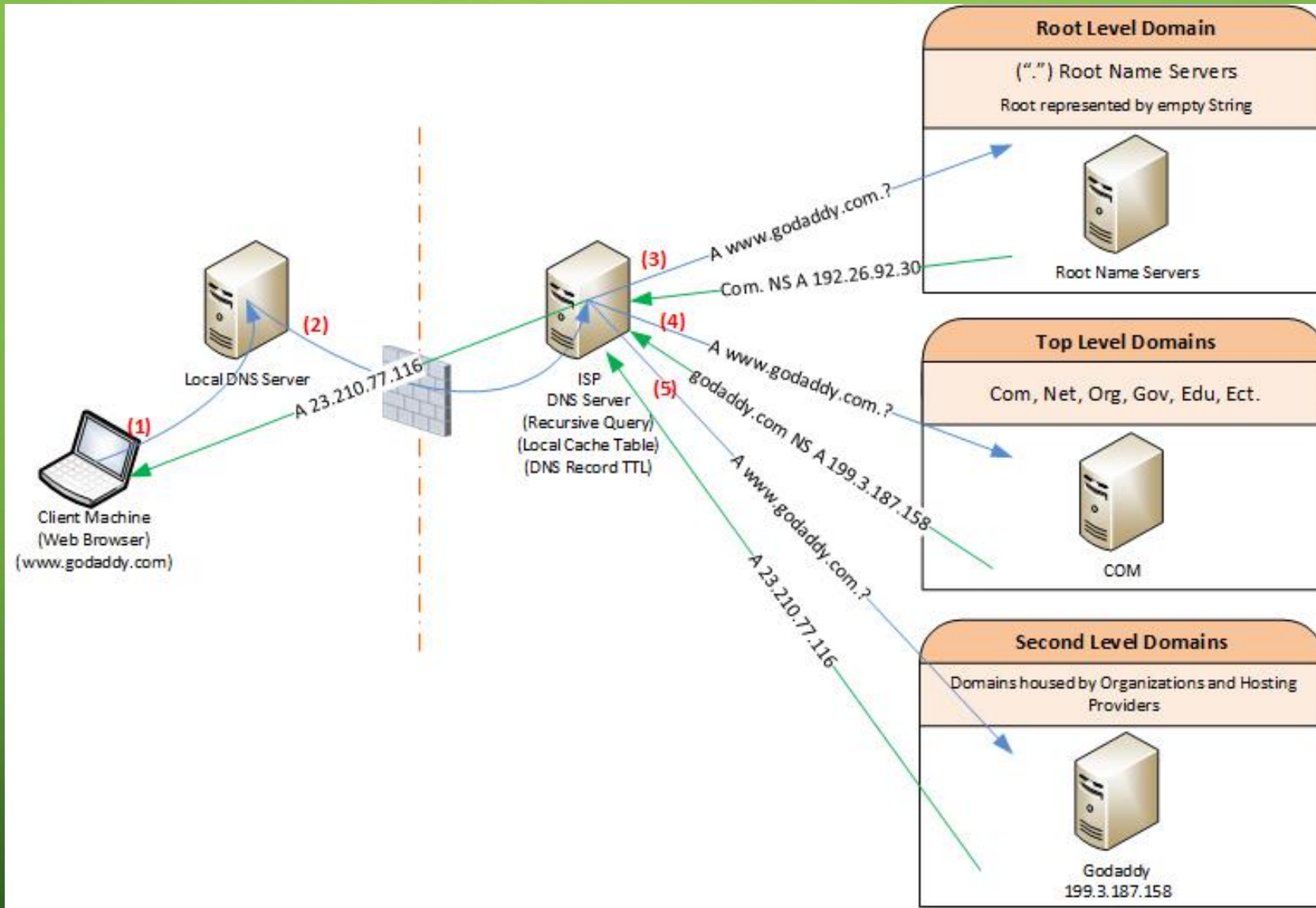
End IP Address: 192 . 168 . 15 . 254

Subnet Mask: 255 . 255 . 255 . 0

WINS Server: 0 . 0 . 0 . 0

Lease Time in Minutes: 11520

☒ Provide Host Name If Not Specified by Client



HOW PI-HOLE WORKS

- DNS requests from the device are sent to the Pi-hole. If Pi-hole doesn't find the domain on it's block list it sends the request along to the upstream server and routes the response back to the client.
- If the Pi-hole decides the domain should be blocked, it returns its own IP address to the client.
- When the client then asks for a resource from that IP address, the Pi-hole returns a blank (or a configurable) image, an explanatory box or a web page that self-closes.

ACCESSING A PAGE AT A BLOCKED DOMAIN



Website Blocked

Access to the following site has been blocked:

`googleads.g.doubleclick.net/fgh.htm`

If you have an ongoing use for this website, please ask the owner of the Pi-hole in your network to have it whitelisted.

This page is blocked because it is explicitly contained within the following block list (s):

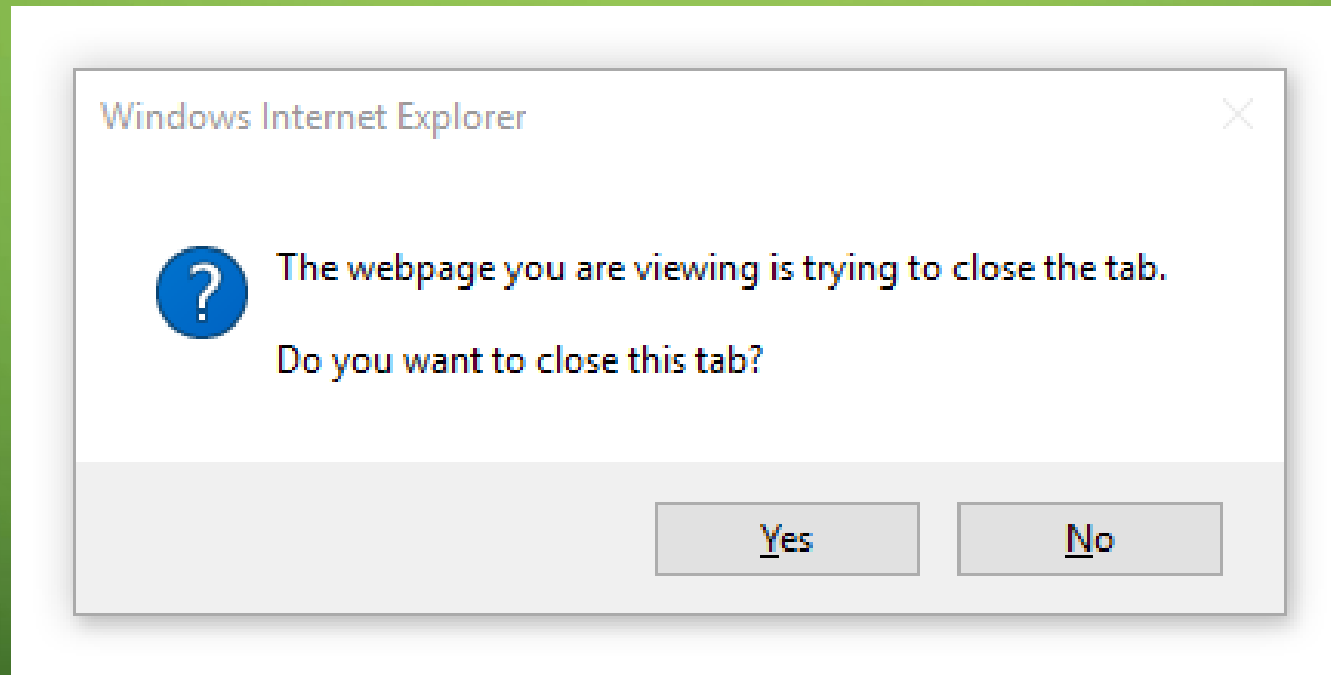
[Go back](#)

[Whitelist this page](#)

[Close window](#)

Generated Sat 6:44 AM, Jul 29 by Pi-hole v3.1.4

ACCESSING AN IMAGE AT A BLOCKED DOMAIN



TROUBLESHOOTING

- I have had to whitelist some domains. E.g., I use WMP to rip audio CDs to MP3 files. WMP will attempt to find and enter artist, album, track list and album cover information from an online source. This stopped working after I installed Pi-hole.
- I suggest that you identify domains to be unblocked by trying to access the domain and then looking at the query log. If you can identify the domain that is blocked, click the whitelist button to immediately fix the problem.
- Disabling the Pi-hole temporarily can also help pinpoint the problem domain.
- If you whitelist an incorrect domain, then simply remove it from the whitelist as you continue to look for the right domain.

CLEAN CLIENT CACHE

- Remember that your browser and/or your OS may keep their own caches of DNS responses so they should be cleared as part of the troubleshooting process.
- I keep this batch file on the desktop and run it as I disable the Pi-hole.
- FlushDNS.bat:

```
ipconfig /flushdns
```

UPDATE PI-HOLE

- A notice will appear in the bottom of the web screen when an update is available for the Pi-hole software. Enter `pihole -up` at a terminal prompt.
- Raspbian updates/upgrades should be done regularly in the same manner as done after the initial installation.
- You can clone the SD card (make an image copy) after everything is set up just in case! I use Win32 Disk Imager to do that.
- Use 'teleporter' tool to save a copy of your whitelist, etc. to a zip file as backup or to move to another pi

SHUTTING DOWN THE RASPBERRY PI

- Pulling the plug is likely to cause disk corruption at some point.
- It's best to start a terminal session and enter `sudo shutdown -h now`
- Or, start a VNC session and shutdown from there.
- To reboot: use the settings entry on the web interface or start a terminal session and enter `sudo shutdown -r now`
- The red light is a power indicator; The green light indicates SD card activity.

LINKS

- Raspberry Pi: <https://www.raspberrypi.org/>
- Adafruit: <https://www.adafruit.com/>
- Pi-hole software: <https://pi-hole.net/>
- SD formatter: <https://www.sdcard.org/>
- Win32 Disk Imager: <https://sourceforge.net/projects/win32diskimager/>
- PuTTY: <http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html>
- VNC Viewer: <https://www.realvnc.com/download/viewer/>
- More about DNS: [https://en.wikipedia.org/wiki/Domain Name System](https://en.wikipedia.org/wiki/Domain_Name_System)



My Unit

PI-HOLE

A LAN-WIDE AD BLOCKER THAT RUNS ON A RASPBERRY-PI

Don Arrowsmith

President, Philadelphia Area Computer Society

president (at) PACSnet.org



Questions?

