

TrueNAS

SCALE




UNRAID



Introduction to TrueNAS SCALE

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March 4, 2024



How many of you have some kind of network attached storage? What kind of solution?

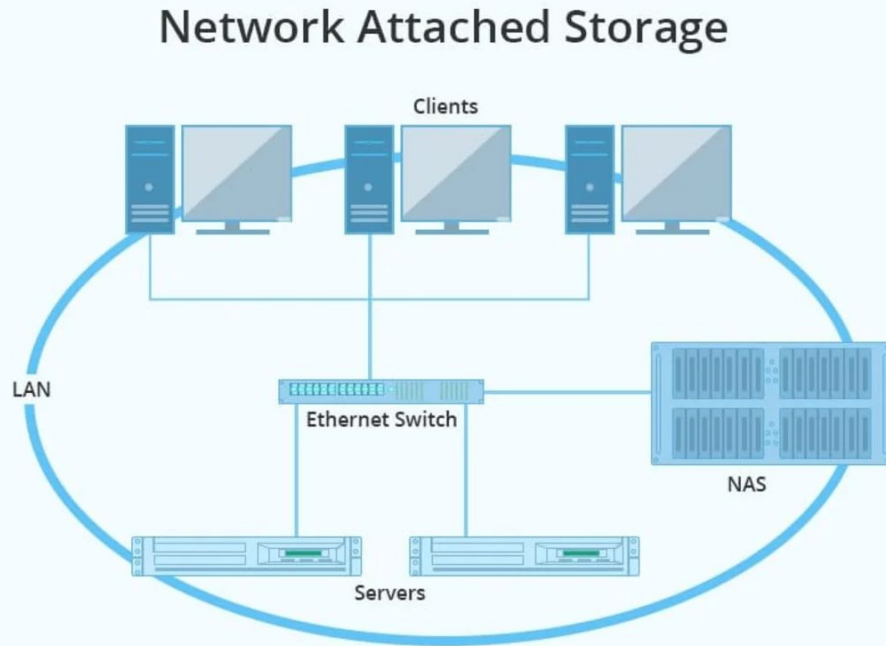


Who is Jason Paul?



- Born in Winnipeg, MB.
- Been using Linux since 2001.
- Living in Waterloo Region since 2004.
- Find out more about me at my website:
<https://www.linuxtek.ca/>
- Connect with me on LinkedIn:
<https://www.linkedin.com/in/jason-paul-it/>

What is a NAS?

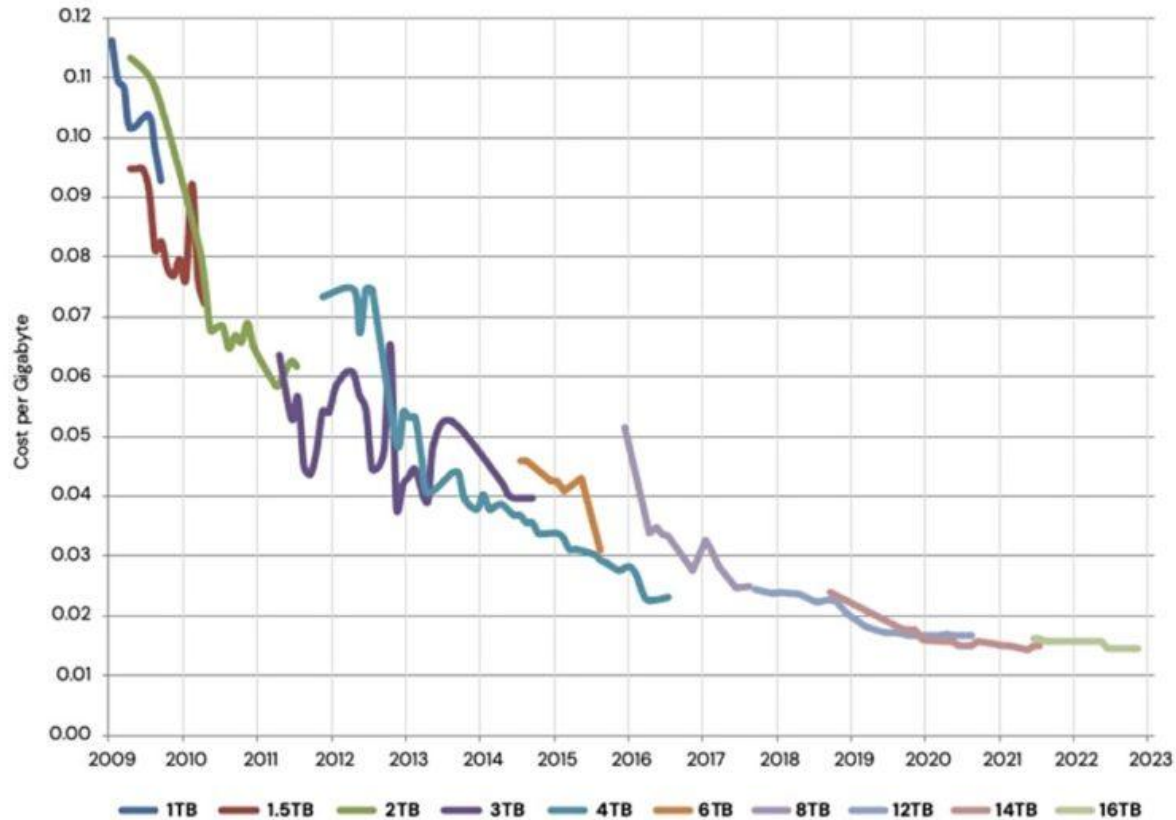


Why use a NAS?

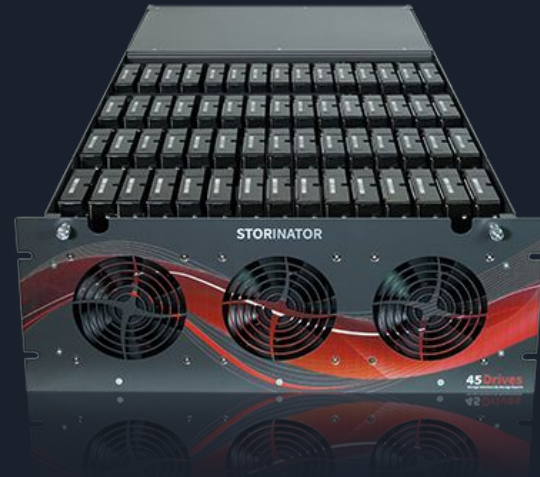


Backblaze Average Cost per Gigabyte by Drive Size Over Time

Drive sales grouped by drive size and month to compute average cost per month



Commercial NAS Offerings



What is TrueNAS?



Get Started with TrueNAS



High
Availability



Turnkey
Appliances



24/7
Support

[Get A Quote](#)

[Learn More](#)



Free
To Use



Deploy on
Any Hardware



Community
Support

[Learn more](#)

All TrueNAS Editions Include



Robust Data Security



ZFS File System



Legendary Data Protection



File, Block, Object Storage



Integrated Apps

TrueNAS Project Timeline

2005



2020

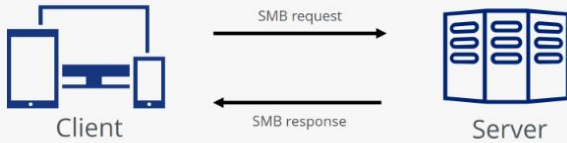


2022

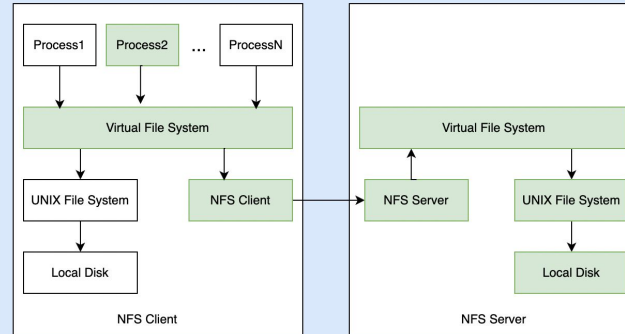


TrueNAS SCALE Features

Server Message Block (SMB)



NFS Architecture

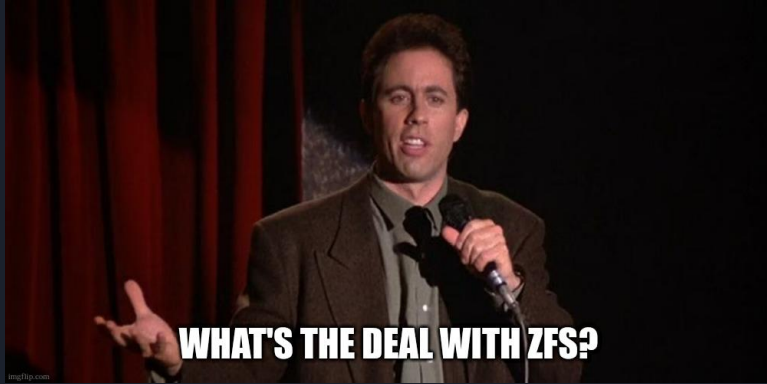


kubernetes



docker

Quick Primer on ZFS

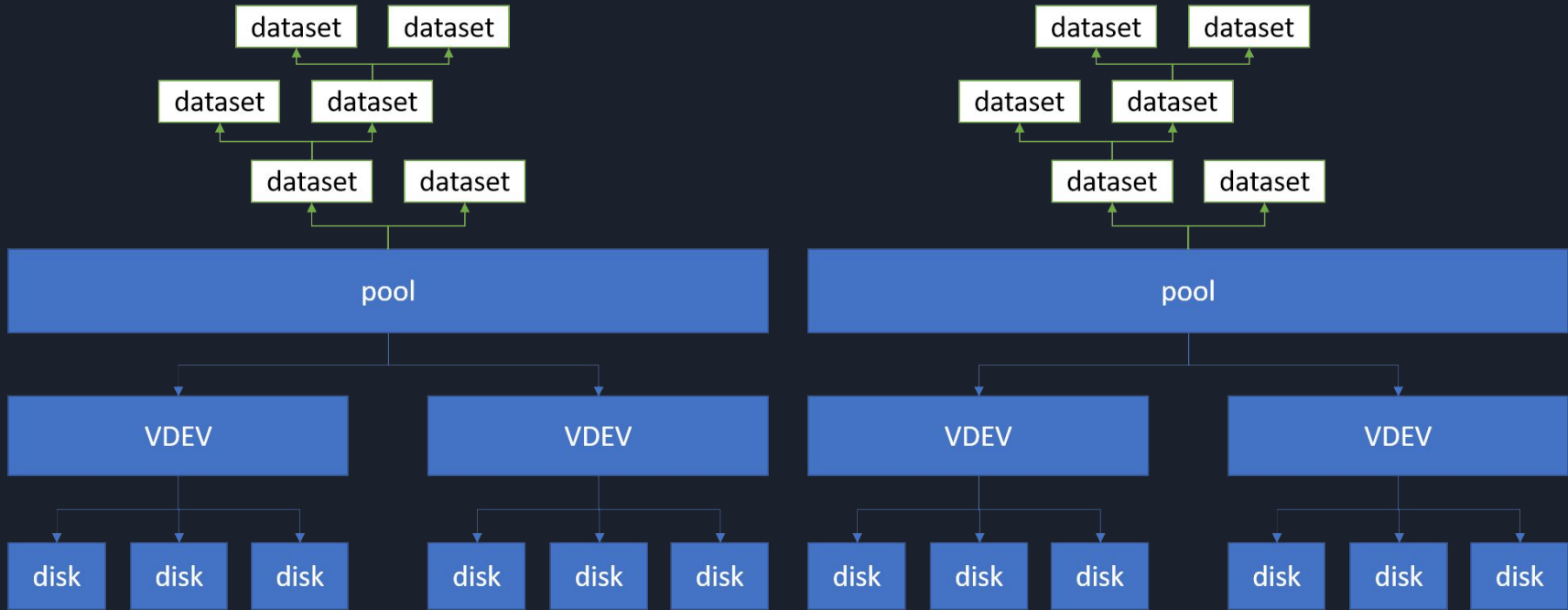


- Pooled storage
- Copy-on-write
- Snapshots
- Data integrity verification and automatic repair
- RAID-Z (no RAID controller)
- Maximum 16 Exabyte file size
- Maximum 256 Quadrillion Zettabytes storage



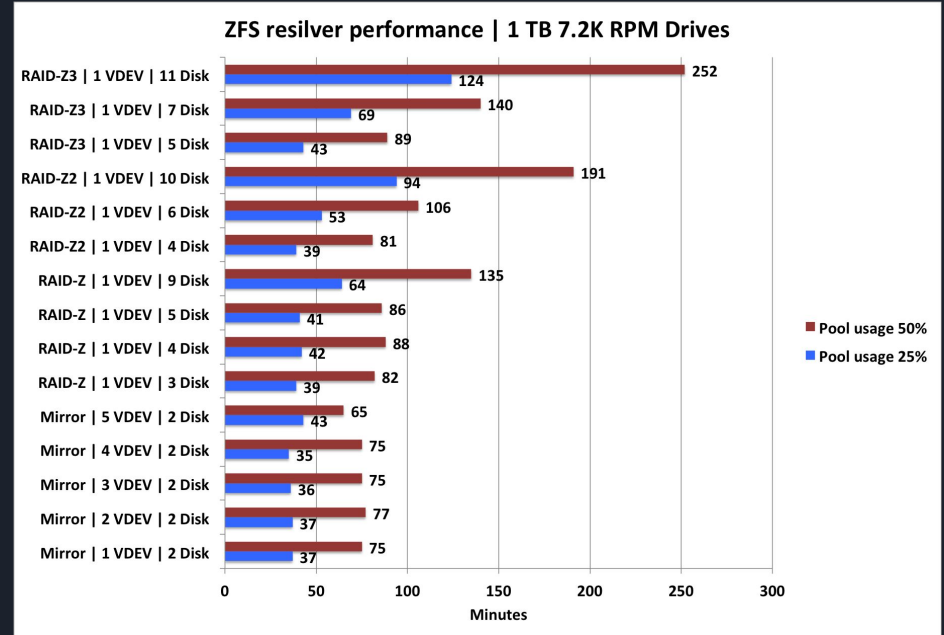
Open**ZFS**

ZFS Data Architecture



ZFS VDEV Types

- VDEV is a cluster of disks. Supports variation of RAID.
- Stripe (RAID-0)
- Mirror (RAID-1)
- RAID5 (RAID-Z1)
- RAID6 (RAID-Z2, RAID-Z3)
- RAID10 (Mirroring + Striping)



ZFS Performance Tuning



ZFS Caching








- ARC - Adaptive Replacement Cache (RAM)
- L2ARC - Level 2 ARC (SSD)
- ZIL - ZFS Intent Log
- SLOG - Separate Log (Write-Cache)

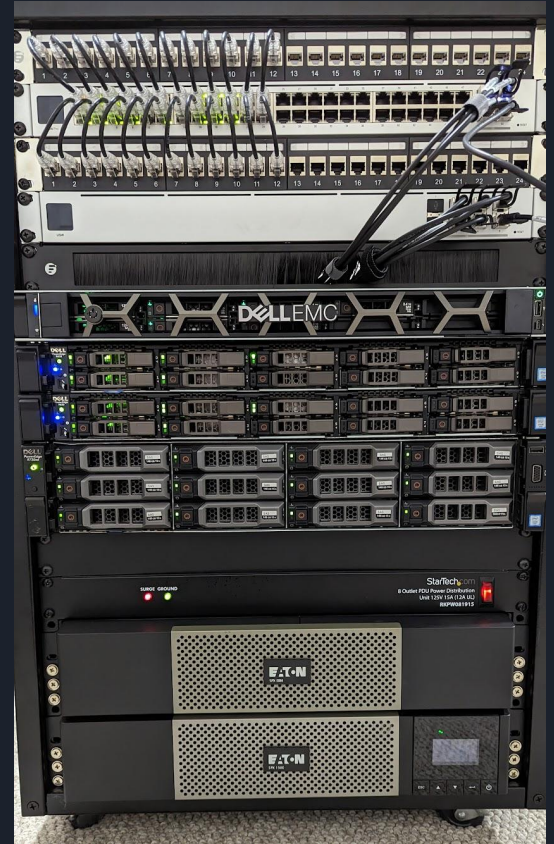
More Terminology

- Special VDEV Classes (Log, Cache, Special, Spare)
- ZPool Scrubbing
- Resilvering
- Data deduplication

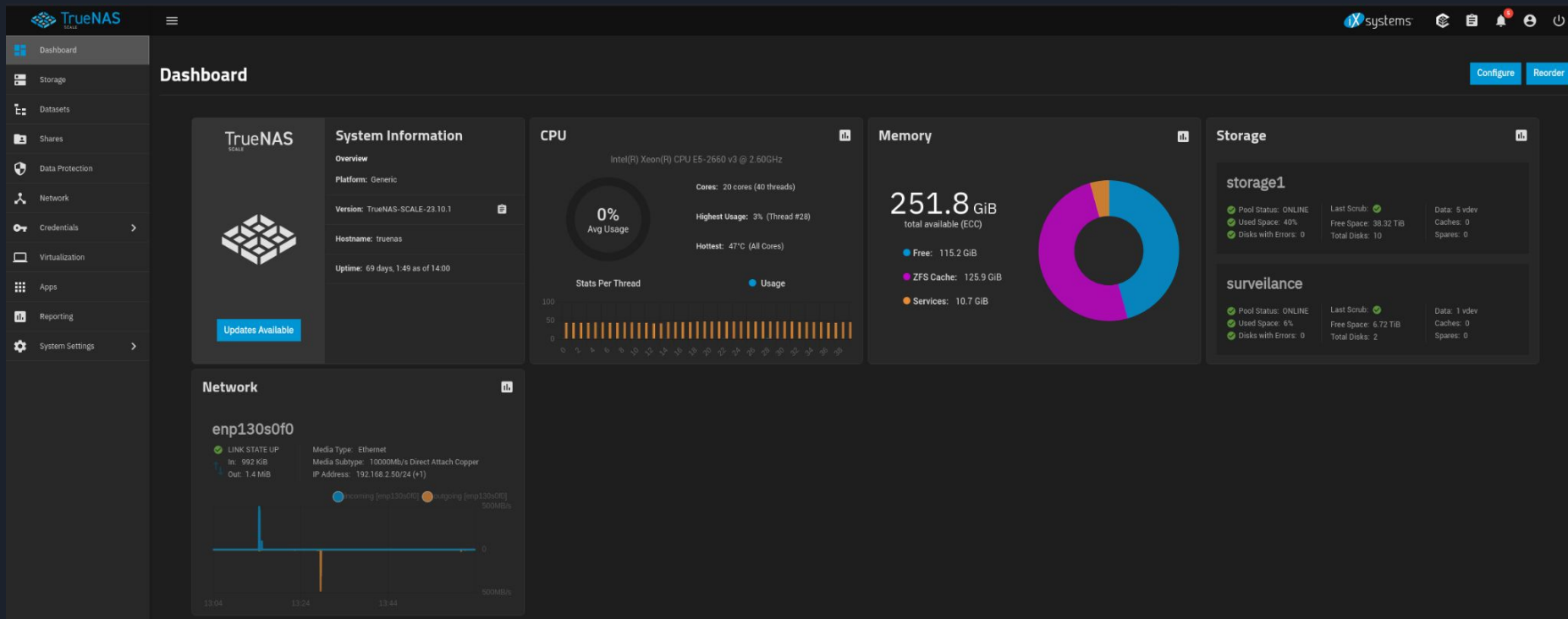
Homelab - TrueNAS SCALE Server

- Dell R730XD 2U Server
- TrueNAS SCALE 23.10 (Cobia)
- 2x Xeon E5-2660v3 CPU @ 2.60Ghz
- 256GB DDR4 ECC RAM
- 10x 14TB Western Digital 3.5" Disks (63TB)
- 2x 8TB Western Digital Purple (7.14TB)

Device Name	Status	Capacity	Errors
Data VDEVs			
✓  MIRROR	ONLINE		No Errors
 sdb	ONLINE	12.73 TiB	No Errors
 sdg	ONLINE	12.73 TiB	No Errors
>  MIRROR	ONLINE		No Errors
>  MIRROR	ONLINE		No Errors
>  MIRROR	ONLINE		No Errors
>  MIRROR	ONLINE		No Errors



Web Dashboard



Storage Dashboard

storage1

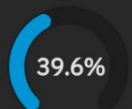
[Upgrade](#)[Export/Disconnect](#)[Expand](#)

Topology ✓

[Manage Devices](#)

Data VDEs	5 x MIRROR 2 wide 12.73 TiB
Metadata VDEs	VDEs not assigned
Log VDEs	VDEs not assigned
Cache VDEs	VDEs not assigned
Spare VDEs	VDEs not assigned
Dedup VDEs	VDEs not assigned

Usage ✓

[Manage Datasets](#)**Usable Capacity: 63.45 TiB**

- Used: 25.13 TiB
- Available: 38.32 TiB

[View Disk Space Reports](#)

ZFS Health ✓

[Scrub](#)

Pool Status: Online

Total ZFS Errors: 0

Scheduled Scrub Task: Set

[View All Scrub Tasks](#)

Auto TRIM: Off

[Edit Auto TRIM](#)

Last Scan: Finished Scrub on 2024-02-04 09:54:13

Last Scan Errors: 0

Last Scan Duration: 9 hours 54 minutes 6 seconds

Disk Health ✓

[Manage Disks](#)

Disks temperature related alerts: 0

Highest Temperature: No Data

Lowest Temperature: No Data

Average Disk Temperature: No Data

[View Reports](#)

Failed S.M.A.R.T. Tests: 0

[View All S.M.A.R.T. Tests](#)

surveillance

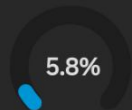
[Upgrade](#)[Export/Disconnect](#)[Expand](#)

Topology ✓

[Manage Devices](#)

Data VDEs	1 x MIRROR 2 wide 7.28 TiB
Metadata VDEs	VDEs not assigned
Log VDEs	VDEs not assigned
Cache VDEs	VDEs not assigned
Spare VDEs	VDEs not assigned
Dedup VDEs	VDEs not assigned

Usage ✓

[Manage Datasets](#)**Usable Capacity: 7.14 TiB**

- Used: 426.73 GiB
- Available: 6.72 TiB

[View Disk Space Reports](#)

ZFS Health ✓

[Scrub](#)

Pool Status: Online

Total ZFS Errors: 0

Scheduled Scrub Task: Set

[View All Scrub Tasks](#)

Auto TRIM: Off

[Edit Auto TRIM](#)

Last Scan: Finished Scrub on 2024-02-04 00:37:23

Last Scan Errors: 0

Last Scan Duration: 37 minutes 21 seconds

Disk Health ✓

[Manage Disks](#)

Disks temperature related alerts: 0

Highest Temperature: No Data

Lowest Temperature: No Data

Average Disk Temperature: No Data

[View Reports](#)

Failed S.M.A.R.T. Tests: 0

[View All S.M.A.R.T. Tests](#)

Virtualization

7 Confirm Options

Name: testubuntu
Guest Operating System: Linux
CPU Configuration: 2 CPUs, 2 cores, 1 thread
CPU Mode: Custom
CPU Model:
Memory: 4 GiB
Disk: Create new disk image
Disk Description: 64 GiB AHCI at storage1/apps
NIC: VirtIO (enp130s0f0)
Installation Media: /mnt/storage1/NAS/Other/Software/Linux
ISO/ubuntu-22.04.4-live-server-amd64.iso

Confirm these settings.

Back

Save


Installing system

[Help]











```
subiquity/Package/apply_autoinstall_config
subiquity/Debconf/apply_autoinstall_config
subiquity/Kernel/apply_autoinstall_config
subiquity/Zdev/apply_autoinstall_config
subiquity/Ad/apply_autoinstall_config
subiquity/Late/apply_autoinstall_config
configuring apt
  curtin command in-target
installing system
  executing curtin install initial step
  executing curtin install partitioning step
    curtin command install
      configuring storage
        running 'curtin block-meta simple'
        curtin command block-meta
          removing previous storage devices
          configuring disk: disk-sda
          configuring partition: partition-0
          configuring format: format-0
          configuring partition: partition-1
          configuring format: format-1
          configuring mount: mount-1
          configuring mount: mount-0
        executing curtin install extract step
        curtin command install
          writing install sources to disk
          running 'curtin extract'
          curtin command extract
            acquiring and extracting image from cp:///tmp/tmpth9mu8qv/mount
          configuring keyboard
            curtin command in-target
            executing curtin install curthooks step
            curtin command install
              configuring installed system
              running 'curtin curthooks'
              curtin command curthooks
                configuring apt configuring apt
                installing missing packages |
                Installing packages on target system: ['efibootmgr', 'grub-efi-amd64', -
'grub-efi-amd64-signed', 'shim-signed']
```

[View full log]

Virtualization









Name	State	Autostart
TestUbuntu		<input checked="" type="checkbox"/>

Virtual CPUs: 2
Cores: 2
Threads: 1
Memory Size: 4 GiB
Boot Loader Type: UEFI
System Clock: LOCAL
Display Port: 5900
Description: Test Ubuntu
Shutdown Timeout: 90 seconds

 Restart  Power Off  Stop  Edit  Delete  Devices  Clone  Display  Serial Shell  Download Logs

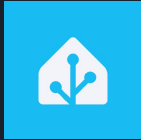
Applications



Dataset Name	Used / Available	Encryption	Roles
▼  storage1	25.13 TiB / 38.32 TiB	Unencrypted	   
 apps	4.82 GiB / 38.32 TiB	Unencrypted	
 ix-applications	6.23 GiB / 38.32 TiB	Unencrypted	

Applications

- Enterprise - iXsystems supported applications
- Official - Tested for stability & curated by iXsystems



- Community Apps - basic functionality tested



- Third Party Catalogs



TRUECHARTS

Applications - PiHole

Details

Application Info

Edit



Name: pihole-12

App Version: 2024.02.0

Chart Version: 15.2.0

Last Updated: N/A

Source:

[github.com/pi-hole](https://github.com/pi-hole/pi-hole), [github.com/docker-pi-hole](https://github.com/pi-hole/docker-pi-hole), pi-hole.net,
github.com/truecharts/charts/tree/master/charts/stable/pihole,
hub.docker.com/r/pihole/pihole

Developer: N/A

Catalog: Truecharts

Train: stable

Admin Open

Roll Back

Delete

Pi-hole



Status

● Active
● Load: 1.08 0.84 0.71
● Memory usage: 51.6 %
● Temp: 52.0 °C

Dashboard

Query Log

Long-term Data

Groups

Clients

Domains

Adlists

Disable Blocking

Local DNS

Tools

Settings

Donate

hostname: pihole-12-79bbfde487-d51rb

Total queries

79,737

30 active clients

Queries Blocked

4,898

List blocked queries

Percentage Blocked

6.1%

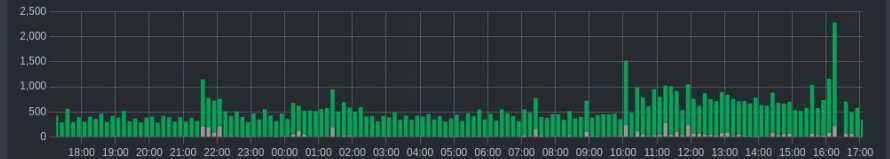
List all queries

Domains on Adlists

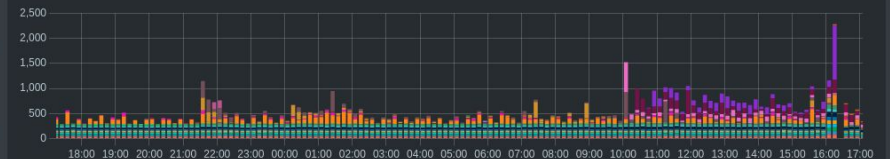
165,117

Manage adlists

Total queries over last 24 hours

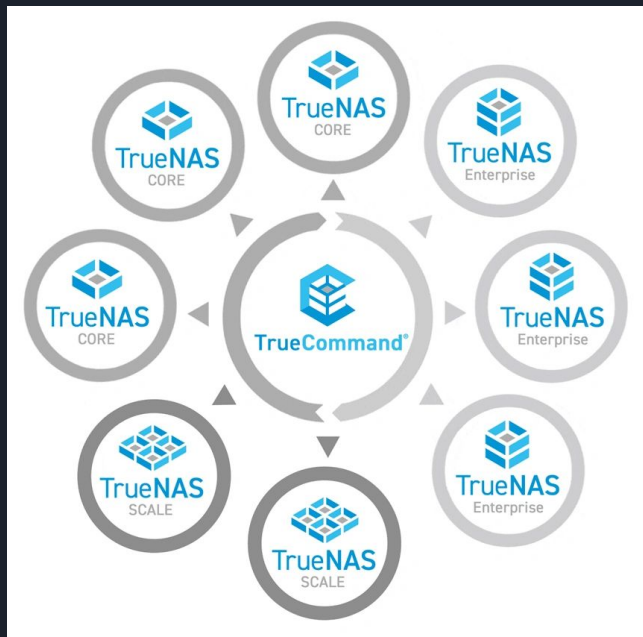


Client activity over last 24 hours





TrueCommand®



- TrueCommand is a multi-system management application that helps control and monitor your TrueNAS fleet.
- TrueCommand assists in managing TrueNAS systems through REST APIs, WebSocket APIs, and a web user interface.
- The TrueCommand web interface provides single sign-on functionality and unified administration of users and TrueNAS systems.

Clustering

Configure Cluster

1

VIPs

2

Associate VIPs

3

Active Directory

4

Confirmation

Enter public addresses. These addresses will later be associated with a public interface.

NEXT

VIPs

ADD

Address *

10.238.238.225

Netmask *

24



Address *

10.238.238.226

Netmask *

24



Address *

10.238.238.227

Netmask *

24



Address *

10.238.238.228

Netmask *


24



- TrueNAS SCALE SMB clustering using OpenZFS and Gluster scalable network file system.
- Minimum 3 nodes, properly configured Active Directory environment.
- Future of TrueNAS clustering uncertain...




TrueNAS SCALE 24.04 - Dragonfish




TrueNAS 24.04

SCALE


TrueNAS SCALE Foundation




OpenZFS




Web UI
REST APIs




SMB
NFS




iSCSI




S3



Apps




Replication
Encryption &
Security



Scale-Up

"Dragonfish"




SCALE Dragonfish Highlights


- Increase of ARC size
- Latest OpenZFS 2.2.2
- NVIDIA Driver 545.23.08
- Improved Log Management UI
- Read or Write-only App permissions
- Admins with restricted permissions
- Immutable Snapshots

Platforms

Software-only

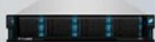


VMs/Clouds




Bare Metal


High Availability



X-Series




M-Series




F-Series

Single Controller



Mini Series



R-Series



TrueNAS SCALE vs Unraid

Feature	ixSystems - TrueNAS SCALE	Limetech - Unraid
License	Community Edition Free, ixSystems sells hardware and support services.	Unraid OS required one time license purchase. Pricing change announced February 19,2024.
Source Code	Open Source	Proprietary NAS OS based on Linux. Uses many open source resources.
File Systems	ZFS	XFS, BTRFS, ZFS in progress.
Virtualization	KVM	Previously Xen, now KVM
Containers	Docker via k3s	Docker Manager
Community	Higher Learning Curve	Active and friendly support



Resources

- [BackBlaze Article - Hard Drive Cost Per GB](#)
- [IXsystems - TrueNAS SCALE](#)
- [ItsFoss Article - What is ZFS](#)
- [45Drives - How ZFS Organizes Its Data](#)
- [45Drives - ZFS Caching](#)
- [45Drives - ZFS Best Practices](#)

Contest - Netgear ReadyNAS Pro 6



Questions





Survey



Survey Link: <https://forms.gle/Ze1eLZC7LFSgHnqH6>