Gain Control of your Home Network using Pi-hole

Eric Dunn

2023 December 05

If something is free, you are the product, and **You** are big business!

- April 2021, Apple disabled unique identifier tracking on their devices by default. The result:
  - In 2021, Snap, Facebook, Twitter and YouTube were estimated to have lost about $10 **billion** in total because of this change.
  - In early 2022, Meta said it alone stood to lose $10 billion!

  "What Google's multibillion payment to Apple says about privacy", Zeynep Tufekci, New York Times
- Companies have BIG financial incentives to
  - Advertise to you
  - Know all about you

What the Result?

- Ads Everywhere
  - Obtrusive Ads
  - Slow loading ads
  - Consumes Internet bandwidth
- Tracking
  - You can pay to stop seeing ads, but tracking…
- Illicit Activities
  - Bitcoin miners
  - Phishing / malware
- It’s Not Just Windows devices
  - What are all the devices on your network doing?
  - Where are they sending data?

Pi-hole comes to the Rescue!

- Network-wide blocking of web ads, trackers, and telemetry collection.
  - Free and open source software
  - Minimal hardware requirements
  - Works right out of the box
  - Very powerful / configurable
- Benefits
  - Ads and tracking requests get null response from the PiHole DNS server
    - No waiting for ads to load
    - Reduces traffic on your Internet backhaul
    - Less clutter on web pages
    - Faster, more private Internet
  - Caching DNS server
  - Works for all devices on your network
  - Excellent visibility into your local network (Statistics!)

PiHole runs on almost any hardware

- Windows 11 PC: https://tinyurl.com/3sa6p3nd
- MAC: https://www.imore.com/how-run-pi-hole-your-mac
- Raspberry PI
  - Low cost linux server
    - Pi Zero W ($15)
    - >4GB microSD Card
    - Ethernet dongle ($15)
  - Low power (5W-10W as shown)
  - Raspberry PI 4 with Ethernet ports available for $35 and up.

Network topology

Fixed IP

Pihole DNS Server

Router

Internet

LAN

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

Steps to get Pi-hole up and running

- Setup a Raspberry PI server
  - Instructions at https://www.raspberrypi.com/software/
  - Burn Raspberry Pi OS install onto micro SD card.
  - Insert the micro SD card into a raspberry PI
  - Boot and complete configuration and update process.
- Install Pi-hole
  - Instructions at https://pi-hole.net/
  - Open a terminal window on the Raspberry Pi, and type

    curl –sSL https://install.pi-hole.net | bash
- Configure your router to use the new pi-hole server as your DNS server
- Start enjoying faster, more private Internet!

Nice to haves:

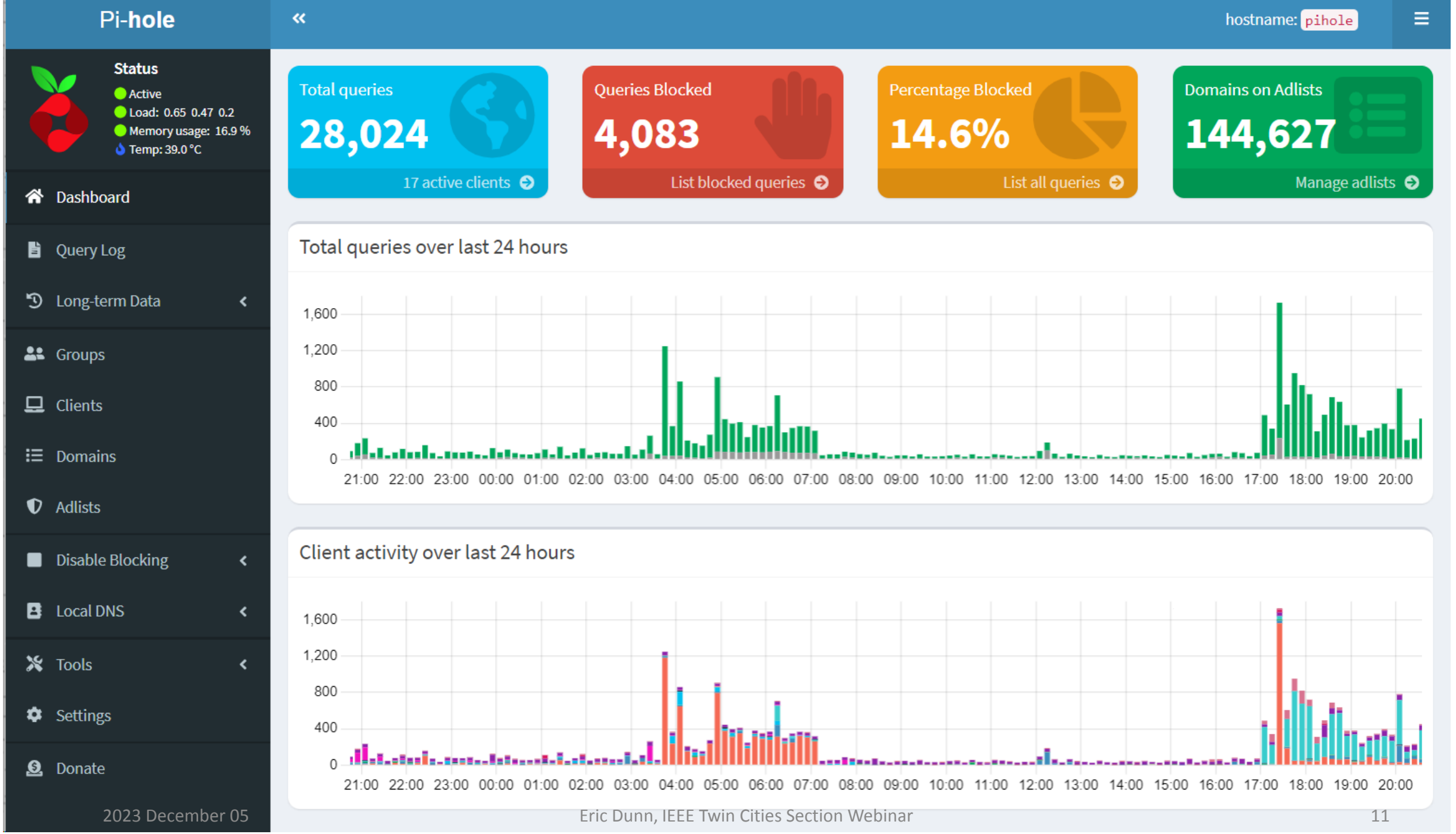
- Set up a cron job to keep Pi-hole up-to-date
  - 0 0 * * 1 sudo pihole –up
- Use Windows Remote Desktop for headless/remote access
  - sudo apt install xrdp
  - …or use ssh for command line

Other considerations…

- When content and ads are served from the same domain
  - Netflix / YouTube
  - BlackList is more complicated
- Web browsers using DNS over HTTPS (DoH!)
  - Secure mode that can be enabled in browsers
  - DNS served by Microsoft/Google servers
  - Not enabled by default—for now
- RaspberryPi server has other used
  - Desktop, media server, http server, etc.
  - Software development

Home Internet Case Study

- Statistics
  - Percentage Blocked - typically 5% - 35%
  - Cache hit rate – around 25% of queries serviced from cache
  - Per device activity – Some are chatty
- Blocking controls
  - Enable / disable
  - Whitelisting
  - Blacklisting
- Adlists
- Groups
- Upstream DNS configuration – many options


Pi-hole
hostname: pihole
Status
Active
Load: 0.65 0.47 0.2
Memory usage: 16.9 %
Temp: 39.0 °C
Dashboard
Query Log
Long-term Data
Groups
Clients
Domains
Adlists
Disable Blocking
Local DNS
Tools
Settings
Donate
Total queries
28,024
17 active clients
Queries Blocked
4,083
List blocked queries
Percentage Blocked
14.6%
List all queries
Domains on Adlists
144,627
Manage adlists
Total queries over last 24 hours
1,600
1,200
800
400
0
21:00 22:00 23:00 00:00 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00
Client activity over last 24 hours
1,600
1,200
800
400
0
21:00 22:00 23:00 00:00 01:00 02:00 03:00 04:00 05:00 06:00 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00

Thank You