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TrueNAS CORE and Enterprise

TrueNAS

OPEN STORAGE

TrueNAS is the world's most popular Open Source storage operating system and is the most efficient solution for managing and sharing data over a network. It is the simplest way to create a safe, secure, centralized, and easily accessible place for your data. TrueNAS Open Storage provides unified storage for file, block, object, and application data.

TrueNAS can be installed on virtually any hardware platform and is suitable for home, business, and enterprise applications. There are three editions of TrueNAS that enable a broad range of applications while sharing common management tools and enabling data transfers:

TrueNAS CORE

TrueNAS CORE is free and Open Source and is the successor to the wildly popular FreeNAS. It runs on virtually any x86_64 system and provides a broad set of features for many users. Plugin applications like Plex, NextCloud, and Asigra allow the functionality of a system to be customized for many use cases.

TrueNAS ENTERPRISE

TrueNAS Enterprise is provided as a system with either single or dual controllers to enable High Availability (HA). It can also be provided with Enterprise-grade support from iXsystems. Coupled with the TrueNAS M-Series system, it scales to 15GB/s and 20 PB with five 9's of uptime.

TrueNAS SCALE

TrueNAS SCALE is the latest member of the TrueNAS family and provides Open Source HyperConverged Infrastructure including Linux containers and VMs. TrueNAS SCALE includes the ability to cluster systems and provide scale-out storage with capacities of up to hundreds of Petabytes. It is currently in development and will be available for deployment in 2021.

TrueNAS Software products offer market-leading features to be the most effective NAS solution:

⊙

OpenZFS for Maximum Protection and Performance

All TrueNAS editions leverage the enterprise-grade OpenZFS file system to provide an all-inclusive data management solution that is designed for decades of continuous use. To provide the perfect balance between total storage capacity and data redundancy, storage pools can be configured in a variety of RAIDZ or Mirrored configurations. Pools can even be expanded when new disks or SSDs are added to the system, allowing your storage environment to grow with application requirements.

ZFS protects your data with features like Copy-on-Write, Checksums, Scrubbing, and 2-Copy Metadata. Automated replication ensures you can keep a bit-for-bit identical copy of your data safe in a remote storage location and fast resilvering times mean that if a disk fails, a replacement disk can be quickly integrated into the degraded data storage pool. ZFS uses efficient snapshot and cloning techniques to maximize available space, as well as in-line data compression, thin provisioning, and deduplication.

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Security-focused to give you Peace of Mind

TrueNAS supports a variety of security solutions including self-encrypted drives (SEDs) and ZFS native dataset encryption. Access control lists are fully customizable and provide another layer of protection for sensitive data. TrueNAS supports FIPS 140-2 Level 2 drives and installs with secure defaults in place, including encryption for file transfers and disabling SSH. Local users and groups can be managed, along with integrating TrueNAS with LDAP, Active Directory, Kerberos, and NIS. For enterprises, centralized key management (KMIP) is also available.

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Sharing Your Data has Never Been Easier

TrueNAS supports all the prominent network file sharing and remote backup options, and can even be expanded with applications from FreeBSD or Linux. Supported sharing protocols include NFS (v3,4), SMB (v1,2,3,4), AFP, FTP, WebDAV, and rsync. TrueNAS fully supports block sharing (iSCSI, Fibre Channel) and has been certified for use with vSphere, Citrix, and Veeam. Want to securely import or back up data with a Cloud Storage Provider? No problem! TrueNAS can even store and sync your S3 data with an automated schedule.

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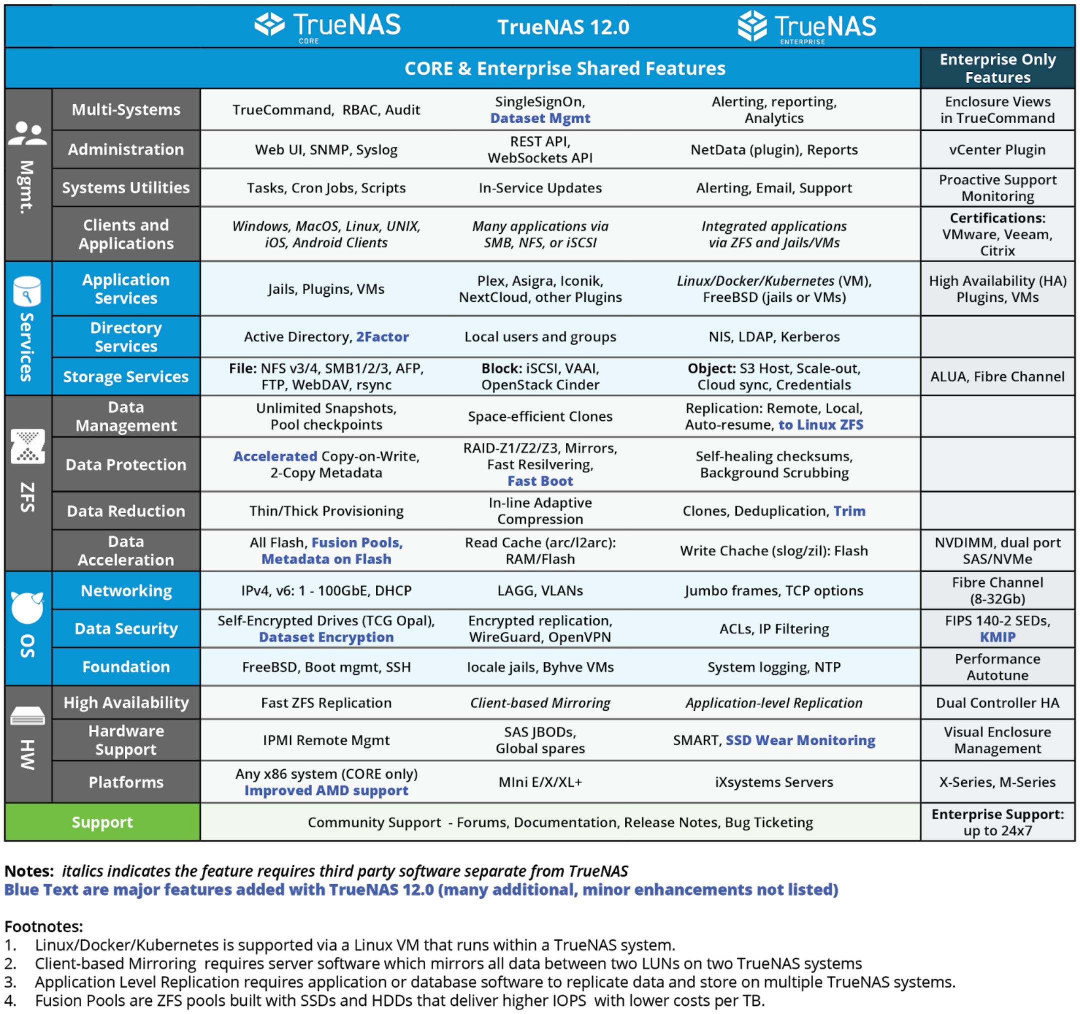
TrueNAS Delivers a Rich Set of Features

There are an enormous number of features in each TrueNAS edition. You can read the Open Source software, try out TrueNAS in a VM at zero cost, or have a look through this chart which summarizes the key features (TrueNAS 12.0 features are in blue).



		TrueNAS CORE	TrueNAS 12.0	TrueNAS ENTERPRISE	
		CORE & Enterprise Shared Features			Enterprise Only Features
Mgmt.	Multi-Systems	TrueCommand, RBAC, Audit	SingleSignOn, **Dataset Mgmt**	Alerting, reporting, Analytics	Enclosure Views in TrueCommand
	Administration	Web UI, SNMP, Syslog	REST API, WebSockets API	NetData (plugin), Reports	vCenter Plugin
	Systems Utilities	Tasks, Cron Jobs, Scripts	In-Service Updates	Alerting, Email, Support	Proactive Support Monitoring
	Clients and Applications	*Windows, MacOS, Linux, UNIX,* *iOS, Android Clients*	*Many applications via* *SMB, NFS, or iSCSI*	*Integrated applications* *via ZFS and Jails/VMs*	**Certifications:** VMware, Veeam, Citrix
Services	Application Services	Jails, Plugins, VMs	Plex, Asigra, Iconik, NextCloud, other Plugins	*Linux/Docker/Kubernetes* (VM), FreeBSD (jails or VMs)	High Availability (HA) Plugins, VMs
	Directory Services	Active Directory, **2Factor**	Local users and groups	NIS, LDAP, Kerberos	
	Storage Services	**File:** NFS v3/4, SMB1/2/3, AFP, FTP, WebDAV, rsync	**Block:** iSCSI, VAAI, OpenStack Cinder	**Object:** S3 Host, Scale-out, Cloud sync, Credentials	ALUA, Fibre Channel
ZFS	Data Management	Unlimited Snapshots, Pool checkpoints	Space-efficient Clones	Replication: Remote, Local, Auto-resume, **to Linux ZFS**	
	Data Protection	**Accelerated** Copy-on-Write, 2-Copy Metadata	RAID-Z1/Z2/Z3, Mirrors, Fast Resilvering, **Fast Boot**	Self-healing checksums, Background Scrubbing	
	Data Reduction	Thin/Thick Provisioning	In-line Adaptive Compression	Clones, Deduplication, **Trim**	
	Data Acceleration	All Flash, **Fusion Pools,** **Metadata on Flash**	Read Cache (arc/l2arc): RAM/Flash	Write Chache (slog/zil): Flash	NVDIMM, dual port SAS/NVMe
OS	Networking	IPv4, v6: 1 - 100GbE, DHCP	LAGG, VLANs	Jumbo frames, TCP options	Fibre Channel (8-32Gb)
	Data Security	Self-Encrypted Drives (TCG Opal), **Dataset Encryption**	Encrypted replication, WireGuard, OpenVPN	ACLs, IP Filtering	FIPS 140-2 SEDs, **KMIP**
	Foundation	FreeBSD, Boot mgmt, SSH	locale jails, Byhve VMs	System logging, NTP	Performance Autotune
HW	High Availability	Fast ZFS Replication	*Client-based Mirroring*	*Application-level Replication*	Dual Controller HA
	Hardware Support	IPMI Remote Mgmt	SAS JBODs, Global spares	SMART, **SSD Wear Monitoring**	Visual Enclosure Management
	Platforms	Any x86 system (CORE only) **Improved AMD support**	MIni E/X/XL+	iXsystems Servers	X-Series, M-Series
Support		Community Support - Forums, Documentation, Release Notes, Bug Ticketing			**Enterprise Support:** up to 24x7

Notes: *italics indicates the feature requires third party software separate from TrueNAS*
Blue Text are major features added with TrueNAS 12.0 (many additional, minor enhancements not listed)

Footnotes:

1. Linux/Docker/Kubernetes is supported via a Linux VM that runs within a TrueNAS system.
2. Client-based Mirroring requires server software which mirrors all data between two LUNs on two TrueNAS systems
3. Application Level Replication requires application or database software to replicate data and store on multiple TrueNAS systems.
4. Fusion Pools are ZFS pools built with SSDs and HDDs that deliver higher IOPS with lower costs per TB.

TrueNAS SCALE uses much of the same TrueNAS CORE source code, but adds a few different capabilities which are defined by this acronym:

Scale-out ZFS
Converged
Active-active
Linux containers
Easy-to-manage

○

Run TrueNAS on Any System

TrueNAS delivers Software Defined Storage (SDS) and runs on any x86_64 server, no matter how old or modern. Intel and AMD processors or any generation are supported, whether it's a single core or a sixty-four core behemoth. The TrueNAS hardware guide provides recommendations to assist you in building your own systems.

TrueNAS software has been developed under the sponsorship of iXsystems since 2009 and uses a large team of professionals who develop, build, QA, document, and support the Open Source software and the TrueNAS community. Since the TrueNAS software is free, iXsystems grows its business by building professional and enterprise-grade systems that have similar reliability to the major NAS vendors, but at a much lower Total Cost of Ownership (TCO). The iXsystems proposition is that TrueNAS enables dramatic storage cost savings through Open Source economics. TrueNAS provides the industry's most powerful Open Storage.

TrueNAS can be downloaded from this page.

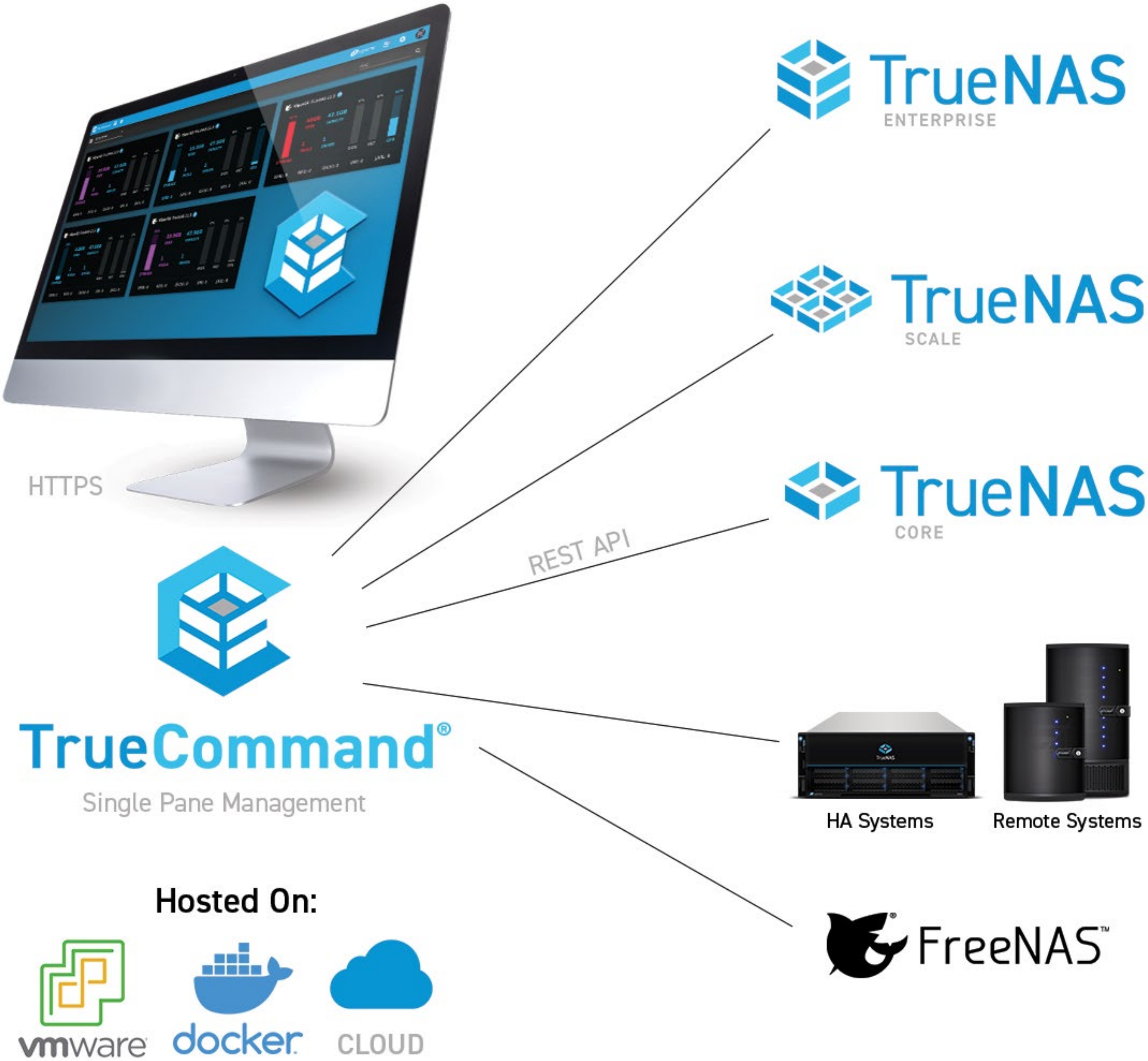
The current TrueNAS systems available cover a wide range of sizes and use cases! Go to the hardware section to learn more about each family of TrueNAS hardware.

Join the Expert Community

TrueNAS comprises both the Open Source software and an experienced and expert community developed over the last dozen years. Ask for advice and contribute your experiences for others to use. The community can save you many hours and be a great resource for new projects and applications. If you need more professional support, iXsystems offers Bronze/Silver/Gold Enterprise support including 24x365 coverage and onsite support with its systems.

TrueCommand Manages your NAS Fleet

TrueCommand is a single Pane-of-Glass management application that takes the repetitive work out of multi-TrueNAS management by centralizing system alerts, reports, and analytics in one easy to use interface. It supports users and teams with 24x365 global operations, role-based access control, and a full log of every TrueNAS configuration change. TrueCommand runs on docker, VMs, or as a cloud service and is free to users with less than 50 drives and affordable for those with larger installations. Read more information about TrueCommand in the overview article.


TrueNAS ENTERPRISE
TrueNAS SCALE
TrueNAS CORE
HTTPS
REST API
TrueCommand®
Single Pane Management
HA Systems
Remote Systems
FreeNAS™
Hosted On:
vmware
docker
CLOUD

1 - Getting Started

This section guides you through installing and accessing TrueNAS, storing and backing up data, sharing data over a network, and expanding TrueNAS with different applications solutions.

For more detailed interface reference articles, configuration instructions, and tuning recommendations, see the remaining sections in this topic. Content sections are organized by order of appearance in the web interface.

1.1 - CORE Hardware Guide

From repurposed systems to highly-custom builds, the fundamental freedom of TrueNAS is the ability to run it on almost any x86 computer.

Minimum Hardware Requirements

The recommended system requirements to install TrueNAS:

Processor	Memory	Boot Device	Storage
2-Core Intel 64-Bit or AMD x86_64 Processor	16 GiB Memory	16 GB SSD Boot Device	Two identically-sized devices for a single storage pool

The TrueNAS installer recommends 8 GB of RAM. TrueNAS installs, runs, operates jails, hosts SMB shares, and replicates TBs of data with less. iXsystems recommends the above for better performance and fewer issues.

You don't need an SSD boot device, but we discourage using a spinner or a USB stick for obvious reasons. We do not recommend installing TrueNAS on a single disk or striped pool unless you have a good reason to do so. You can install and run TrueNAS without any data device, but we strongly discourage it.

TrueNAS does not require two cores, as most halfway-modern 64-bit CPUs likely already have at least two.

For help building a system according to your unique performance, storage, and networking requirements, read on!

Storage Considerations

The heart of any storage system is the symbiotic pairing of its file system and physical storage devices. The ZFS file system in TrueNAS provides the best available data protection of any file system at any cost and makes very effective use of both spinning-disk and all-flash storage or a mix of the two. ZFS is prepared for the eventual failure of storage devices. It is highly configurable to achieve the perfect balance of redundancy and performance to meet any storage goal. A properly-configured TrueNAS system can tolerate the failure of multiple storage devices and even recreate its boot media with a copy of the configuration file .

Storage Media

Choosing storage media is the first step in designing the storage system to meet immediate objectives and prepare for future capacity expansion.

⊙ Spinning Disks

Until the next scientific breakthrough in storage media, spinning hard disks are here to stay thanks to their balance of capacity and cost. The arrival of double-digit terabyte consumer and enterprise drives provides more choices to TrueNAS users than ever. TrueNAS Mini systems ship with Western Digital NAS and NL-SAS for good reason. Understanding the alternatives explains this decision.

○ SATA NAS Disks

Serial Advanced Technology Attachment (SATA) is still the de facto standard disk interface found in many desktop/laptop computers, servers, and some non-enterprise storage arrays. SATA disks first arrived offering double-digit gigabyte capacities and are now produced to meet many capacity, reliability, and performance goals. While consumer desktop SATA disks don't have the problematic overall reliability issues they once had, they are still not designed or warrantied for continuous operation or use in RAID groups. Enterprise SATA disks address the always-on factor, vibration tolerance, and drive error handling required in storage systems. However, the price gap between desktop and enterprise SATA drives is vast enough that it forces users to push their consumer drives into 24/7 service to pursue cost savings.

Drive vendors, likely tired of honoring warranties for failed desktop drives used in incorrect applications, responded to this gap in the market by producing NAS drives. NAS drives achieved fame from the original Western Digital (WD) Red™ drives with CMR/PMR technology (now called WD Red Plus). Western Digital Designed the WD Red™ Plus NAS drives (non-SMR) for systems with up to 8 hard drives, the WD Red™ Pro for systems with up to 16 drives, and the WD UltraStar™ for systems beyond 16 drives.

The iXsystems Community Forum regards WD drives as the preferred hard drives for TrueNAS builds due to their exceptional quality and reliability. All TrueNAS Minis ship with WD Red™ Plus drives unless requested otherwise.

○ Nearline SAS Disks

Nearline SAS (NL-SAS) disks are 7200 RPM enterprise SATA disks with the industry-standard SAS interface found in most enterprise storage systems. SAS stands for **Serial Attached SCSI**, with the traditional SCSI disk interface in serial form. SAS systems, designed for data center storage applications, have accurate, verbose error handling, predictable failure behavior, reliable hot swapping, and the added feature of multipath support. Multipath access means that each drive has two interfaces and can connect to two storage controllers or one controller over two cables. This redundancy protects against cable, controller card, or complete system failure in the case of the TrueNAS high-availability architecture in which each controller is an independent server that accesses the same set of NL-SAS drives. NL-SAS drives are also robust enough to handle the rigors of systems with more than 16 disks. So, capacity-oriented TrueNAS systems ship with Western Digital UltraStar NL-SAS disks thanks to the all-around perfect balance of capacity, reliability, performance, and flexibility that NL-SAS drives offer.

○ SAS Disks

Enterprise SAS disks, built for the maximum performance and reliability that a spinning platter can provide, are the traditional heavy-lifters of the enterprise storage industry. SAS disk capacities are low compared to NL-SAS or NAS drives due to the speed at which the platters spin, reaching as high as 15,000 RPMs. While SAS drives may sound like the ultimate answer for high-performance storage, many consumer and enterprise flash-based options have come onto the market and significantly reduced the competitiveness of SAS drives. For example, enterprise SAS drives discontinued from the TrueNAS product lines were almost completely replaced by flash drives (SSDs or NVMe) in 2016 due to their superior performance/cost ratio.

○ SATA & SAS Flash Storage SSDs

Flash storage technology has progressed significantly in recent years, leading to a revolution in mobile devices and the rise of flash storage in general-purpose PCs and servers. Unlike hard disks, flash storage is not sensitive to vibration and can be much faster with comparable reliability. Flash storage remains more expensive per gigabyte, but is becoming more common in TrueNAS systems as the price gap narrows.

The shortest path for introducing flash storage into the mainstream market was for vendors to use standard SATA/SAS hard disk interfaces and form factors that emulate standard hard disks but without moving parts. For this reason, flash storage Solid State Disks (SSDs) have SATA interfaces and are the size of 2.5" laptop hard disks, allowing them to be drop-in replacements for traditional hard disks. Flash storage SSDs can replace HDDs for primary storage on a TrueNAS system, resulting in a faster, though either a smaller or more expensive storage solution. If you plan to go all-flash, buy the highest-quality flash storage SSDs your budget allows with a focus on power, safety, and write endurance that matches your expected write workload.

NVMe

While SSDs pretending to be HDDs made sense for rapid adoption, the Non-Volatile Memory Express (NVMe) standard is a native flash protocol that takes full advantage of flash storage's non-linear, parallel nature.

The main advantage of NVMe is generally its low-latency performance, and it's becoming a mainstream option for boot and other tasks. At first, NVMe was limited to expansion-card form factors such as PCIe and M.2. The new U.2 interface offers a universal solution that includes the 2.5" drive form factor and an externally accessible (but generally not hot-swappable) NVMe interface.

Note: NVMe devices can run quite hot and may need dedicated heat sinks.

USB Hard Disks

Avoid using USB-connected hard disks for primary storage with TrueNAS. You can use USB Hard Disks for very basic backups in a pinch. While TrueNAS does not automate this process, you can connect a USB HDD, replicate at the command line, and then take it off-site for safekeeping.

> **Warning:** USB-connected media (including SSDs) may report their serial numbers inaccurately, making them indistinguishable from each other.

These storage device media arrange together to create powerful storage solutions.

Storage Solutions

Hybrid Storage & Flash Cache (SLOG/ZIL/L2ARC)

With hard disks providing double-digit terabyte capacities and flash-based options providing even higher performance, a best of both worlds option is available. With TrueNAS and OpenZFS, you can merge both flash and disk to create hybrid storage that makes the most of both storage types. Hybrid setups use high-capacity spinning disks to store data while DRAM and flash perform hyper-fast read and write caching. The technologies work together with a flash-based separate write log (SLOG). Think of it as a write cache keeping the ZFS-intent log (ZIL) used to speed up writes. On the read side, flash is a level two adaptive replacement (read) cache (L2ARC) to keep the hottest data sets on the faster flash media. Workloads with synchronous writes such as NFS and databases benefit from SLOG devices, while workloads with frequently-accessed data might benefit from an L2ARC device. An L2ARC device is not always the best choice because the level one ARC in RAM always provide a faster cache, and the L2ARC table uses some RAM.

SLOG devices don't need to be large, since they only need to service five seconds of data writes delivered by the network or a local application. A high-endurance, low-latency device between 8 GB and 32 GB in size is adequate for most modern networks, and you can strip or mirror several devices for either performance or redundancy. Pay attention to the device's published endurance claims since a SLOG acts as the funnel point for most of the writes made to the system.

SLOG devices also need power protection. The purpose of the ZFS intent log (ZIL), and thus the SLOG, is to keep sync writes safe during a crash or power failure. If the SLOG isn't power-protected and loses data after a power failure, it defeats the purpose of using a SLOG in the first place. Check the manufacturer's specifications to ensure the SLOG device is power-safe or has power loss/failure protection.

The most important quality to look for in an L2ARC device is random read performance. The device needs to support more IOPS than the primary storage media it caches. For example, using a single SSD as an L2ARC is ineffective in front of a pool of 40 SSDs, as the 40 SSDs can handle far more IOPS than the single L2ARC drive. As for capacity, 5x to 20x larger than RAM size is a good guideline. High-end TrueNAS systems can have NVMe-based L2ARC in double-digit terabyte sizes.

Keep in mind that for every data block in the L2ARC, the primary ARC needs an 88-byte entry. Poorly-designed systems can cause an unexpected fill-up in the ARC and reduce performance in a p. For example, a 480 GB L2ARC filled with 4KiB blocks needs more than 10GiB of metadata storage in the primary ARC.

Self Encrypting Drives

TrueNAS supports two forms of data encryption at rest to achieve privacy and compliance objectives: Native ZFS encryption and Self Encrypting Drives (SEDs) . SEDs do not experience the performance overhead introduced by software partition encryption but aren't as readily available as non-SED drives (and thus can cost a little more).

○ Boot Devices

Booting legacy FreeNAS systems from 8 GB or larger USB flash drives was once very popular. We recommend looking at other options since USB drive quality varies widely and modern TrueNAS versions perform increased drive writes to the boot pool. For this reason, all pre-built TrueNAS Systems ship with either M.2 drives or SATA DOMs.

SATA DOMs, or disk-on-modules, offer reliability close to that of consumer 2.5" SSDs with a smaller form factor that mounts to an internal SATA port and doesn't use a drive bay. Because SATA DOMs and motherboards with m.2 slots are not as common as the other storage devices mentioned here, users often boot TrueNAS systems from 2.5" SSDs and HDDs (often mirrored for added redundancy). The recommended size for the TrueNAS boot volume is 8 GB, but using 16 or 32 GB (or a 120 GB 2.5" SATA SSD) provides room for more boot environments.

○ Hot Swapability

TrueNAS systems come in all shapes and sizes. Many users want to have external access to all storage devices for efficient replacement if issues occur. Most hot-swap drive bays need a proprietary drive tray into which you install each drive. These bay and tray combinations often include convenient features like activity and identification lights to visualize activity and illuminate a failed drive with sesutil(8) (https://www.freebsd.org/cgi/man.cgi?query=sesutil&sektion=8 for CORE, https://manpages.debian.org/testing/sg3-utils/sg3_utils.8.en.html for SCALE). TrueNAS Mini systems ship with four or more hot-swap bays. TrueNAS R-Series systems can support dozens of drives in their head units and external expansion shelves. Pre-owned or repurposed hardware is popular among TrueNAS users.
Pay attention to the maximum performance offered by the hot-swap backplanes of a given system. Aim for at least 6 Gbps SATA III support. Note that hot-swapping PCIe NVMe devices is not currently supported.

Storage Device Sizing

Zpool layout (the organization of LUNs and volumes, in TrueNAS/ZFS parlance) is outside of the scope of this guide. The availability of double-digit terabyte drives raises a question TrueNAS users now have the luxury of asking: How many drives should I use to achieve my desired capacity? You can mirror two 16TB drives to achieve 16TB of available capacity, but that doesn't mean you should. Mirroring two large drives offers the advantage of redundancy and balancing reads between the two devices, which could lower power draw, but little else. The write performance of two large drives, at most, is that of a single drive. By contrast, an array of eight 4TB drives offers a wide range of configurations to optimize performance and redundancy at a lower cost. If configured as striped mirrors, eight drives could yield four times greater write performance with a similar total capacity. You might also consider adding a hot-spare drive with any zpool configuration, which lets the zpool automatically rebuild itself if one of its primary drives fails.

Storage Device Burn-In

Spinning disk hard drives have moving parts that are highly sensitive to shock and vibration and wear out with use. Consider pre-flighting every storage device before putting it into production, paying attention to:

- Start a long HDD self-test (`smartctl -t long /dev/`), and after the test completes (could take 12+ hrs)
- Check the results (`smartctl -a /dev/`)
- Check pending sector reallocations (`smartctl -a /dev/ | grep Current_Pending_Sector`)
- Check reallocated sector count (`smartctl -a /dev/ | grep Reallocated_Sector_Ct`)
- Check the UDMA CRC errors (`smartctl -a /dev/ | grep UDMA_CRC_Error_Count`)
- Check HDD and SSD write latency consistency (`diskinfo -wS`) *Unformatted drives only!*
- Check HDD and SSD hours (`smartctl -a /dev/ | grep Power_On_Hours`)
- Check NVMe percentage used (`nvmecontrol logpage -p 2 nvme0 | grep "Percentage used"`)

Take time to create a pool before deploying the system. Subject it to as close to a real-world workload as possible to reveal individual drive issues and help determine if an alternative pool layout is better suited to that workload. Be cautious of used drives as vendors may not be honest or informed about their age and health. Check the number of hours on all new drives using `smartctl(8)` to verify they aren't recertified. A drive vendor could also zero the hours of a drive during recertification, masking its true age. iXsystems tests all storage devices it sells for at least 48 hours before shipment.

Storage Controllers

The uncontested most popular storage controllers used with TrueNAS are the 6 and 12 Gbps (Gigabits per second, sometimes expressed as Gb/s) Broadcom (formerly Avago, formerly LSI) SAS host bus adapters (HBA). Controllers ship embedded on some motherboards but are generally PCIe cards with four or more internal or external SATA/SAS ports. The 6 Gbps LSI 9211 and its rebranded siblings that also use the LSI SAS2008 chip, such as the IBM M1015 and Dell H200, are legendary among TrueNAS users who build systems using parts from the second-hand market. Flash using the latest IT or Target Mode firmware to disable the optional RAID functionality found in the IR firmware on Broadcom controllers. For those with the budget, newer models like the Broadcom 9300/9400 series give 12 Gbps SAS capabilities and even NVMe to SAS translation abilities with the 9400 series. TrueNAS includes the `sas2flash`, `sas3flash`, and `storcli` commands to flash or perform re-flashing operations on 9200, 9300, and 9400 series cards.

Onboard SATA controllers are popular with smaller builds, but motherboard vendors are better at catering to the needs of NAS users by including more than the traditional four SATA interfaces. Be aware that many motherboards ship with a mix of 3 Gbps and 6 Gbps onboard SATA interfaces and that choosing the wrong one could impact performance. If a motherboard includes hardware RAID functionality, do not use or configure it, but note that disabling it in the BIOS might remove some SATA functionality depending on the motherboard. Most SATA compatibility-related issues are immediately apparent.

There are countless warnings against using hardware RAID cards with TrueNAS. ZFS and TrueNAS provide a built-in RAID that protects your data better than any hardware RAID card. You can use a hardware RAID card if it's all you have, but there are limitations. First and most importantly, do not use their RAID facility if your hardware RAID card supports HBA mode, also known as passthrough or JBOD mode (there is one caveat in the bullets below). When used, it allows it to perform indistinguishably from a standard HBA. If your RAID card does not have this mode, you can configure a RAID0 for every single disk in your system. While not the ideal setup, it works in a pinch. If repurposing hardware RAID cards with TrueNAS, be aware that some hardware RAID cards:

- Could mask disk serial number and S.M.A.R.T. health information
- Could perform slower than their HBA equivalents
- Could cause data loss if using a write cache with a dead battery backup unit (BBU))

SAS Expanders

A direct-attached system, where every disk connects to an interface on the controller card, is optimal but not always possible. A SAS expander (a port multiplier or splitter) enables each SAS port on a controller card to service many disks. You find SAS expanders only on the drive backplane of servers or JBODs with more than twelve drive bays. For example, a TrueNAS JBOD that eclipses 90 drives in only four rack units of space wouldn't be possible without SAS expanders. Imagine how many eight-port HBAs you would need to access 90 drives without SAS expanders.

While SAS expanders, designed for SAS disks, can often support SATA disks via the SATA Tunneling Protocol or STP, we still prefer SAS disks for reasons mentioned in the NL-SAS section above (SATA disks function on a SAS-based backplane). Note that the opposite is not true: you can't use a SAS drive in a port designed for SATA drives.

Storage Device Cooling

A much-cited study floating around the Internet asserts that drive temperature has little impact on drive reliability. The study makes for a great headline or conversation starter, but carefully reading the report indicates that the drives were tested under optimal environmental conditions. The average temperature that a well-cooled spinning hard disk reaches in production is around 28 °C, and one study found that disks experience twice the number of failures for every 12 °C increase in temperature. Before adding drive cooling that often comes with added noise (especially on older systems), know that you risk throwing money away by running a server in a data center or closet without noticing that the internal cooling fans are set to their lowest setting. Pay close attention to drive temperature in any chassis that supports 16 or more drives, especially if they are exotic, high-density designs. Every chassis has certain areas that are warmer for whatever reason. Watch for fan failures and the tendency for some models of 8TB drives to run hotter than other drive capacities. In general, try to keep drive temperatures below the drive vendor's specification.

Memory, CPU, and Network Considerations

Memory Sizing

TrueNAS has higher memory requirements than many Network Attached Storage solutions for good reason: it shares dynamic random-access memory (DRAM or simply RAM) between sharing services, add-on plugins, jails, and virtual machines, and sophisticated read caching. RAM rarely goes unused on a TrueNAS system and enough RAM is key to maintaining peak performance. You should have at least 8 GB of RAM for basic TrueNAS operations with up to eight drives. Other use cases each have distinct RAM requirements:

- Add 1 GB for each drive added after eight to benefit most use cases.
- Add extra RAM (in general) if more clients will connect to the TrueNAS system. A 20 TB pool backing lots of high-performance VMs over iSCSI might need more RAM than a 200 TB pool storing archival data. If using iSCSI to back VMs, plan to use at least 16 GB of RAM for reasonable performance and 32 GB or more for optimal performance.
- Add 2 GB of RAM for directory services for the winbind internal cache.
- Add more RAM as required for plugins and jails as each has specific application RAM requirements.
- Add more RAM for virtual machines with a guest operating system and application RAM requirements.
- Add the suggested 5 GB per TB of storage for deduplication that depends on an in-RAM deduplication table.
- Add approximately 1 GB of RAM (conservative estimate) for every 50 GB of L2ARC in your pool. Attaching an L2ARC drive to a pool uses some RAM, too. ZFS needs metadata in ARC to know what data is in L2ARC.

Error Correcting Code Memory

Electrical or magnetic interference inside a computer system can cause a spontaneous flip of a single bit of RAM to the opposite state, resulting in a memory error. Memory errors can cause security vulnerabilities, crashes, transcription errors, lost transactions, and corrupted or lost data. So RAM, the temporary data storage location, is one of the most vital areas for preventing data loss.

Error-correcting code or ECC RAM detects and corrects in-memory bit errors as they occur. If errors are severe enough to be uncorrectable, ECC memory causes the system to hang (become unresponsive) rather than continue with errored bits. For ZFS and TrueNAS, this behavior virtually eliminates any chances that RAM errors pass to the drives to cause corruption of the ZFS pools or file errors.

The lengthy, Internet-wide debate on whether to use error-correcting code (ECC) system memory with OpenZFS and TrueNAS summarizes as:

- ECC RAM is *strongly* recommended as another data integrity defense

However:

- Some CPUs or motherboards support ECC RAM but not all
- Many TrueNAS systems operate every day without ECC RAM
- RAM of any type or grade can fail and cause data loss
- RAM is most likely to fail in the first three months so test all RAM before deployment.

Central Processing Unit (CPU) Selection

Choosing ECC RAM limits your CPU and motherboard options, but that can be a good thing. Intel® makes a point of limiting ECC RAM support to their lowest and highest-end CPUs, cutting out the mid-range i5 and i7 models.

Which CPU to choose can come down to a short list of factors:

- An underpowered CPU can create a performance bottleneck because of how OpenZFS does checksums, and compresses and (optional) encrypts data.
- A higher-frequency CPU with fewer cores usually performs best for SMB only workloads because of Samba, the lightly-threaded TrueNAS SMB daemon.
- A higher-core-count CPU is better suited for parallel encryption and virtualization.
- A CPU with AES-NI encryption acceleration support improves the speed of the file system and network encryption.
- A server-class CPU is recommended for its power and ECC memory support.
- A Xeon E5 CPU (or similar) is recommended for software-encrypted pools.

- An Intel Ivy Bridge CPU or later recommended for virtual machine use.

Watch for VT-d/AMD-Vi device virtualization support on the CPU and motherboard to pass PCIe devices to virtual machines. Be aware if a given CPU contains a GPU or requires an external one. Also, note that many server motherboards include a BMC chip with a built-in GPU. See below for more details on BMCs.

AMD CPUs are making a comeback thanks to the Ryzen and EPYC (Naples/Rome) lines. Support for these platforms is limited on FreeBSD and, by extension, TrueNAS CORE. However, Linux has significant support, and TrueNAS SCALE should work with AMD CPUs without issue.

Remote Management: IPMI

As a courtesy to further limit the motherboard choices, consider the Intelligent Platform Management Interface or IPMI (a.k.a. baseboard management controller, BMC, iLo, iDrac, and other names depending on the vendor) if you need:

- Remote power control and monitoring of remote systems
- Remote console shell access for configuration or data recovery
- Remote virtual media for TrueNAS installation or reinstallation

TrueNAS relies on its web-based user interface (UI), but you might occasionally need console access to make network configuration changes. TrueNAS administration and sharing default to a single network interface, which can be challenging when you need to upgrade features like LACP aggregated networking. The ideal solution is to have a dedicated subnet to access the TrueNAS web UI, but not all users have this luxury. The occasional visit to the hardware console is necessary for global configuration and even for system recovery. The latest TrueNAS Mini and R-Series systems ship with full-featured, HTML5-based IPMI support on a dedicated gigabit network interface.

Power Supply Units

The top criteria to consider for a power supply unit (or PSU) on a TrueNAS system are its:

- Power capacity (in watts) for the motherboard and number of drives it must support
- Reliability
- Efficiency rating
- Relative noise
- Optional redundancy to keep important systems running if one power supply fails

Select a PSU rated for the initial and a future load placed on it. Have a PSU with adequate power to migrate from a large-capacity chassis to a fully-populated chassis. Also, consider a hot-swappable redundant PSU to help guarantee uptime. Users on a budget can keep a cold spare PSU to limit their potential downtime to hours rather than days. A good, modern PSU is efficient and completely integrates into the IPMI management system to provide real-time fan, temperature, and load information.

Most power supplies carry a certified efficiency rating known as an 80 Plus rating. The 80 plus rating indicates the power drawn from the wall is lost as heat, noise, and vibration, instead of doing useful work like powering your components. If a power supply needs to draw 600 watts from the wall to provide 500 watts of power to your components, it’s operating at 500/600 = ~83% efficiency. The other 100 watts get lost as heat, noise, and vibration. Power supplies with higher ratings are more efficient but also far more expensive. Do some return-on-investment calculations if you’re unsure what efficiency to buy. For example, if an 80 Plus Platinum PSU costs $50 more than the comparable 80 Plus Gold, it should save you at least $10 per year on your power bill for that investment to pay off over five years. You can read more about 80 Plus ratings in this post .

Uninterruptible Power Supplies

TrueNAS provides the ability to communicate with a battery-backed, uninterruptible power supply (UPS) over a traditional serial or USB connection to coordinate a graceful shutdown in the case of power loss. TrueNAS works well with APC brand UPSs, followed by CyberPower. Consider budgeting for a UPS with pure sine wave output. Some models of SSD can experience data corruption on power loss. If several SSDs experience simultaneous power loss, it could cause total pool failure, making a UPS a critical investment.

Ethernet Networking

The network in Network Attached Storage is as important as storage, but the topic reduces to a few key points:

- Simplicity - Simplicity is often the secret to reliability with network configurations.
- Individual interfaces - Faster individual interfaces such as 10/25/40/100GbE are preferable to aggregating slower interfaces.
- Interface support - Intel and Chelsio interfaces are the best-supported options.
- Packet fragmentation - Only consider a *jumbo frames* MTU with dedicated connections such as between servers or video editors and TrueNAS that are unlikely to experience packet fragmentation.
- LRO/LSO offload features - Interfaces with LRO and LSO offload features generally alleviates the need for jumbo frames and their use can result in lower CPU overhead.

High-Speed Interconnects

Higher band hardware is becoming more accessible as the hardware development pace increases and enterprises upgrade more quickly. Home labs can now deploy and use 40 GB and higher networking components. Home users are now discovering the same issues and problems with these higher speeds found by Enterprise customers.

iXsystems recommends using optical fiber over *direct attached copper* (DAC) cables for the high speed interconnects listed below:

- 10Gb NICs: SFP+ connectors
- 25Gb NICs: SFP28 connectors
- 40Gb NICs: QSFP+ connectors
- 100Gb NICs: QSFP28 connectors
- 200Gb NICs: QSFP56 connectors
- 400Gb NICs: QSFP-DD connectors

iXsystems also recommends using optical fiber for any transceiver form factors mentioned when using fiber channels. Direct attached copper (DAC) cables could create interoperability issues between the NIC, cable, and switch.

Virtualized TrueNAS CORE

Finally, the ultimate TrueNAS hardware question is whether to use actual hardware or choose a virtualization solution. TrueNAS developers virtualize TrueNAS every day as part of their work, and cloud services are popular among users of all sizes. TrueNAS's design has OpenZFS at its heart. The design from day one works with physical storage devices. It is aware of their strengths and compensates for their weaknesses. When the need arises to virtualize TrueNAS:

- Pass hardware disks or the entire storage controller to the TrueNAS VM if possible (requires VT-d/AMD-Vi support).
- Disable automatic scrub pools on virtualized storage such as VMFS, and never scrub a pool while also running storage repair tasks on another layer.
- Use a least three vdevs to provide adequate metadata redundancy, even with a striped pool.
- Provide one or more 8 GB or larger boot devices.
- Provide the TrueNAS VM with adequate RAM per its usual requirements.
- Consider jumbo frame networking if all devices support it.
- Understand that the guest tools in FreeBSD might lack features found in other guest operating systems.
- Enable MAC address spoofing on virtual interfaces and enable promiscuous mode to use VNET jail and plugins.

1.2 - Install

Now that the .iso file is downloaded, you can start installing TrueNAS!

Major Upgrades expand □

The install process can be repeated with newer installation files when the system already has TrueNAS installed. This is used for major version upgrades

ISO Verification expand □

The iXsystems Security Team cryptographically signs TrueNAS ISO files so that users can verify the integrity of their downloaded file. This section demonstrates how to verify an ISO file using the Pretty Good Privacy (PGP) and SHA256 methods.

PGP ISO Verification

You will need an OpenPGP encryption application for this method of ISO verification. There are many different free applications available, but the OpenPGP group provides a list of available software for different operating systems at https://www.openpgp.org/software/. The examples in this section show verifying the TrueNAS .iso using gnupg2 in a command prompt, but Gpg4win is also a good option for Windows users.

To verify the .iso source, go to https://www.truenas.com/download-tn-core/, expand the **Security** option, and click *PGP Signature* to download the Gnu Privacy Guard (.gpg) signature file. The PGP Public Key can be downloaded from either pgp.mit.edu (search for `security-officer@ixsystems.com`) or keys.openpgp.org.

Open the PGP Public key link and note the address in your browser and **Search results for** string .

Use one of the OpenPGP encryption tools mentioned above to import the public key and verify the PGP signature.

Go to the .iso and .iso.gpg download location and import the public key using the keyserver address and search results string:

```
q5sys@athena /tmp>  gpg --keyserver keys.gnupg.net --recv-keys
0xc8d62def767c1db0dff4e6ec358eaa9112cf7946
gpg: requesting key 12CF7946 from hkp server keys.gnupg.net
gpg: key 12CF7946: "IX SecTeam <security-officer@ixsystems.com>" not changed
gpg: Total number processed: 1
gpg:              unchanged: 1
q5sys@athena /tmp>
```

Use `gpg --verify` to compare the .iso and .iso.gpg files:

```
q5sys@athena /tmp>  gpg --verify TrueNAS-12.0-BETA2.1.iso.gpg TrueNAS-12.0-BETA2.iso
gpg: Signature made Thu Aug 27 10:06:02 2020 EDT using RSA key ID 12CF7946
gpg: Good signature from "IX SecTeam <security-officer@ixsystems.com>"
gpg: WARNING: This key is not certified with a trusted signature!
gpg:          There is no indication that the signature belongs to the owner.
Primary key fingerprint: C8D6 2DEF 767C 1DB0 DFF4  E6EC 358E AA91 12CF 7946
q5sys@athena /tmp>
```

This response means the signature is correct but still untrusted. Go back to the browser page that has the **PGP Public key** open and manually confirm that the key was issued for `IX SecTeam <security-officer@ixsystems.com>` (iX Security Team) on October 15, 2019 and has been signed by an iXsystems account.

SHA256 Verification

The command to verify the checksum varies by operating system:

- BSD: `sha256 isofile`
- Linux: `sha256sum isofile`
- Mac: `shasum -a 256 isofile`
- Windows or Mac users can install additional utilities like HashCalc or HashTab.

The value produced by running the command must match the value shown in the sha256.txt file. Different checksum values indicate a corrupted installer file that should not be used.

Choose the install type to see specific instructions:

⦿ **Physical Hardware**

Hardware Considerations expand □

TrueNAS is very flexible and can run on most x86 computers. However, there are many different hardware considerations when building a NAS! If you're still researching what kind of hardware to use with TrueNAS, read over the very detailed CORE Hardware Guide .

Prepare the Install File

Physical hardware typically requires burning the TrueNAS installer to a physical device. In general a CD or removable USB device is used. This device is temporarily attached to the system to install TrueNAS to the system's permanent boot device.

Headless, or remote, installation is possible when the system has IPMI available and can create a virtual media CD-ROM using a locally stored .iso .

The method of writing the installer to a device varies between operating systems. Click **Windows** or **Linux** to see instructions for your Operating System, or **CD** for generic CD burning guidance.

CD expand □

To use the installer with a CD, download your favorite CD burning utility and burn the .iso file to the CD. Insert the CD into the TrueNAS system and boot from the CD.

Windows expand □

To write the TrueNAS installer to a USB stick on Windows, plug the USB stick into the system and use a program like Rufus to write the .iso file to the memory stick. When Rufus prompts for which write method to use, make sure *dd mode* is selected.

The USB stick is not recognized by Windows after the TrueNAS installer writes to it. To reclaim the USB stick after installing TrueNAS, use Rufus to write a "Non bootable" image, then remove and reinsert the USB stick.

Linux expand □

To write the TrueNAS installer to a USB stick on Linux, plug the USB stick into the system and open a terminal.

Start by making sure the USB stick connection path is correct. There are many ways to do this in Linux, but a quick option is to enter `lsblk -po +vendor,model` and note the path to the USB stick. This shows in the **NAME** column of the `lsblk` output.

Next, use `dd` to write the installer to the USB stick.

Be very careful when using dd, as choosing the wrong ***of=*** device path can result in irretrievable data loss!

Enter `dd status=progress if=path/to/.iso of=path/to/USB` in the CLI. If this results in a "permission denied" error, use `sudo dd` with the same parameters and enter the administrator password.

Headless Install expand □

Systems with IPMI connectivity, like the TrueNAS Mini, can use the Virtual Media feature with an .iso to create a virtual boot device for installation. Mounting the .iso in a virtual CD-ROM, allows installing or updating headless servers remotely through the console.

Here is an example of setting up a virtual CD-ROM with a SUPERMICRO IPMI:

1. From the **Virtual Media** menu, select *CD-ROM Image*.
2. Fill in the details:
    1. **Shared Host**: The IP address of the system storing the .iso .
    2. **Path to Image**: The path to the image file. Example: *install/iso/SCALEAngelfish.iso*
3. Click **Mount**.
4. Click **Refresh Status** and confirm a disk is being emulated.
5. Click **Save**.

Install Process

With the installer added to a device, you can now install TrueNAS onto the desired system. Insert the install media, or load the iso using IPMI, and reboot or boot the system. At the motherboard splash screen, use the hotkey defined by your motherboard manufacturer to boot into the motherboard UEFI/BIOS.

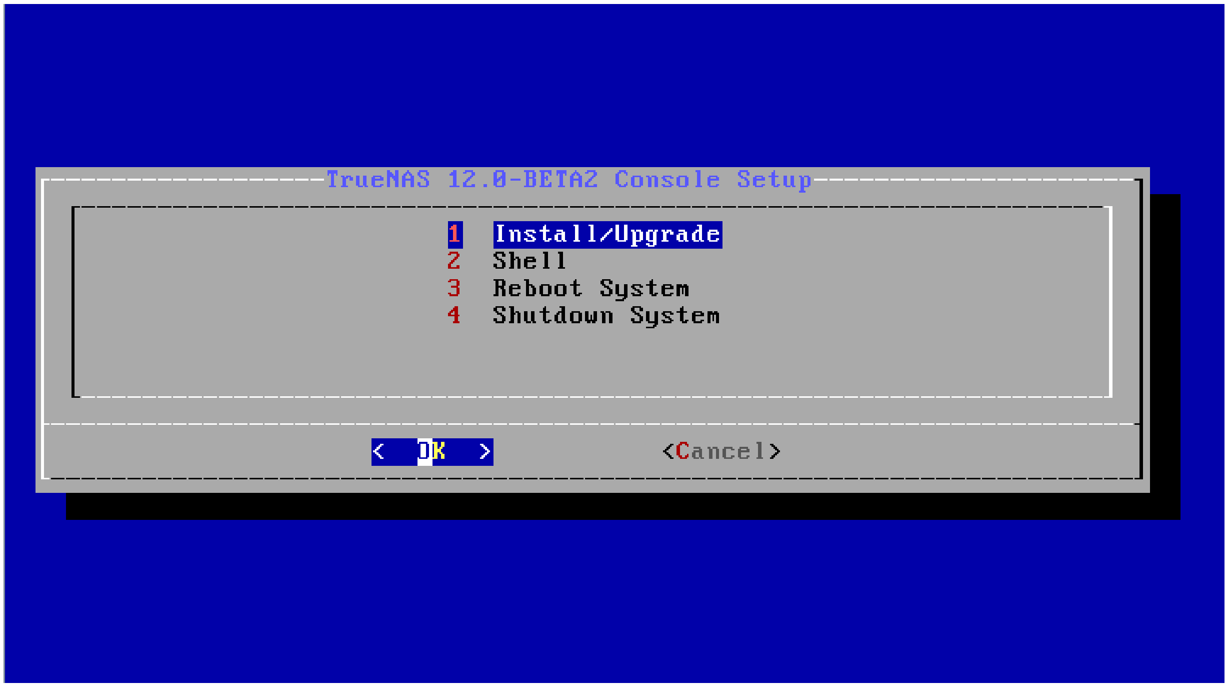
Choose to boot in UEFI mode or legacy CSM/BIOS mode. When installing TrueNAS, make the matching choice for the installation. For Intel chipsets manufactured in 2020 or later, UEFI is likely the only option.

If your system supports SecureBoot, you will need to either disable it or set it to “Other OS” to be able to boot the install media.

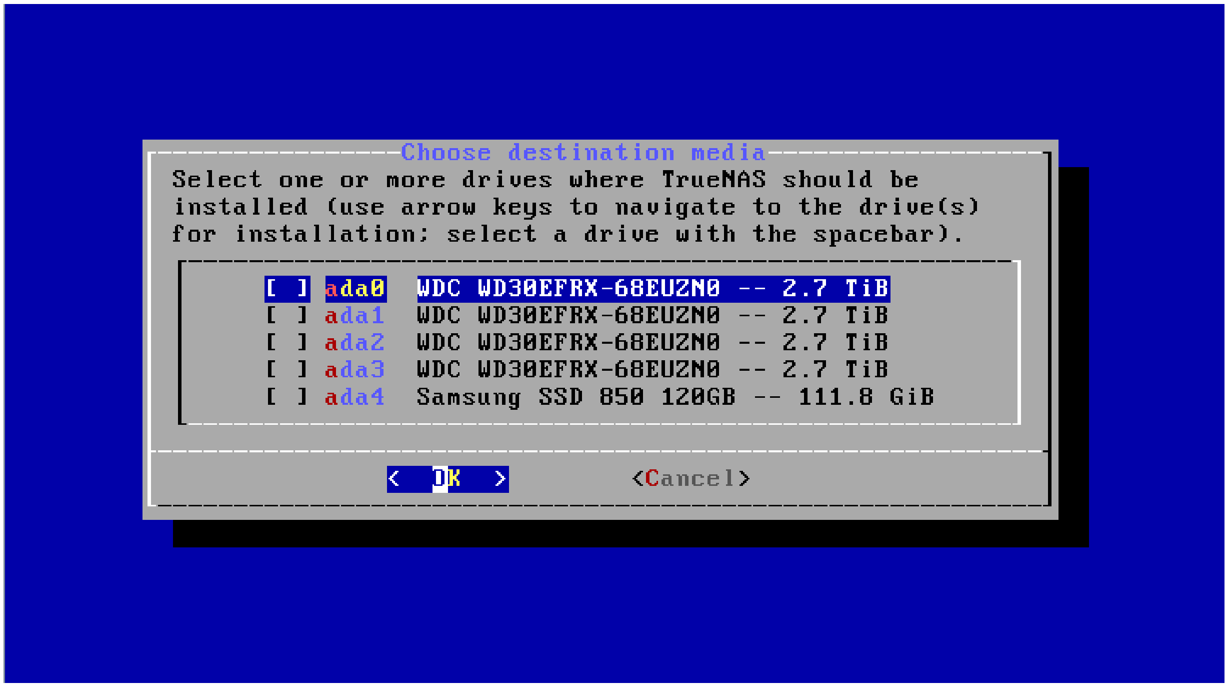
Select the install device as the boot drive, exit, and reboot the system. If the USB stick is not shown as a boot option, try a different USB slot. Which slots are available for boot differs by hardware.

After the system has booted into the installer, follow these steps.

Select *Install/Upgrade*.

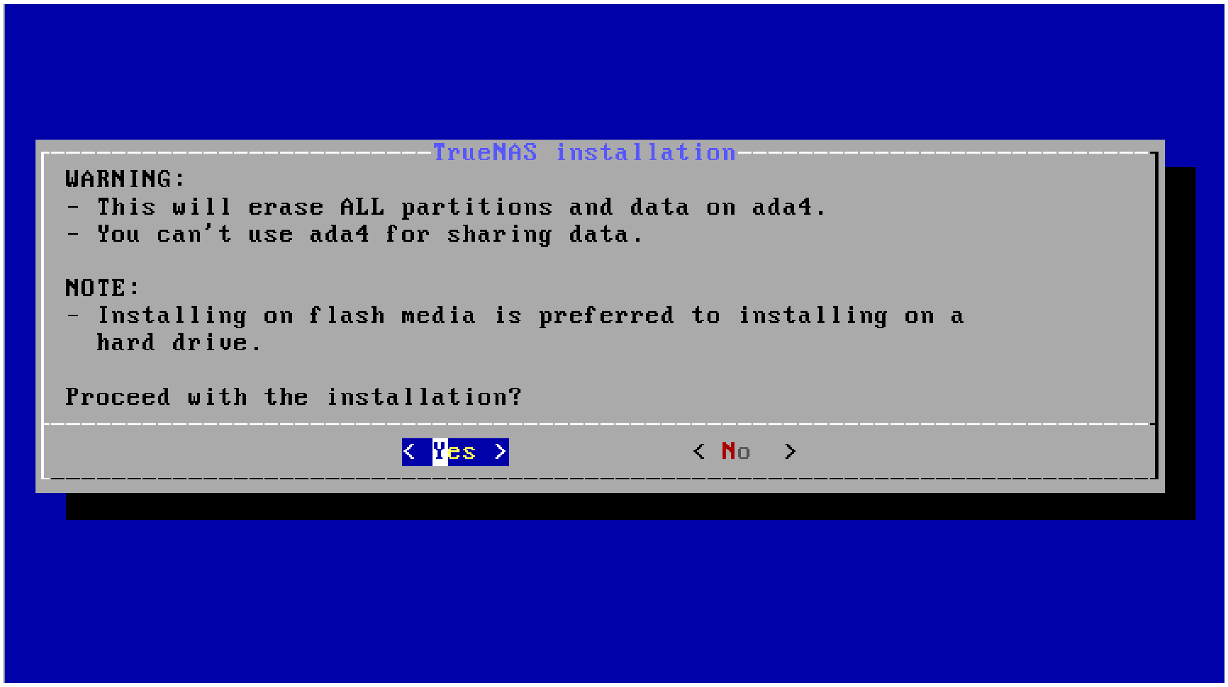


Select the desired install drive.



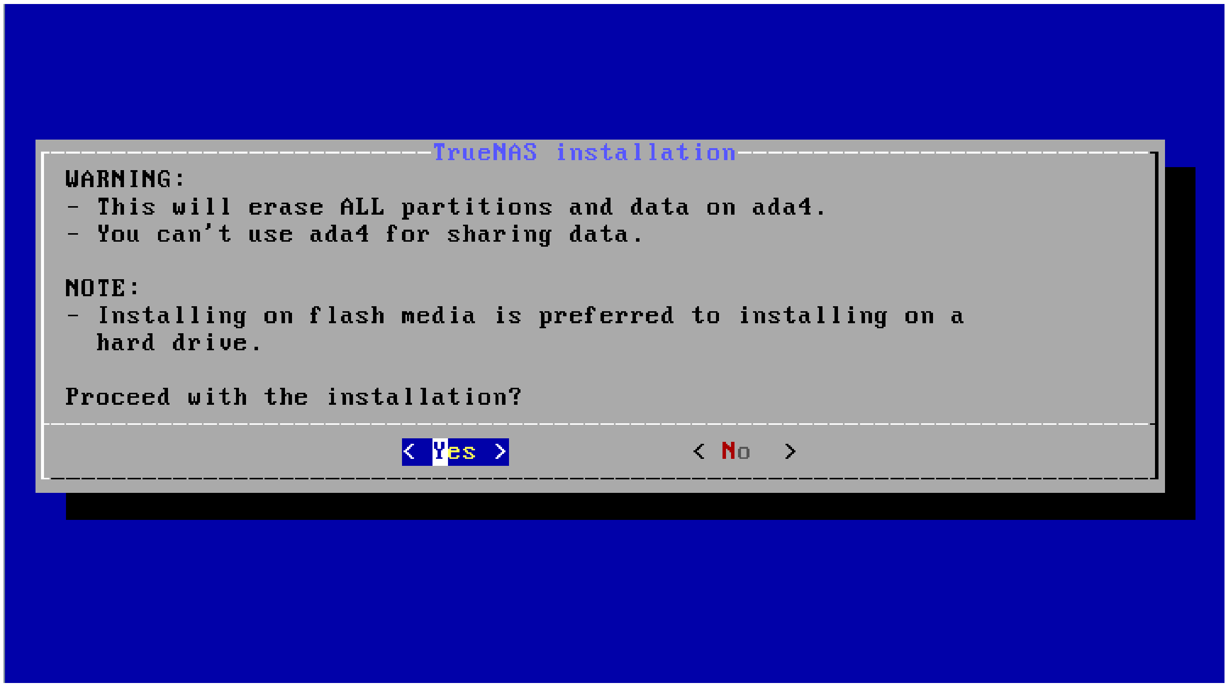
```
Choose destination media
Select one or more drives where TrueNAS should be
installed (use arrow keys to navigate to the drive(s)
for installation; select a drive with the spacebar).

        [ ] ada0   WDC WD30EFRX-68EUZN0 -- 2.7 TiB
        [ ] ada1   WDC WD30EFRX-68EUZN0 -- 2.7 TiB
        [ ] ada2   WDC WD30EFRX-68EUZN0 -- 2.7 TiB
        [ ] ada3   WDC WD30EFRX-68EUZN0 -- 2.7 TiB
        [ ] ada4   Samsung SSD 850 120GB -- 111.8 GiB
```

Select *Yes*



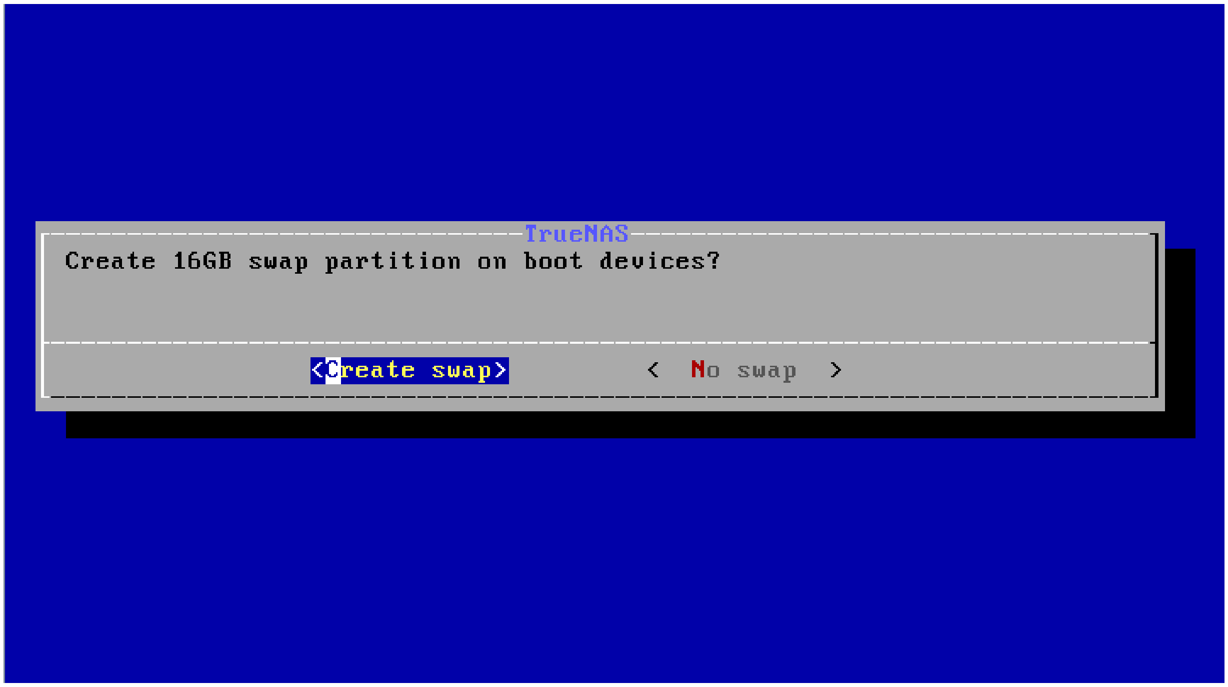
```
TrueNAS installation
WARNING:
- This will erase ALL partitions and data on ada4.
- You can't use ada4 for sharing data.

NOTE:
- Installing on flash media is preferred to installing on a
  hard drive.

Proceed with the installation?
```

Select *Fresh Install* to do a clean install of the downloaded version of TrueNAS. **This will erase the contents of the selected drive.**!



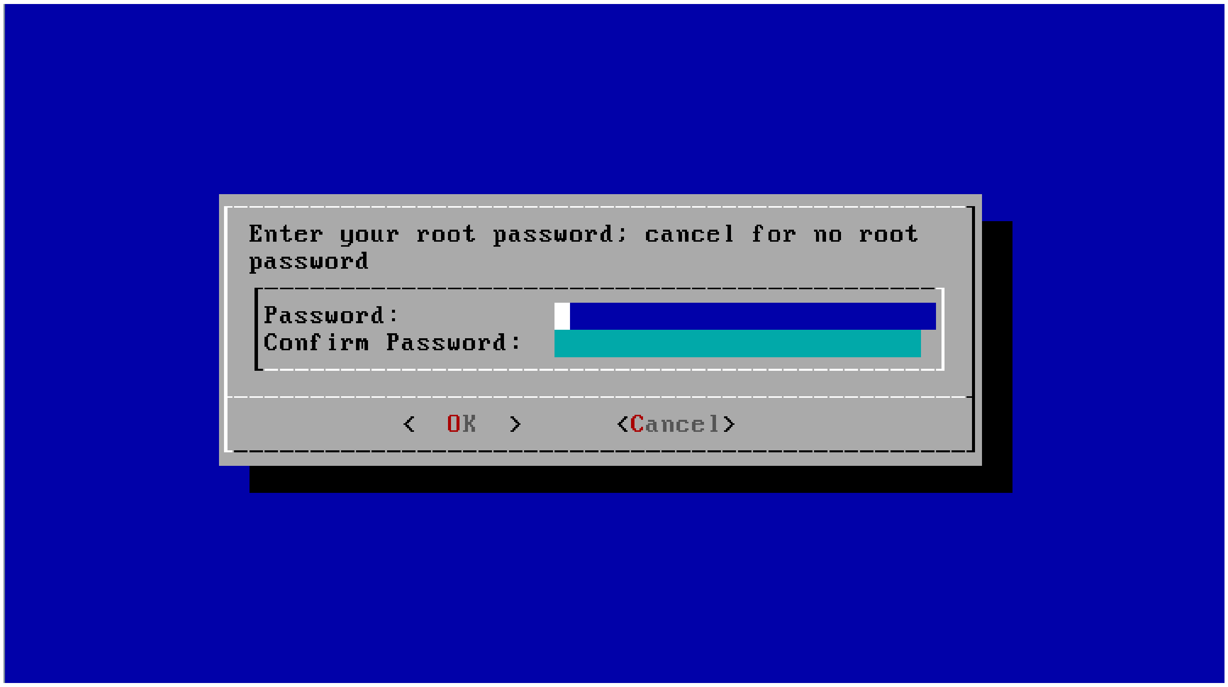
```
WARNING:
- This will erase ALL partitions and data on ada4.
- You can't use ada4 for sharing data.

NOTE:
- Installing on flash media is preferred to installing on a
  hard drive.

Proceed with the installation?
```

When the operating system device has enough additional space, you can choose to allocate some space for a swap partition to improve performance.



```
Create 16GB swap partition on boot devices?
```

Enter a password for the `root` user to log in to the web interface.



```
Enter your root password; cancel for no root
password

Password:
Confirm Password:

         <  OK  >          <Cancel>
```

After following the steps to install, reboot the system and remove the install media.

Troubleshooting expand □

If the system does not boot into TrueNAS, there are several things that can be checked to resolve the situation:

- Check the system BIOS and see if there is an option to change the USB emulation from CD/DVD/floppy to hard drive. If it still will not boot, check to see if the card/drive is UDMA compliant.
- If the system BIOS does not support EFI with BIOS emulation, see if it has an option to boot using legacy BIOS mode.
- If the system starts to boot but hangs with this repeated error message: `run_interrupt_driven_hooks: still waiting after 60 seconds for xpt_config`, go into the system BIOS and look for an onboard device configuration for a `1394 Controller`. If present, disable that device and try booting again.
- If the burned image fails to boot and the image was burned using a Windows system, wipe the USB stick before trying a second burn using a utility such as Active@ KillDisk. Otherwise, the second burn attempt will fail as Windows does not understand the partition which was written from the image file. Be very careful to specify the correct USB stick when using a wipe utility!

○ Virtual Machine

Because TrueNAS is built and provided as an .iso file, it works on all virtual machine solutions (VMware, VirtualBox, Citrix Hypervisor, etc). This section demonstrates installing with VMware Workstation Player on Windows.

Minimum Virtual Machine Settings

Regardless of virtualization application, use these minimum settings:

- RAM: at least 8192MB (8GB)
- DISKS: one virtual disk with at least 8GB for the operating system and boot environments and at least one additional virtual disk with at least 4GB to be used as data storage.
- NETWORK: Use NAT, Bridged, or Host-only depending on your host network configuration.

FreeBSD UEFI Bug with ESXi expand □

VMWare products and EFI boot mode: A third party bug currently affects EFI (UEFI) booting on VMWare products. TrueNAS should be installed in BIOS mode until this is resolved. See VMware article Host Fails to Boot

After You Install ESXi in UEFI Mode.

Networking checks for VMware expand □

When installing TrueNAS in a VMware VM, double check the virtual switch and VMware port group. Network connection errors for plugins or jails inside the TrueNAS VM can be caused by a misconfigured virtual switch or VMware port group. Make sure *MAC spoofing* and *promiscuous mode* are enabled on the switch first, and then the port group the VM is using.

Jail Networking

If you have installed TrueNAS in VMware, you will need functional networking to create a jail.

For the jail to have functional networking, you have to change the VMware settings to allow Promiscuous, MAC address changes, and Forged Transmits.

Setting	Description
Promiscuous Mode	When enabled at the virtual switch level, objects defined within all portgroups can receive all incoming traffic on the vSwitch.
MAC Address Changes	When set to **Accept**, ESXi accepts requests to change the effective MAC address to a different address than the initial MAC address.
Forged Transmits	When set to **Accept**, ESXi does not compare source and effective MAC addresses.

Generic VM Creation Process

For most hypervisors, the procedure for creating a TrueNAS VM is the same:

1. Create a new Virtual Machine as usual, taking note of the following settings.
2. The virtual hardware has a bootable CD/DVD device pointed to the TrueNAS installer image (this is usually an .iso).
3. The virtual network card is configured so it can be reached from your network. **bridged** mode is optimal as this treats the network card as if it is plugged into a simple switch on the existing network.
4. Some products require identifying the OS being installed on the VM. The ideal option is *FreeBSD 12 64 bit*. If this is not available, try options like *FreeBSD 12*, *FreeBSD 64 bit*, *64 bit OS*, or *Other*. **Do not choose a Windows or Linux related OS type.**
5. For VMWare hypervisors, install in BIOS mode.
6. The VM has sufficient memory and disk space. TrueNAS needs at least *8 GB* RAM and *20 GB* disk space. Not all hypervisors allocate enough memory by default.
7. Boot the VM and install TrueNAS as usual.
8. When installation is complete, shut down the VM instead of rebooting, and disconnect the CD/DVD from the VM before rebooting the VM.
9. After rebooting into TrueNAS, install VM tools if applicable for your VM, and if they exist for FreeBSD 12, or ensure they are loaded on boot.

Example installation for VMWare Player 15.5

Open VMware Player and click *Create a New Virtual Machine* to enter the New Virtual Machine Wizard.

1. Installer disk image file

Select the *Installer disk image file (iso)* option, click *Browse…*, and upload the TrueNAS Core .iso downloaded earlier.

2. Name the Virtual Machine

In this step, the virtual machine name and location can be changed.

3. Specify Disk Capacity

Specify the maximum disk size for the initial disk. The default *20GB* is enough for TrueNAS. Next, select *Store virtual disk as a single file*.

4. Review Virtual Machine

Review the virtual machine configuration before proceeding. By default, VMware Player doesn't set enough RAM for the virtual machine. Click *Customize Hardware… > Memory*. Drag the slider up to 8GB and click *Ok*. If you wish to power on the machine after creation, select *Power on this virtual machine after creation*.

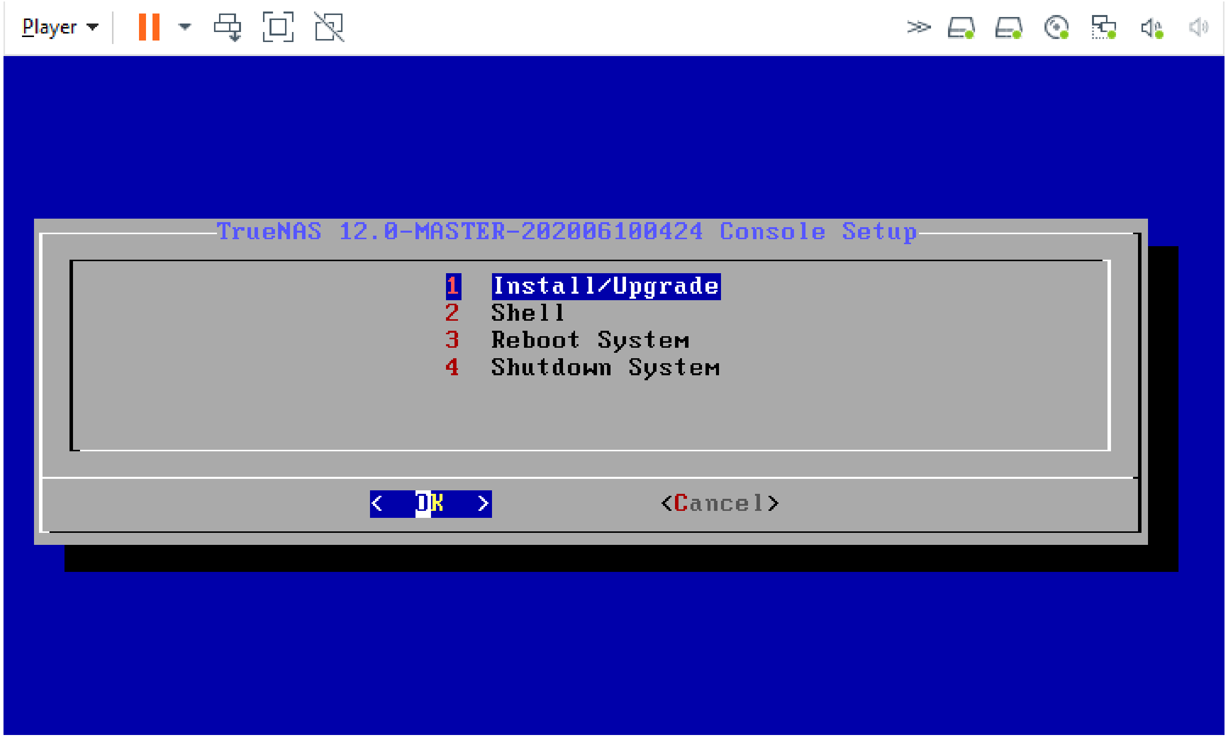
Add Virtual Disks for Storage

After the virtual machine has been created, select it from the virtual machine list and click *Edit virtual machine settings*. Click *Add…* and select *Hard Disk*. Select *SCSI* as the virtual disk type. Select *Create a new virtual disk*. Specify the maximum size of this additional virtual disk. This disk stores data in TrueNAS. If desired, allocate the disk space immediately by setting *Allocate all disk space now*. Select *Store virtual disk as single file*. Finally, name and chose a location for the new virtual disk.

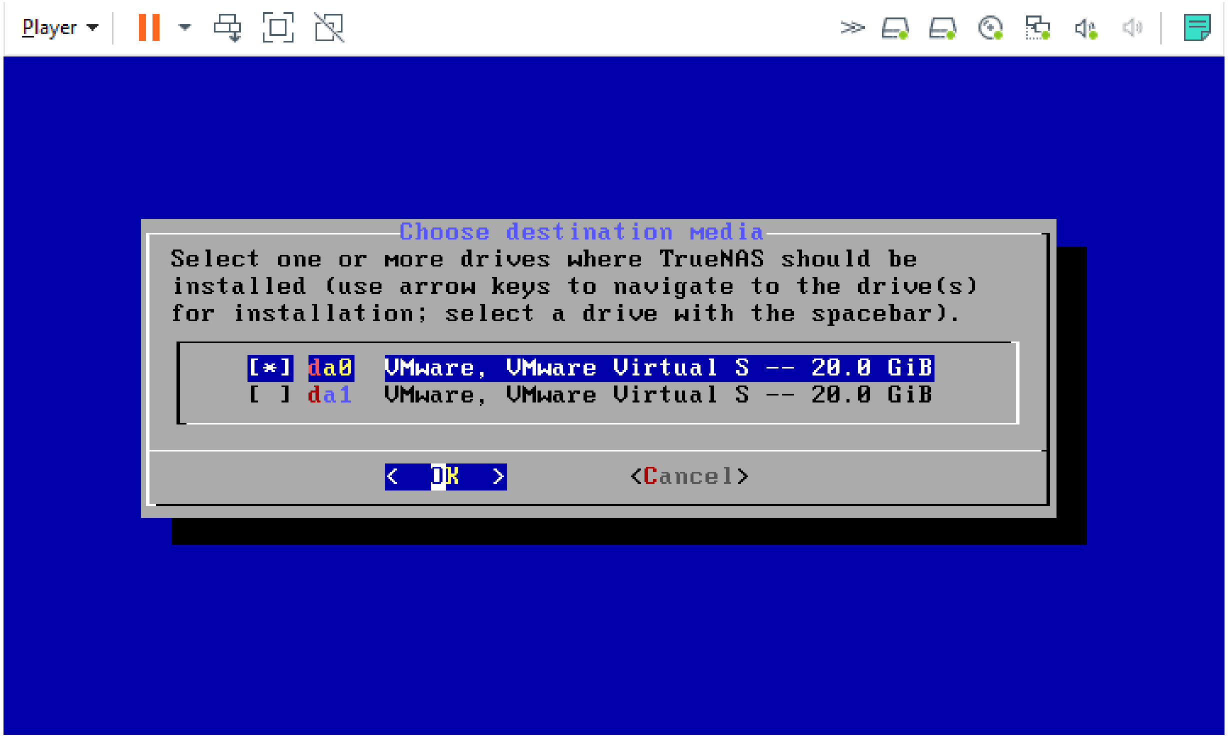
Repeat this process until enough disks are available for TrueNAS to create ideal storage pools This depends on your specific TrueNAS use case. See Pool Creation for descriptions of the various pool ("vdev") types and layouts

TrueNAS Installer

Select the virtual machine from the list and click *Play virtual machine*. The machine starts and boots into the TrueNAS installer. Select *Install/Upgrade*.

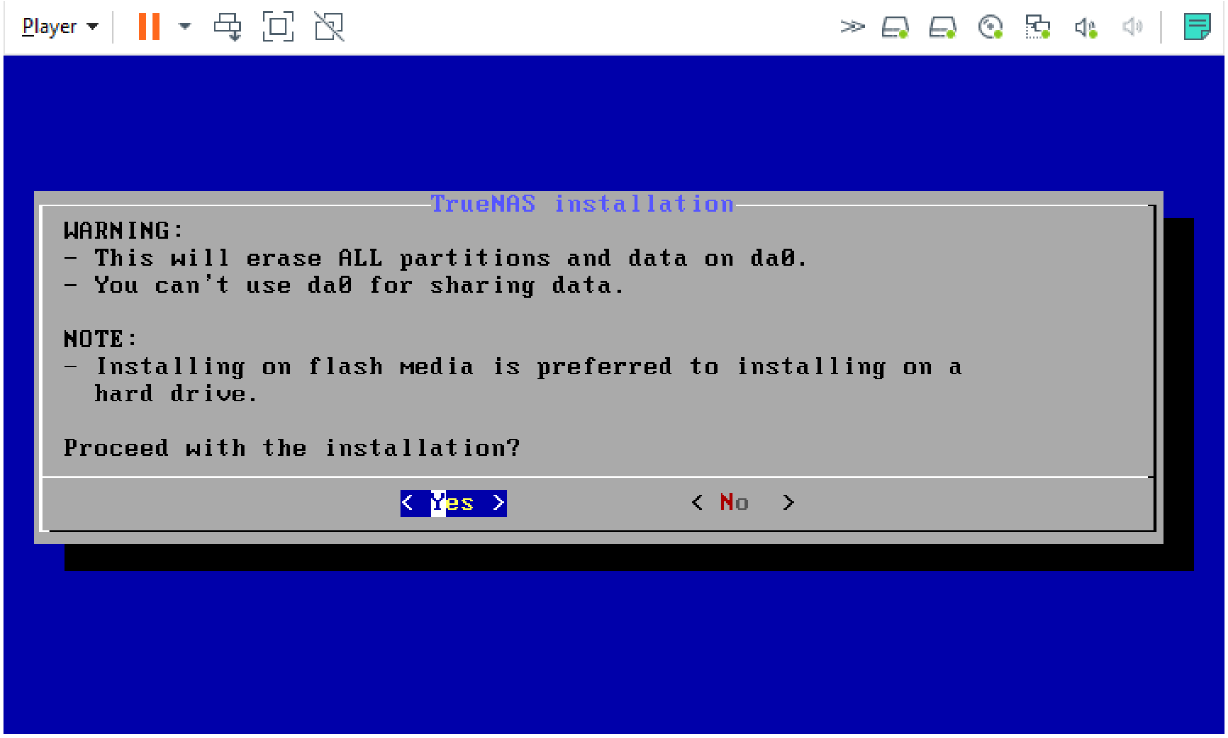


Select the desired disk for the boot environments.



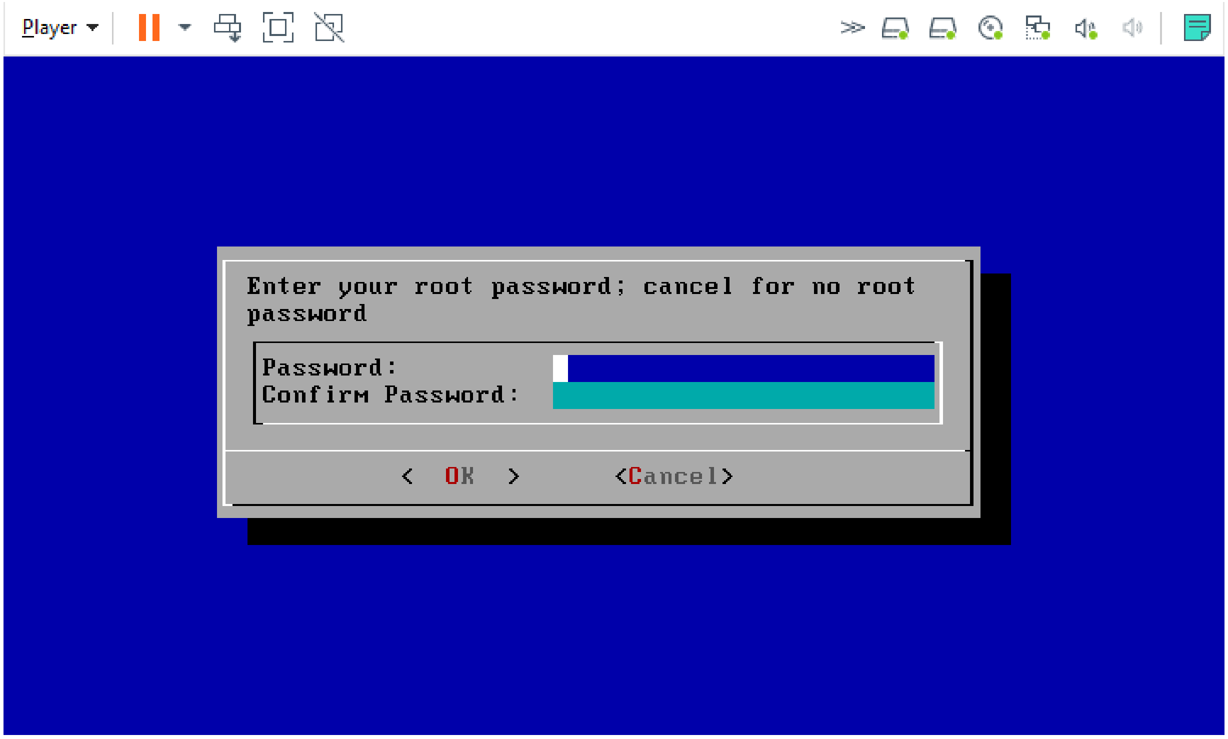
```
Choose destination media
Select one or more drives where TrueNAS should be
installed (use arrow keys to navigate to the drive(s)
for installation; select a drive with the spacebar).

   [*] da0  VMware, VMware Virtual S -- 20.0 GiB
   [ ] da1  VMware, VMware Virtual S -- 20.0 GiB

            <  OK  >          <Cancel>
```

Select *Yes*. **This will erase all contents on the disk**!



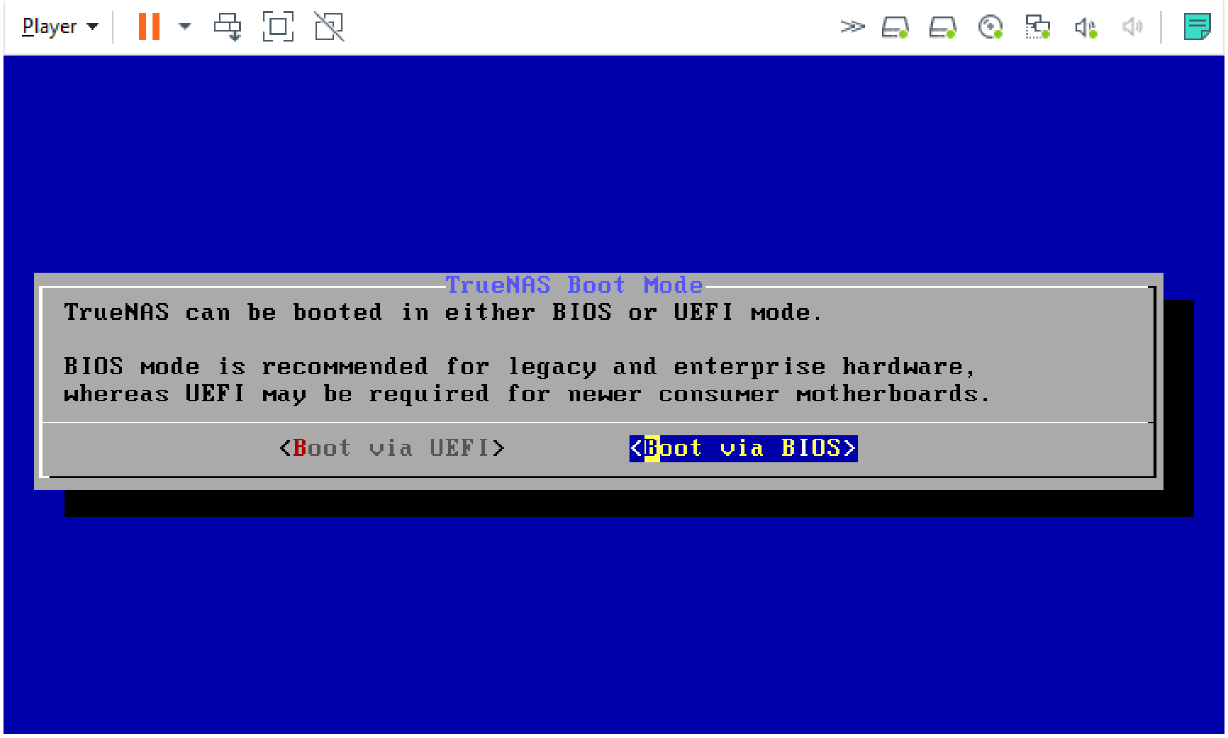
```
TrueNAS installation
WARNING:
- This will erase ALL partitions and data on da0.
- You can't use da0 for sharing data.

NOTE:
- Installing on flash media is preferred to installing on a
  hard drive.

Proceed with the installation?

            < Yes >          <  No  >
```

Set a password for root login.



```
Enter your root password; cancel for no root
password

Password:
Confirm Password:

< OK >        <Cancel>
```

Select *Boot via BIOS*.

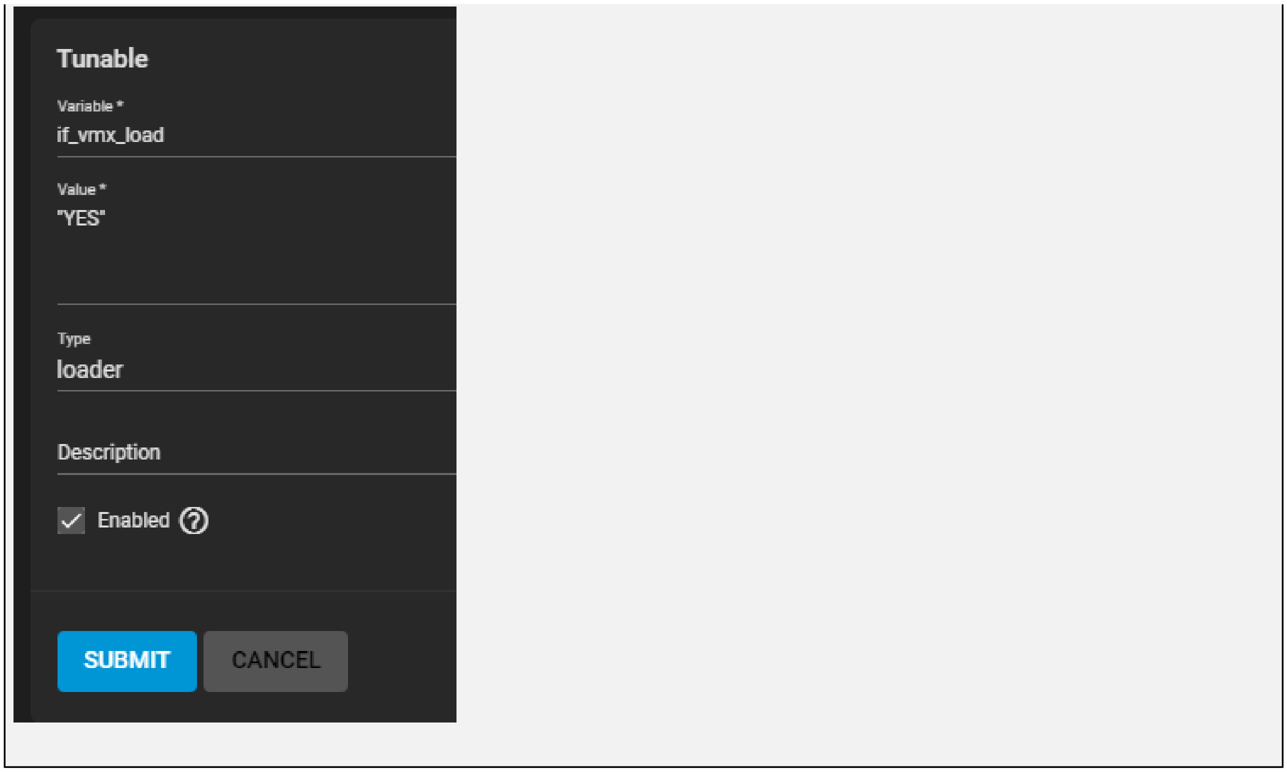


```
                 TrueNAS Boot Mode
TrueNAS can be booted in either BIOS or UEFI mode.

BIOS mode is recommended for legacy and enterprise hardware,
whereas UEFI may be required for newer consumer motherboards.

        <Boot via UEFI>        <Boot via BIOS>
```

After the TrueNAS installation is complete, reboot the system. The Console Setup Menu displays when the system boots successfully.

VMWare post-install expand □

After installing TrueNAS in a VMware VM, it is recommended to configure and use the vmx(4) drivers on TrueNAS. To load the VMX driver when TrueNAS boots, log in to the web interface and go to **System > Tunables**. CLick *Add* and create a new tunable with the *Variable* `if_vmx_load`, *Value* `"YES"`, and *Type* `loader`, and save the tunable:



Tunable

Variable *
if_vmx_load

Value *
"YES"

Type
loader

Description

☑ Enabled

Congratulations, TrueNAS is now installed!

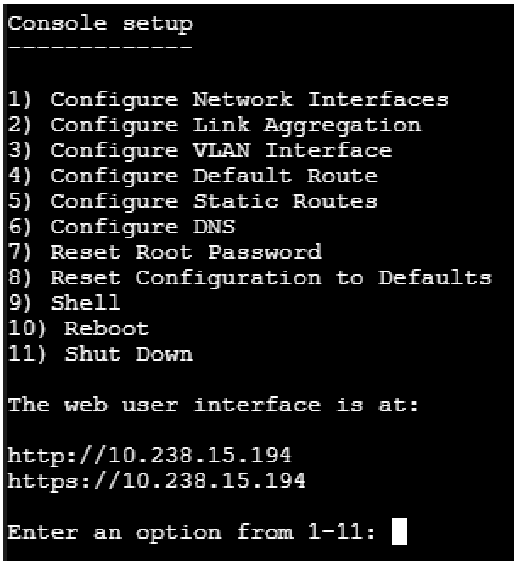
The next step is to log in to the web interface and begin configuring the system.

1.3 - Console Setup Menu

The Console Setup menu displays at the end of the boot process. If the TrueNAS system has a keyboard and monitor, this menu can be used to administer the system.

When connecting with SSH or the web shell, the Console Setup menu is not shown by default. It can be started by the `root` user or another user with root permissions by entering `/etc/netcli`.

To disable the Console Setup menu, go to **System > Advanced** and unset *Show Text Console without Password Prompt*.



```
Console setup
-------------

1) Configure Network Interfaces
2) Configure Link Aggregation
3) Configure VLAN Interface
4) Configure Default Route
5) Configure Static Routes
6) Configure DNS
7) Reset Root Password
8) Reset Configuration to Defaults
9) Shell
10) Reboot
11) Shut Down

The web user interface is at:

http://10.238.15.194
https://10.238.15.194

Enter an option from 1-11:
```

On HA systems, some of these menu options are not available unless HA has been administratively disabled.

The menu provides these options:

1. **Configure Network Interfaces** provides a configuration wizard to set up the system's network interfaces. If the system has been licensed for High Availability (HA), the wizard prompts for IP addresses for both "This Controller" and "TrueNAS Controller 2".

2. **Configure Link Aggregation** is for creating or deleting link aggregations.

3. **Configure VLAN Interface** is used to create or delete VLAN interfaces.

4. **Configure Default Route** is used to set the IPv4 or IPv6 default gateway. When prompted, enter the IP address of the default gateway.

5. **Configure Static Routes** prompts for the destination network and gateway IP address. Re-enter this option for each static route needed.

6. **Configure DNS** prompts for the name of the DNS domain and the IP address of the first DNS server. When adding multiple DNS servers, press Enter to enter the next one. Press Enter twice to leave this option.

7. **Reset Root Password** is used to reset a lost or forgotten root password. Select this option and follow the prompts to set the password.

8. **Reset Configuration to Defaults** *Caution!* This option deletes all of the configuration settings made in the administrative GUI and is used to reset TrueNAS® back to defaults. Before selecting this option, make a full backup of all data and make sure all encryption keys and passphrases are known! After this option is selected, the configuration is reset to defaults and the system reboots. Storage Pools Import Pool can be used to re-import pools.

9. **Shell** starts a shell for running FreeBSD commands. To leave the shell, type exit.

10. **Reboot** reboots the system.
11. **Shut Down** shuts down the system.

The numbering and quantity of options on this menu can change due to software updates, service agreements, or other factors. Please carefully check the menu before selecting an option, and keep this in mind when writing local procedures.

During boot, TrueNAS automatically attempts to connect to a DHCP server from all live interfaces. If it successfully receives an IP address, the address is displayed so it can be used to access the graphical user interface. In the example shown above, TrueNAS is accessible at `10.0.0.102`.

Some TrueNAS systems are set up without a monitor, making it challenging to determine which IP address has been assigned. On networks that support Multicast DNS (mDNS), the hostname and domain can be entered into the address bar of a browser. By default, this value is `truenas.local`.

If TrueNAS is not connected to a network with a DHCP server, use the console network configuration menu to manually configure the interface as shown here. In this example, the TrueNAS system has one network interface, `em0`.

```
Enter an option from 1-12: 1
1) em0
Select an interface (q to quit): 1
Remove the current settings of this interface? (This causes a momentary disconnec
tion of the network.) (y/n) n
Configure interface for DHCP? (y/n) n
Configure IPv4? (y/n) y
Interface name:     (press enter, the name can be blank)
Several input formats are supported
Example 1 CIDR Notation:
    192.168.1.1/24
Example 2 IP and Netmask separate:
    IP: 192.168.1.1
    Netmask: 255.255.255.0, or /24 or 24
IPv4 Address: 192.168.1.108/24
Saving interface configuration: Ok
Configure IPv6? (y/n) n
Restarting network: ok

...

The web user interface is at
http://192.168.1.108
```

1.4 - Logging In

Now that TrueNAS is installed, it’s time to log in to the web interface and begin managing data!

Can I configure TrueNAS using a CLI? expand □

After installing TrueNAS, configuring and using the system is all managed through the web interface. It is important to only use the web interface to make configuration changes to the system. By default, using the command-line interface (CLI) to modify the system **does not modify the settings database**. Any changes made in the command line are lost and reverted to the original database settings whenever the system restarts. TrueNAS automatically creates a number of ways to access the web interface, but you might need to adjust the default settings to better fit the system in your network environment.

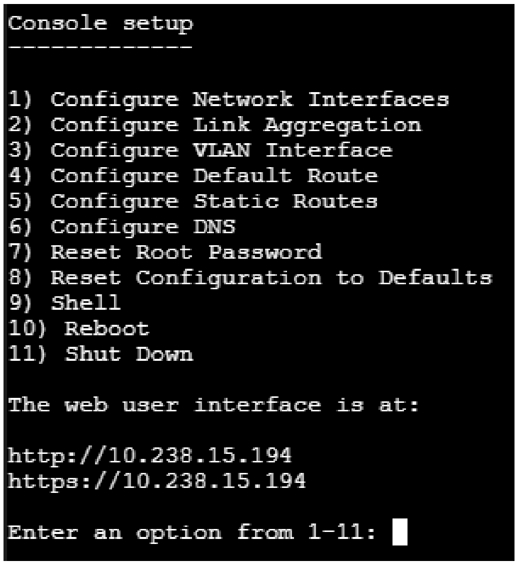
Web Interface Access

By default, TrueNAS provides a default address for logging in to the web interface. To view the web interface IP address or reconfigure web interface access, you will need to connect a monitor and keyboard to your TrueNAS system or connect with IPMI for out-of-band system management.

⊙ CORE Defaults

When powering on a TrueNAS system, the system attempts to connect to a DHCP server from all live interfaces and provide access to the web interface. On networks that support Multicast Domain Name Services (mDNS), a hostname and domain can be used to access the TrueNAS web interface. By default, TrueNAS is configured to use the hostname and domain *truenas.local* You can change this after logging in to the web interface by going to **Network > Global Configuration** and setting a new *Hostname* and *Domain*.

If an IP address is needed, connect a monitor to the TrueNAS system and view the console setup menu that displays at the end of the boot process.



```
Console setup
-------------

1) Configure Network Interfaces
2) Configure Link Aggregation
3) Configure VLAN Interface
4) Configure Default Route
5) Configure Static Routes
6) Configure DNS
7) Reset Root Password
8) Reset Configuration to Defaults
9) Shell
10) Reboot
11) Shut Down

The web user interface is at:

http://10.238.15.194
https://10.238.15.194

Enter an option from 1-11:
```

When able to automatically configure a connection, the system shows the web interface IP address at the bottom of the console setup menu. If needed, you can reset the root password in the TrueNAS console setup menu or by clicking **Settings > Change Password** in the web interface. To require logging in to the system before showing the system console menu, go to **System > Advanced** and unset *Show Text Console without Password Prompt*.

○ Enterprise Defaults

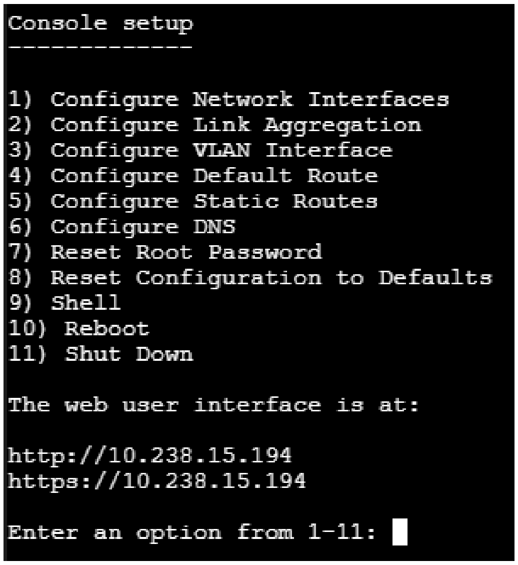
TrueNAS Enterprise hardware from iXsystems is preconfigured with your provided networking details. The IP address of the TrueNAS web interface is provided on the system sales order or configuration sheet. Please contact iX Support if the TrueNAS web interface IP address has not been provided with these documents or cannot be identified from the TrueNAS system console.

Customers who purchase iXystems hardware or that want additional support must have a support contract to use iXystems Support Services. The TrueNAS Community forums provides free support for users without an iXsystems Support contract.

Contact Method	Contact Options
Web	https://support.ixsystems.com
Email	support@ixsystems.com
Telephone	Monday - Friday, 6:00AM to 6:00PM Pacific Standard Time: US-only toll-free: 1-855-473-7449 option 2 Local and international: 1-408-943-4100 option 2
Telephone	After Hours (24x7 Gold Level Support only): US-only toll-free: 1-855-499-5131 International: 1-408-878-3140 (international calling rates apply)

○ Configuring Web Interface Access

If the TrueNAS system is not connected to a network with a DHCP server, you can use the console network configuration menu to manually *Configure Network Interfaces*.



```
Console setup
-------------

1) Configure Network Interfaces
2) Configure Link Aggregation
3) Configure VLAN Interface
4) Configure Default Route
5) Configure Static Routes
6) Configure DNS
7) Reset Root Password
8) Reset Configuration to Defaults
9) Shell
10) Reboot
11) Shut Down

The web user interface is at:

http://10.238.15.194
https://10.238.15.194

Enter an option from 1-11:
```

This example shows configuring a single interface, *em0*:

```
Enter an option from 1-12: 1
1) em0
Select an interface (q to quit): 1
Remove the current settings of this interface? (This causes a momentary disconnec
tion of the network.) (y/n) n
Configure interface for DHCP? (y/n) n
Configure IPv4? (y/n) y
Interface name:     (press enter, the name can be blank)
Several input formats are supported
Example 1 CIDR Notation:
    192.168.1.1/24
Example 2 IP and Netmask separate:
    IP: 192.168.1.1
    Netmask: 255.255.255.0, or /24 or 24
IPv4 Address: 192.168.1.108/24
Saving interface configuration: Ok
Configure IPv6? (y/n) n
Restarting network: ok

...

The web user interface is at
```

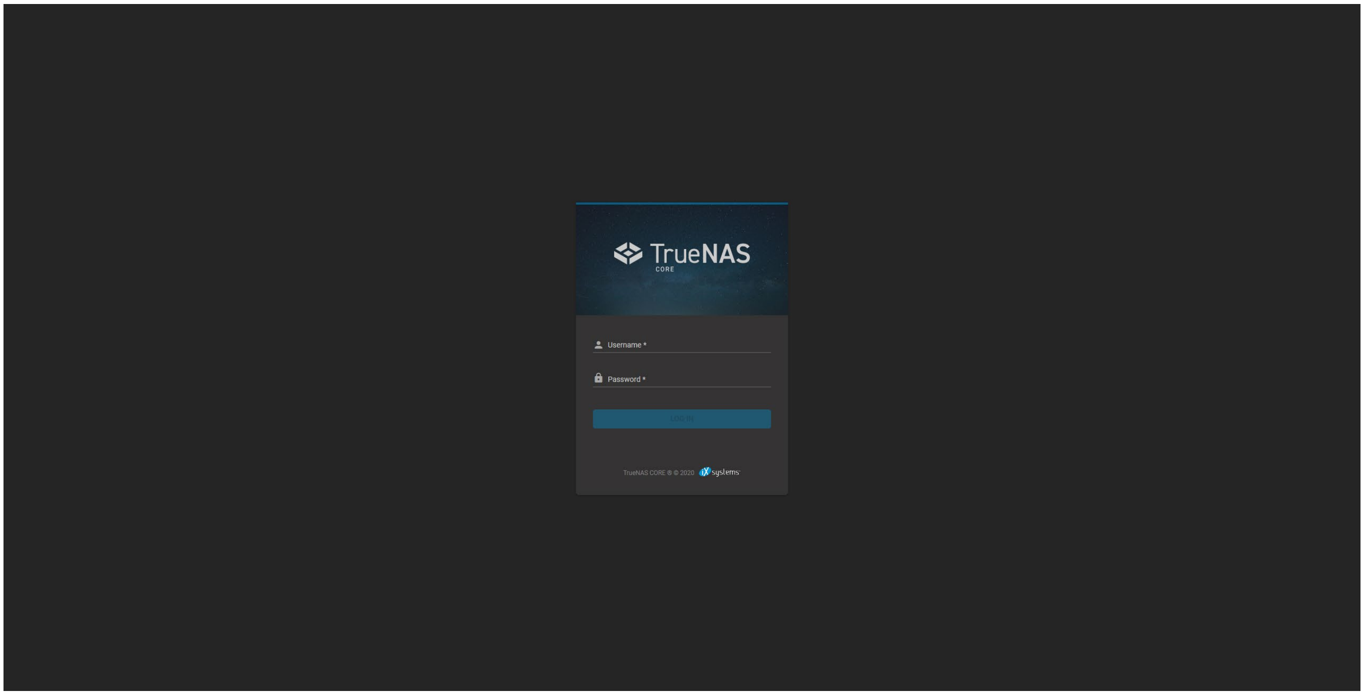
```
http://192.168.1.108
```

Depending on the network environment, review the *Configure Default Route* option to define your IPv4 or IPv6 default gateway. *Configure Static Routes* allows adding destination network and gateway IP addresses, one for each route. To change the DNS domain and add nameservers, select *Configure DNS*.

These settings can be adjusted later in the various **Network** options available in the web interface.

Logging In

On a computer that can access the same network as the TrueNAS system, enter the hostname and domain or IP address in a web browser to connect to the web interface.



Only the `root` username is used to log in to the web interface. Enter the `root` account password that was created during installation.

Troubleshooting expand □

If the user interface is not accessible by IP address from a browser, check these things:

- Are proxy settings enabled in the browser configuration? If so, disable the settings and try connecting again.
- If the page does not load, make sure that a `ping` reaches the TrueNAS system IP address. If the address is in a private IP address range, it is only accessible from within that private network.

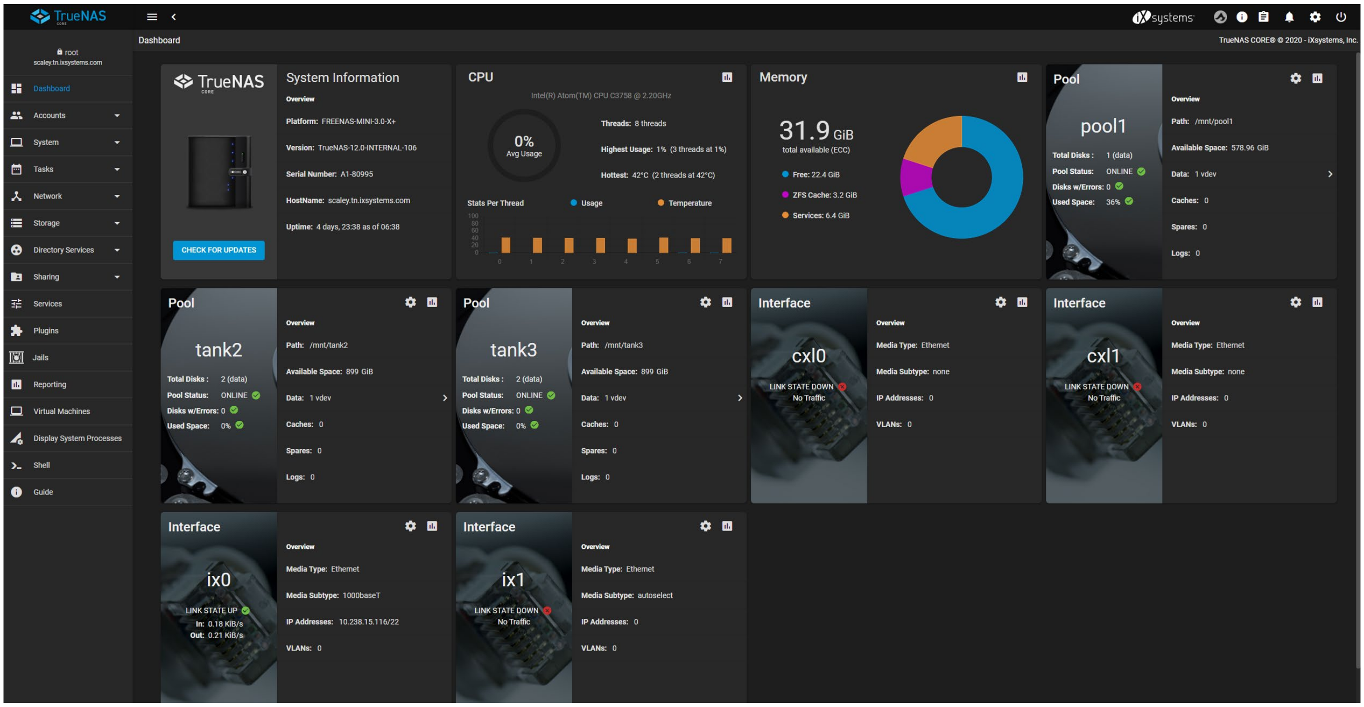
If the web interface is shown but seems unresponsive or incomplete:

- Make sure the browser allows cookies, Javascript, and custom fonts from the TrueNAS system.
- Try a different browser. Firefox is recommended.

If the UI becomes unresponsive after an upgrade or other system operation, clear the site data and refresh the browser (`Shift+F5`).

Dashboard

After logging in, the system **Dashboard** is shown. Basic information about the installed version, systems component usage and network traffic are all presented on this screen. For users with compatible TrueNAS Hardware, clicking the system image will take you to the **System > View Enclosure** page.



root
scaley.tn.ixsystems.com

Dashboard

TrueNAS CORE® © 2020 - iXsystems, Inc.

System Information

Overview

Platform: FREENAS-MINI-3.0-X+

Version: TrueNAS-12.0-INTERNAL-106

Serial Number: A1-80995

HostName: scaley.tn.ixsystems.com

Uptime: 4 days, 23:38 as of 06:38

CPU

Intel(R) Atom(TM) CPU C3758 @ 2.20GHz

0% Avg Usage

Threads: 8 threads

Highest Usage: 1% (3 threads at 1%)

Hottest: 42°C (2 threads at 42°C)

Memory

31.9 GiB total available (ECC)

Free: 22.4 GiB

ZFS Cache: 3.2 GiB

Services: 6.4 GiB

Pool

pool1

Total Disks : 1 (data)

Pool Status: ONLINE ✓

Disks w/Errors: 0 ✓

Used Space: 36% ✓

Overview

Path: /mnt/pool1

Available Space: 578.96 GiB

Data: 1 vdev

Caches: 0

Spares: 0

Logs: 0

Pool

tank2

Total Disks : 2 (data)

Pool Status: ONLINE ✓

Disks w/Errors: 0 ✓

Used Space: 0% ✓

Overview

Path: /mnt/tank2

Available Space: 899 GiB

Data: 1 vdev

Caches: 0

Spares: 0

Logs: 0

Pool

tank3

Total Disks : 2 (data)

Pool Status: ONLINE ✓

Disks w/Errors: 0 ✓

Used Space: 0% ✓

Overview

Path: /mnt/tank3

Available Space: 899 GiB

Data: 1 vdev

Caches: 0

Spares: 0

Logs: 0

Interface

cxl0

LINK STATE DOWN
No Traffic

Overview

Media Type: Ethernet

Media Subtype: none

IP Addresses: 0

VLANs: 0

Interface

cxl1

LINK STATE DOWN
No Traffic

Overview

Media Type: Ethernet

Media Subtype: none

IP Addresses: 0

VLANs: 0

Interface

ix0

LINK STATE UP ✓
In: 0.18 KiB/s
Out: 0.21 KiB/s

Overview

Media Type: Ethernet

Media Subtype: 1000baseT

IP Addresses: 10.238.15.116/22

VLANs: 0

Interface

ix1

LINK STATE DOWN
No Traffic

Overview

Media Type: Ethernet

Media Subtype: autoselect

IP Addresses: 0

VLANs: 0

The **Dashboard** provides access to all TrueNAS management options. Across the top row are links to outside resources and buttons to control the system. There is also a column of options at the left hand side of the screen for accessing the various TrueNAS Configuration screens.

Logos in the top row are links to iXsystems sites. The button next to the iXsystems logo shows TrueCommand connection options. The next two buttons show information about what is happening on the system, like active or previous tasks and any alerts generated by a system condition. The remaining buttons link to system configuration option or can be used to logout, restart, or shutdown the physical system.

The top row has buttons to hide the left side column. The top of this column shows the system hostname and the active user. TrueNAS configuration screens are linked in the left hand column.

Now that you can access the TrueNAS web interface and see all the management options, it’s time to begin storing data!

1.5 - Storage Configuration

Now that we're logged in to the web interface, it's time to set up TrueNAS storage. These instructions demonstrate a simple *mirrored* pool setup, where one disk is used for storage and the other for data protection. However, there are a vast number of configuration possibilities for your storage environment! You can read more about these options in the in-depth Pool Creation article.

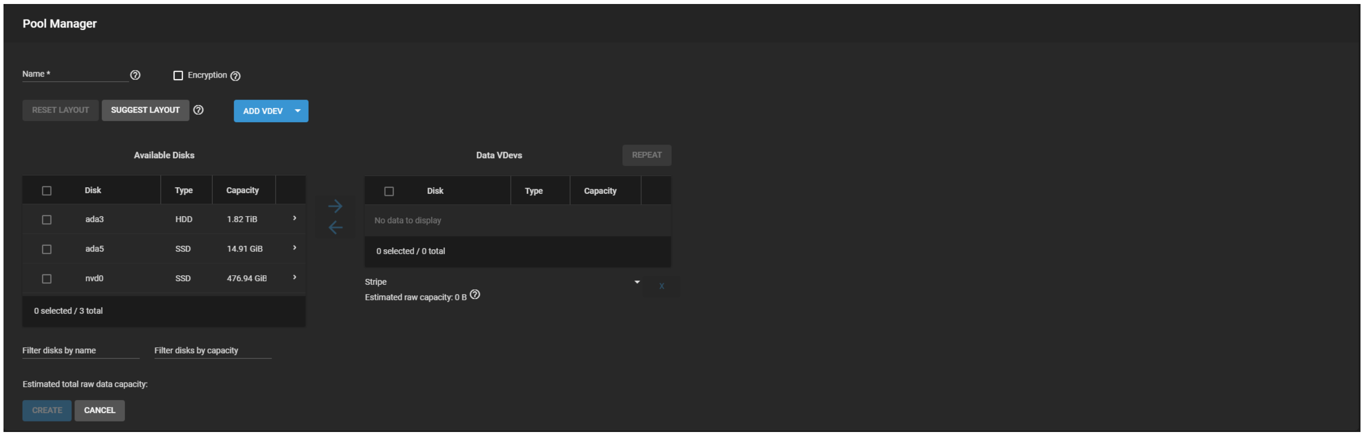
Requirements

At minimum, the system needs at least two identically sized disks to create a mirrored storage pool. While a single-disk pool is technically allowed, it is not recommended. The disk used for the TrueNAS installation does not count toward this limit.

Data backups can be configured in several ways and have different requirements. Backing data up in the Cloud requires a 3rd party Cloud Storage provider account. Backups with Replication requires either additional storage on the TrueNAS system or (ideally) another TrueNAS system in a different location.

Simple Storage Setup

Go to **Storage > Pools** and click *ADD*. Set *Create a new pool* and click *CREATE POOL*



Pool Manager

Name *

□ Encryption

Available Disks

□	Disk	Type	Capacity
□	ada3	HDD	1.82 TiB
□	ada5	SSD	14.91 GiB
□	nvd0	SSD	476.94 GiB

0 selected / 3 total

Data VDevs

□	Disk	Type	Capacity
No data to display			

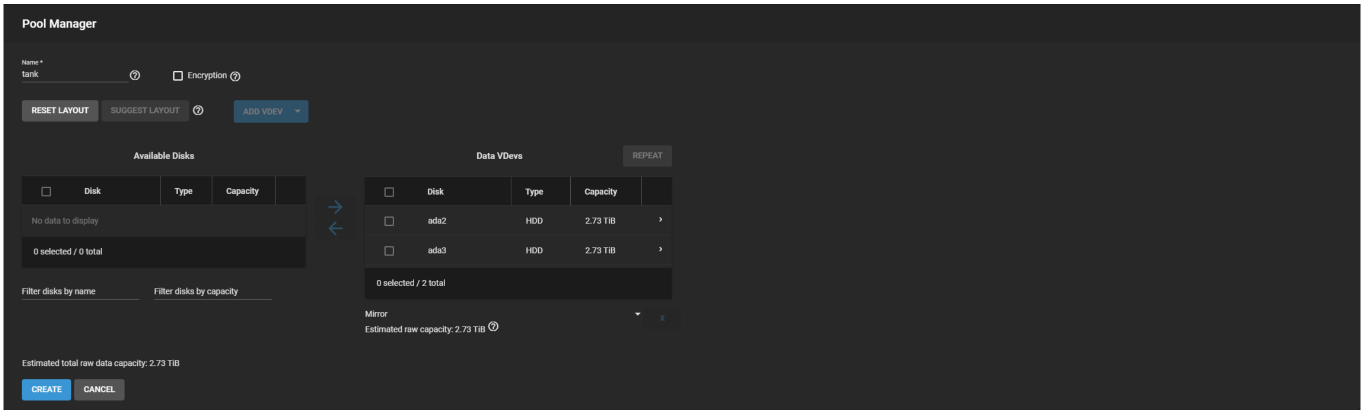
0 selected / 0 total

Stripe

Estimated raw capacity: 0 B

Estimated total raw data capacity:

For the *Name*, enter *tank* or any other preferred name. In the **Available Disks**, set two identical disks and click the to move them to the **Data VDevs** area.



Pool Manager

Name *
tank

□ Encryption

Available Disks

□	Disk	Type	Capacity
No data to display			

0 selected / 0 total

Data VDevs

□	Disk	Type	Capacity
□	ada2	HDD	2.73 TiB
□	ada3	HDD	2.73 TiB

0 selected / 2 total

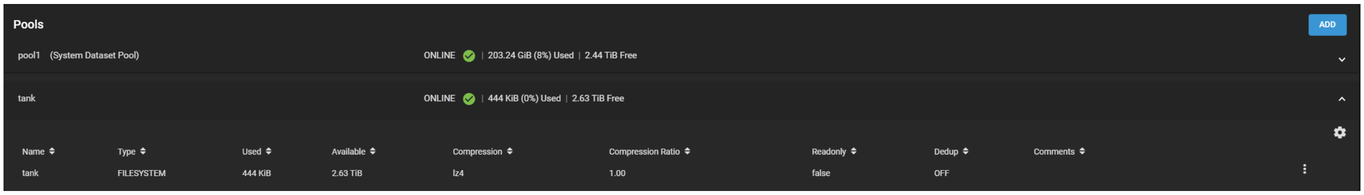
Mirror

Estimated raw capacity: 2.73 TiB

Estimated total raw data capacity: 2.73 TiB

TrueNAS automatically suggests *Mirror* as the ideal layout for maximized data storage and protection.

Review the **Estimated total raw data capacity** and click *CREATE*. TrueNAS wipes the disks and adds *tank* to the **Storage > Pools** list.



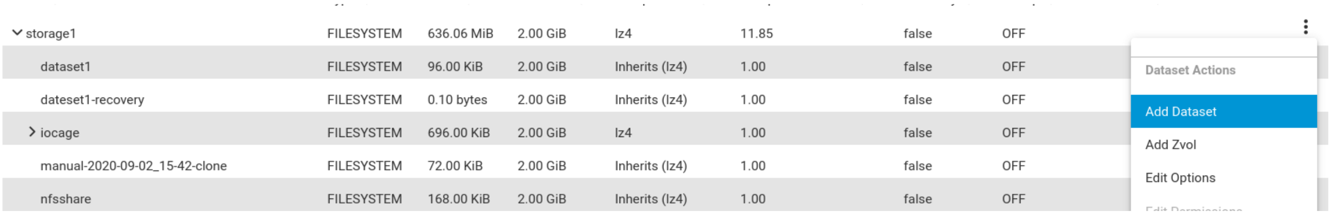
pool1 (System Dataset Pool) ONLINE | 203.24 GiB (8%) Used | 2.44 TiB Free

tank ONLINE | 444 KiB (0%) Used | 2.63 TiB Free

Name	Type	Used	Available	Compression	Compression Ratio	Readonly	Dedup	Comments
tank	FILESYSTEM	444 KiB	2.63 TiB	lz4	1.00	false	OFF	

Adding Datasets or Zvols

New pools have a “root” dataset that allows further division into new *datasets* or *zvols*. A *dataset* is a file system that stores data and has specific permissions. A *zvol* is a virtual block device that has a predefined storage size. To create either one, go to **Storage > Pools**, click □, and select *Add Dataset* or *Add Zvol*.



storage1	FILESYSTEM	636.06 MiB	2.00 GiB	lz4	11.85	false	OFF
dataset1	FILESYSTEM	96.00 KiB	2.00 GiB	Inherits (lz4)	1.00	false	OFF
dateset1-recovery	FILESYSTEM	0.10 bytes	2.00 GiB	Inherits (lz4)	1.00	false	OFF
iocage	FILESYSTEM	696.00 KiB	2.00 GiB	lz4	1.00	false	OFF
manual-2020-09-02_15-42-clone	FILESYSTEM	72.00 KiB	2.00 GiB	Inherits (lz4)	1.00	false	OFF
nfsshare	FILESYSTEM	168.00 KiB	2.00 GiB	Inherits (lz4)	1.00	false	OFF

These are often created as part of configuring specific data sharing situations:

- Setting a dataset *Share Type* to *SMB* optimizes that dataset for the Windows sharing protocol.
- Block device sharing (iSCSI) requires a zvol.

Organize the pool with additional datasets or zvols according to your access and data sharing requirements before moving any data into the pool.

When you’re finished building and organizing your TrueNAS pools, move on to configuring how the system shares data

1.6 - Sharing Storage

- - Sharing Data

With TrueNAS **Storage** configured and backed up, it’s time to begin sharing data. There are several available sharing solutions, but we’ll look at the most common in this article. Choose a tab to get started with simple sharing examples:

Sharing Data

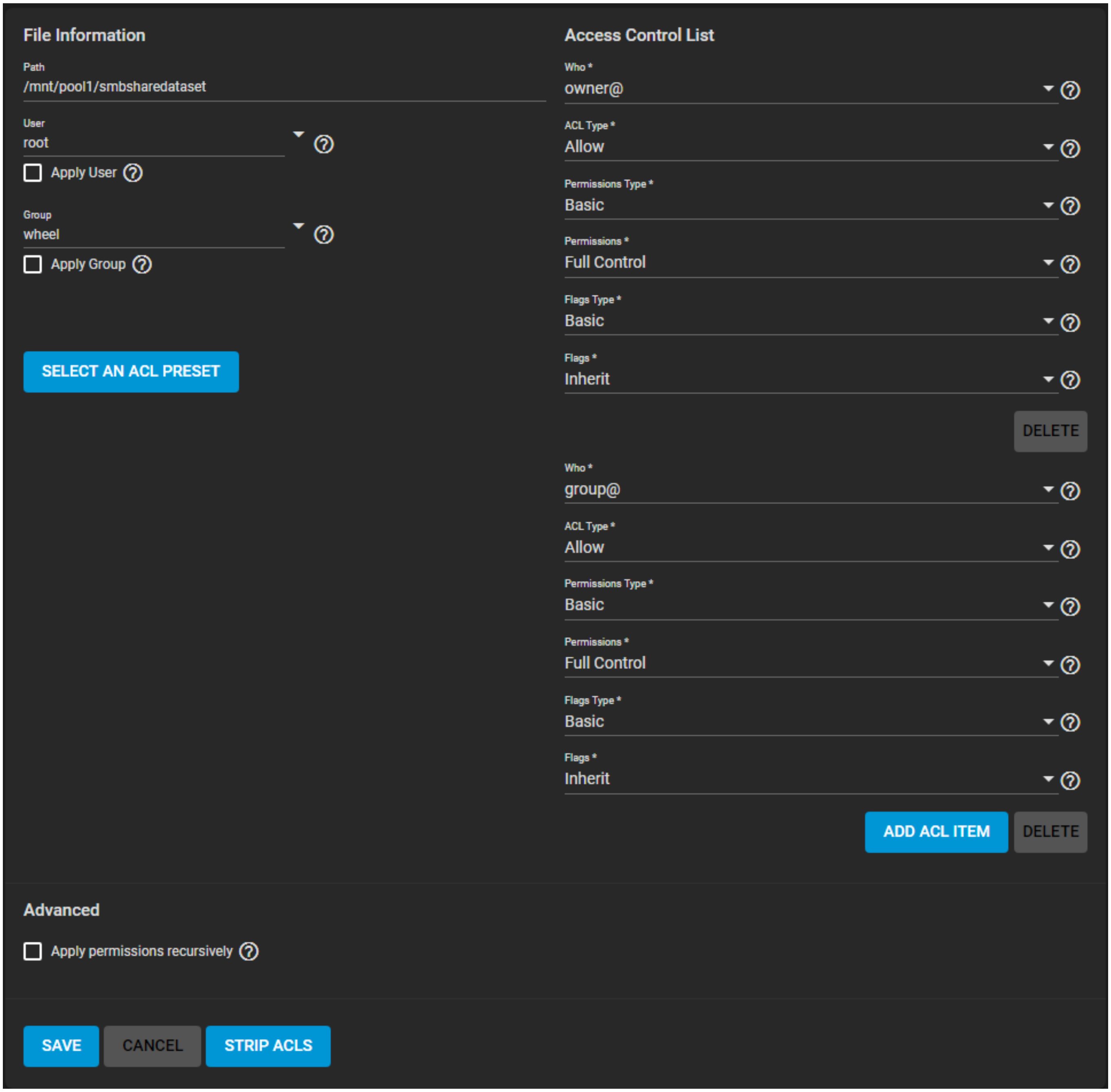
⊙ Windows (SMB)

Requirements

- Dataset with *Share Type* set to *SMB*.
- TrueNAS user accounts with *Samba Authentication* set.

Set Permissions

Go to **Storage > Pools** and find the dataset to share. Click □ and *Edit Permissions*.



File Information

Path: /mnt/pool1/smbsharedataset

User: root

□ Apply User

Group: wheel

□ Apply Group

Access Control List

Who *: owner@

ACL Type *: Allow

Permissions Type *: Basic

Permissions *: Full Control

Flags Type *: Basic

Flags *: Inherit

Who *: group@

ACL Type *: Allow

Permissions Type *: Basic

Permissions *: Full Control

Flags Type *: Basic

Flags *: Inherit

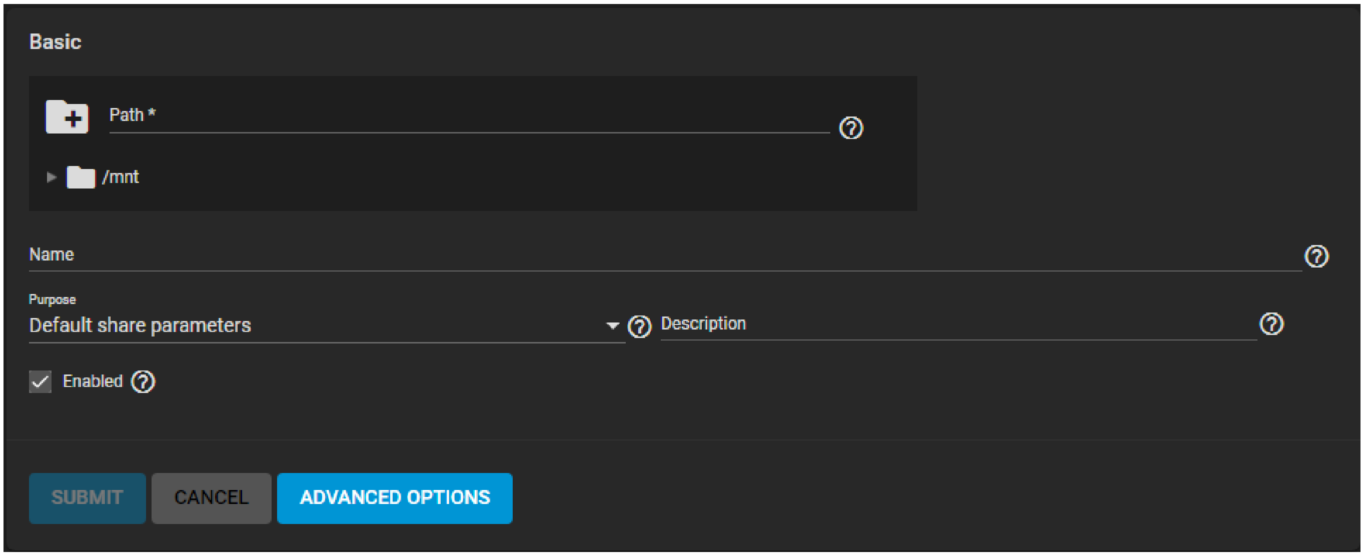
Advanced

□ Apply permissions recursively

Click *SELECT AN ACL PRESET*, open the drop down, and choose *OPEN*. Click *SAVE*.

Create the Share

Go to **Sharing > Windows Shares (SMB)** and click *ADD*.



Path *

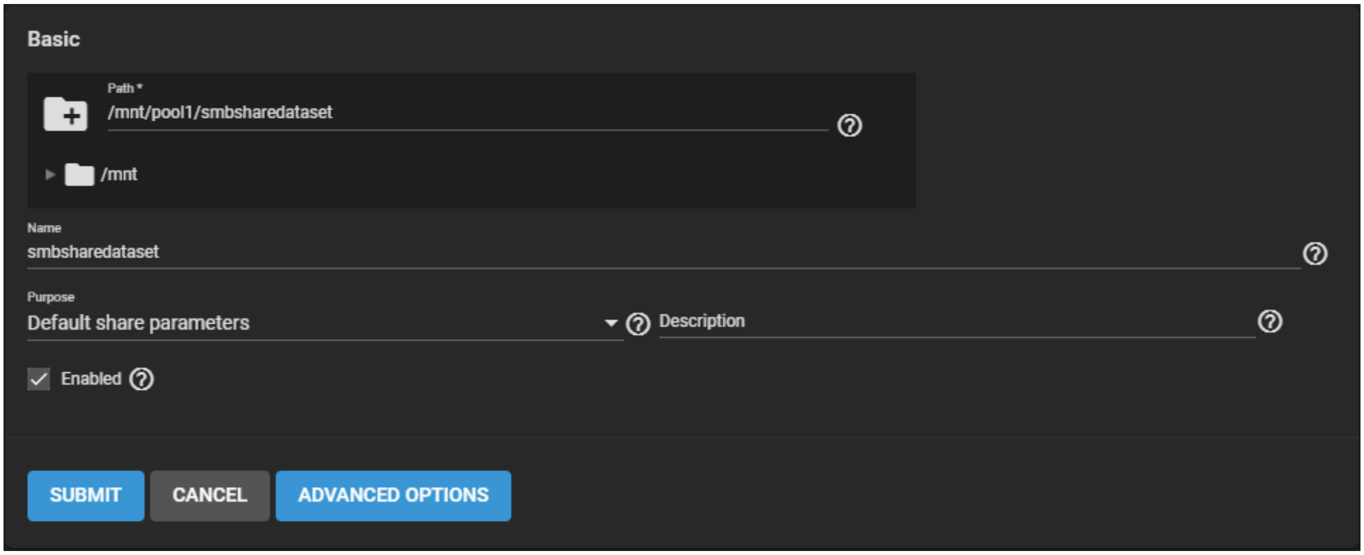
Name

Purpose: Default share parameters

Description

☑ Enabled

Only the *Path* and *Name* are initially required. The *Path* is the directory tree on TrueNAS that is shared using the SMB protocol. The *Name* forms part of the “full share pathname” when SMB clients connect.



Path *: /mnt/pool1/smbsharedataset

Name: smbsharedataset

Purpose: Default share parameters

Description

☑ Enabled

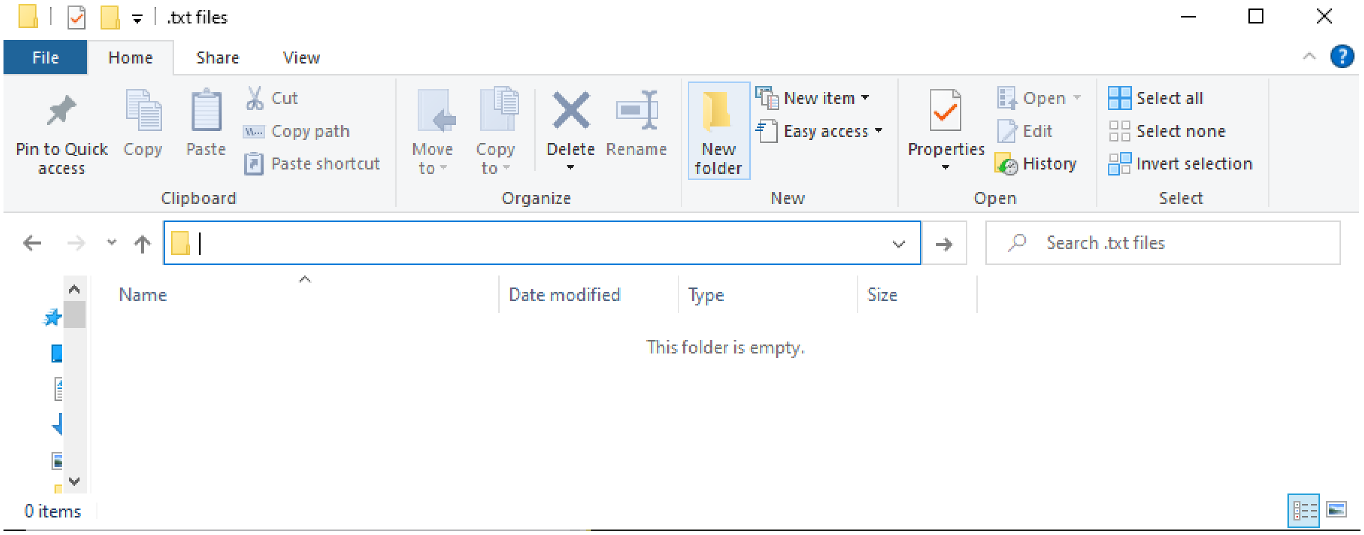
Click *SUBMIT* to save the configuration to **Sharing > Windows Shares (SMB)**.

Activate the Service

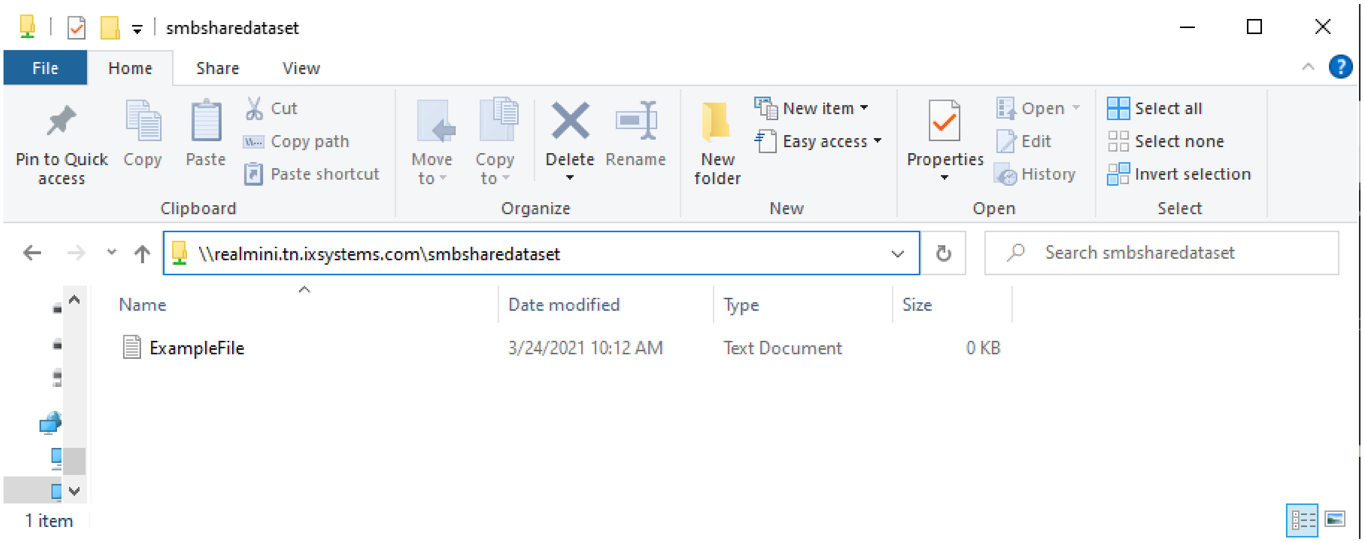
Go to **Services** and toggle **SMB**. Set *Start Automatically* when you want the share to become accessible immediately after TrueNAS boots.

Connecting to the Share

On a Windows 10 system, open the **File Browser**.



In the navigation bar, enter \\ and the TrueNAS system name. When prompted, enter the TrueNAS user account credentials and begin browsing the dataset.



\\realmini.tn.ixsystems.com\smbsharedataset

Name	Date modified	Type	Size
ExampleFile	3/24/2021 10:12 AM	Text Document	0 KB

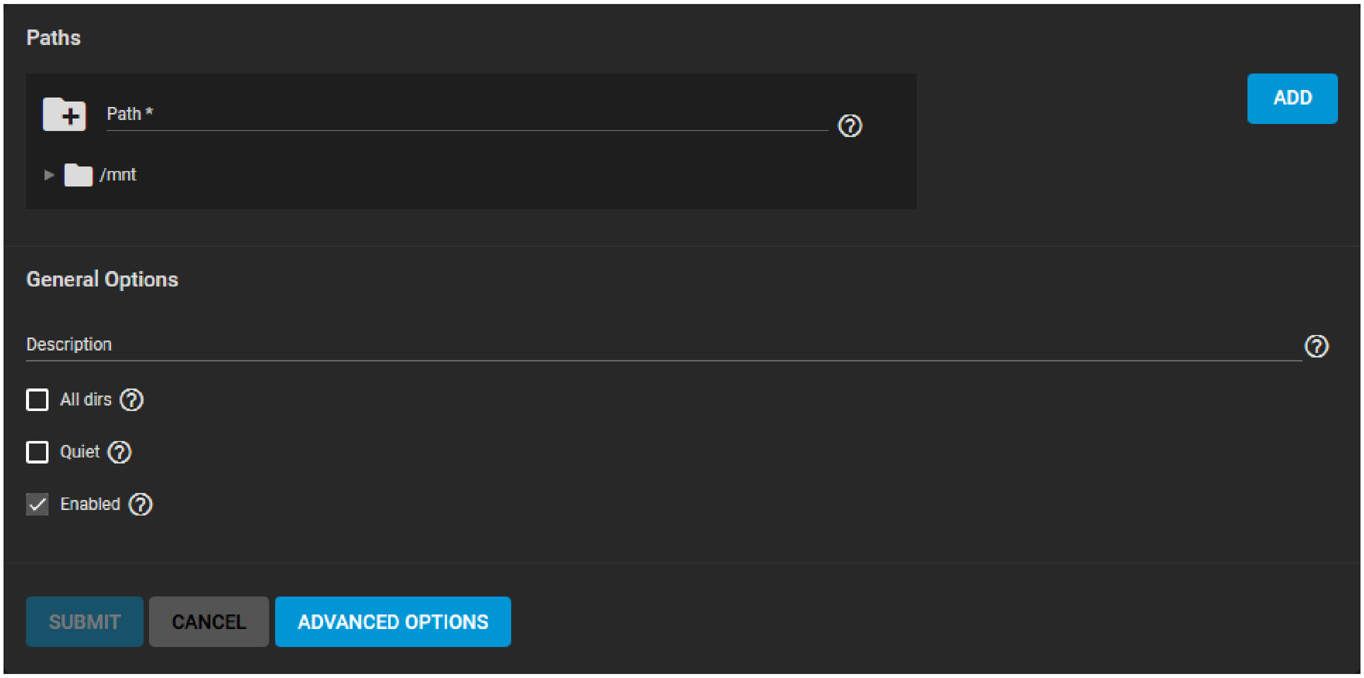
○ Unix-like (NFS)

Requirements

- TrueNAS dataset to share.
- Client systems might require additional packages like `nfs-common`.

Creating the Share

Go to **Sharing > Unix Shares (NFS)** and click *ADD*.



Paths

Path *

/mnt

General Options

Description

□ All dirs

□ Quiet

☑ Enabled

Use the file browser to select the dataset to be shared and click *SUBMIT*. When prompted, click *ENABLE SERVICE* to immediately begin sharing the dataset.

Accessing the Dataset

On a Unix-like system, open a command line. Enter `showmount -e IPADDRESS`, replacing *IPADDRESS* with your TrueNAS system address:

```
tmoore@ChimaeraPrime:~$ showmount -e 10.238.15.194
Export list for 10.238.15.194:
/mnt/pool1/testds (everyone)
```

Now make a local directory for the NFS mount:

```
tmoore@ChimaeraPrime:~$ sudo mkdir nfstemp/
```

Finally, mount the shared directory:

```
tmoore@ChimaeraPrime:~$ sudo mount -t nfs 10.238.15.194:/mnt/pool1/testds nfstemp/
```

From here, `cd` into the local directory and view or modify the files as needed.

○ Block Shares (iSCSI)

Block sharing is a complicated scenario that requires detailed configuration steps and knowledge of your network environment. A simple configuration is beyond the scope of this getting started guide, but detailed articles are available in in the iSCSI Sharing topic

1.7 - Data Backups

With storage created and shared, it’s time to ensure TrueNAS data is effectively backed up. TrueNAS offers several options for backing up data.

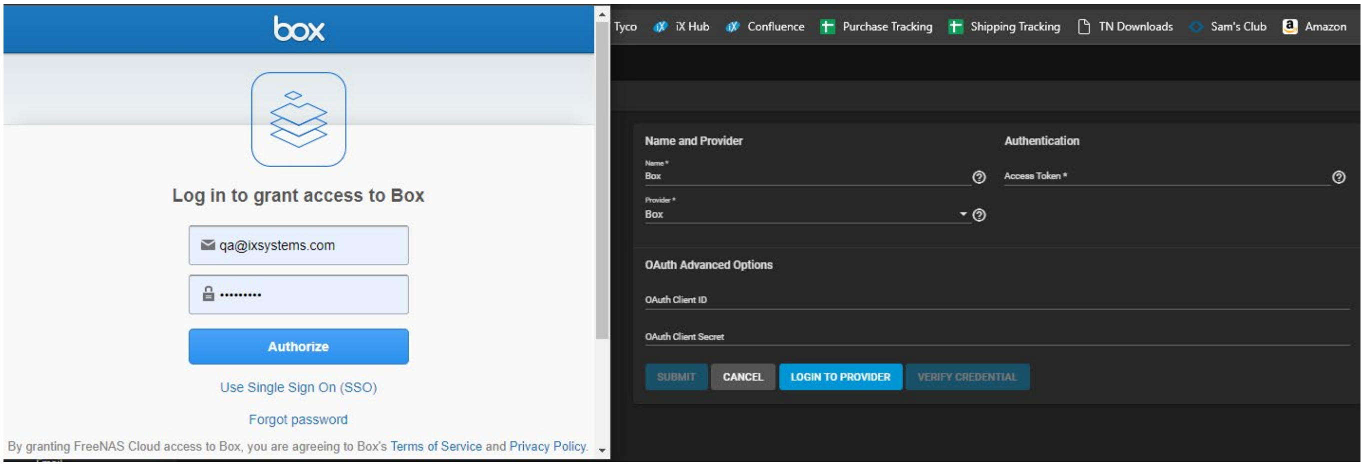
⊙ Cloud Sync

> This option requires an account with the Cloud Storage provider and a storage location created with the provider, like an Amazon S3 bucket. Major providers like Amazon S3, Google Cloud, Box and Microsoft Azure are supported, along with a variety of other vendors. These can charge fees for data transfers and storage, so please review your cloud storage provider’s policies before transferring any data.

You can configure TrueNAS to send, receive, or synchronize data with a Cloud Storage provider. Configuring a Cloud Sync task allows you to transfer data a single time or set up a recurring schedule to periodically transfer data.

Add the Credential

Go to **System > Cloud Credentials > ADD**. Enter a *Name* and choose the *Provider* from the dropdown menu. The authentication options change depending on the selected *Provider*. Credentials either must be entered manually or a single provider login is required and the credentials add automatically.



Log in to grant access to Box

qa@ixsystems.com

••••••••••

By granting FreeNAS Cloud access to Box, you are agreeing to Box's Terms of Service and Privacy Policy.

Name and Provider

Name * Box

Provider * Box

Authentication

Access Token *

OAuth Advanced Options

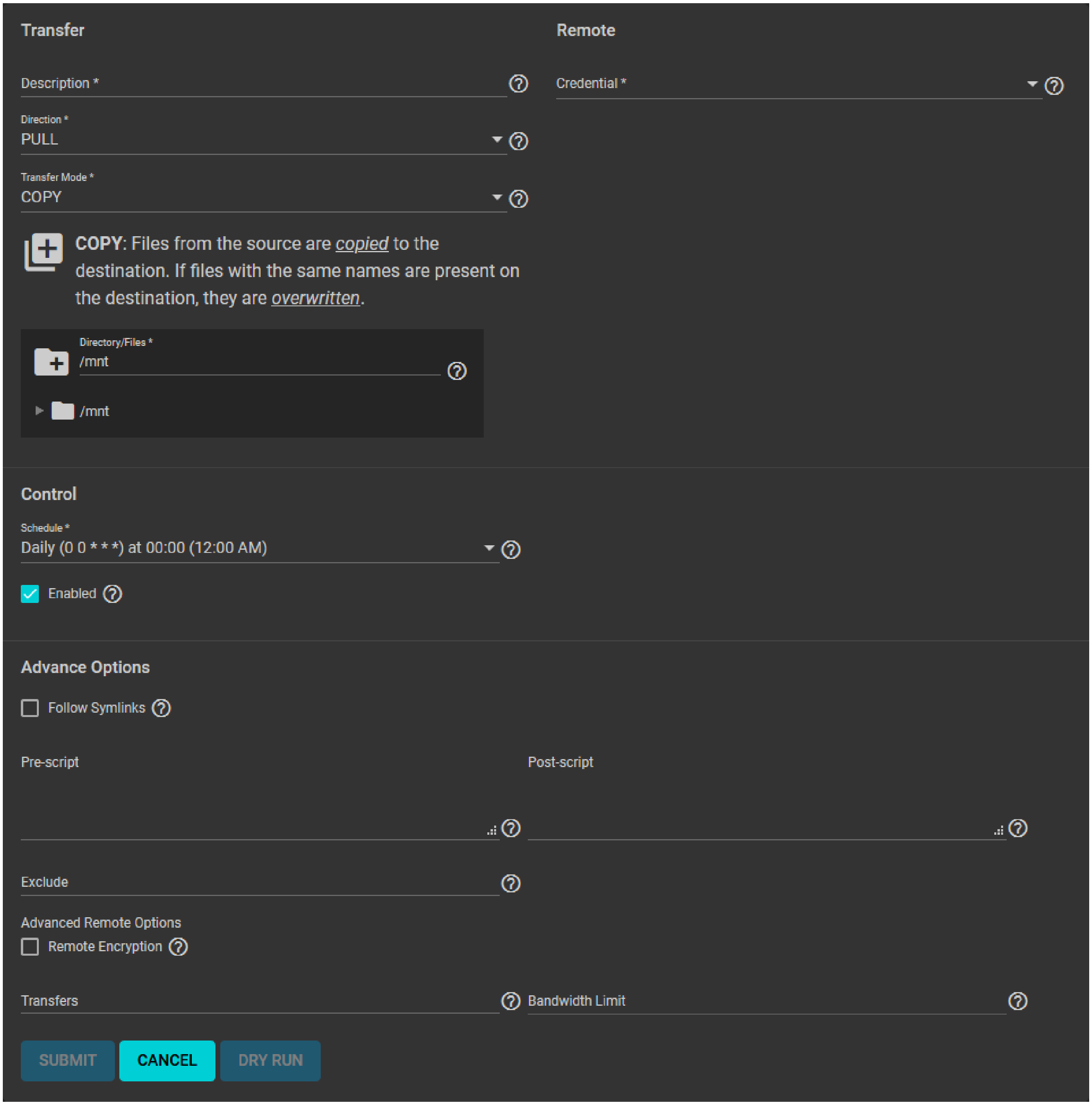
OAuth Client ID

OAuth Client Secret

After entering the *Provider* credentials, click *VERIFY CREDENTIAL*. When verification is confirmed, click *SUBMIT*.

Add the Data Transfer Task

Go to **Tasks > Cloud Sync Tasks** and click *ADD*.



Transfer

Description *

Direction *
PULL

Transfer Mode *
COPY

COPY: Files from the source are *copied* to the destination. If files with the same names are present on the destination, they are *overwritten*.

Directory/Files *
/mnt

/mnt

Remote

Credential *

Control

Schedule *
Daily (0 0 * * *) at 00:00 (12:00 AM)

☑ Enabled

Advance Options

□ Follow Symlinks

Pre-script

Post-script

Exclude

Advanced Remote Options

□ Remote Encryption

Transfers

Bandwidth Limit

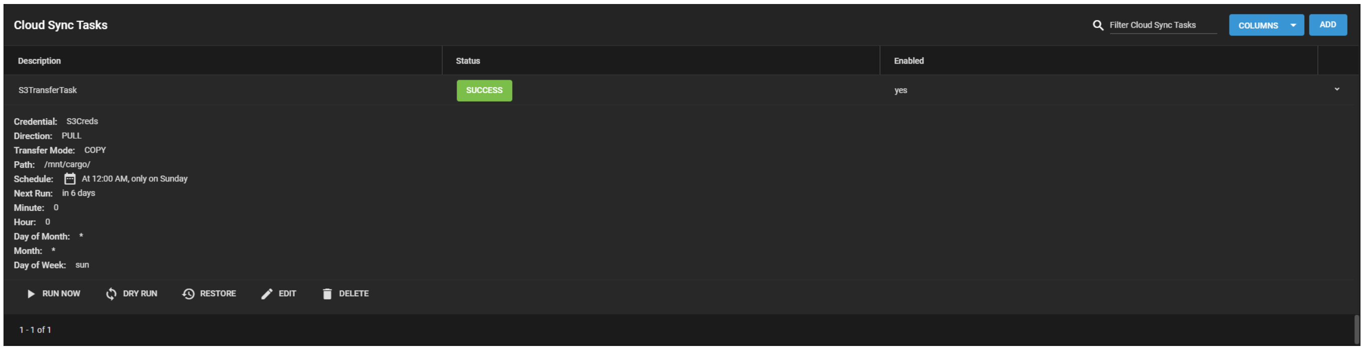
Select the previously saved *Credential* to populate the **Remote** section.

Add a *Description* for the task, select *PUSH* or *PULL* as the *Direction* and *COPY* as the *Transfer Mode*. Under *Directory/Files*, choose the **tank** dataset previously created.

Now, use the **Control** options to define how often this task runs. Open the *Schedule* drop down and choose a preset time when running the task is least intrusive to your network. When the task only needs to run once, unset *Enabled*. The task can then be triggered a single time from the **Tasks > Cloud Sync Tasks** list to do the initial migration or backup.

To test your task, click *DRY RUN*. When the test run is successful, click *SUBMIT* to save the task and add it to **Tasks > Cloud Sync Tasks**.

To manually run the task, go to **Tasks > Cloud Sync Tasks**, click **>** to expand the new task, and click *RUN NOW*.



Description	Status	Enabled
S3TransferTask	SUCCESS	yes

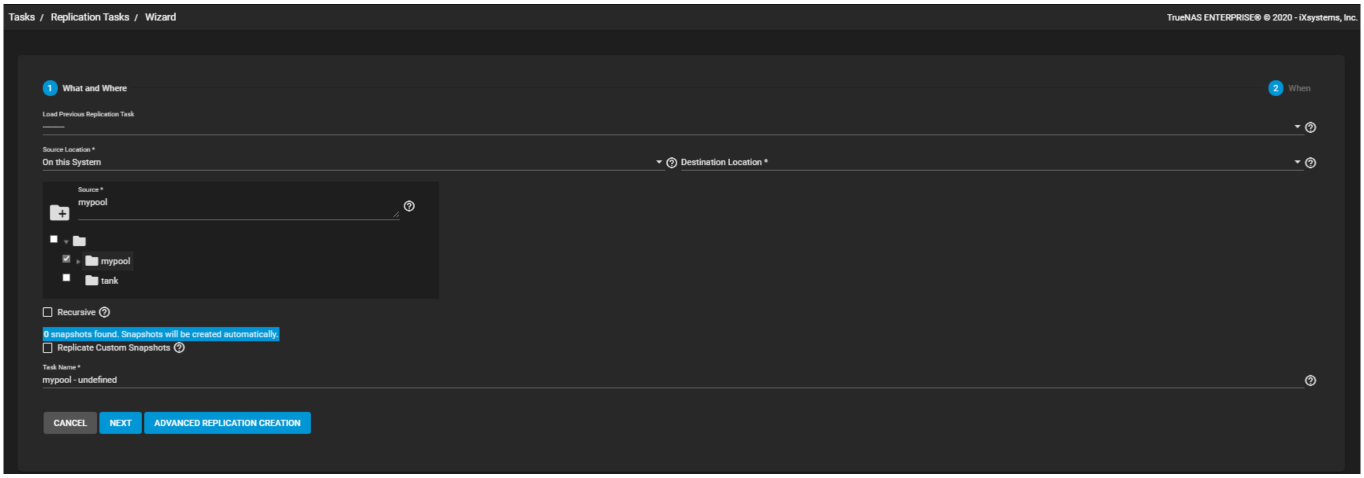
Credential: S3Creds
Direction: PULL
Transfer Mode: COPY
Path: /mnt/cargo/
Schedule: At 12:00 AM, only on Sunday
Next Run: in 6 days
Minute: 0
Hour: 0
Day of Month: *
Month: *
Day of Week: sun

The **Status** shows success or failure. Click the status entry to see a detailed log of the action.

○ Replication

Replication is the process of taking a moment in time "snapshot" of the data and copying that snapshot to another location. Snapshots typically use less storage than full file backups and have more management options. This instruction shows using the TrueNAS Wizard to create a simple replication.

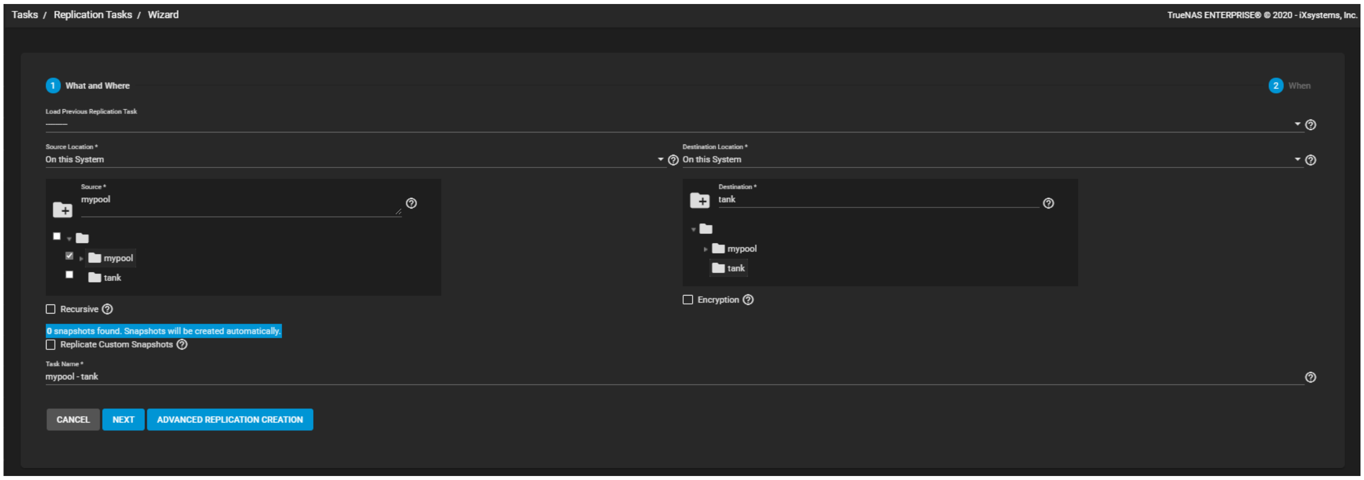
Go to **Tasks > Replication Tasks** and click *ADD*. Set the source location to the local system and pick which datasets to snapshot. The wizard takes new snapshots of the sources when no existing source snapshots are found.


Tasks / Replication Tasks / Wizard
TrueNAS ENTERPRISE® © 2020 - iXsystems, Inc.
1 What and Where
2 When
Load Previous Replication Task
Destination Location *

Source Location * On this System
Source * mypool
☐ ▾
☑ ▸ mypool
☐ tank
☐ Recursive
0 snapshots found. Snapshots will be created automatically.
☐ Replicate Custom Snapshots
Task Name * mypool - undefined

CANCEL
NEXT
ADVANCED REPLICATION CREATION

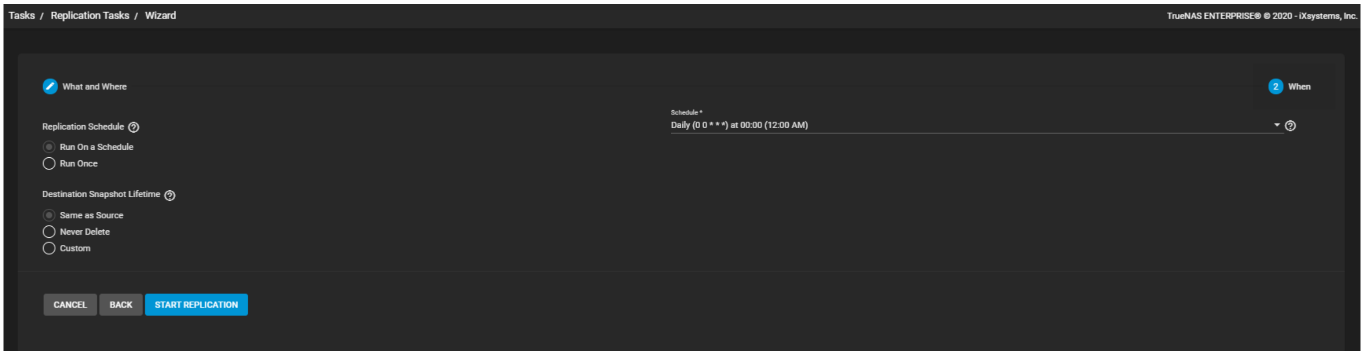
Set the destination to the local system and define the path to the storage location for replicated snapshots. When manually defining the destination, be sure to type the full path to the destination location.


Tasks / Replication Tasks / Wizard
TrueNAS ENTERPRISE® © 2020 - iXsystems, Inc.
1 What and Where
2 When
Load Previous Replication Task

Source Location * On this System
Destination Location * On this System
Source * mypool
☐ ▾
☑ ▸ mypool
☐ tank
Destination * tank
▾
▸ mypool
tank
☐ Encryption
☐ Recursive
0 snapshots found. Snapshots will be created automatically.
☐ Replicate Custom Snapshots
Task Name * mypool - tank

CANCEL
NEXT
ADVANCED REPLICATION CREATION

You can define a specific schedule for this replication or choose to run it immediately after saving the new task. Unscheduled tasks are still saved in the replication task list and can be run manually or edited later to add a schedule.

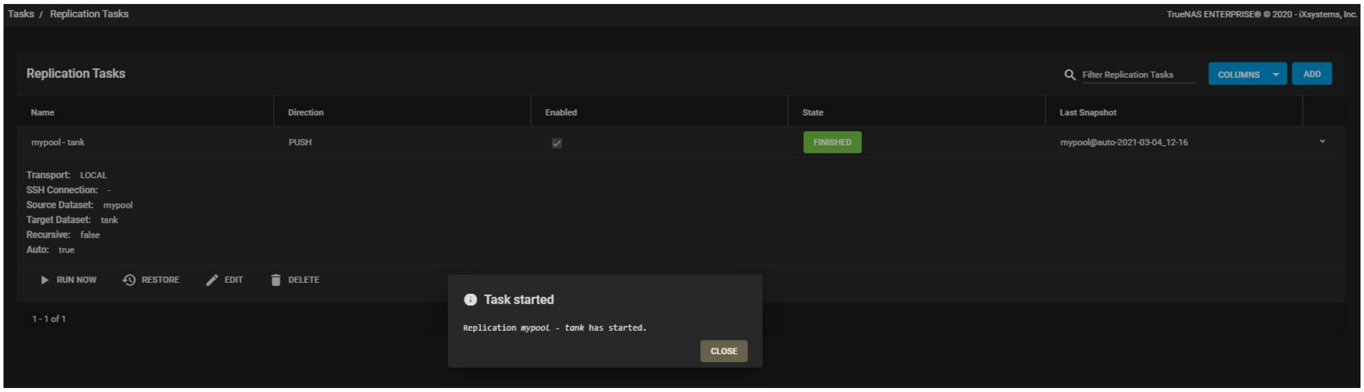

Tasks / Replication Tasks / Wizard
TrueNAS ENTERPRISE® © 2020 - iXsystems, Inc.
What and Where
2 When
CANCEL
BACK
START REPLICATION

Replication Schedule
● Run On a Schedule
○ Run Once

Schedule *
Daily (0 0 * * *) at 00:00 (12:00 AM)

Destination Snapshot Lifetime
● Same as Source
○ Never Delete
○ Custom

Clicking *START REPLICATION* saves the new task and immediately attempts to replicate snapshots to the destination.



Name	Direction	Enabled	State	Last Snapshot
mypool - tank	PUSH	☑	FINISHED	mypool@auto-2021-03-04_12-16

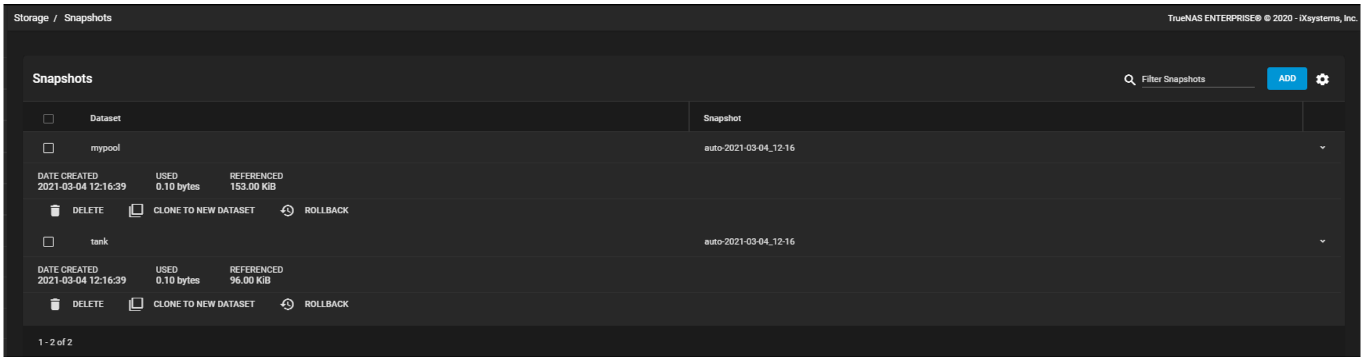
Transport: LOCAL
SSH Connection: -
Source Dataset: mypool
Target Dataset: tank
Recursive: false
Auto: true

1 - 1 of 1

Task started

```
Replication mypool - tank has started.
```

To confirm that snapshots have been replicated, go to **Storage > Snapshots** and verify the destination dataset has new snapshots with correct timestamps.



□ Dataset	Snapshot
□ mypool	auto-2021-03-04_12-16
□ tank	auto-2021-03-04_12-16

mypool:
DATE CREATED 2021-03-04 12:16:39 USED 0.10 bytes REFERENCED 153.00 KiB

tank:
DATE CREATED 2021-03-04 12:16:39 USED 0.10 bytes REFERENCED 96.00 KiB

1 - 2 of 2

TrueNAS is now accessible and configured to store, share, and back up your data!

If you need to expand the system capabilities, see the remaining article about additional Applications . When you're ready to fine-tune the system configuration or learn more about the advanced features, see the remaining sections in the TrueNAS CORE and Enterprise section. These sections are organized in order of appearance in the TrueNAS interface, with additional topics for 3rd party solutions , API reference guide, official notices from iXsystems, Inc, and community recommendations .

1.8 - Applications

With the rest of the system configured and data being shared over a network, the final step to consider for first time setup is installing any application solutions. Applications or features added to TrueNAS are created in separate “Plugins”, Jails", or “Virtual Machines” that are kept separate from the base TrueNAS operating system. If anything goes wrong or a security vulnerability is exploited in one of these application environments, TrueNAS remains unaffected. These solutions safely expand TrueNAS' capabilities in a restricted, safeguarded way.

The primary method to install applications is to use **Plugins**. These are pre-packaged applications that quickly install in a tailor-made environment. Some plugins are supported by iXsystems while others are provided and maintained by the open source community.

A **Jail** is a restricted FreeBSD operating system installed as a separate subset of TrueNAS. Jails can install a wide variety of applications and be tuned to very specific use cases, but require more extensive knowledge of FreeBSD and command line operation.

A **Virtual Machine** is a fully independent operating system installation. This reserves or splits the available hardware resources to create a different, full operating system experience. TrueNAS can install Windows or Unix-like operating systems in a Virtual Machine (VM), but regular system performance is reduced while virtual machines are running.

Click one of the tabs below to see instructions on installing your preferred application solution.

Network Hardware Offloading expand □
Plugins that use a network interface need to Disable Hardware Offloading in **Network -> Interface**. Disabling hardware offloading can reduce general network performance for that interface, so it is recommended to use a secondary interface for application environments.

⊙ **Plugins**

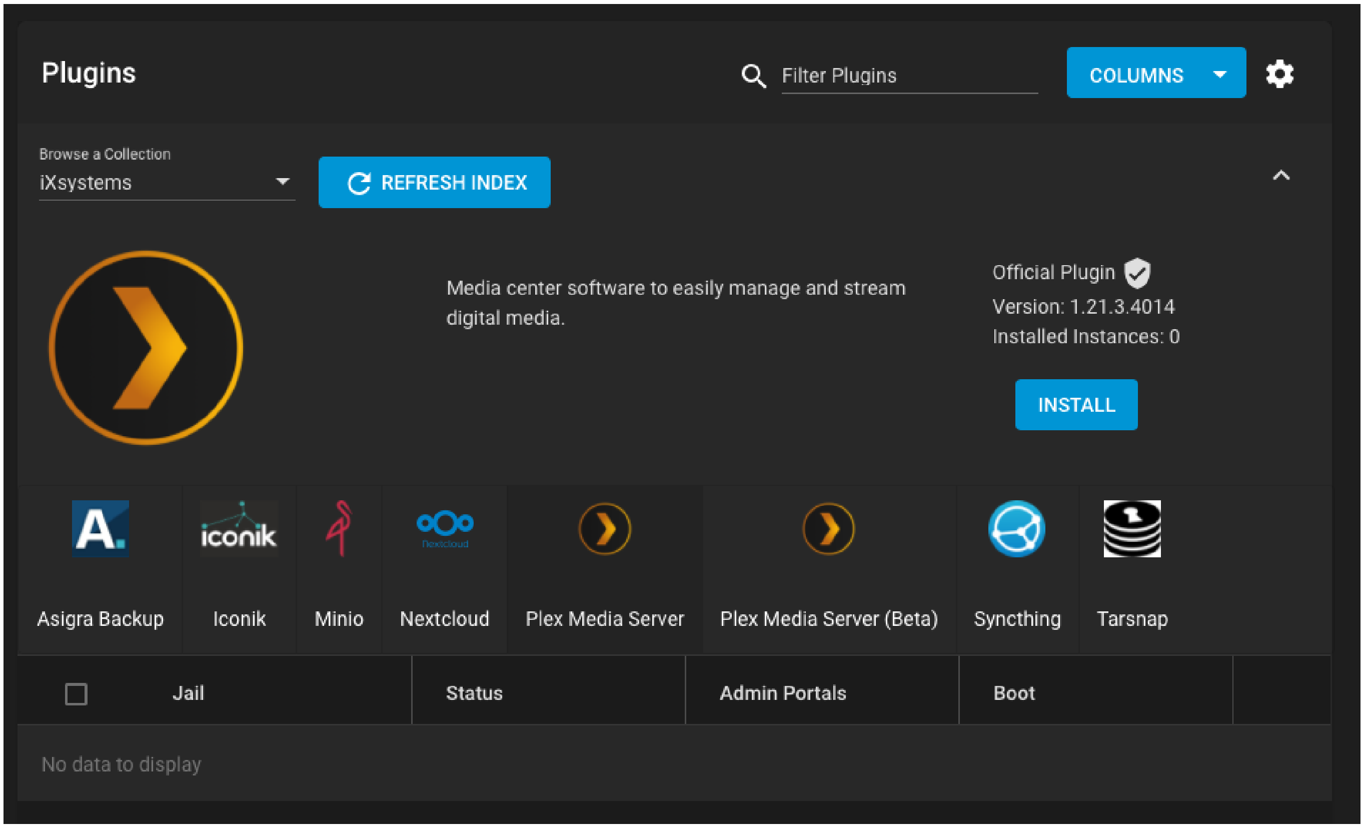
This instruction demonstrates plugins by walking you through installing the community-favorite Plex application. You will need an account with Plex to follow these instructions.

Installing Plex

Create a dataset called *audio* and a dataset called *video* to be used as mount points for Plex. Next, go to the **Plugins** page.

Installing a basic PlexMedia Plugin:

1. Select the *Plex Media Server* plugin and click *INSTALL*.



Browse a Collection: iXsystems

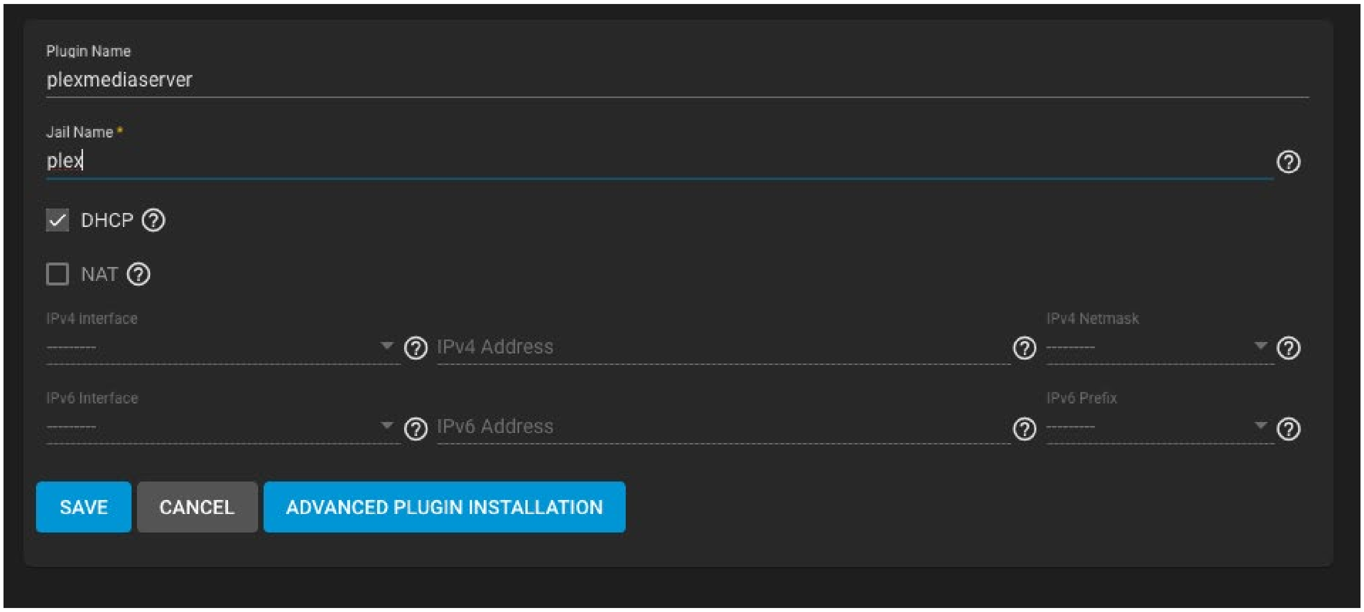
Media center software to easily manage and stream digital media.

Official Plugin
Version: 1.21.3.4014
Installed Instances: 0

□	Jail	Status	Admin Portals	Boot

No data to display

2. Under *Jail Name*, enter whatever name you'd like (i.e. "Plex").
3. *DHCP* is set automatically.
4. Click *SAVE*.



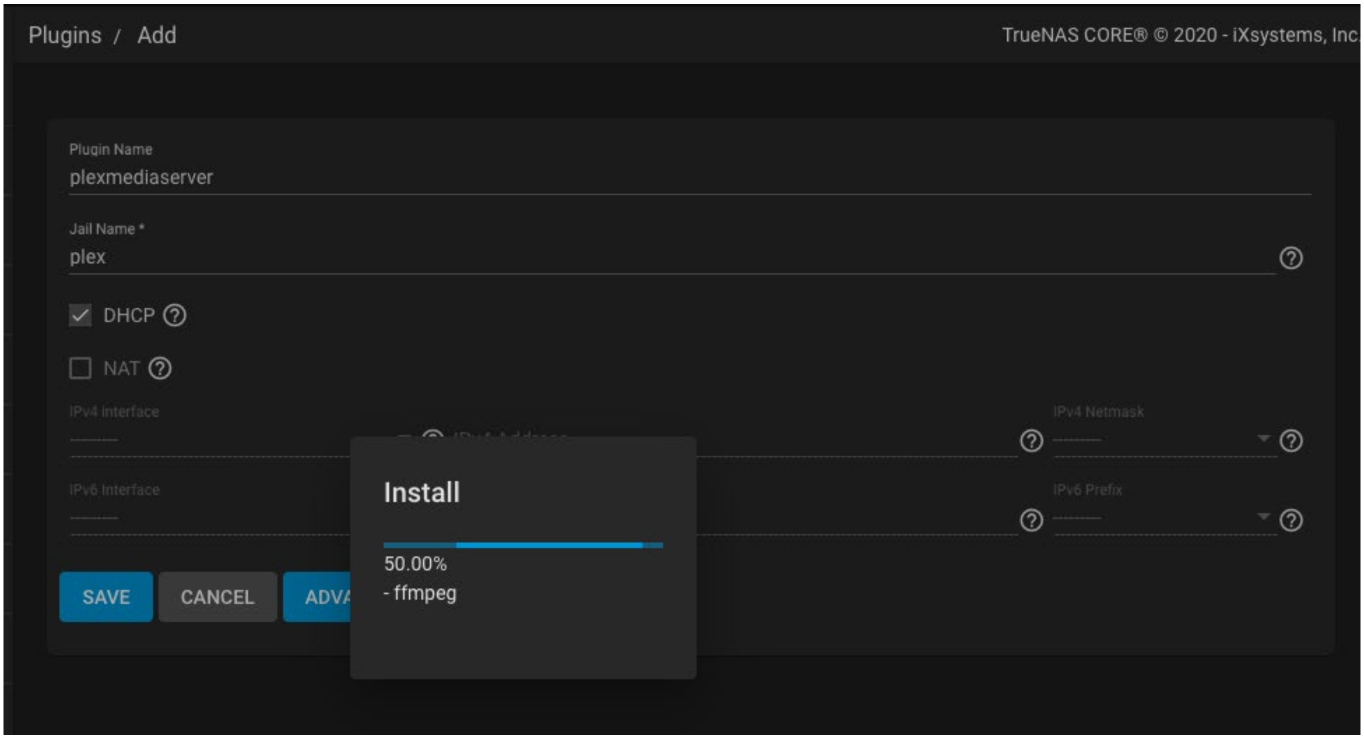
Plugin Name: plexmediaserver

Jail Name *: plex

☑ DHCP

□ NAT

5. A dialog window shows the installation progress.



Plugin Name
plexmediaserver

Jail Name *
plex

☑ DHCP

☐ NAT

IPv4 interface

IPv4 Netmask

IPv6 Interface

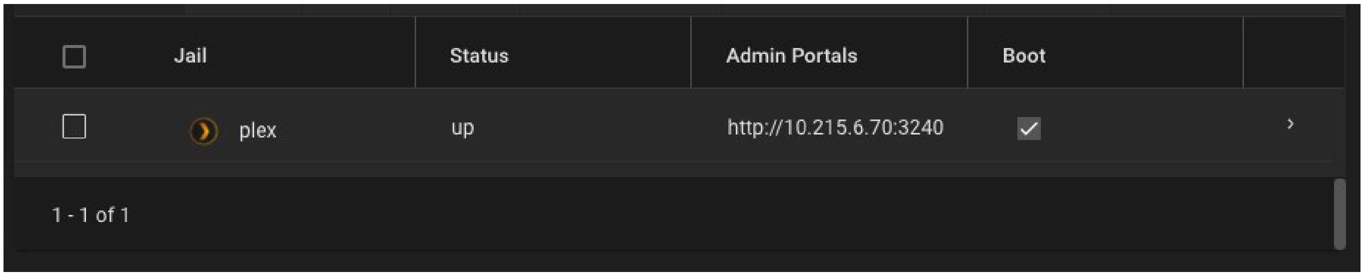
IPv6 Prefix

Install

50.00%
- ffmpeg

When available, *Plugin Installation Notes* display when the install completes.

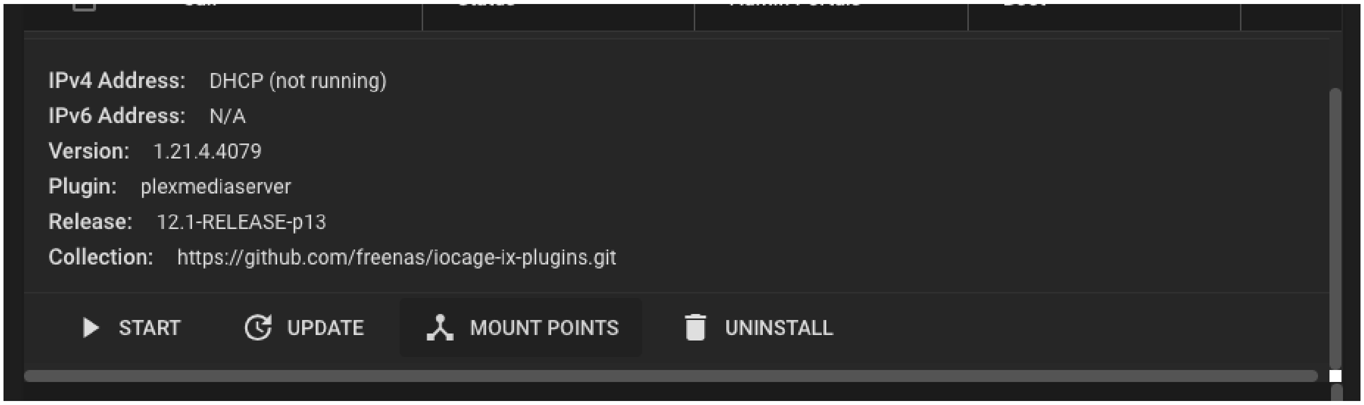
6. The plugin *Status* shows as **up**, with the *Boot* option set.
7. Click **>** to expand the Plex table entry:



☐	Jail	Status	Admin Portals	Boot	
☐	plex	up	http://10.215.6.70:3240	✓	›

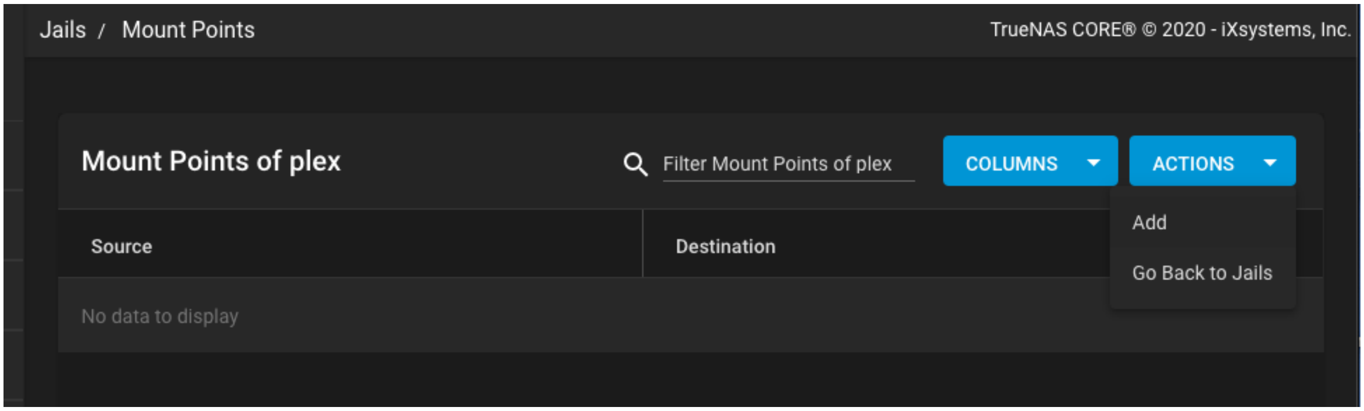
1 - 1 of 1

8. Stop the *up* plugin.
9. Click *MOUNT POINTS*.



IPv4 Address: DHCP (not running)
IPv6 Address: N/A
Version: 1.21.4.4079
Plugin: plexmediaserver
Release: 12.1-RELEASE-p13
Collection: https://github.com/freenas/iocage-ix-plugins.git

10. Click *Actions* and *Add*.

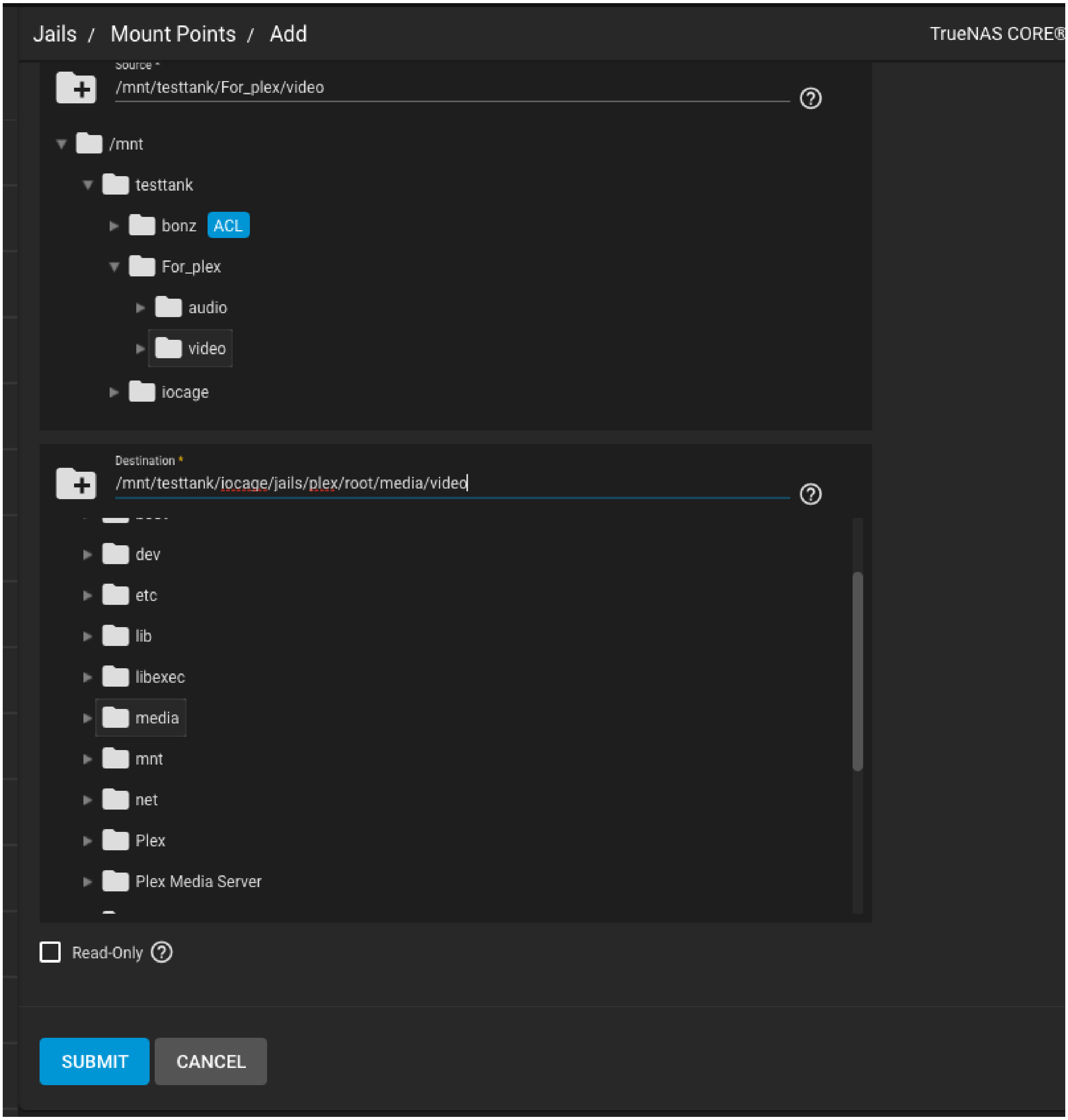


Jails / Mount Points
TrueNAS CORE® © 2020 - iXsystems, Inc.
Filter Mount Points of plex
COLUMNS
ACTIONS
Add
Go Back to Jails

Mount Points of plex

Source	Destination
No data to display	

11. Fill out one mount point for each previously created dataset. The *Source* is the created dataset and the *Destination* is the media directory with /datasetname appended (see example):



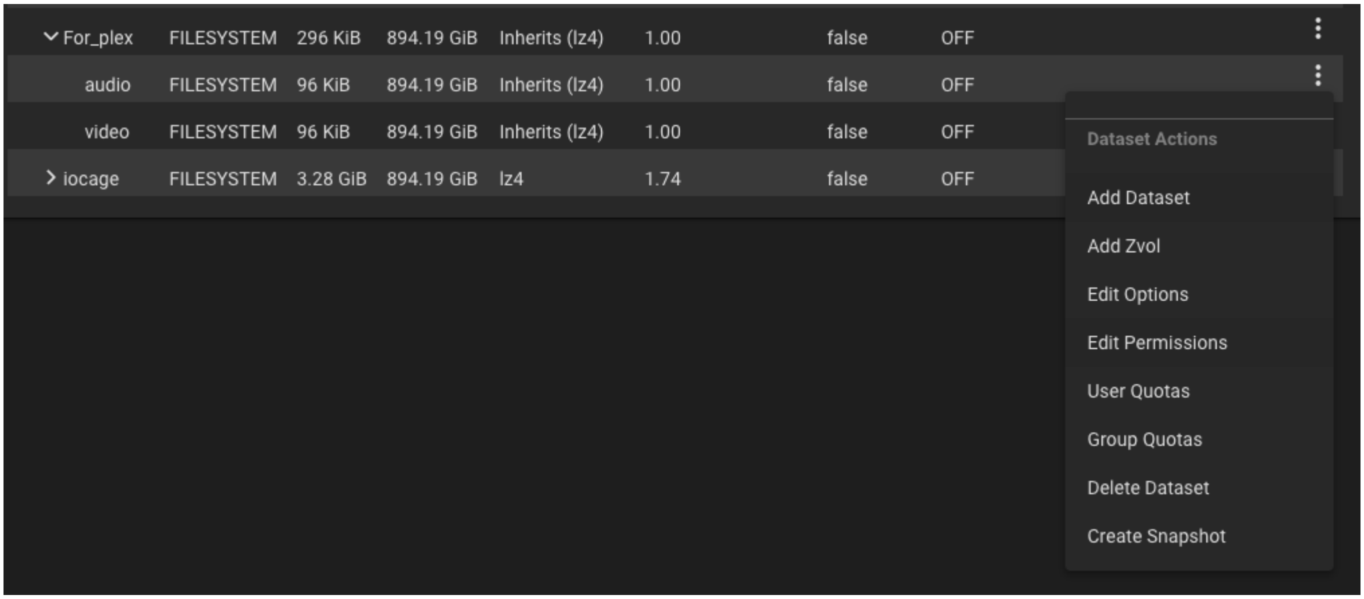
Source *: /mnt/testtank/For_plex/video

Destination *: /mnt/testtank/iocage/jails/plex/root/media/video

□ Read-Only

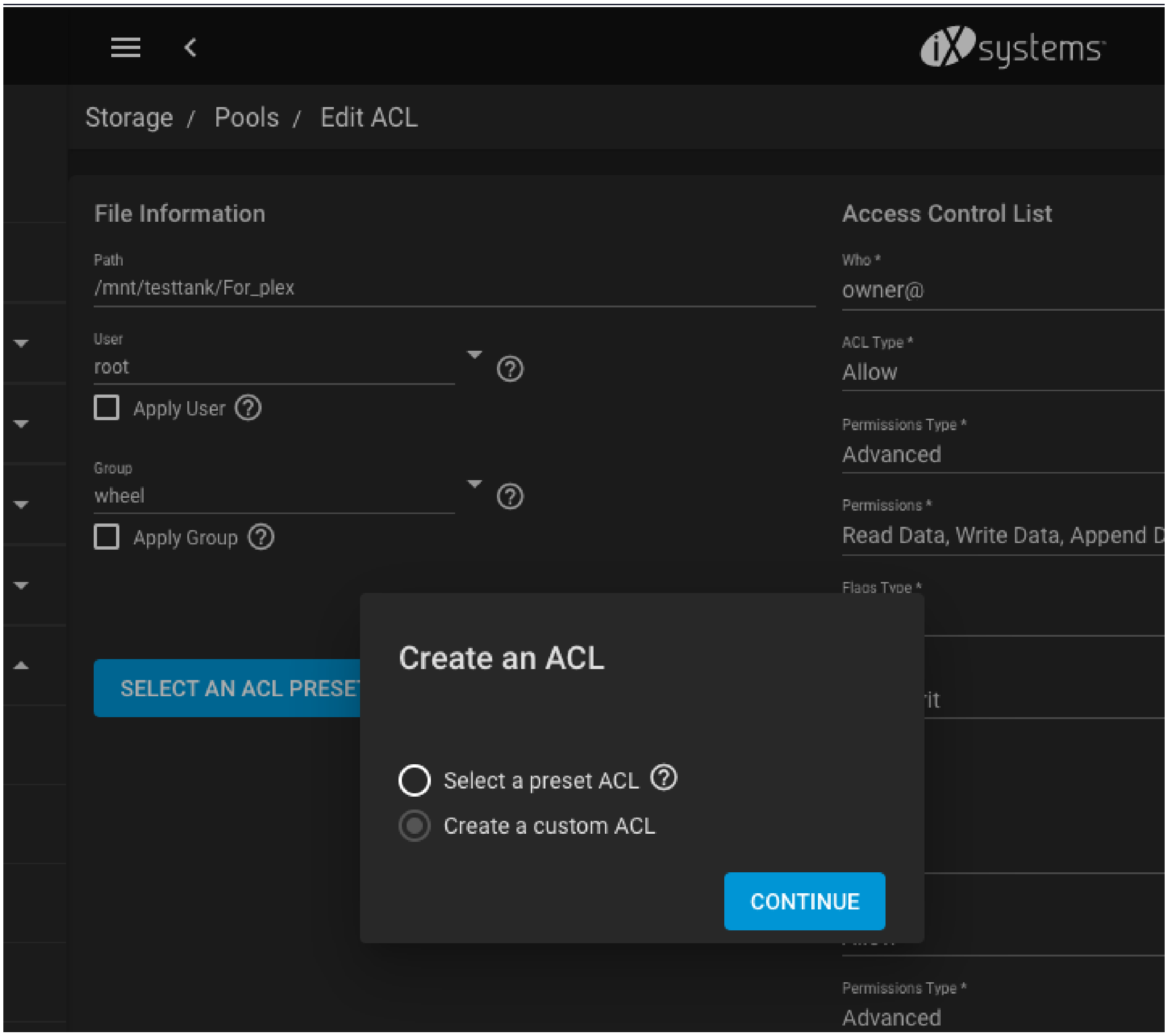
12. Click *Submit*. Do this for as many mount points as needed. In this example, we have *audio* and *video*.

13. Go to **Storage > Pools** and click more_vert > *Edit Permissions* for your source datasets.



For_plex	FILESYSTEM	296 KiB	894.19 GiB	Inherits (lz4)	1.00	false	OFF
audio	FILESYSTEM	96 KiB	894.19 GiB	Inherits (lz4)	1.00	false	OFF
video	FILESYSTEM	96 KiB	894.19 GiB	Inherits (lz4)	1.00	false	OFF
iocage	FILESYSTEM	3.28 GiB	894.19 GiB	lz4	1.74	false	OFF

14. Click *Create a custom ACL* and *Continue*.



Storage / Pools / Edit ACL

File Information

Path
/mnt/testtank/For_plex

User
root

□ Apply User

Group
wheel

□ Apply Group

Access Control List

Who *
owner@

ACL Type *
Allow

Permissions Type *
Advanced

Permissions *
Read Data, Write Data, Append D

Flags Type *

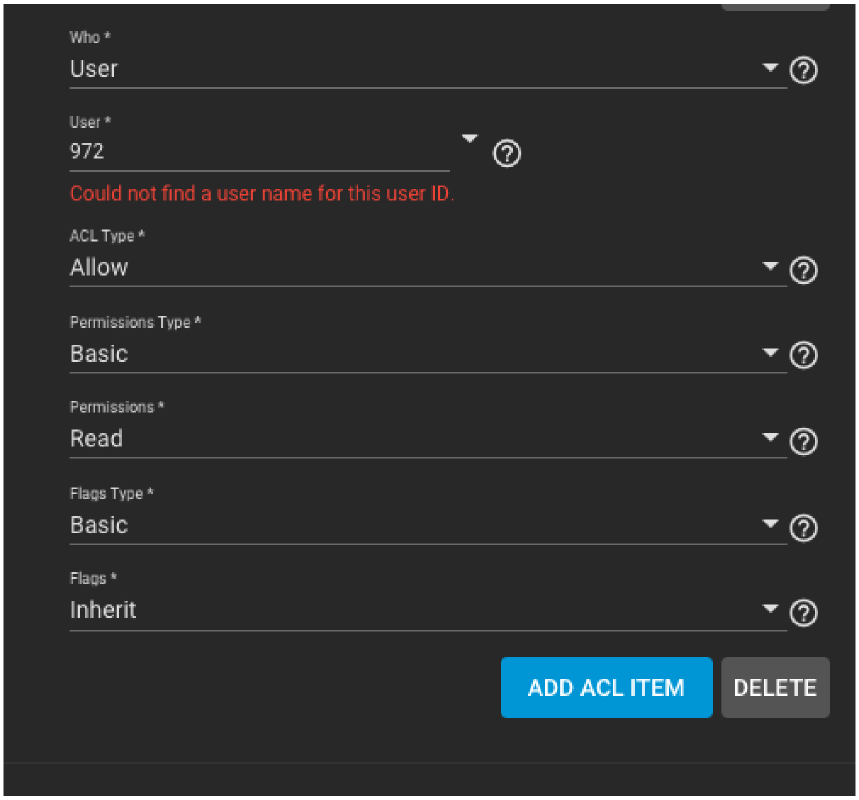
Permissions Type *
Advanced

Create an ACL

○ Select a preset ACL

● Create a custom ACL

15. Click *ADD ACL ITEM* and enter the values pictured below:


Who *
User

User *
972
Could not find a user name for this user ID.

ACL Type *
Allow

Permissions Type *
Basic

Permissions *
Read

Flags Type *
Basic

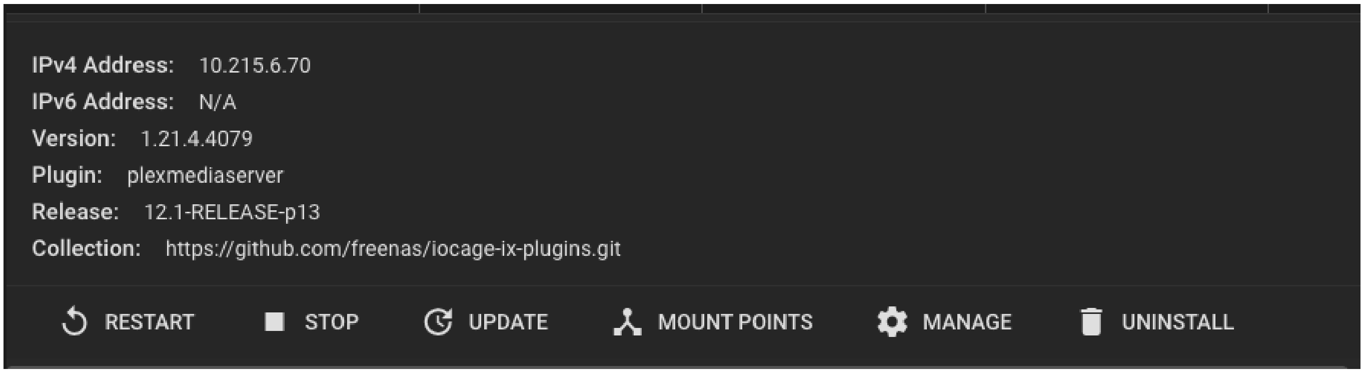
Flags *
Inherit

Set *Apply permissions recursively* and click *Save*.

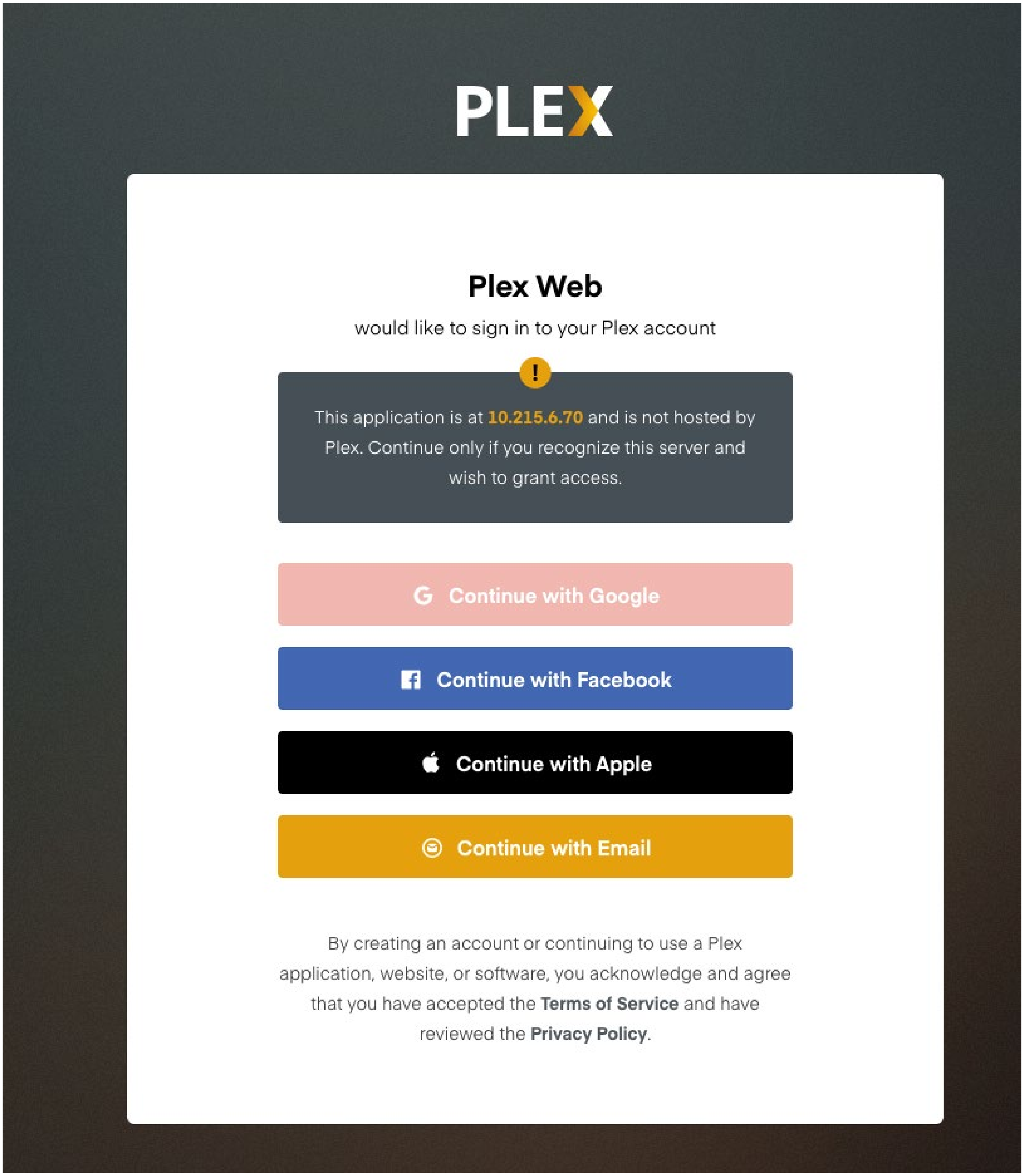
16. Go to **Plugins**, find the **Plex** entry, and click the >. *Start* the plugin.

Accessing Plex

1. When the **Plex** plugin status is **up**, click the > and *Manage*.


IPv4 Address: 10.215.6.70
IPv6 Address: N/A
Version: 1.21.4.4079
Plugin: plexmediaserver
Release: 12.1-RELEASE-p13
Collection: https://github.com/freenas/iocage-ix-plugins.git

2. Enter your Plex login informamtion.

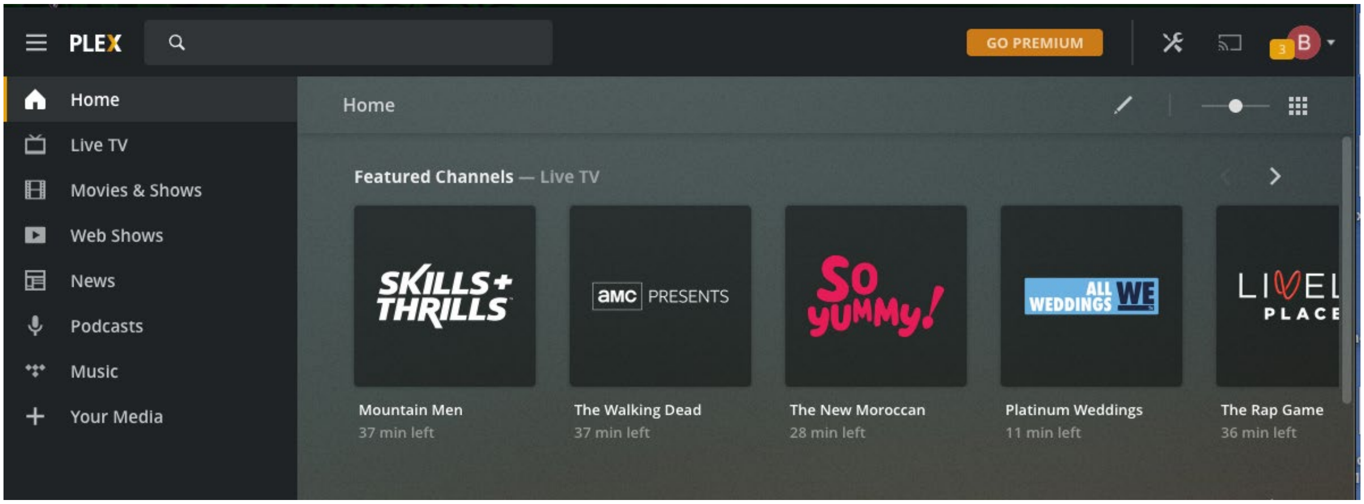


Plex Web

would like to sign in to your Plex account

This application is at **10.215.6.70** and is not hosted by Plex. Continue only if you recognize this server and wish to grant access.

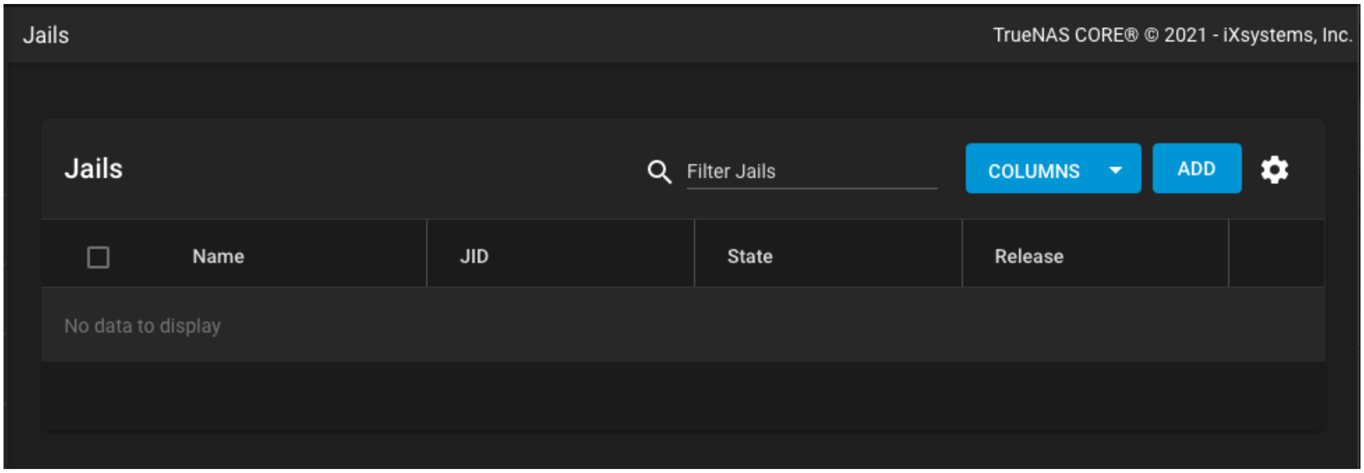
By creating an account or continuing to use a Plex application, website, or software, you acknowledge and agree that you have accepted the **Terms of Service** and have reviewed the **Privacy Policy**.



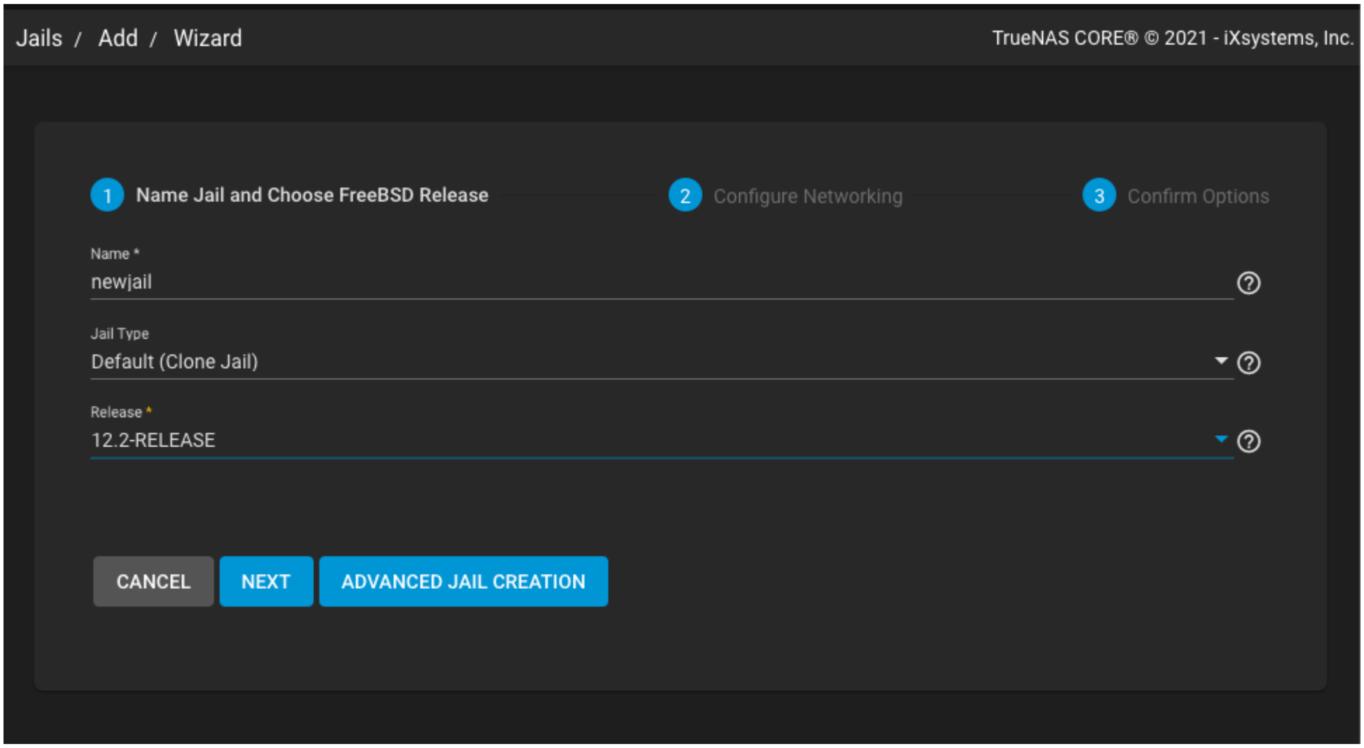
- **FreeBSD Jails**

Installing a Jail

1. Go to the **Jails** page and click *ADD*.



2. Enter a jail *Name*, select the *Release* version, and click *NEXT*.

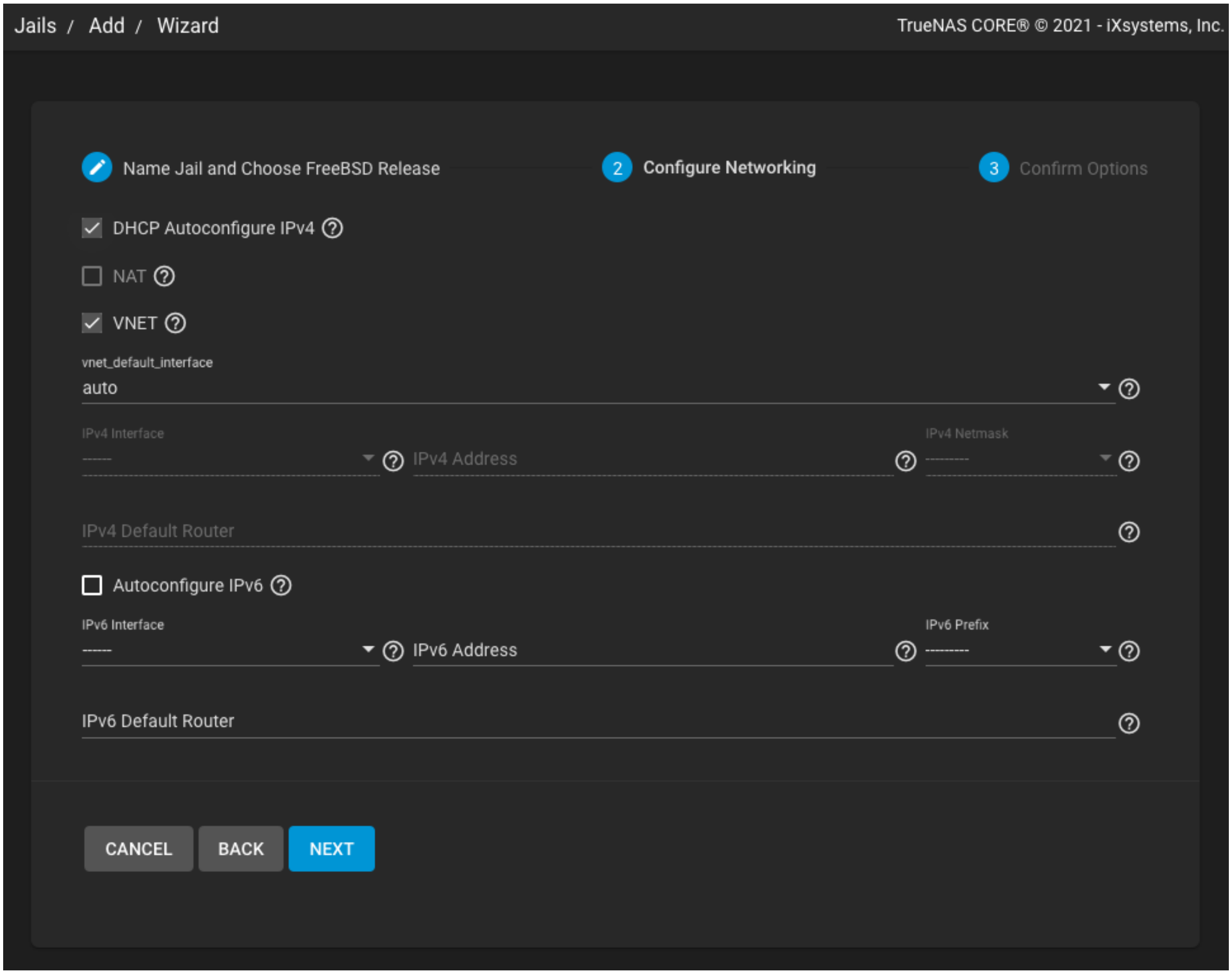


Name * newjail

Jail Type Default (Clone Jail)

Release * 12.2-RELEASE

3. To allow the jail access to the internet, set *DHCP Autoconfigure IPv4* and click *NEXT*. Additional defaults are set when the DHCP option is set.


Jails / Add / Wizard
TrueNAS CORE® © 2021 - iXsystems, Inc.
Name Jail and Choose FreeBSD Release
2 Configure Networking
3 Confirm Options
CANCEL
BACK
NEXT

☑ DHCP Autoconfigure IPv4

☐ NAT

☑ VNET

vnet_default_interface auto

IPv4 Interface ------- IPv4 Address IPv4 Netmask ---------

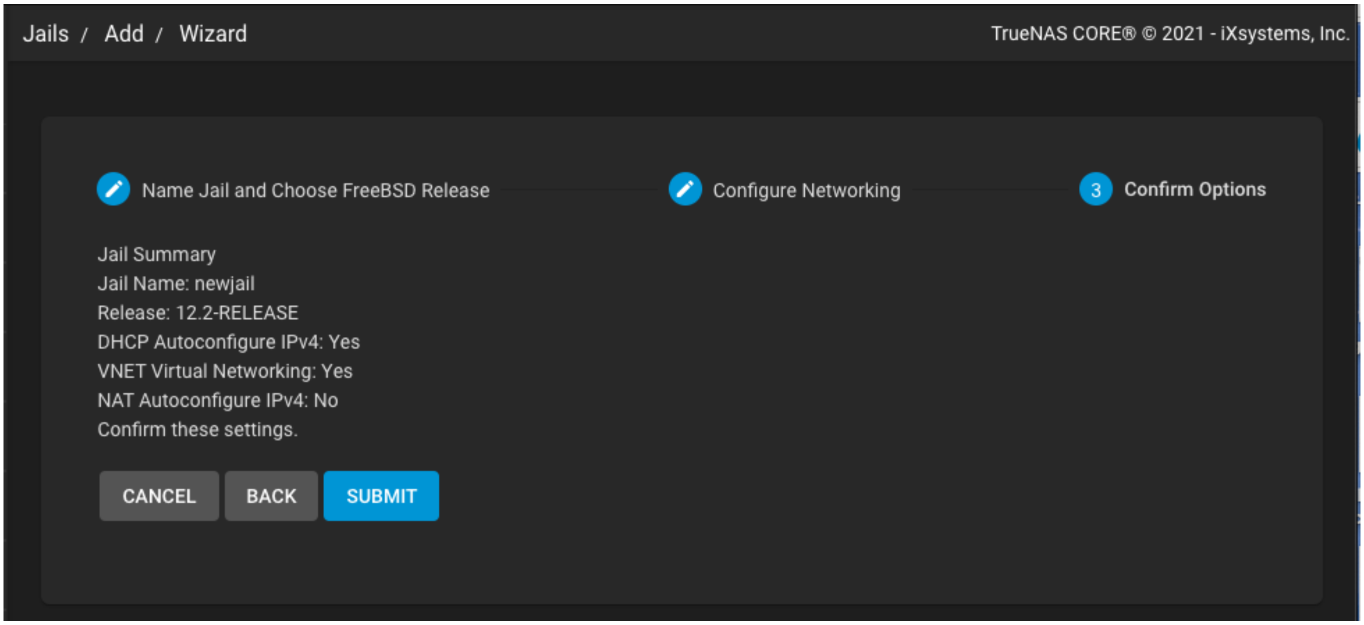
IPv4 Default Router

☐ Autoconfigure IPv6

IPv6 Interface ------- IPv6 Address IPv6 Prefix ---------

IPv6 Default Router

4. Review the **Jail Summary** and click *SUBMIT*.



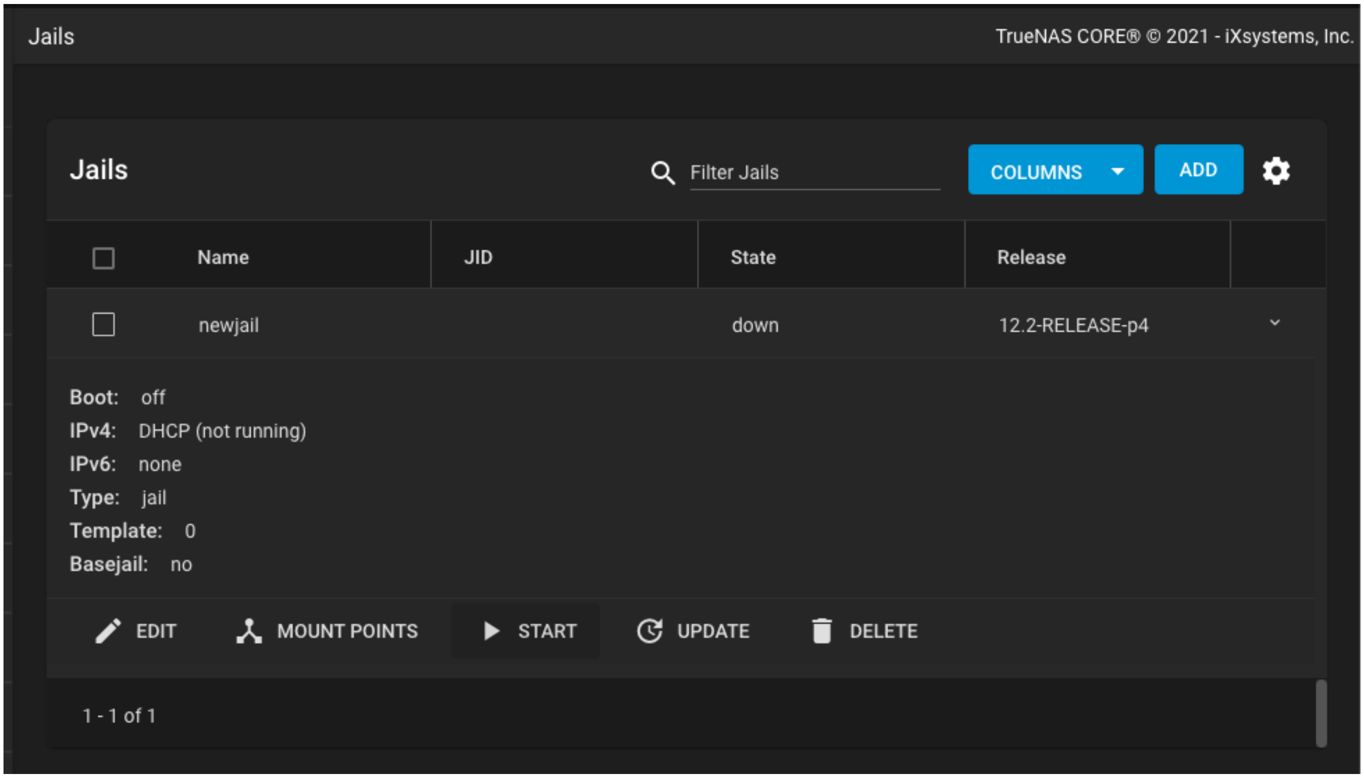
Jails / Add / Wizard

TrueNAS CORE® © 2021 - iXsystems, Inc.

Jail Summary
Jail Name: newjail
Release: 12.2-RELEASE
DHCP Autoconfigure IPv4: Yes
VNET Virtual Networking: Yes
NAT Autoconfigure IPv4: No
Confirm these settings.

Accessing a Jail

1. Go to **Jails** and click the **>** next to the newly created jail. Click *START*.



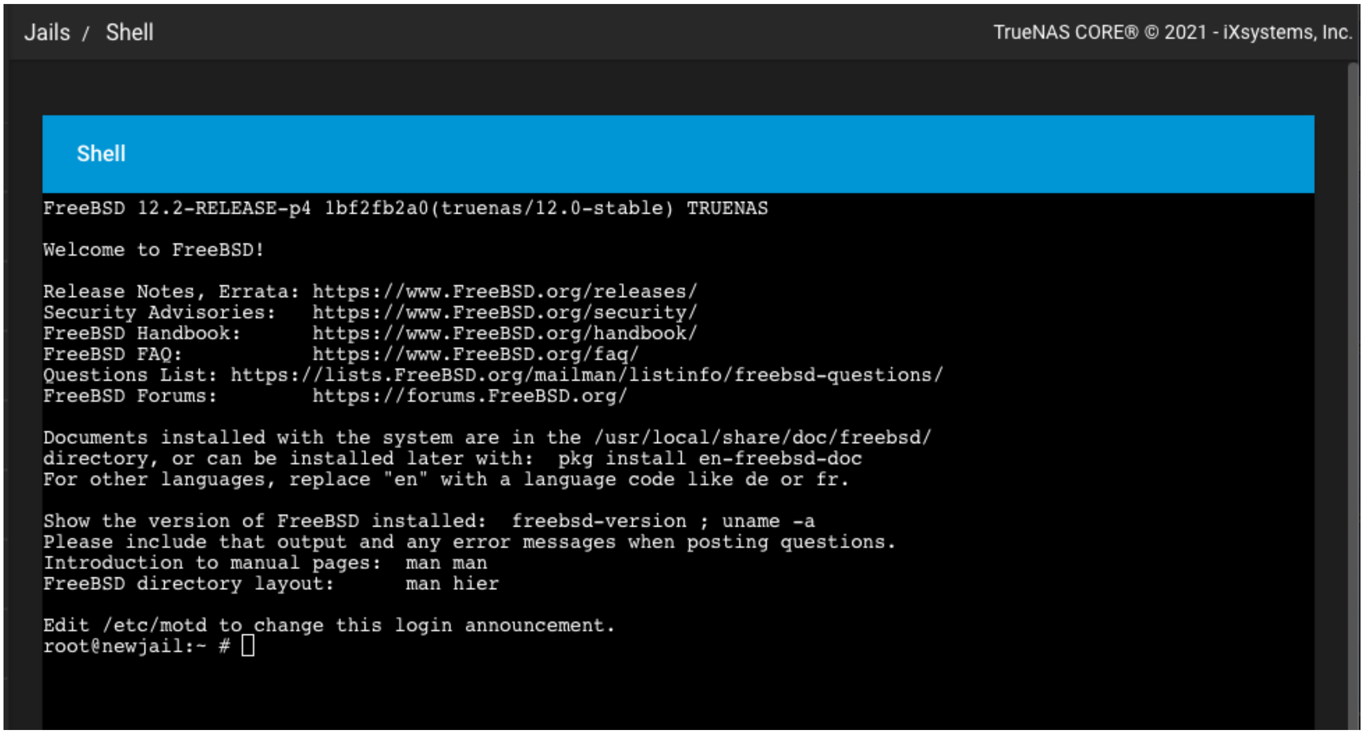
Jails

TrueNAS CORE® © 2021 - iXsystems, Inc.

	Name	JID	State	Release
□	newjail		down	12.2-RELEASE-p4

Boot: off
IPv4: DHCP (not running)
IPv6: none
Type: jail
Template: 0
Basejail: no

2. When the jail **State** changes to **up**, click > *SHELL* to see the jail command line.



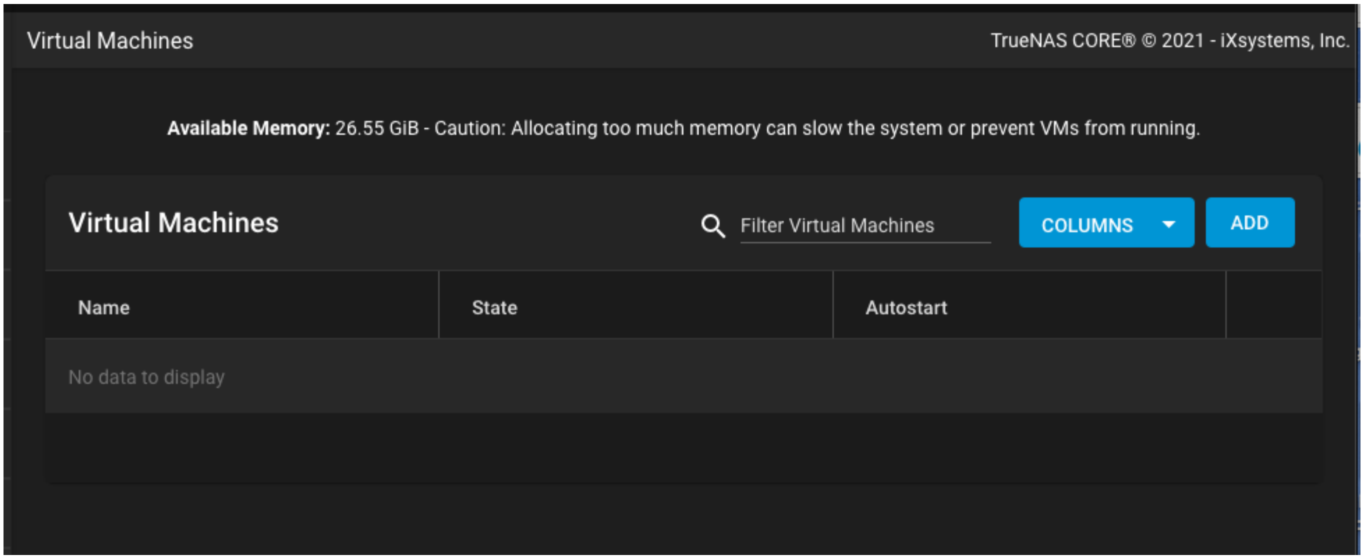
```
FreeBSD 12.2-RELEASE-p4 1bf2fb2a0(truenas/12.0-stable) TRUENAS

Welcome to FreeBSD!

Release Notes, Errata: https://www.FreeBSD.org/releases/
Security Advisories:   https://www.FreeBSD.org/security/
FreeBSD Handbook:      https://www.FreeBSD.org/handbook/
FreeBSD FAQ:           https://www.FreeBSD.org/faq/
Questions List: https://lists.FreeBSD.org/mailman/listinfo/freebsd-questions/
FreeBSD Forums:        https://forums.FreeBSD.org/

Documents installed with the system are in the /usr/local/share/doc/freebsd/
directory, or can be installed later with:  pkg install en-freebsd-doc
For other languages, replace "en" with a language code like de or fr.

Show the version of FreeBSD installed:  freebsd-version ; uname -a
Please include that output and any error messages when posting questions.
Introduction to manual pages:  man man
FreeBSD directory layout:      man hier

Edit /etc/motd to change this login announcement.
root@newjail:~ # 
```

○ **Virtual Machines**

Installing a Virtual Machine

Virtual Machines require uploading an Operating System .iso to TrueNAS. This example shows using an Ubuntu .iso :

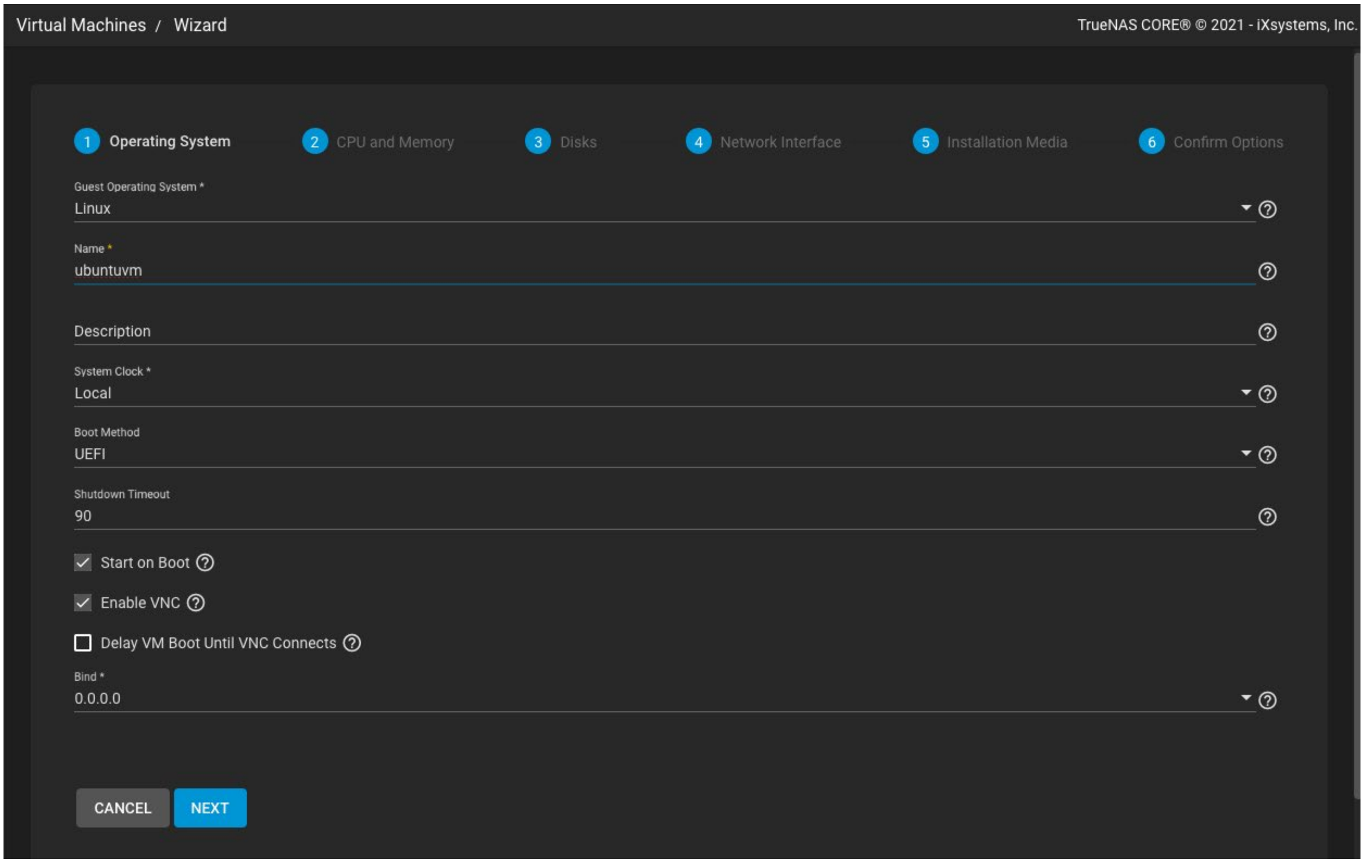
1. Go to **Virtual Machines** and click *ADD*.



Available Memory: 26.55 GiB - Caution: Allocating too much memory can slow the system or prevent VMs from running.

Name	State	Autostart
No data to display		

2. Select a *Guest Operating System* and enter a *Name*. For this example the *Guest Operating System* is set to *Linux*. Click *NEXT*.



Virtual Machines / Wizard

TrueNAS CORE® © 2021 - iXsystems, Inc.

Guest Operating System * Linux

Name * ubuntuvm

Description

System Clock * Local

Boot Method UEFI

Shutdown Timeout 90

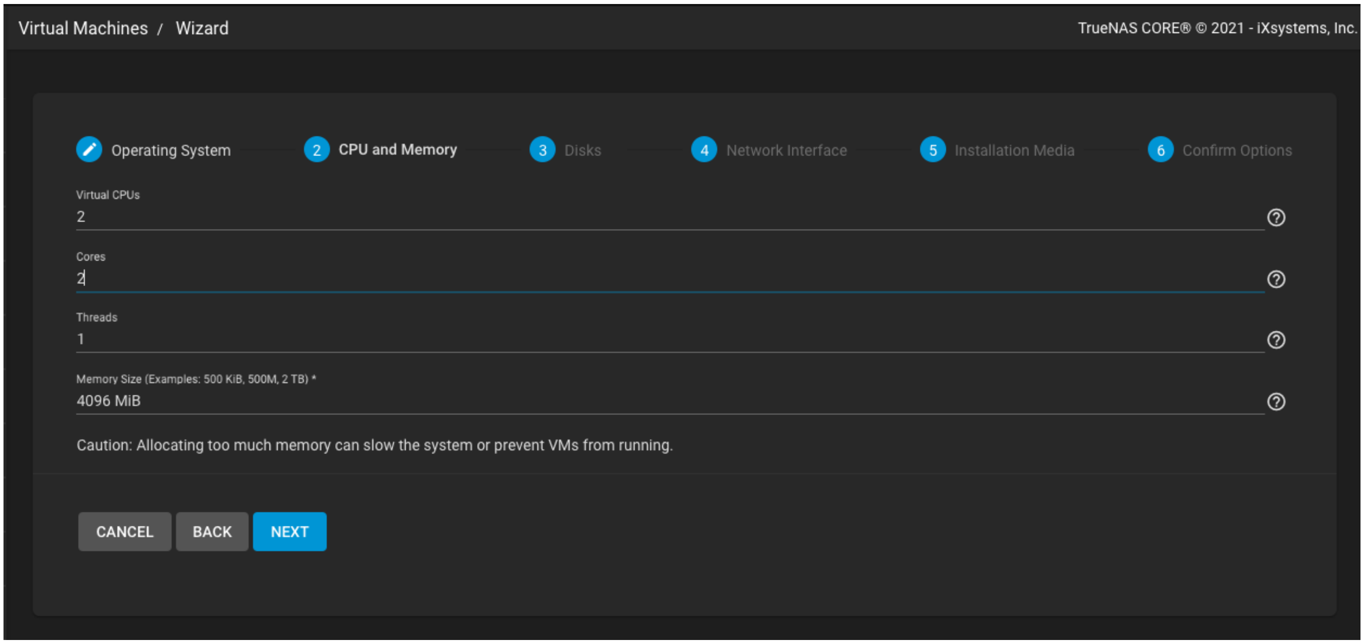
☑ Start on Boot

☑ Enable VNC

□ Delay VM Boot Until VNC Connects

Bind * 0.0.0.0

3. Now enter the physical resources to give the VM. Larger numbers of *Virtual CPUs*, *Cores*, *Threads*, and *Memory* allow the VM to perform better, but reduces the performance of the TrueNAS system. Click *NEXT*.



Virtual Machines / Wizard

TrueNAS CORE® © 2021 - iXsystems, Inc.

Virtual CPUs 2

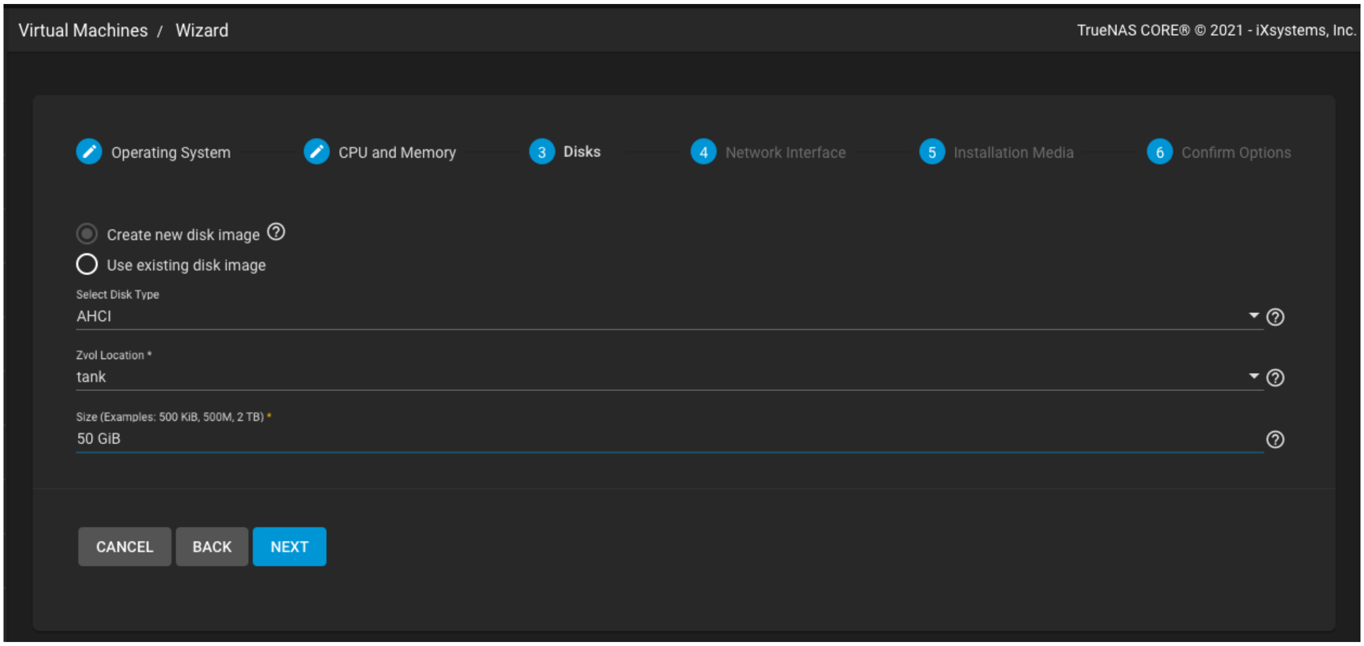
Cores 2

Threads 1

Memory Size (Examples: 500 KiB, 500M, 2 TB) * 4096 MiB

Caution: Allocating too much memory can slow the system or prevent VMs from running.

4. Set *Create a new disk image* and select a *Zvol Location* for the VM storage. Enter a usable storage *Size* (example shows 50 GiB) and click the *NEXT* button.



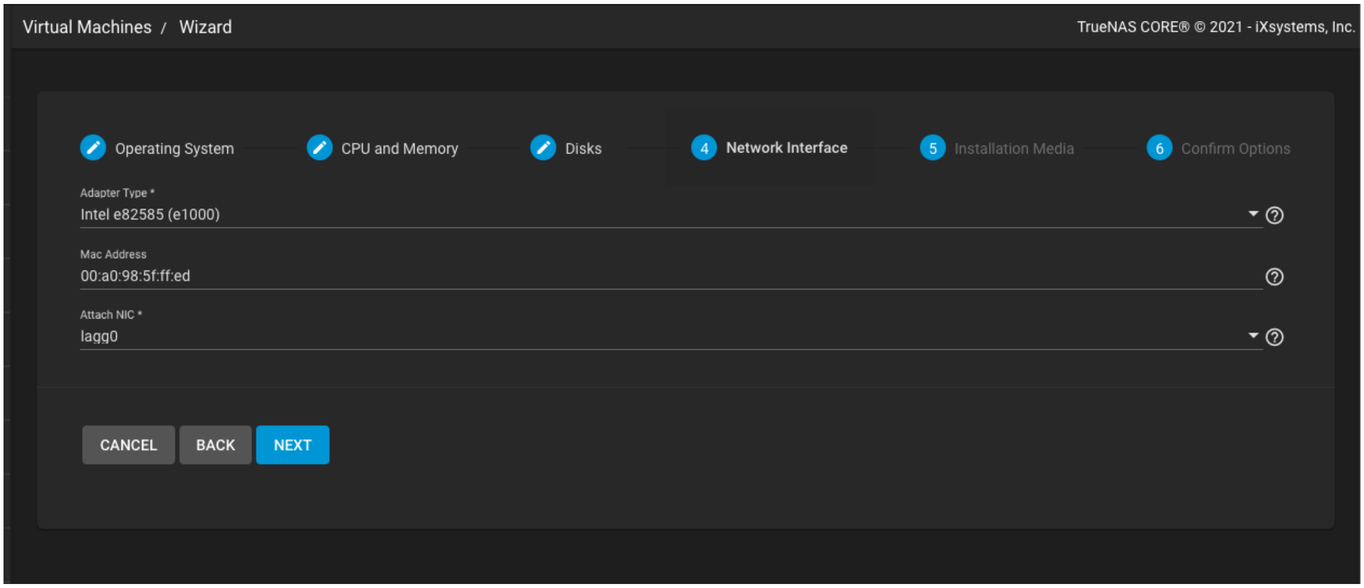
● Create new disk image
○ Use existing disk image

Select Disk Type
AHCI

Zvol Location *
tank

Size (Examples: 500 KiB, 500M, 2 TB) *
50 GiB

5. **Network Interface** automatically detects the hardware and sets defaults that allow network access. Make sure these settings are valid, then click *NEXT*.

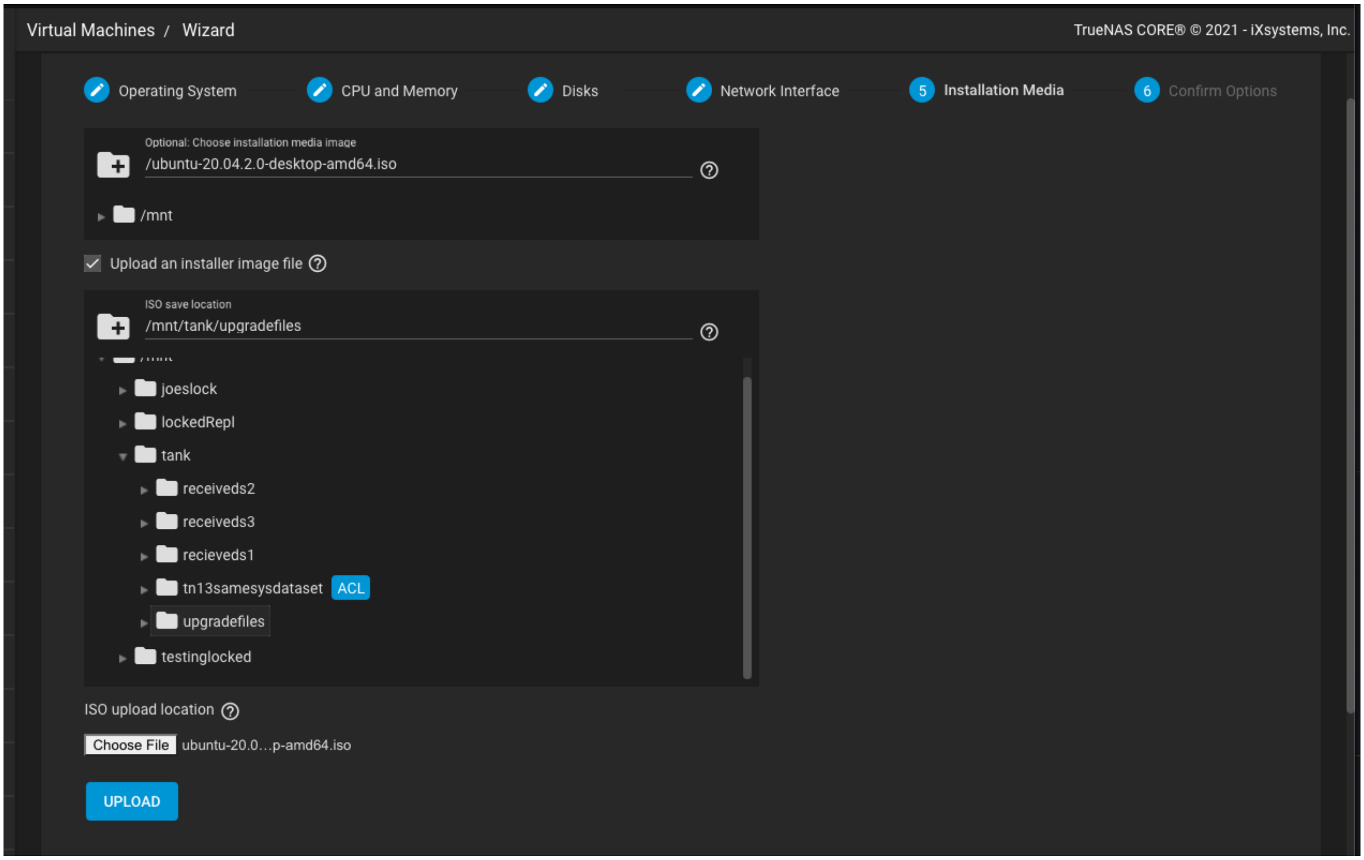


Adapter Type *
Intel e82585 (e1000)

Mac Address
00:a0:98:5f:ff:ed

Attach NIC *
lagg0

6. Set *Upload an installer image file* to see additional options. Select an *ISO save location* on the TrueNAS system. Now click *Choose File* and browse to the OS installation .iso. Click *UPLOAD* and wait for the process to finish (this can take some time). Click *NEXT*.



Optional: Choose installation media image: /ubuntu-20.04.2.0-desktop-amd64.iso

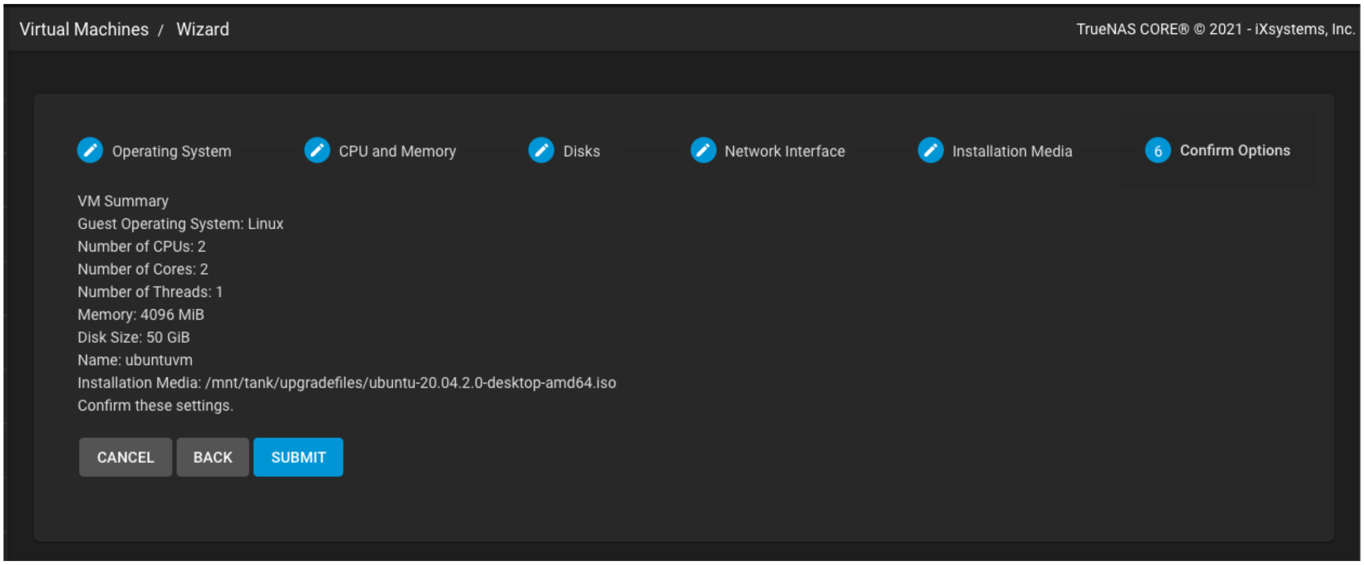
☑ Upload an installer image file

ISO save location: /mnt/tank/upgradefiles

ISO upload location

Choose File ubuntu-20.0…p-amd64.iso

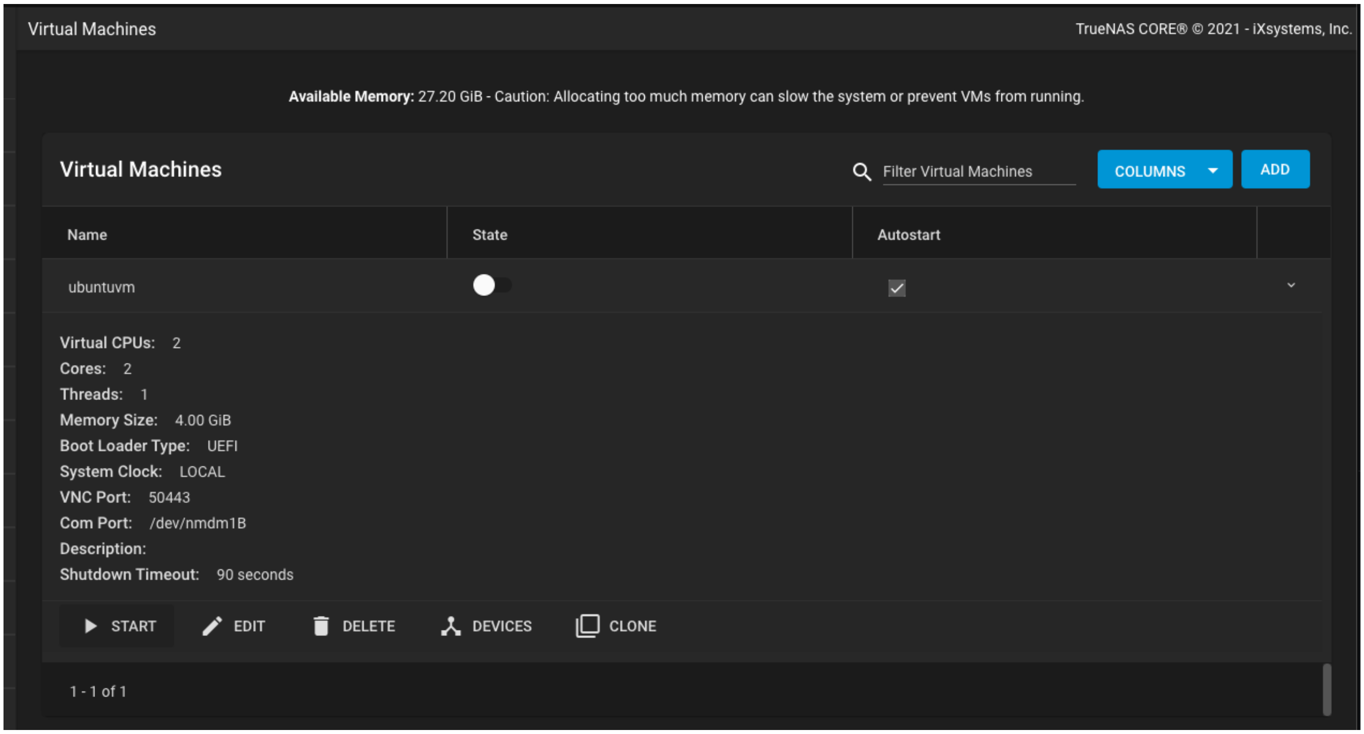
7. Confirm the VM configuration is correct and click *SUBMIT*.



VM Summary
Guest Operating System: Linux
Number of CPUs: 2
Number of Cores: 2
Number of Threads: 1
Memory: 4096 MiB
Disk Size: 50 GiB
Name: ubuntuvm
Installation Media: /mnt/tank/upgradefiles/ubuntu-20.04.2.0-desktop-amd64.iso
Confirm these settings.

Accessing a Virtual Machine

1. Go to **Virtual Machines** and click **>** next to the newly created VM. Click *START*.



Virtual Machines

TrueNAS CORE® © 2021 - iXsystems, Inc.

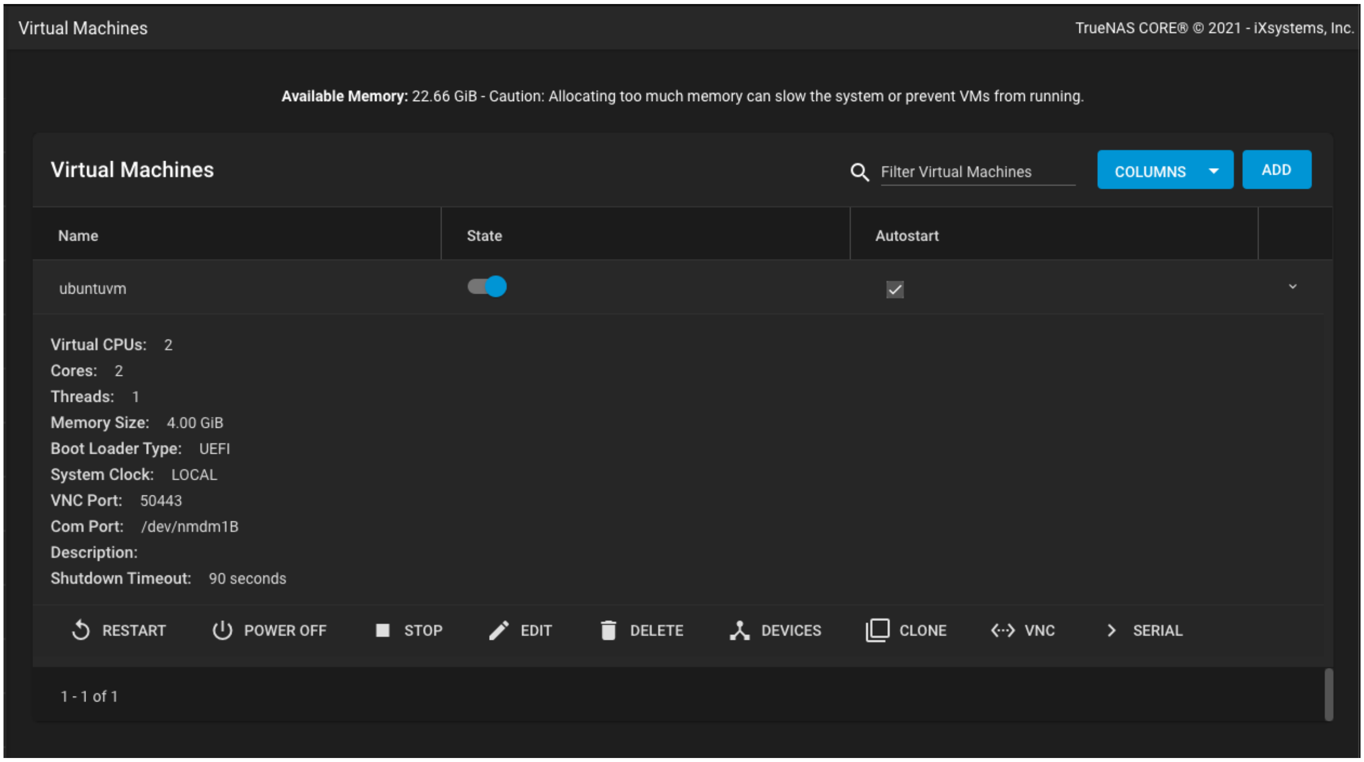
Available Memory: 27.20 GiB - Caution: Allocating too much memory can slow the system or prevent VMs from running.

Virtual Machines

Name	State	Autostart
ubuntuvm	○	☑

Virtual CPUs: 2
Cores: 2
Threads: 1
Memory Size: 4.00 GiB
Boot Loader Type: UEFI
System Clock: LOCAL
VNC Port: 50443
Com Port: /dev/nmdm1B
Description:
Shutdown Timeout: 90 seconds

2. When the VM **State** changes to **up**, click *VNC* to see the VM display.



Virtual Machines

TrueNAS CORE® © 2021 - iXsystems, Inc.

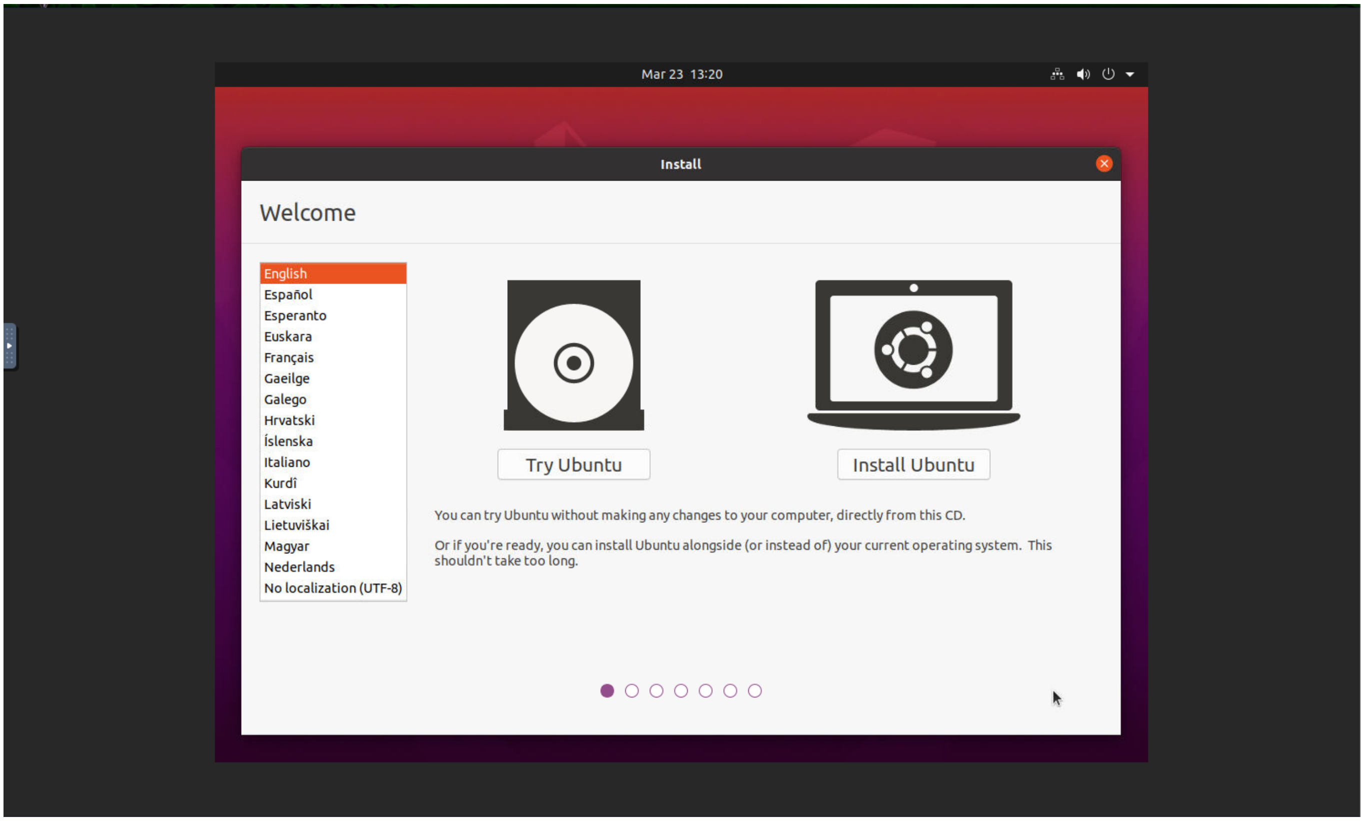
Available Memory: 22.66 GiB - Caution: Allocating too much memory can slow the system or prevent VMs from running.

Virtual Machines

Name	State	Autostart
ubuntuvm	●	☑

Virtual CPUs: 2
Cores: 2
Threads: 1
Memory Size: 4.00 GiB
Boot Loader Type: UEFI
System Clock: LOCAL
VNC Port: 50443
Com Port: /dev/nmdm1B
Description:
Shutdown Timeout: 90 seconds

Because this example used an Ubuntu .iso , the Ubuntu installation screen is shown.



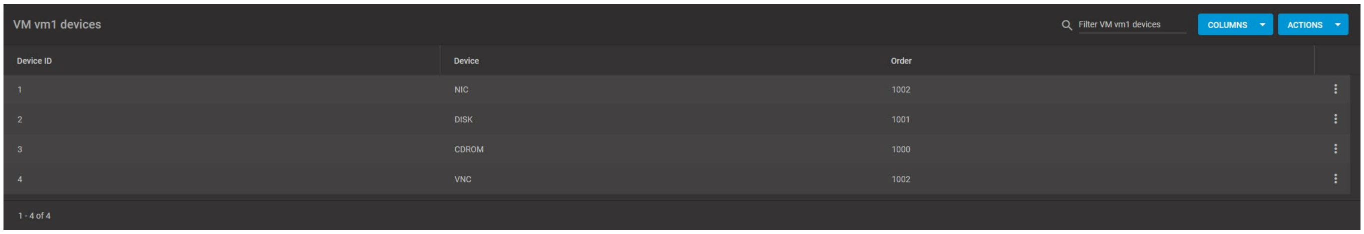
Welcome

You can try Ubuntu without making any changes to your computer, directly from this CD.

Or if you're ready, you can install Ubuntu alongside (or instead of) your current operating system. This shouldn't take too long.

From here, install the OS as normal.

3. When the OS install completes, go back to **Virtual Machines**, toggle the *State*, and click *DEVICES*.



VM vm1 devices

Device ID	Device	Order
1	NIC	1002
2	DISK	1001
3	CDROM	1000
4	VNC	1002

1 - 4 of 4

Find the **CDROM** entry and click □ > *Delete* to remove it. This removes the installation .iso from the VM and allows it to boot into the full OS the next time the VM activates.

2 - Accounts

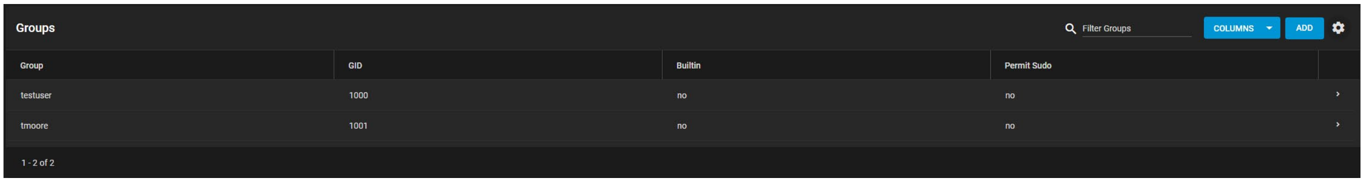
2.1 - Groups

- View Existing Groups
  - Add a New Group
  - Group Member Management

Using groups in TrueNAS can be an efficient way of managing permissions for many similar user accounts. See Users for managing users. The interface provides management of UNIX-style groups. If the network uses a directory service, import the existing account information using the instructions in Active Directory.

View Existing Groups

To see saved groups, go to **Accounts > Groups**



Groups

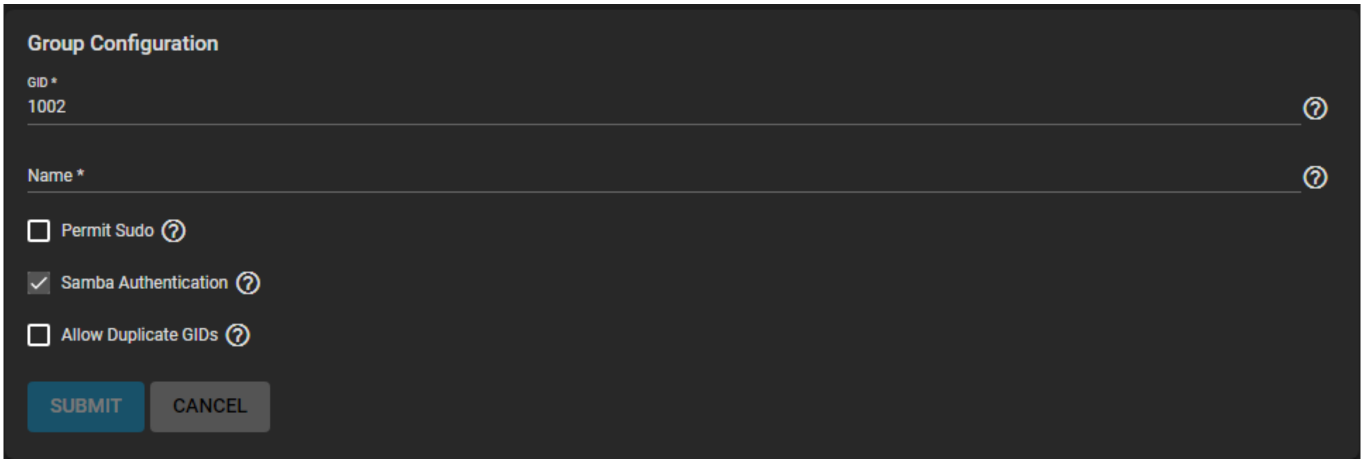
Group	GID	Builtin	Permit Sudo
testuser	1000	no	no
tmoore	1001	no	no

1 - 2 of 2

By default, groups built in to the system are hidden. To see built-in groups, click settings and *SHOW*.

Add a New Group

To create a new group, go to **Accounts > Groups** and click *ADD*.



Group Configuration

GID * 1002

Name *

□ Permit Sudo

☑ Samba Authentication

□ Allow Duplicate GIDs

Each group is assigned a Group ID (*GID*). Enter a number above *1000* for a group with user accounts. The GID cannot be changed later. Groups used by a system service must have an ID that matches the default port number used by the service.

Next, enter a descriptive group *Name*. Group names cannot begin with a hyphen (`-`) or contain a space, tab, or these characters: `, : + & # % ^ ( ) ! @ ~ * ? < > =`.

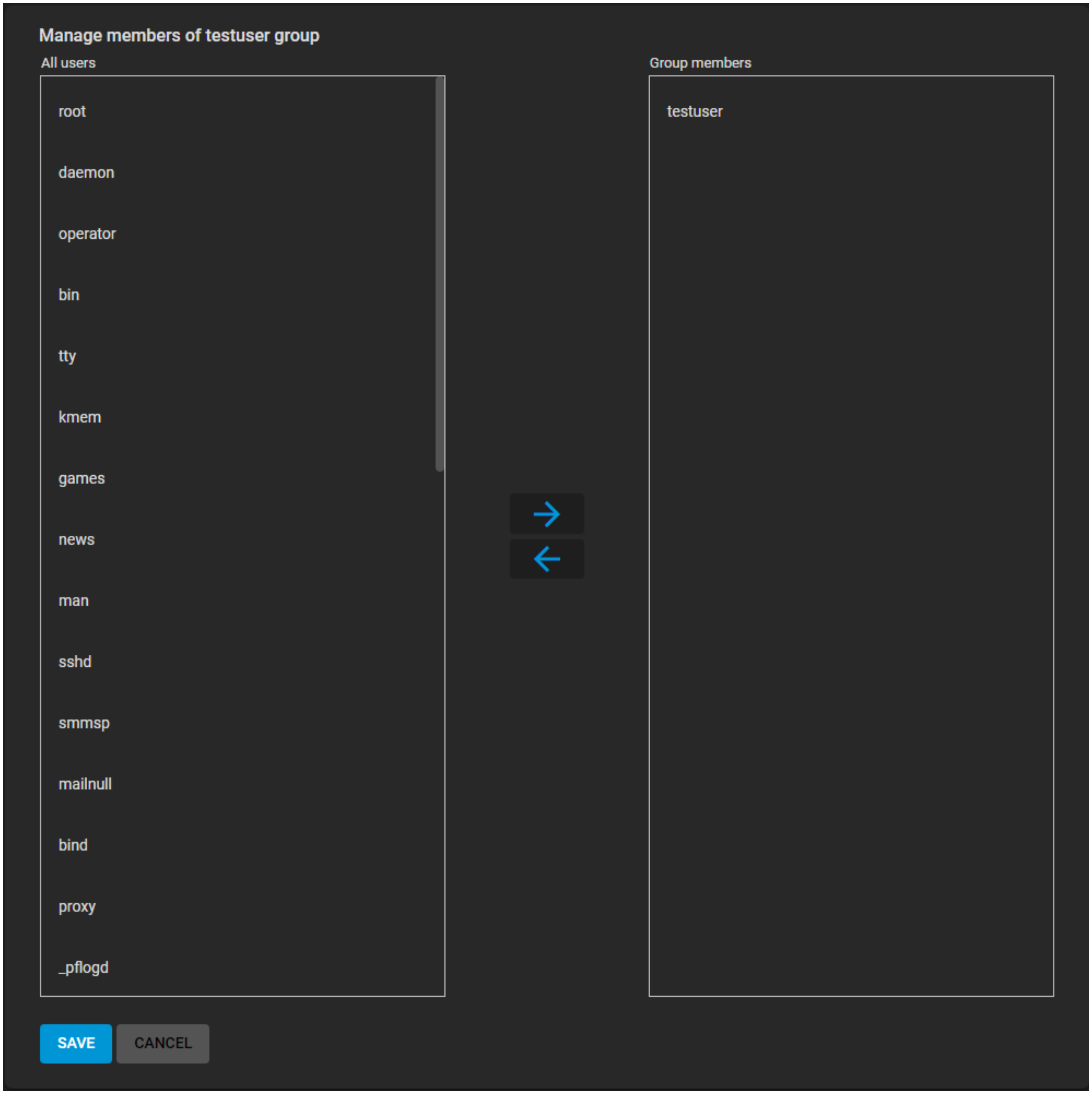
By default, the *Permit Sudo* option is unset. Setting allows group members to act as the root account by using sudo. A common security practice is to leave this disabled.

The option **Samba Authentication** is set by default. This allows group members to be used for SMB permissions and authentication.

Finally, *Allow Duplicate GIDs* allows setting a duplicate group ID, but can greatly complicate system configurations. Leaving this option unset is recommended.

Group Member Management

Register user accounts to a group to simplify permissions and access to large numbers of user accounts. To manage group membership, go to **Accounts > Groups**, click the navigate_next for a group, and click group **MEMBERS**:



Manage members of testuser group

All users

root
daemon
operator
bin
tty
kmem
games
news
man
sshd
smmsp
mailnull
bind
proxy
_pflogd

Group members

testuser

To add user accounts to the group, select them in **All users** and click □. Select multiple users by holding `CTRL` while clicking each entry.

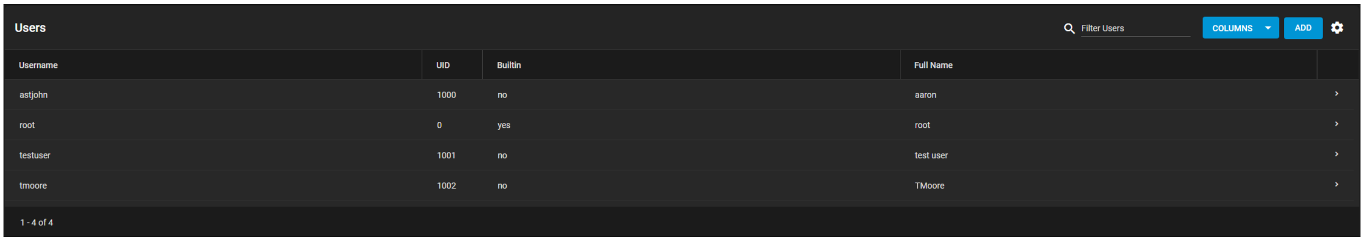
2.2 - Users

In TrueNAS, user accounts allow flexibility for accessing shared data. A common practice is to create users and assign them to groups . This allows for efficient permissions tuning for large numbers of users.

> Only the *root* user account can log in to the TrueNAS web interface.

When the network uses a directory service, import the existing account information using the instructions in Directory Services . Using Active Directory requires setting Windows user passwords inside Windows.

To see user accounts, go to **Accounts > Users**.



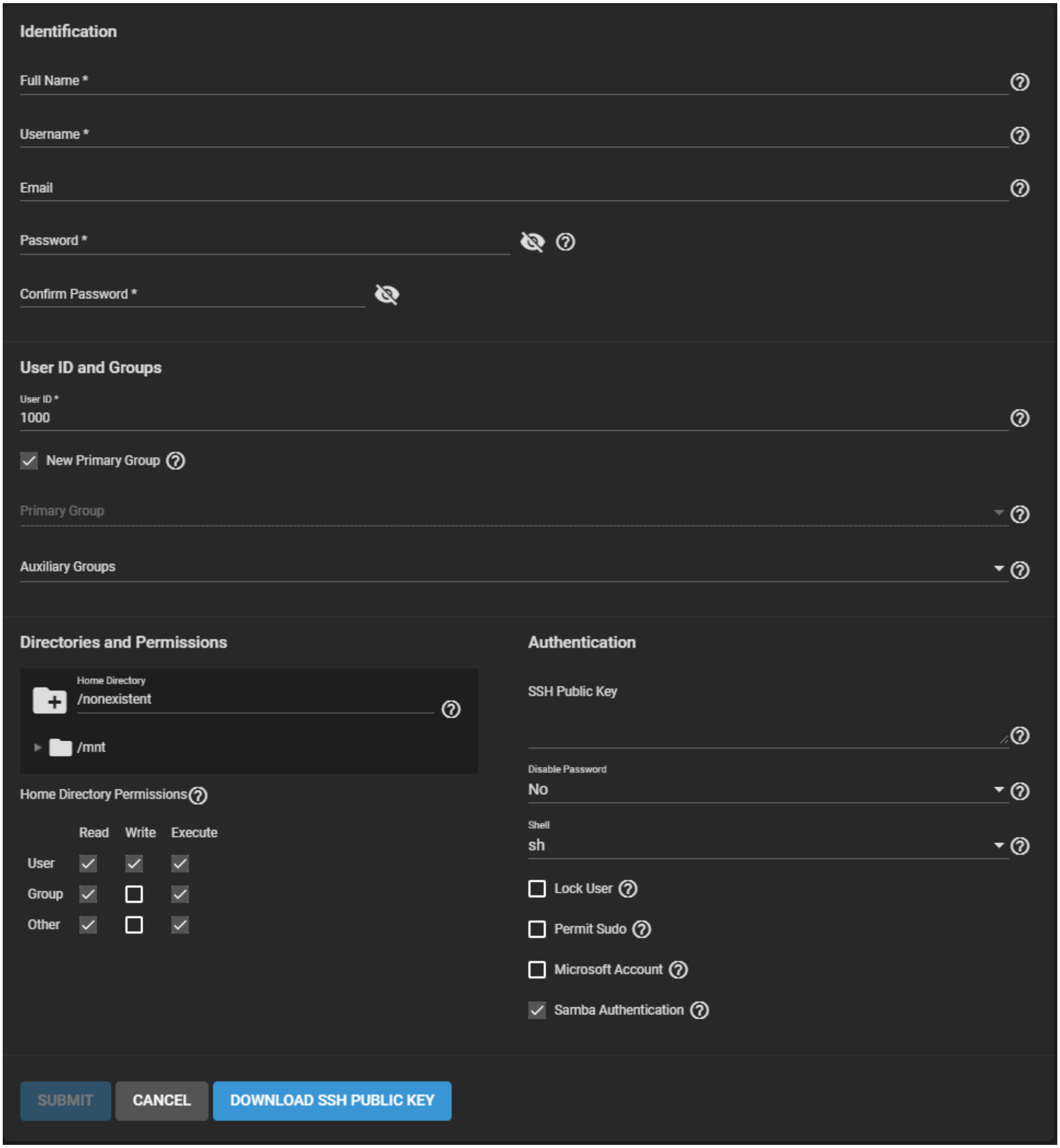
Username	UID	Builtin	Full Name
astjohn	1000	no	aaron
root	0	yes	root
testuser	1001	no	test user
tmoore	1002	no	TMoore

1 - 4 of 4

TrueNAS hides all built-in users by default. To see all built-in users, click settings and **SHOW**.

Creating User Accounts

To create a new user, go to **Accounts > Users** and click *ADD*.



Identification

Full Name *

Username *

Email

Password *

Confirm Password *

User ID and Groups

User ID *
1000

☑ New Primary Group

Primary Group

Auxiliary Groups

Directories and Permissions

Home Directory
/nonexistent

/mnt

Home Directory Permissions

	Read	Write	Execute
User	☑	☑	☑
Group	☑	□	☑
Other	☑	□	☑

Authentication

SSH Public Key

Disable Password
No

Shell
sh

□ Lock User

□ Permit Sudo

□ Microsoft Account

☑ Samba Authentication

SUBMIT CANCEL DOWNLOAD SSH PUBLIC KEY

Account options are subdivided into groups of similar options.

⊙ **Identification**

Identification

Enter the *Full Name* of the user. A simplified *Username* is suggested from the *Full Name*, but can be overridden with your own choice.

An *Email* address can be associated with an user account.

Set and confirm a password for the user.

○

User ID and Groups

User ID and Groups

Next, a user ID must be set. TrueNAS automatically suggests the user ID, starting at *1000*. This suggestion can be changed if desired. It is recommended to use an ID of *1000* or more for non built-in users.

By default, TrueNAS creates a new primary group with the same name as the user. To instead add the user to an existing primary group, unset *New Primary Group* and select an existing group from the *Primary Group* drop-down. The user can be added to additional groups using the *Auxiliary Groups* drop-down.

○ Directories and Permissions

Directories and Permissions

When creating a user, the home directory path is set to /nonexistent . This does not create a home directory for the user. To set a home directory for the user, select a path using the file browser. If the directory exists and matches the user name, it is set as the user home directory. When the path does not end with a subdirectory matching the user name, a new subdirectory is created. The full path to the users home directory is shown here when editing a user.

Directly under the file browser, the home directory permissions can be set. TrueNAS default user accounts cannot have their permissions changed.

○ Authentication

Authentication

A public SSH key can be assigned to a user for key based authentication. Just paste the *public* key into the *SSH Public Key* field. If you are using an SSH public key, it is always a good idea to keep a backup of the key. Click *DOWNLOAD SSH PUBLIC KEY* to download the pasted key as a .txt file.

When *Disable Password* is *Yes*, the *Password* field becomes unavailable. Any existing password is removed from the account. The *Lock User* and *Permit Sudo* options are also removed. The account is then restricted from password-based logins for services. For example, disabling the password prevents using account credentials to log in to an SMB share or open an SSH session on the system. By default, *Disable Password* is *No*.

A specific shell can be set for the user from the *Shell* drop-down:

Shell	Description
csh	C shell for UNIX system interactions.
sh	Bourne shell
tcsh	Enhanced C shell that includes editing and name completion.
bash	Bourne Again shell for the GNU operating system.
ksh93	Korn shell that incorporates features from both *csh* and *sh*.
mksh	MirBSD Korn Shell
rbash	Restricted bash
rzsh	Restricted zsh
scponly	scponly restricts the user's SSH usage to only the `scp` and `sftp` commands.
zsh	Z shell
git-shell	restricted git shell
nologin	Use when creating a system account or to create a user account that can authenticate with shares but which cannot log in to the TrueNAS system using `ssh`.

Setting *Lock User* disables all password-based functionality for this account until the option is unset.

Permit Sudo allows this account to act as the system administrator using the `sudo` command. For better security, leave this option disabled.

When the user account is going to be using a *Windows 8* or newer client to access data stored on TrueNAS, set *Microsoft Account*. This enables additional authentication methods available from those operating systems.

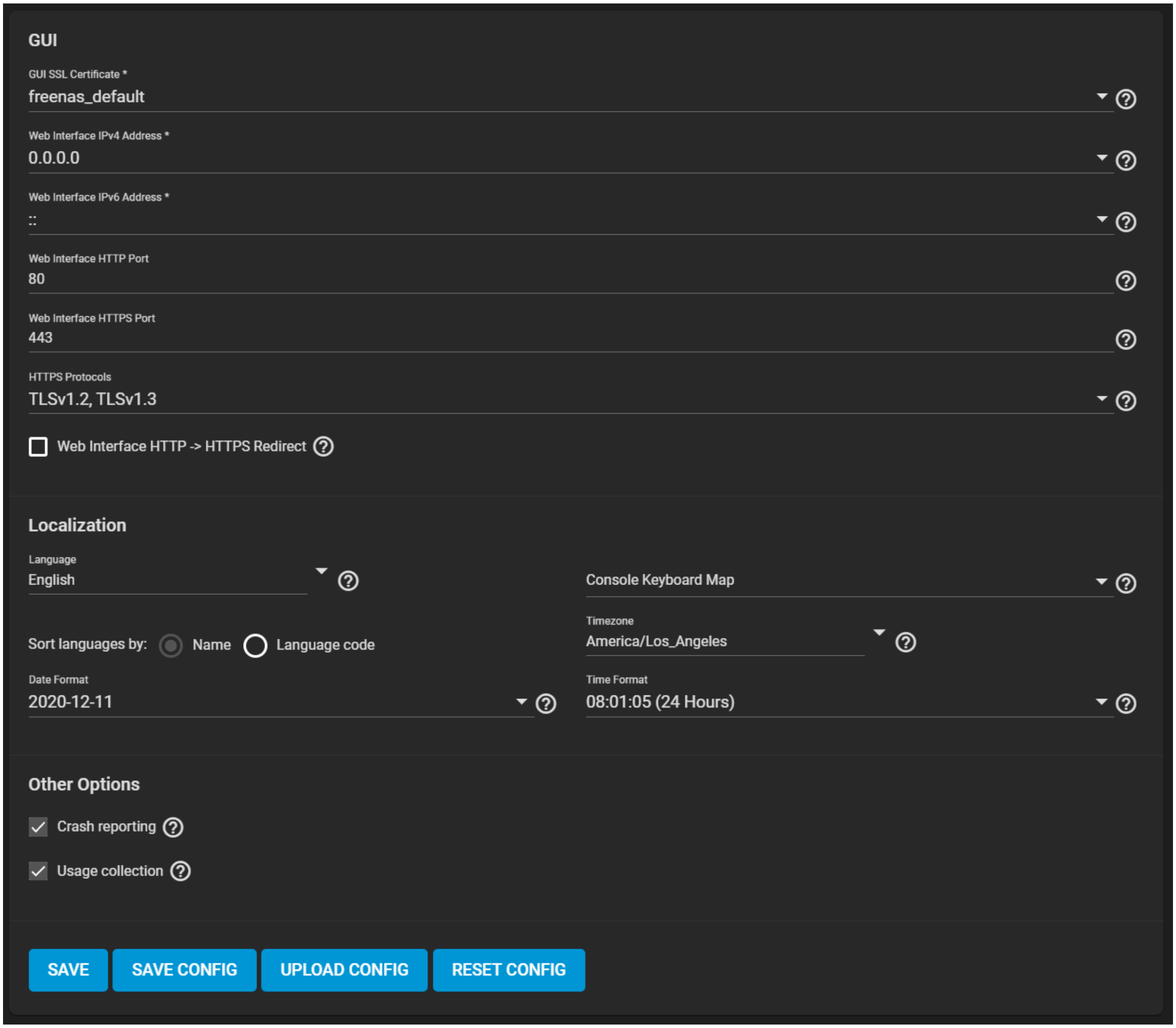
By default, *Samba Authentication* is enabled. This allows using the account credentials to access data shared with SMB.

3 - System

3.1 - General

3.1.1 - Settings

TrueNAS has numerous settings contained inside **System > General**. These allow a wide range of system customization, from changing the web interface address, localization options, and data collection to SED, console, and storage options.



GUI

GUI SSL Certificate *
freenas_default

Web Interface IPv4 Address *
0.0.0.0

Web Interface IPv6 Address *
::

Web Interface HTTP Port
80

Web Interface HTTPS Port
443

HTTPS Protocols
TLSv1.2, TLSv1.3

□ Web Interface HTTP -> HTTPS Redirect

Localization

Language
English

Console Keyboard Map

Sort languages by: ● Name ○ Language code

Timezone
America/Los_Angeles

Date Format
2020-12-11

Time Format
08:01:05 (24 Hours)

Other Options

☑ Crash reporting

☑ Usage collection

GUI

Name	Description
GUI SSL Certificate	The system uses a self-signed certificate to enable encrypted web interface connections. To change the default certificate, select a different certificate that was created or imported in the **Certificates** menu.

Web Interface IPv4 Address	Choose a recent IP address to limit the usage when accessing the administrative GUI. The built-in HTTP server binds to the wildcard address of 0.0.0.0 (any address) and issues an alert if the specified address becomes unavailable.
Web Interface IPv6 Address	Choose a recent IPv6 address to limit the usage when accessing the administrative GUI. The built-in HTTP server binds to the wildcard address of 0.0.0.0 (any address) and issues an alert if the specified address becomes unavailable.
Web Interface HTTP Port	Allow configuring a non-standard port to access the GUI over HTTP. Changing this setting might require changing a Firefox configuration setting.
Web Interface HTTPS Port	Allow configuring a non-standard port to access the GUI over HTTPS.
HTTPS Protocols	Cryptographic protocols for securing client/server connections. Select which Transport Layer Security (TLS) versions TrueNAS can use for connection security.
Web Interface HTTP -> HTTPS Redirect	Redirect HTTP connections to HTTPS. A GUI SSL Certificate is required for HTTPS. Activating this also sets the HTTP Strict Transport Security (HSTS) maximum age to 31536000 seconds (one year). This means that after a browser connects to the web interface for the first time, the browser continues to use HTTPS and renews this setting every year.

Localization

Name	Description
Language	Select a language from the drop-down menu.
Date Format	Choose a date format.
Console Keyboard Map	Select a keyboard layout.
Timezone	Select a time zone.
Time Format	Choose a time format.

Other Options

Name	Description
Crash reporting	Send failed HTTP request data which can include client and server IP addresses, failed method call tracebacks, and middleware log file contents to iXsystems.
Usage collection	Enable sending anonymous usage statistics to iXsystems.

After making any changes, click **SAVE**. Changes to any of the web interface fields can interrupt web interface connectivity while the new settings are applied.

This screen also contains these buttons:

⊙ SAVE CONFIG

Saves a backup copy of the current configuration database in the format *hostname-version-architecture*. This file is downloaded to the computer accessing the web interface. Saving the configuration after making any configuration changes is highly recommended.

See System Config Backups for more details about backing up the system configuration.

○ UPLOAD CONFIG

Changes the system configuration settings. Browse to a previously saved configuration file to restore that configuration.

> This can cause unexpected changes to system settings. Investigate both the current system settings and the settings stored in the other configuration file before uploading a config file to TrueNAS.

○ RESET CONFIG

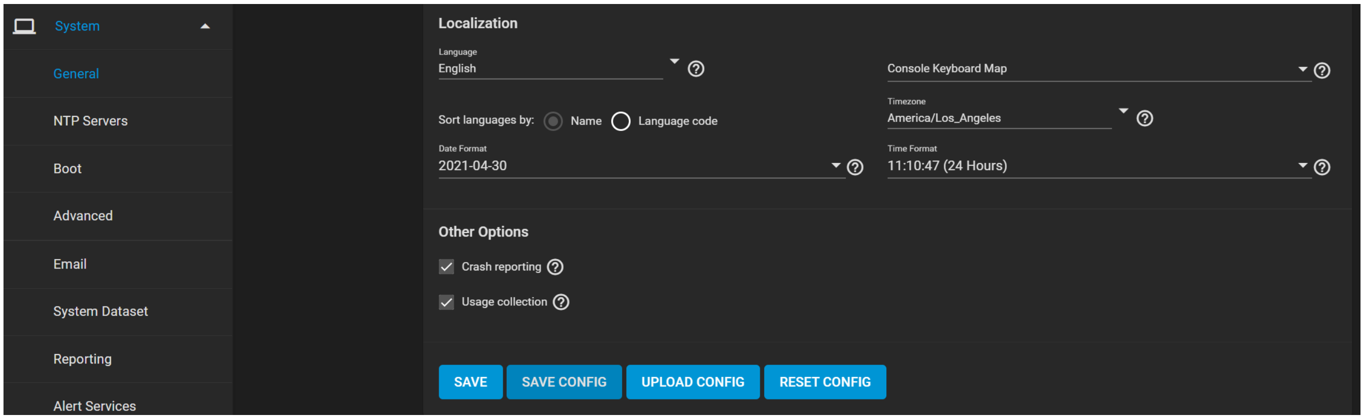
Reset the configuration database to the default base version. This does not delete user SSH keys or any other data stored in a user home directory. Since configuration changes stored in the configuration database are erased, this option is useful when correcting mistakes or returning a test system to the original configuration.

3.1.2 - System Config Backups

We highly recommend backing up the system configuration regularly. Doing so preserves settings when migrating, restoring, or fixing the system if it runs into any issues. Save the configuration file each time the system configuration changes.

Manual Backup

To back up the system configuration, go to **System > General** and click *SAVE CONFIG*, then enter your password.



Localization

Language: English

Console Keyboard Map

Sort languages by: ● Name ○ Language code

Timezone: America/Los_Angeles

Date Format: 2021-04-30

Time Format: 11:10:47 (24 Hours)

Other Options

☑ Crash reporting

☑ Usage collection

> The configuration file contains sensitive data about the TrueNAS system. Ensure that it is stored somewhere safe.

Automatic Backup

TrueNAS automatically backs up the configuration database to the system dataset every morning at 3:45 (relative to system time settings). However, this backup does not occur if the system is shut down at that time. When the system dataset is stored on the boot pool and the boot pool becomes unavailable, the backup also loses availability.

> SSH keys are not stored in the configuration database and must be backed up separately. System host keys are files with names beginning with *ssh_host_* in /usr/local/etc/ssh/ . The root user keys are stored in /root/.ssh .

Passwords

The system backup affects two types of passwords: hashed and encrypted:

⊙ **Hashed**

TrueNAS stores user account passwords for the base operating system as hashed values. The system will save them in the system configuration backup, so they do not need to be encrypted to be secure.

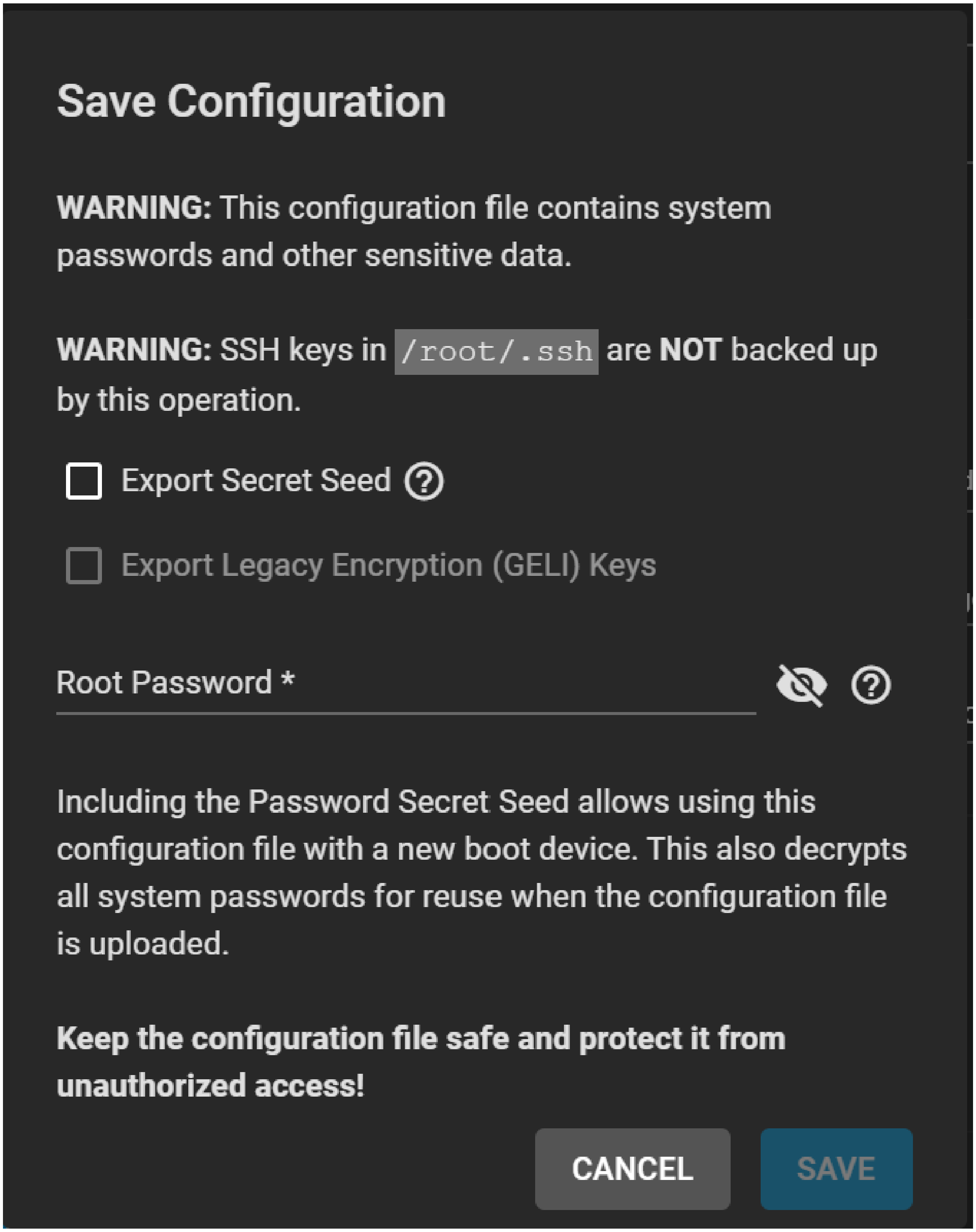
○ **Encrypted**

The system will save other passwords, like iSCSI CHAP passwords, Active Directory bind credentials, and cloud credentials in an encrypted form to prevent them from being visible as plain text in the saved system configuration. The key or seed for this encryption is normally stored only on the operating system device.

There are two options after clicking *SAVE CONFIG*:

1. *Export Password Secret Seed* includes encrypted passwords in the configuration file. This allows the configuration file to be restored to a different operating system device where the decryption seed is not already present. Users must physically secure configuration backups containing the seed to prevent unauthorized access or password decryption.
2. *Export Legacy Encryption (GELI) Keys* includes encrypted legacy encryption keys in the configuration file.

Users can restore the encryption keys by uploading the configuration file to the system using *UPLOAD CONFIG*.



Save Configuration

WARNING: This configuration file contains system passwords and other sensitive data.

WARNING: SSH keys in `/root/.ssh` are **NOT** backed up by this operation.

□ Export Secret Seed

□ Export Legacy Encryption (GELI) Keys

Root Password *

Including the Password Secret Seed allows using this configuration file with a new boot device. This also decrypts all system passwords for reuse when the configuration file is uploaded.

Keep the configuration file safe and protect it from unauthorized access!

Backup Contents

Backup configs store information for accounts, network, services, and system settings, as well as settings for tasks and virtual machines.
Backup configs also index ID’s and credentials for account, network, and system services. Users can view the contents of the backup config using database viewing software like [SQLite DB Browser](#).

Resetting and Restoring Configurations

Reset Configuration

Users can reset their system's configuration to factory settings by going to **System > General** and clicking *RESET CONFIG*.

Save the system's current configuration before resetting the configuration.

If you do not save the system configuration before resetting it, you may lose any data that was not backed up and will not be able to revert back the previous settings.

After resetting the system configuration, the system will restart and you will have to set a new login password.

Restore Configuration

Users can restore configurations by going to **System > General** and clicking *UPLOAD CONFIG*.

When uploading a config, users can select any previously saved config files for their system.

3.1.3 - Managing TLS Ciphers

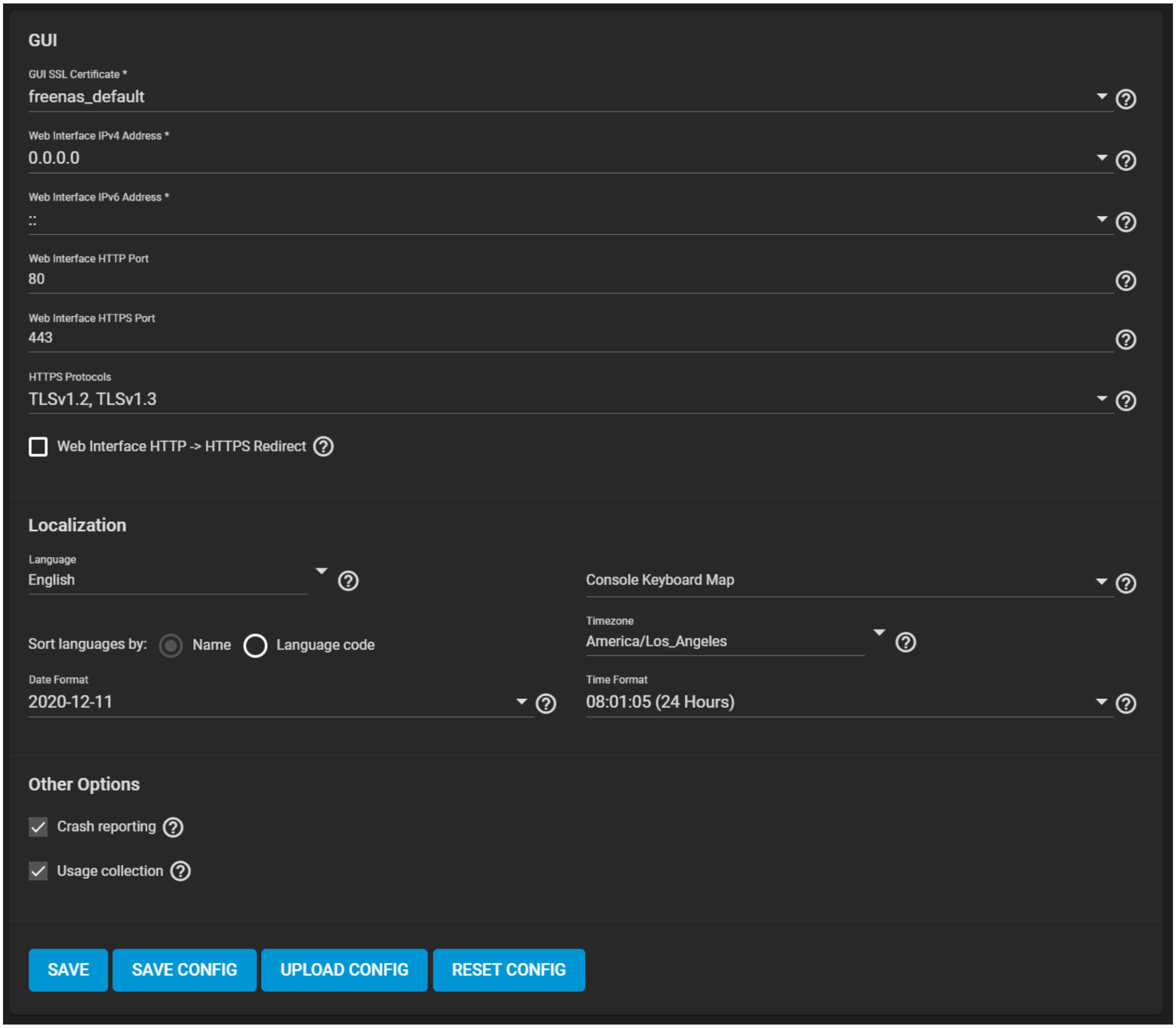
- - [Allowing or Restricting TLS Ciphers](#)

This feature was introduced in TrueNAS 12.0

TrueNAS accepts different Transport Layer Security (TLS) cipher suites for secure connections to the web interface. For best security, only use [TLS 1.2](#) or newer. By default, all options are available if you need to adjust this setting to match your particular network environment or security concerns.

Allowing or Restricting TLS Ciphers

Log in to the web interface and go to **System > General**:



GUI

GUI SSL Certificate *: freenas_default

Web Interface IPv4 Address *: 0.0.0.0

Web Interface IPv6 Address *: ::

Web Interface HTTP Port: 80

Web Interface HTTPS Port: 443

HTTPS Protocols: TLSv1.2, TLSv1.3

☐ Web Interface HTTP -> HTTPS Redirect

Localization

Language: English

Console Keyboard Map

Sort languages by: ● Name ○ Language code

Timezone: America/Los_Angeles

Date Format: 2020-12-11

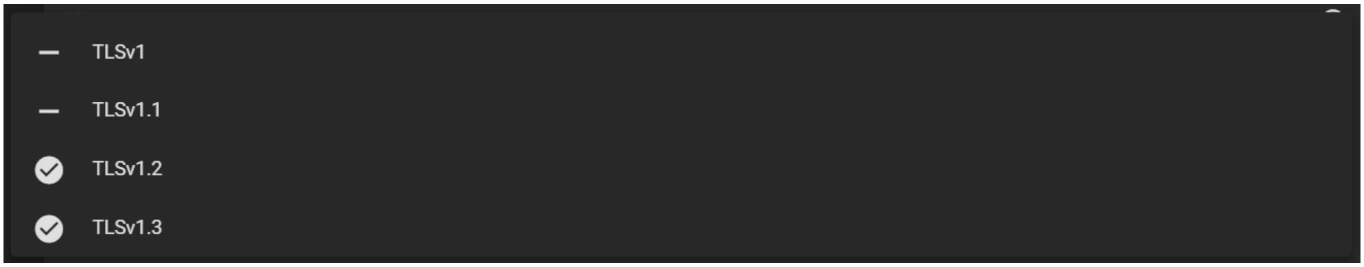
Time Format: 08:01:05 (24 Hours)

Other Options

☑ Crash reporting

☑ Usage collection

Click on *HTTPS Protocols* to open a dropdown menu with the various cipher suites.



— TLSv1

— TLSv1.1

✓ TLSv1.2

✓ TLSv1.3

⊙ TLSv1

Introduced in 1999, TLSv1 provides Internet communication security using encryption and other secure messaging techniques. While not officially deprecated, this suite has been considered obsolete since 2008 and replaced by newer versions of the suite. For security reasons, users are encouraged to avoid enabling this suite unless required by the network environment.

○ TLSv1.1

Introduced in 2006, TLSv1.1 is a small revision of v1.0 with additional protections against CBC attacks. While not officially deprecated, this suite has been considered obsolete since 2008 and replaced by newer versions of the suite. For security reasons, users are encouraged to avoid enabling this suite unless required by the network environment.

○ TLSv1.2

Introduced in 2008, TLSv1.2 greatly increases the protocol's ability to handle cryptographic algorithms. This represents a major step forward in security effectiveness and resulted in the "soft" deprecation of TLS versions 1.0 and 1.1.

○ TLSv1.3

Introduced in 2018, TLSv1.3 represents another major improvement to the protocol. Legacy or insecure encryption algorithms are removed, additional encryption for handshake messages added, and authentication and key exchange concepts are separated.

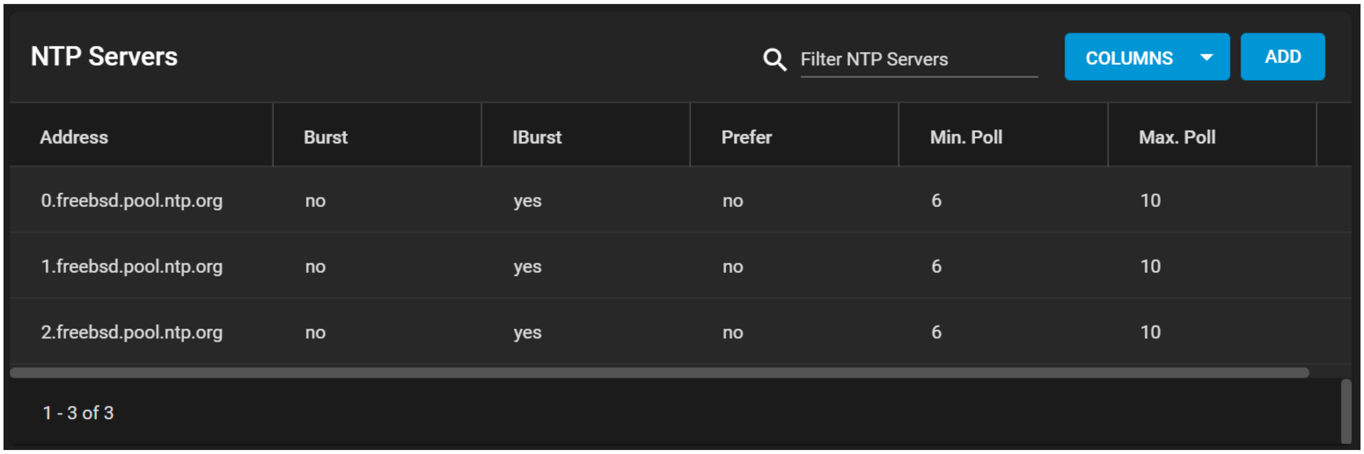
Unsetting a cipher restricts its use in TrueNAS. After enabling or disabling a cipher, the TrueNAS system must be rebooted.

3.2 - NTP Servers

Network Time Protocol (NTP) servers sync the local system time with an accurate external reference. By default, new installations use several existing NTP servers. TrueNAS supports adding custom NTP servers.

Adding a Custom NTP Server

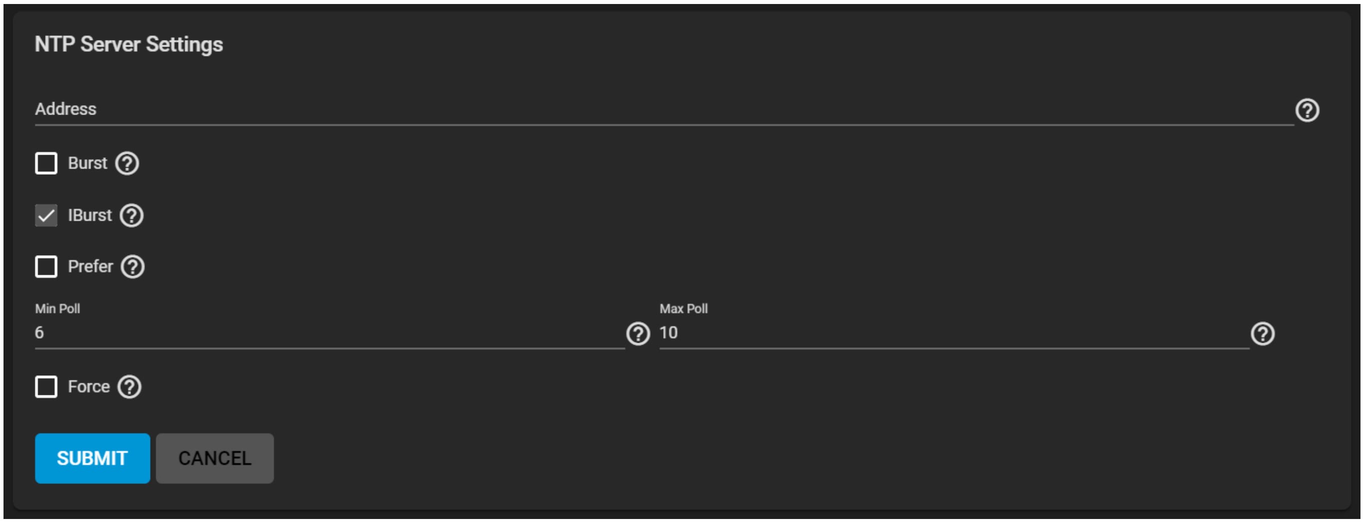
Go to **System > NTP Servers** to view, edit, or remove NTP Servers:



Address	Burst	IBurst	Prefer	Min. Poll	Max. Poll
0.freebsd.pool.ntp.org	no	yes	no	6	10
1.freebsd.pool.ntp.org	no	yes	no	6	10
2.freebsd.pool.ntp.org	no	yes	no	6	10

1 - 3 of 3

Several default servers are listed. To register a new server, click *ADD* and configure the options.



NTP Server Settings

Address

□ Burst

☑ IBurst

□ Prefer

Min Poll: 6

Max Poll: 10

□ Force

NTP Server Settings

Name	Description
Address	Enter the hostname or IP address of the NTP server.
Burst	Recommended when Max. Poll is greater than *10*. Only use on personal NTP servers or those under direct control. Do not enable when using public NTP servers.
IBurst	Speeds up the initial synchronization (seconds instead of minutes).
Prefer	Should only be used for highly accurate NTP servers such as those with time monitoring hardware.
Min Poll	The minimum polling interval, in seconds, as a power of 2. For example, 6 means 2^6, or 64 seconds. The default is 6, minimum value is 4.
Max Poll	The maximum polling interval, in seconds, as a power of 2. For example, 10 means 2^10, or 1,024 seconds. The default is 10, maximum value is 17.

Force	Forces the addition of the NTP server, even if it is currently unreachable.

3.3 - Boot

3.3.1 - Boot Screen

TrueNAS supports a ZFS feature known as boot environments. These are snapshot clones that TrueNAS can boot into. Only one boot environment can be used for booting.

> **How does this help me?** expand □
> A boot environment allows rebooting into a specific point in time and greatly simplifies recovering from system misconfigurations or other potential system failures. With multiple boot environments, the process of updating the operating system becomes a low-risk operation. The updater automatically creates a snapshot of the current boot environment and adds it to the boot menu before applying the update. If anything goes wrong during the update, the system administrator can boot TrueNAS into the previous environment to restore system functionality.

Go to **System > Boot** to see a boot environment list.

Managing Boot Environments

To view the list of boot environments on the system, go to **System > Boot**. Each boot environment entry contains this information:

- **Name**: the name of the boot entry as it appears in the boot menu.
- **Active**: indicates which entry boots by default if a boot environment is not active.
- **Created**: indicates the boot environment creation date and time.
- **Space**: shows boot environment size.
- **Keep**: indicates whether or not TrueNAS deletes this boot environment when a [system update](#) does not have enough space to proceed.

To access more options for a boot environment, click □ :

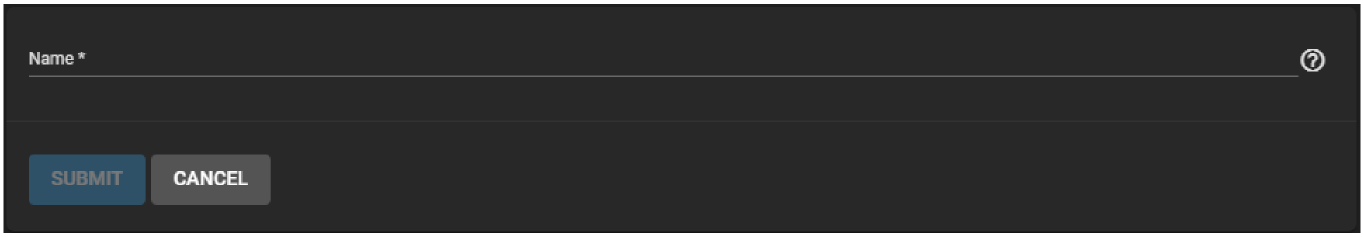
⊙ **Activate**
Only appears on entries which are not currently set to **Active**. Activating an environment means the system boots into the point of time saved in that environment the next time it is started. The status changes to **Reboot** and the current **Active** entry changes from **Now/Reboot** to **Now**, indicating that it is the currently booted environment but will not be used on next boot.
○ **Clone**
Copy the selected boot environment into a new entry. The clone *Name* only allows alphanumeric characters, dashes (-), underscores (_), and periods (.) are allowed.
○ **Rename**
Changes the boot environment name. Alphanumeric characters, dashes (-), underscores (_), and periods (.) are allowed.
○ **Delete**
Removes the highlighted entry and also removes that entry from the boot menu. The **default** and any **Active** entries cannot be deleted. Because an activated entry cannot be deleted, this button does not appear for the active boot environment. To delete a currently **Active** entry, first activate another entry.
○ **Keep**
Toggles whether or not the updater can prune (automatically delete) this boot environment if there is not enough space to proceed with the update.

Boot Actions

Click *ACTIONS* to:

⊙ **Add**

Make a new boot environment from the active environment:



Only alphanumeric characters, dashes (-), and underscores (_) are allowed in the *Name*. *Name* the new boot environment and click *SUBMIT*.

○ **Stats/Settings**
Display statistics for the operating system device: **condition**, **total** and **used size**, and **date and time** of the last scrub. By default, the operating system device is scrubbed every 7 days. To change the default, input a different number in the *Automatic scrub interval (in days)* field and click *UPDATE INTERVAL*.

○ **Boot Pool Status**
Shows the status of each device in the operating system device (boot-pool), including any read, write, or checksum errors.

○ **Scrub Boot Pool**
Perform a manual "scrub" (data integrity check) of the operating system device.

Changing Boot Environments

Sometimes, rolling back to an older boot environment can be useful. For example, if an update process doesn't go as planned, it is easy to roll back to a previous boot environment. TrueNAS automatically creates a boot environment when the system updates.

There are two different methods for changing the active boot environment: using the web interface and through a Command Line Interface (CLI)

⊙ **Web Interface**

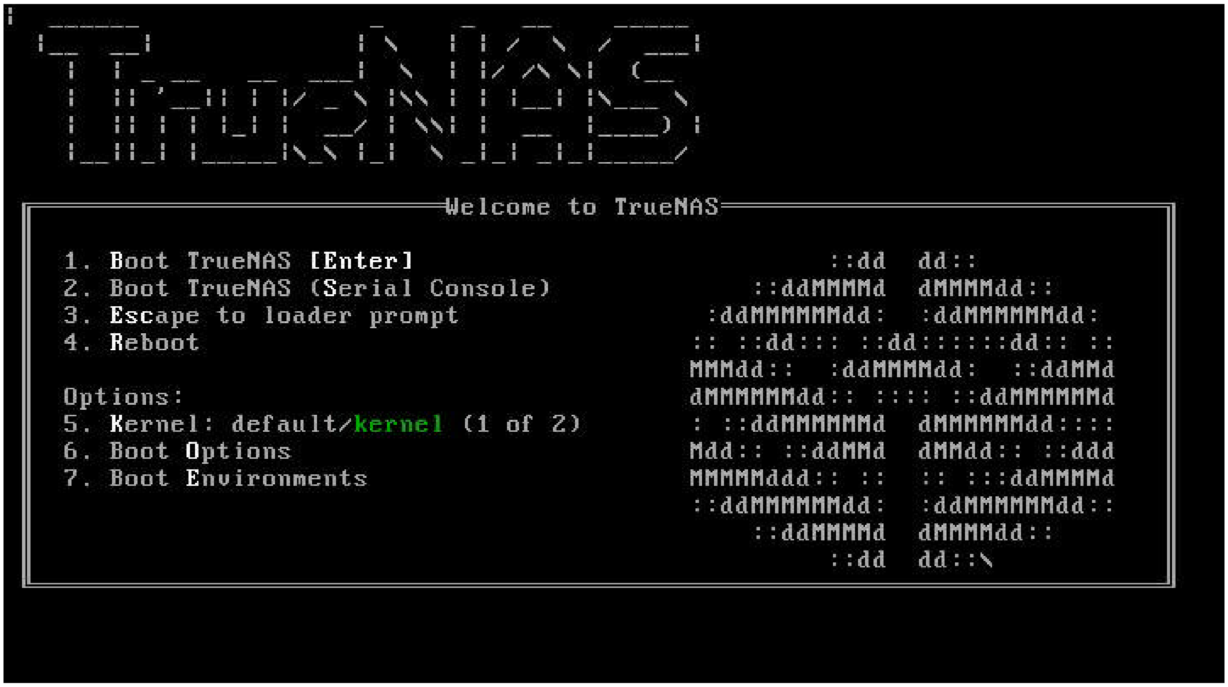
To activate a different boot environment, go to **System > Boot** and click more_vert for the desired boot environment. Next, click *Activate*. This boot environment shows **Reboot** in the **Active** column. This means the boot environment becomes active on the next system boot. The system configuration also changes to the state it was in when the boot environment was created.

○ **Command Line Interface**

If the web interface is inaccessible but physical access to the system is still possible, the boot environment can be changed at the welcome screen of the CLI.

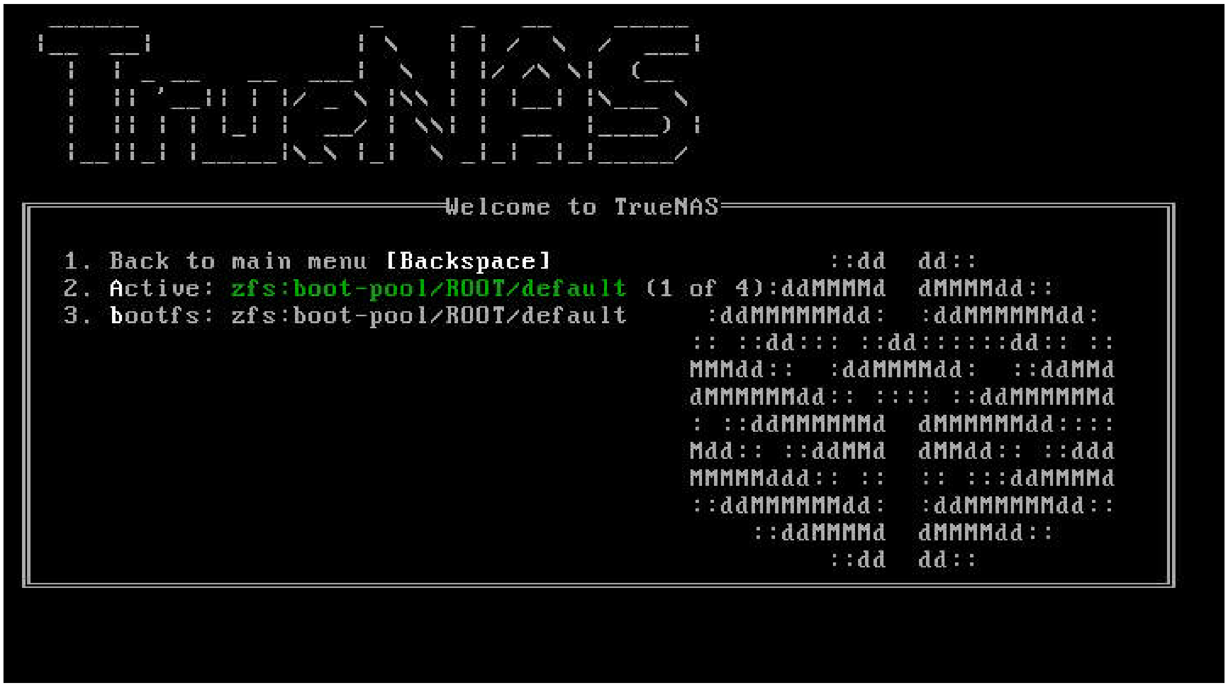
Reboot the system. When the welcome screen appears, press the key that corresponds with the option *Boot Environments*. In the image below, the key to select the *Boot Environments* option is `7`.

The *Boot Environments* options does not appear when no additional boot environments are present.



```
Welcome to TrueNAS

 1. Boot TrueNAS [Enter]                              ::dd  dd::
 2. Boot TrueNAS (Serial Console)                 ::dMMMMd  dMMMMdd::
 3. Escape to loader prompt                    :ddMMMMMMdd:  :ddMMMMMMdd:
 4. Reboot                                    :: ::dd::: ::dd:::::dd:: ::
                                              MMMdd::  :ddMMMMdd:  ::ddMMd
 Options:                                     dMMMMMMdd:: :::: ::ddMMMMMMd
 5. Kernel: default/kernel (1 of 2)           : ::ddMMMMMMd  dMMMMMMdd::::
 6. Boot Options                              Mdd:: ::ddMMd  dMMdd:: ::ddd
 7. Boot Environments                         MMMMMddd:: ::  :: :::ddMMMMd
                                              ::ddMMMMMMdd:  :ddMMMMMMdd::
                                                  ::ddMMMMd  dMMMMdd::
                                                       ::dd  dd::
```

After selecting the *Boot Environment* option, choose the new boot environment to activate. Press the corresponding key for the *Active:* option. In the picture below, the key is `2`.



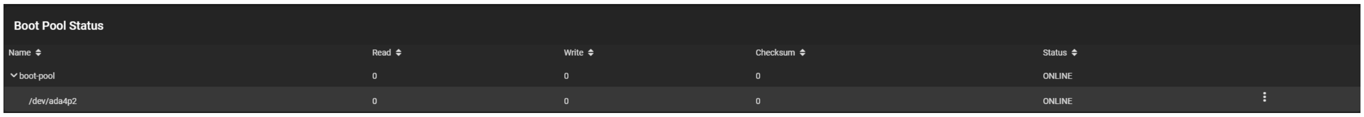
```
Welcome to TrueNAS

 1. Back to main menu [Backspace]                     ::dd  dd::
 2. Active: zfs:boot-pool/ROOT/default (1 of 4):ddMMMMd  dMMMMdd::
 3. bootfs: zfs:boot-pool/ROOT/default     :ddMMMMMMdd:  :ddMMMMMMdd:
                                          :: ::dd::: ::dd:::::dd:: ::
                                          MMMdd::  :ddMMMMdd:  ::ddMMd
                                          dMMMMMMdd:: :::: ::ddMMMMMMd
                                          : ::ddMMMMMMd  dMMMMMMdd::::
                                          Mdd:: ::ddMMd  dMMdd:: ::ddd
                                          MMMMMddd:: ::  :: :::ddMMMMd
                                          ::ddMMMMMMdd:  :ddMMMMMMdd::
                                              ::ddMMMMd  dMMMMdd::
                                                   ::dd  dd::
```

Press the key to cycle through existing boot environments. When the desired boot environment is selected, press `Backspace` to return to the welcome menu. Then, press `4` to reboot the system. The selected boot environment is used when the system reboots.

3.3.2 - Mirroring the Boot Pool

Adding a second storage device to the boot pool changes the configuration to a **Mirror**. This allows one of the devices to fail and the system still boots. If one of the two devices were to fail, that device is easily detached and replaced.

View the current boot pool status by going to **System > Boot > ACTIONS > Boot Pool Status**.



Boot Pool Status

Name	Read	Write	Checksum	Status
boot-pool	0	0	0	ONLINE
/dev/ada4p2	0	0	0	ONLINE

On this page you will find the list and status of each boot pool on the system. By default, this pool is named **boot-pool**.

When adding a second device to create a mirrored boot pool, consider these caveats:

- **Capacity** : The new device must have at least the same capacity as the existing device. Larger capacity devices can be added, but the mirror will only have the capacity of the smallest device. Different models of devices which advertise the same nominal size are not necessarily the same actual size. For this reason, adding another device of the same model of is recommended.

- **Device Type** : It is **strongly recommended** to use SSDs rather than USB devices when creating a mirrored boot pool.

Click □ on the boot device entry to see all possible actions. These are used to mirror the boot pool or maintain it later:

⊙ Attach

Add another disk to the pool. For the system boot pool, this is used to create a mirrored configuration. Click *Attach* and select the new *Member Disk*.

Use all disk space option expand □

This option controls the available capacity for the device. By default, the new device is partitioned to the same size as the existing device. When *Use all disk space* is enabled, the entire capacity of the new device is used.

If the original operating system device fails and is detached, the boot mirror changes to consist of just the newer device and grows to whatever capacity it provides. However, new devices added to this mirror must now be as large as the new capacity.

Click *SAVE* to attach the new device to the mirror.

○ Detach

Removes the device from the pool.

Removing devices from storage pools can result in data loss!

When the device is critical to the pool, the pool status changes to **Degraded** or even **Failed**. This is part of the disk replacement procedure.

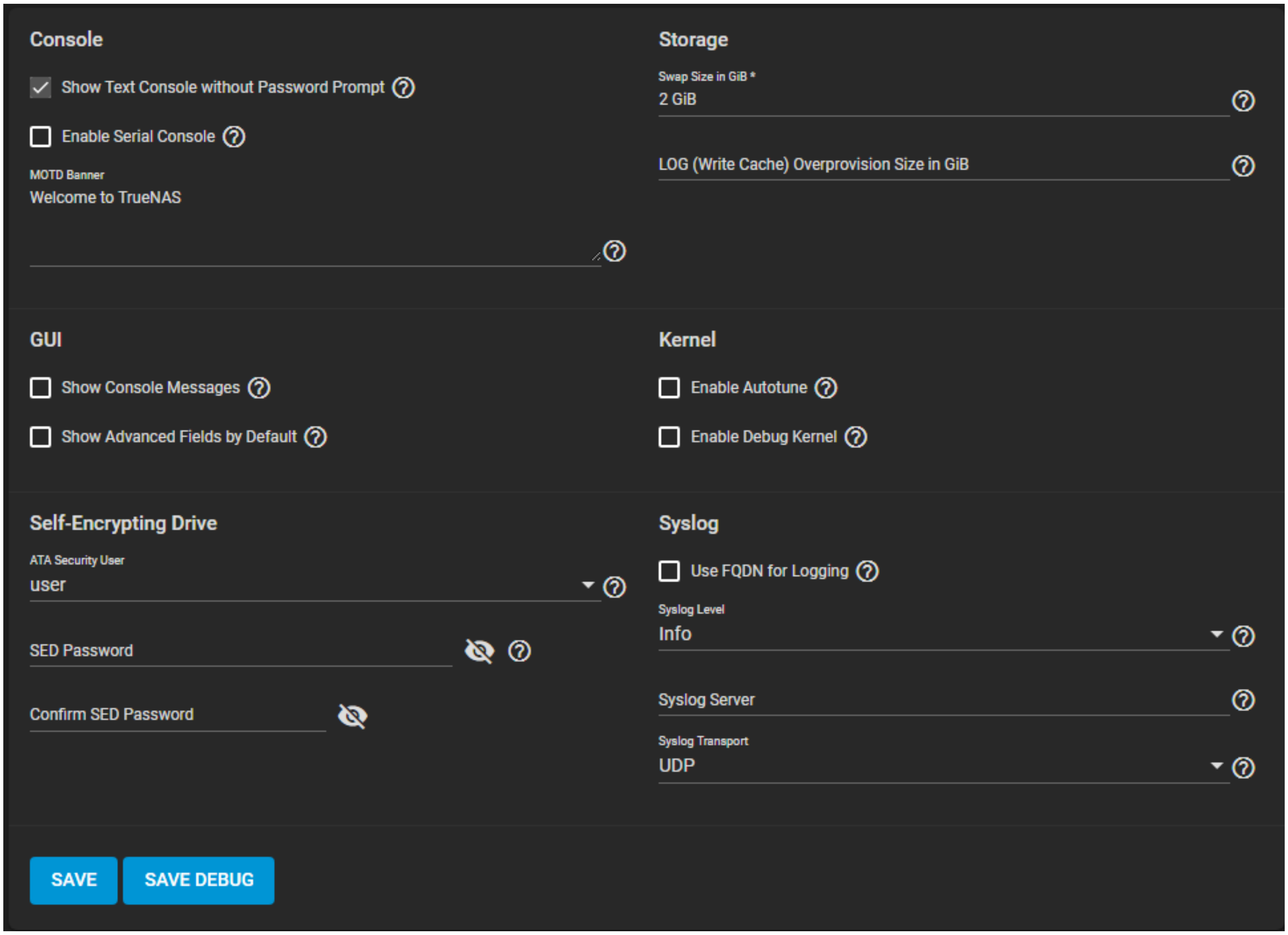
○ Replace

Integrates a new disk into the current location of this disk. Part of the disk replacement procedure. *Detach* the failed device, *Replace* and select the new *Member Disk*, and *Save* to rebuild the mirror.

3.4 - Advanced

System > Advanced contains more advanced options for configuring system settings.

> These options have reasonable defaults in place. Make sure you are comfortable with ZFS, FreeBSD, and system [configuration backup and restoration](#) before making any changes.



Console

☑ Show Text Console without Password Prompt

□ Enable Serial Console

MOTD Banner
Welcome to TrueNAS

Storage

Swap Size in GiB *
2 GiB

LOG (Write Cache) Overprovision Size in GiB

GUI

□ Show Console Messages

□ Show Advanced Fields by Default

Kernel

□ Enable Autotune

□ Enable Debug Kernel

Self-Encrypting Drive

ATA Security User
user

SED Password

Confirm SED Password

Syslog

□ Use FQDN for Logging

Syslog Level
Info

Syslog Server

Syslog Transport
UDP

Console

Name	Description
Show Text Console without Password Prompt	Unset to add a login prompt to the system before the console menu is shown.
Enable Serial Console	Do not set this if the Serial Port is disabled. *Serial Port* and *Serial Speed* options are visible when this is set.
Serial Port	When *Enable Serial Console* is set, the available serial port hex addresses are 0x2F8 or 0x3f8.
Serial Speeds	When *Enable Serial Console* is set, the available serial speeds that can be used by the serial port are 9600 bps, 19200 bps, 38400 bps, 57600 bps, or 115200bps.
MOTD Banner	The message to show when a user logs in with SSH.

Storage

Name	Description
Swap Size in GiB (CORE only)	By default, all data disks are created with the amount of swap specified. Changing the value does not affect the amount of swap on existing disks, only disks added after the change. Does not affect log or cache devices as they are created without swap. Setting to 0 disables swap creation completely. **STRONGLY DISCOURAGED**
LOG (Write Cache) Overprovision Size in GiB	Overprovisioning a ZFS Log SSD can increase its performance and lifespan by distributing writes and erases across more drive flash blocks. Defining a number of GiB here overprovisions ZFS Log disks during pool creation or extension. Examples: 50 GiB, 10g, 5GB

GUI

Name	Description
Show Console Messages	Display console messages in real time at the bottom of the browser.
Show Advanced Fields by Default	Set to always show advanced fields, when available.

Kernel

Name	Description
Show Console Messages	Display console messages in real time at the bottom of the browser.
Show Advanced Fields by Default	Set to always show advanced fields, when available.

Self-Encrypting Drive

Name	Description
ATA Security User	User passed to camcontrol security -u to unlock SEDs
SED Password	Global password to unlock SEDs.

Syslog

Name	Description
Use FQDN for Logging	Set to include the Fully-Qualified Domain Name (FQDN) in logs to precisely identify systems with similar hostnames.
Syslog Level	When Syslog Server is defined, only logs matching this level are sent.
Syslog Server	Remote syslog server DNS hostname or IP address. Nonstandard port numbers can be used by adding a colon and the port number to the hostname, like `mysyslogserver:1928`. Log entries are written to local logs and sent to the remote syslog server.
Syslog Transport	Transport Protocol for the remote system log server connection. Choosing Transport Layer Security (TLS) also requires selecting a preconfigured system Certificate.

There is also an option to **SAVE DEBUG**. This generates text files that contain diagnostic information. After the debug data is collected, the system prompts for a location to save the compressed .tar file.

Autotuning

TrueNAS provides an autotune script that optimizes the system depending on the installed hardware.

Is this script available somewhere? expand □

To see which checks are performed, the autotune script is located in /usr/local/bin/autotune .

For example, if a pool exists on a system with limited RAM, the autotune script automatically adjusts some ZFS sysctl values in an attempt to minimize memory starvation issues. Autotuning can introduce system performance issues and must only be used as a temporary measure on a system until the underlying hardware issue is addressed. Autotune always slows a RAM-starved system, as it caps the ARC.

Using the autotuning script is not recommended for TrueNAS Enterprise customers as this can override any specific tunings made by iXsystems Support.

Enabling autotuning runs the autotuner script at boot. To run the script immediately, reboot the system.

Any tuned settings appear in **System > Tunables**.

Can I manually tune a setting controlled by the autotuner? expand □

Deleting tunables created by the autotune only affects the current session. Autotune-set tunables are recreated every time the system boots. This means any setting controlled by the autotuner does not allow for further manual tuning.

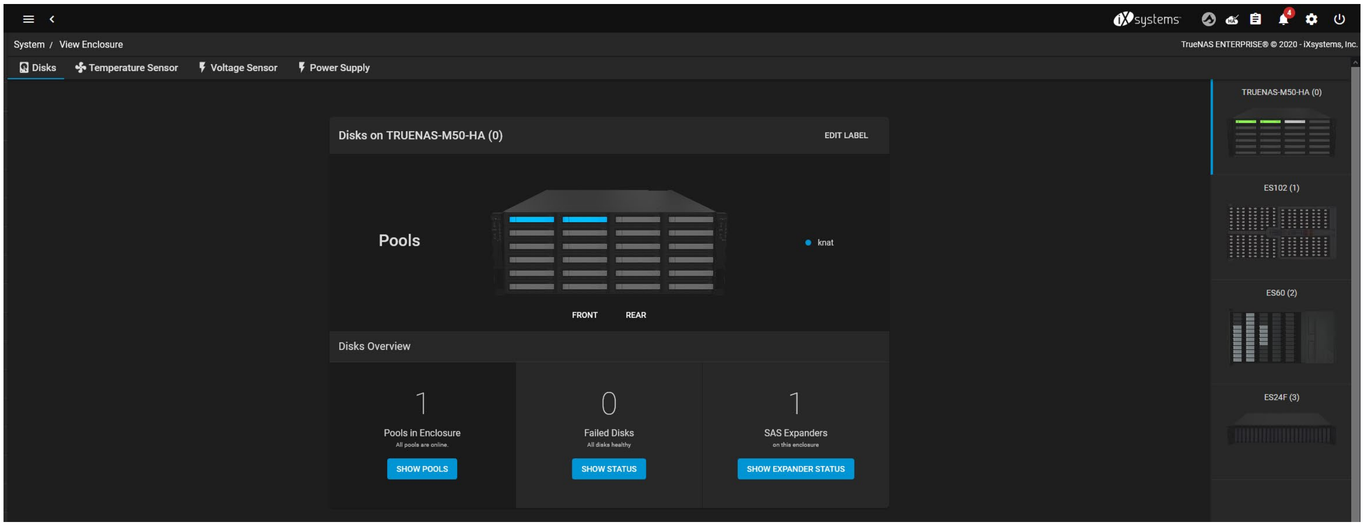
To permanently change a value set by autotune, change the description of the tunable. For example, changing the description to manual override prevents autotune from reverting that tunable back to the autotune default value.

When attempting to increase the performance of the TrueNAS system, and particularly when the current hardware is limiting performance, try enabling autotune.

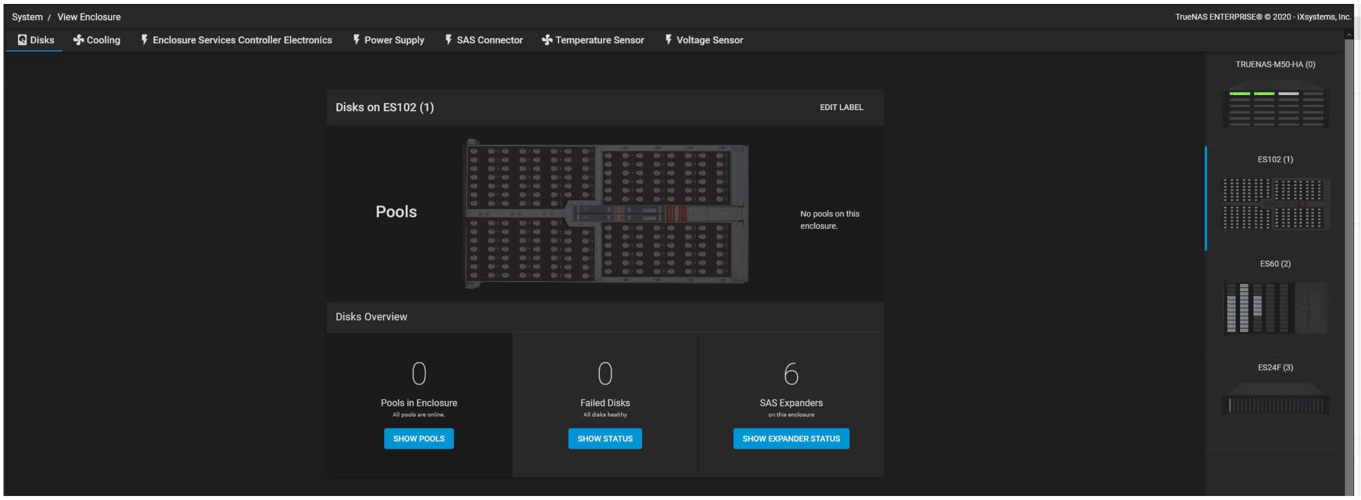
3.5 - View Enclosure

> Only compatible TrueNAS hardware and expansion shelves available from [iXsystems](#) allow seeing the **View Enclosure** option. To learn more about available iXsystems products, see the [TrueNAS Systems Overview](#) or browse the [Hardware](#) documentation.

Go to **System > View Enclosure** to display the status of connected disks and hardware.



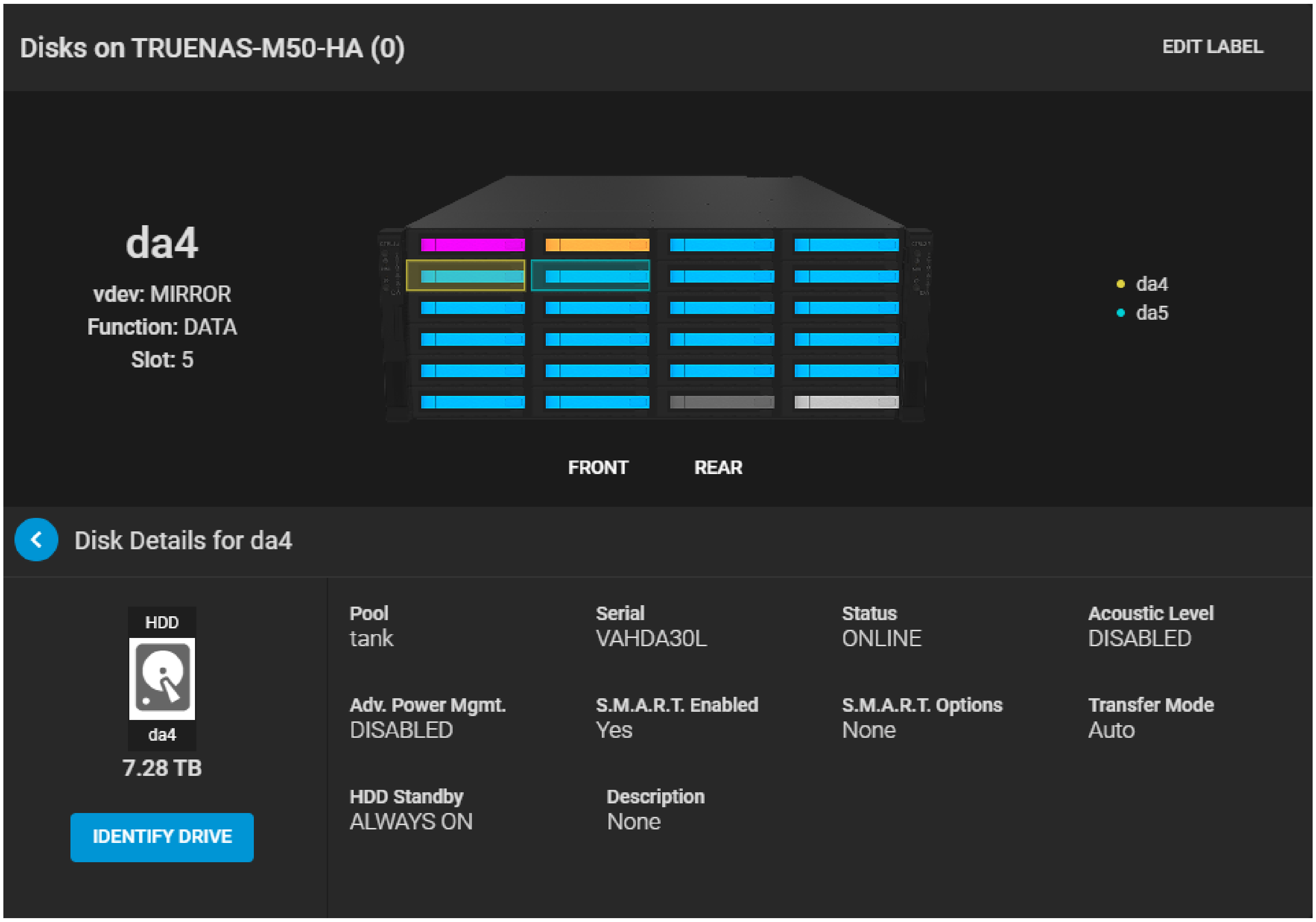
The screen shows the primary system. Other detected TrueNAS hardware is available from a column on the right side of the screen. Click an enclosure to show details about that hardware.



The screen is divided into different tabs. These tabs reflect the sensors that are active in the chosen hardware. Some or all of these can show in the **View Enclosure** screen. The system can be renamed from any tab by clicking *EDIT LABEL*.

⊙ Disks

Shows a graphic representation of the TrueNAS hardware and details about connected disks.



Disks on TRUENAS-M50-HA (0)

da4

vdev: MIRROR
Function: DATA
Slot: 5

Disk Details for da4

HDD
da4
7.28 TB

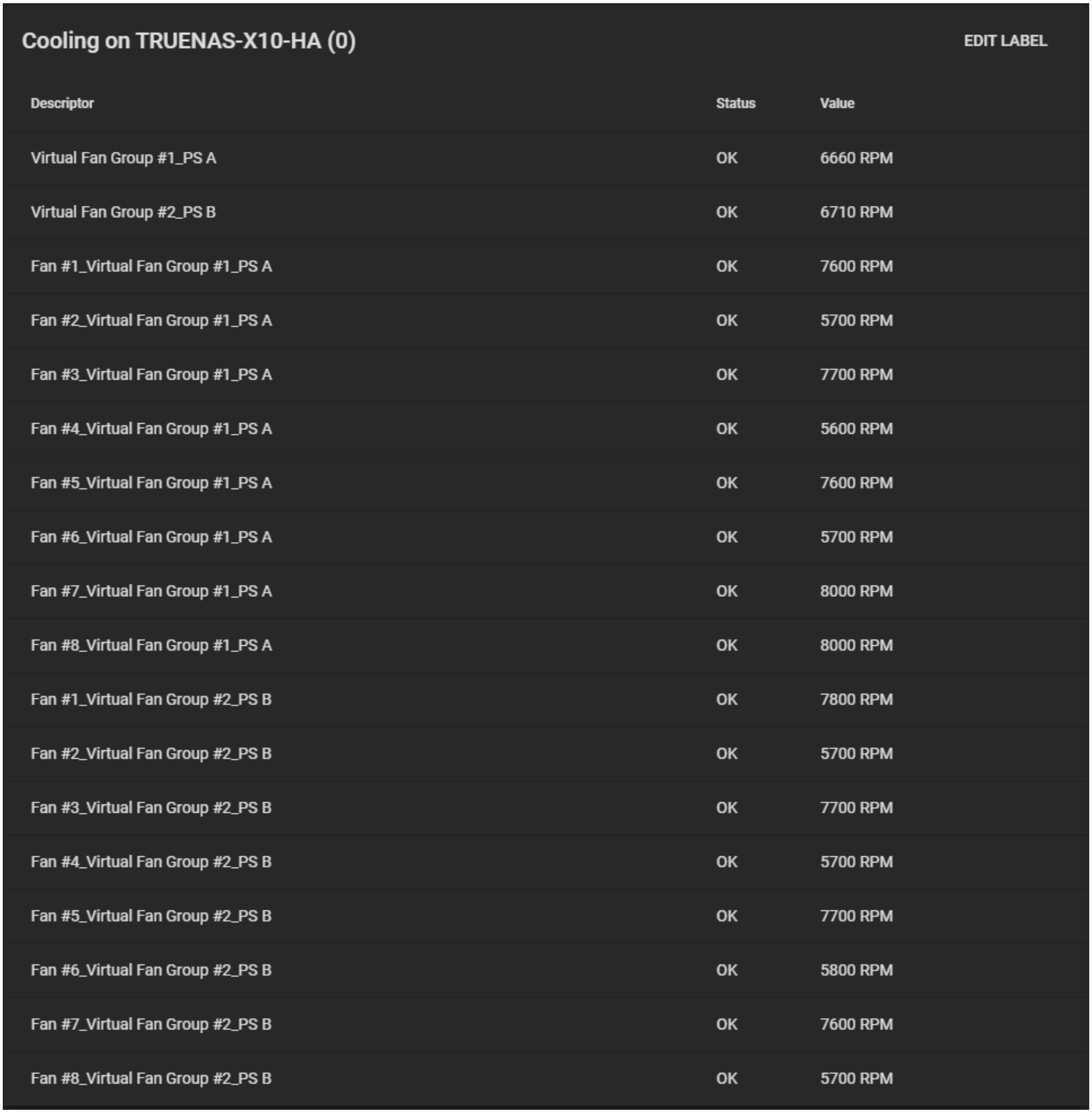
Pool	Serial	Status	Acoustic Level
tank	VAHDA30L	ONLINE	DISABLED
Adv. Power Mgmt.	**S.M.A.R.T. Enabled**	**S.M.A.R.T. Options**	**Transfer Mode**
DISABLED	Yes	None	Auto
HDD Standby	**Description**		
ALWAYS ON	None		

Click any disk slot to see specific details about the disk like the device name, vdev assignment, function, drive slot number, serial number, and current drive settings. *IDENTIFY DRIVE* flashes the identification LED for the chosen drive.

The **Disks Overview** shows statistics about the enclosure pools, status, and detected expanders. There are options to show more details about pools in the enclosure, disk status, and expansion shelf status. Clicking any of the buttons changes the graphic to show the requested details.

○ Cooling

Shows the current status and RPM of each connected fan.

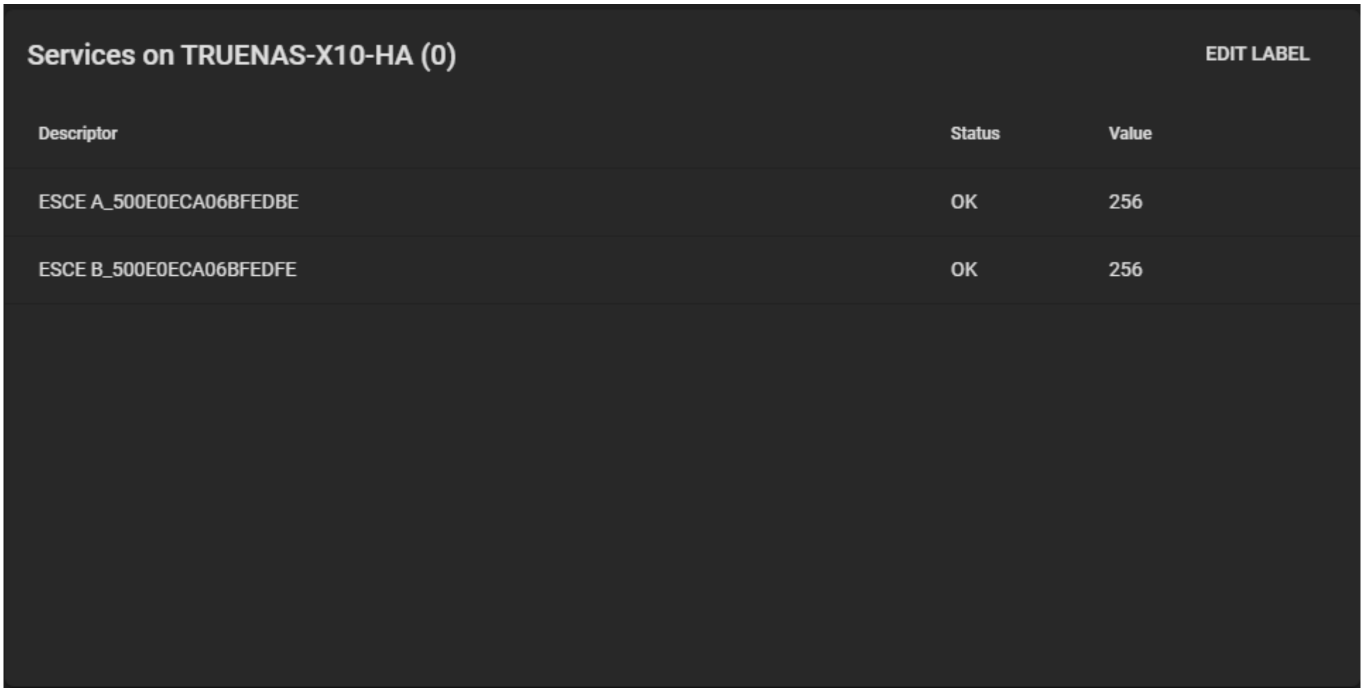


Cooling on TRUENAS-X10-HA (0)

Descriptor	Status	Value
Virtual Fan Group #1_PS A	OK	6660 RPM
Virtual Fan Group #2_PS B	OK	6710 RPM
Fan #1_Virtual Fan Group #1_PS A	OK	7600 RPM
Fan #2_Virtual Fan Group #1_PS A	OK	5700 RPM
Fan #3_Virtual Fan Group #1_PS A	OK	7700 RPM
Fan #4_Virtual Fan Group #1_PS A	OK	5600 RPM
Fan #5_Virtual Fan Group #1_PS A	OK	7600 RPM
Fan #6_Virtual Fan Group #1_PS A	OK	5700 RPM
Fan #7_Virtual Fan Group #1_PS A	OK	8000 RPM
Fan #8_Virtual Fan Group #1_PS A	OK	8000 RPM
Fan #1_Virtual Fan Group #2_PS B	OK	7800 RPM
Fan #2_Virtual Fan Group #2_PS B	OK	5700 RPM
Fan #3_Virtual Fan Group #2_PS B	OK	7700 RPM
Fan #4_Virtual Fan Group #2_PS B	OK	5700 RPM
Fan #5_Virtual Fan Group #2_PS B	OK	7700 RPM
Fan #6_Virtual Fan Group #2_PS B	OK	5800 RPM
Fan #7_Virtual Fan Group #2_PS B	OK	7600 RPM
Fan #8_Virtual Fan Group #2_PS B	OK	5700 RPM

○ Enclosure Services Controller Electronics

Shows the enclosure status.

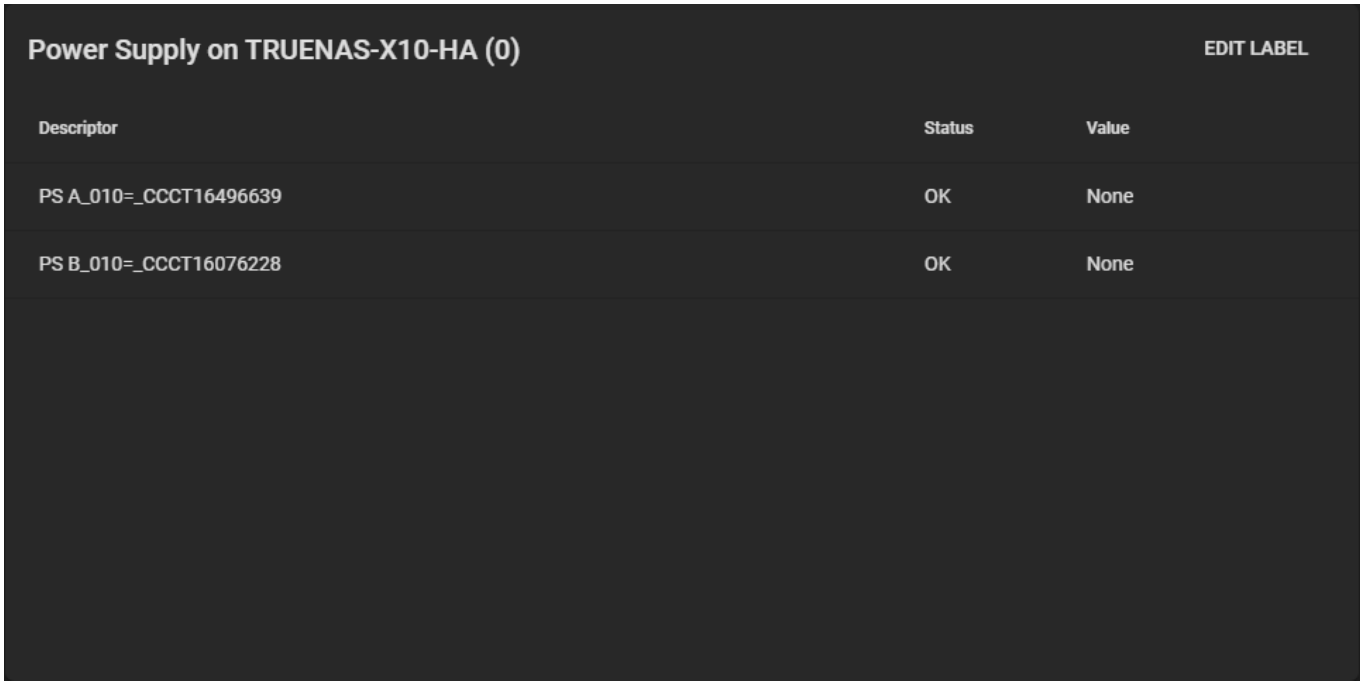


Services on TRUENAS-X10-HA (0)

Descriptor	Status	Value
ESCE A_500E0ECA06BFEDBE	OK	256
ESCE B_500E0ECA06BFEDFE	OK	256

○ Power Supply

Shows details about each power supply.

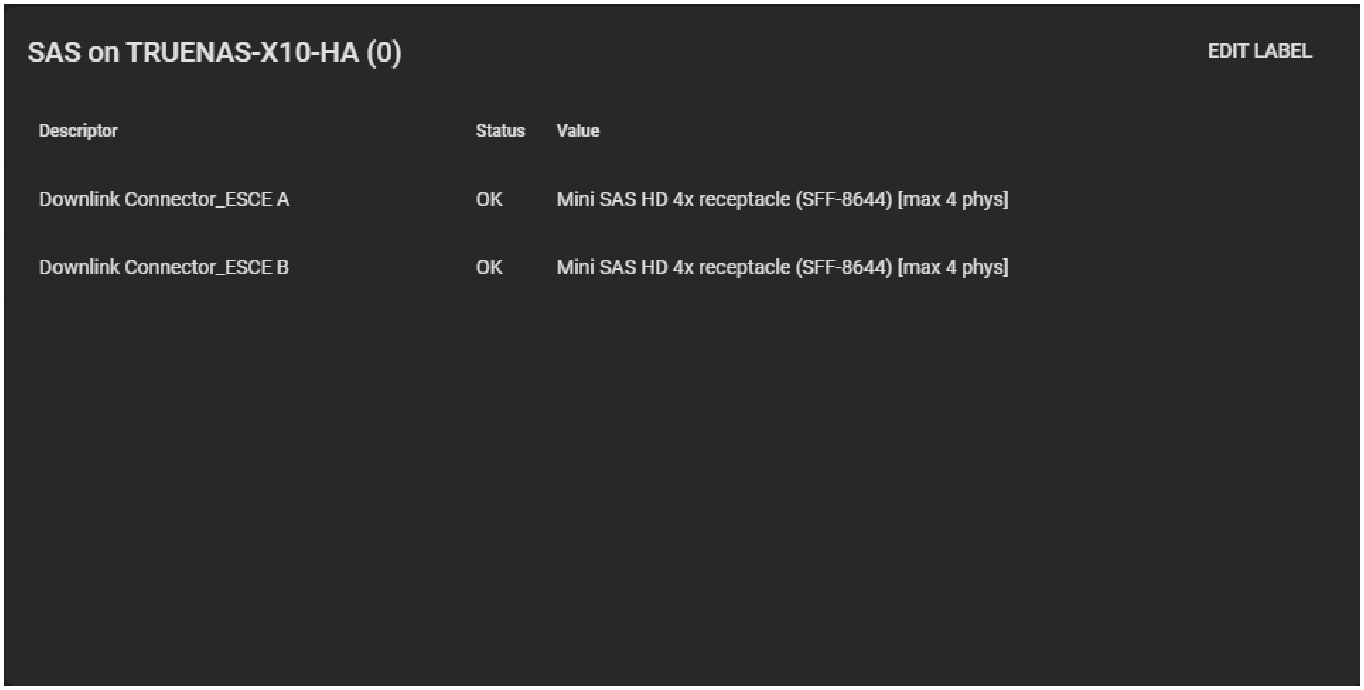


Power Supply on TRUENAS-X10-HA (0)

Descriptor	Status	Value
PS A_010=_CCCT16496639	OK	None
PS B_010=_CCCT16076228	OK	None

○ SAS Connector

Shows the status of the SAS connector components.

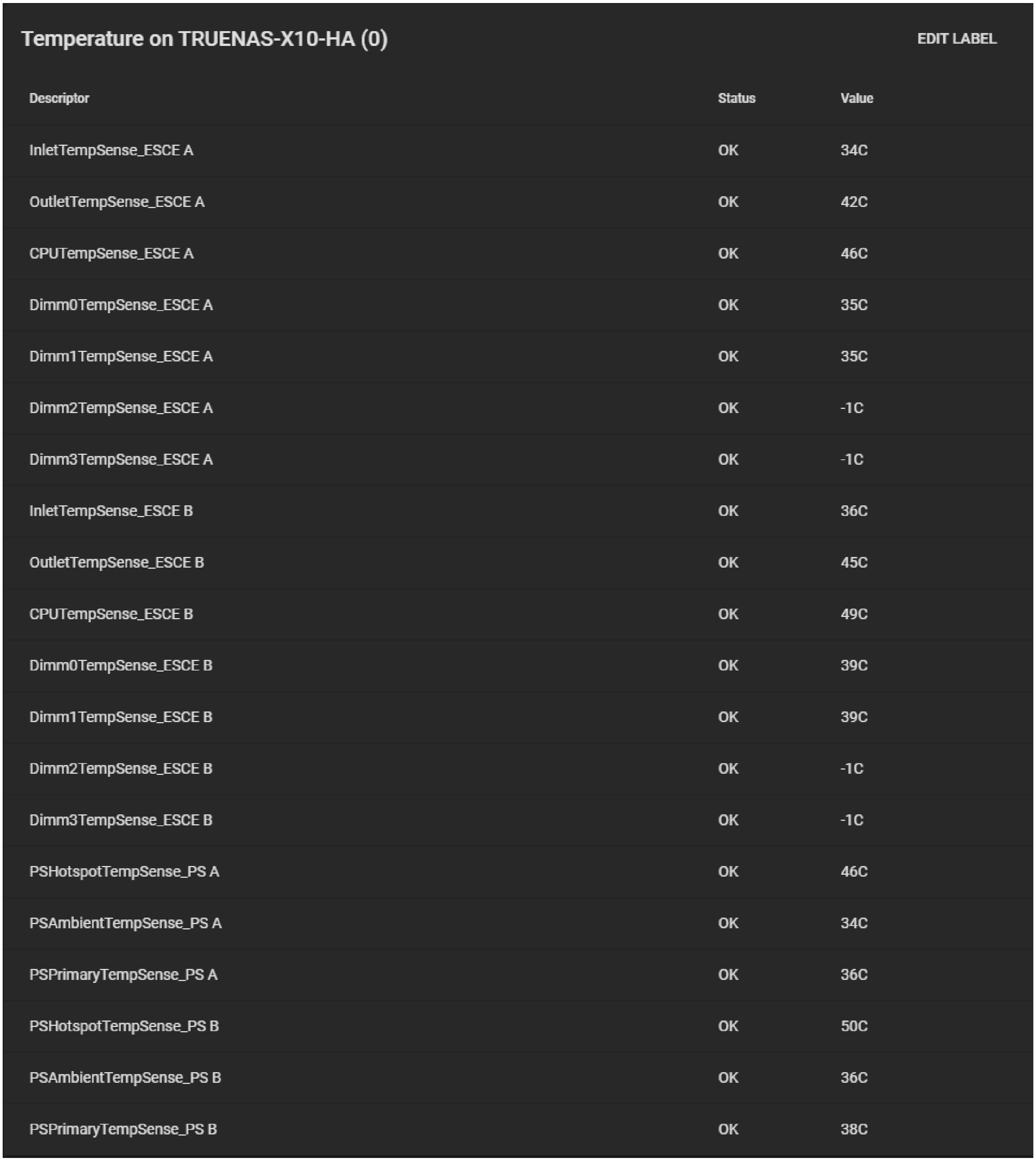


SAS on TRUENAS-X10-HA (0)

Descriptor	Status	Value
Downlink Connector_ESCE A	OK	Mini SAS HD 4x receptacle (SFF-8644) [max 4 phys]
Downlink Connector_ESCE B	OK	Mini SAS HD 4x receptacle (SFF-8644) [max 4 phys]

○ Temperature Sensor

Shows the current temperature of each expansion shelf and the disk chassis.

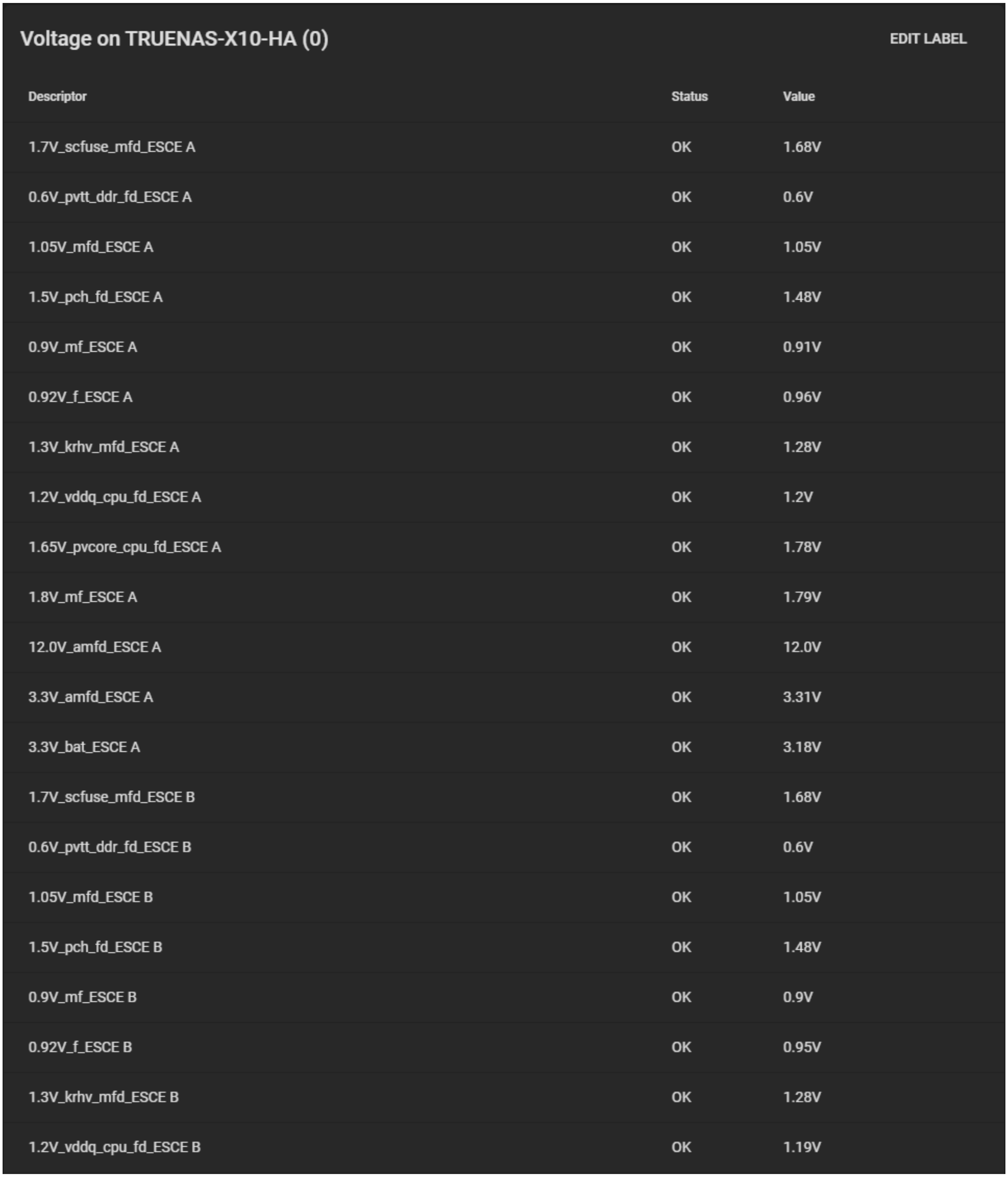


Temperature on TRUENAS-X10-HA (0)

Descriptor	Status	Value
InletTempSense_ESCE A	OK	34C
OutletTempSense_ESCE A	OK	42C
CPUTempSense_ESCE A	OK	46C
Dimm0TempSense_ESCE A	OK	35C
Dimm1TempSense_ESCE A	OK	35C
Dimm2TempSense_ESCE A	OK	-1C
Dimm3TempSense_ESCE A	OK	-1C
InletTempSense_ESCE B	OK	36C
OutletTempSense_ESCE B	OK	45C
CPUTempSense_ESCE B	OK	49C
Dimm0TempSense_ESCE B	OK	39C
Dimm1TempSense_ESCE B	OK	39C
Dimm2TempSense_ESCE B	OK	-1C
Dimm3TempSense_ESCE B	OK	-1C
PSHotspotTempSense_PS A	OK	46C
PSAmbientTempSense_PS A	OK	34C
PSPrimaryTempSense_PS A	OK	36C
PSHotspotTempSense_PS B	OK	50C
PSAmbientTempSense_PS B	OK	36C
PSPrimaryTempSense_PS B	OK	38C

Voltage Sensor

Shows the current voltage for each sensor, VCCP, and VCC.



Voltage on TRUENAS-X10-HA (0)

Descriptor	Status	Value
1.7V_scfuse_mfd_ESCE A	OK	1.68V
0.6V_pvtt_ddr_fd_ESCE A	OK	0.6V
1.05V_mfd_ESCE A	OK	1.05V
1.5V_pch_fd_ESCE A	OK	1.48V
0.9V_mf_ESCE A	OK	0.91V
0.92V_f_ESCE A	OK	0.96V
1.3V_krhv_mfd_ESCE A	OK	1.28V
1.2V_vddq_cpu_fd_ESCE A	OK	1.2V
1.65V_pvcore_cpu_fd_ESCE A	OK	1.78V
1.8V_mf_ESCE A	OK	1.79V
12.0V_amfd_ESCE A	OK	12.0V
3.3V_amfd_ESCE A	OK	3.31V
3.3V_bat_ESCE A	OK	3.18V
1.7V_scfuse_mfd_ESCE B	OK	1.68V
0.6V_pvtt_ddr_fd_ESCE B	OK	0.6V
1.05V_mfd_ESCE B	OK	1.05V
1.5V_pch_fd_ESCE B	OK	1.48V
0.9V_mf_ESCE B	OK	0.9V
0.92V_f_ESCE B	OK	0.95V
1.3V_krhv_mfd_ESCE B	OK	1.28V
1.2V_vddq_cpu_fd_ESCE B	OK	1.19V

3.6 - Email

An automatic script sends a nightly email to the administrator (*root*) account containing important information such as the health of the disks. Alert events are also emailed to the root user account. Configure the system to send these emails to the administrator's remote email account for fast awareness and resolution of any critical issues.

> Scrub Task issues and S.M.A.R.T. reports are mailed separately to the address configured in those services.

TrueNAS Root Email Address

Before configuring anything else, set the *root* account email address. Go to **Accounts > Users**, click more_vert and *Edit* for the `root` user. In the *Email* field, enter a remote email address that is regularly monitored by the system administrator, like *admin@example.com* and click *SAVE*.

Email Options

The remaining configuration is done from **System > Email**.

General Options

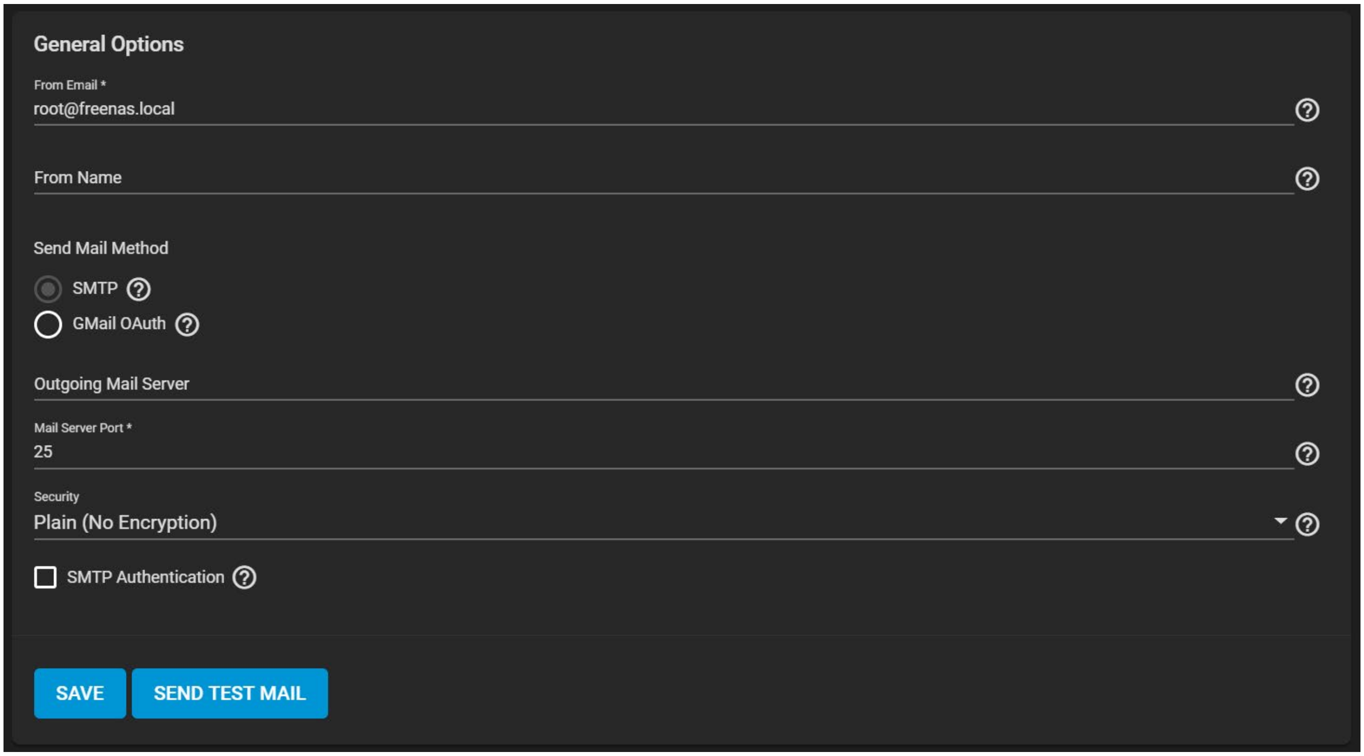
Name	Description
From Email	The user account Email address to use for the envelope From email address. The user account Email in Accounts > Users > Edit must be configured first.
From Name	The friendly name to show in front of the sending email address. Example: `Storage System 01<it@example.com>`

Send Mail Method

Name	Description
SMTP	Shows SMTP configuration options.
GMail OAuth	Shows GMail authentication options.

Changing the *Send Mail Method* shows different options:

⊙ **SMTP**



General Options

From Email *
root@freenas.local

From Name

Send Mail Method

● SMTP

○ GMail OAuth

Outgoing Mail Server

Mail Server Port *
25

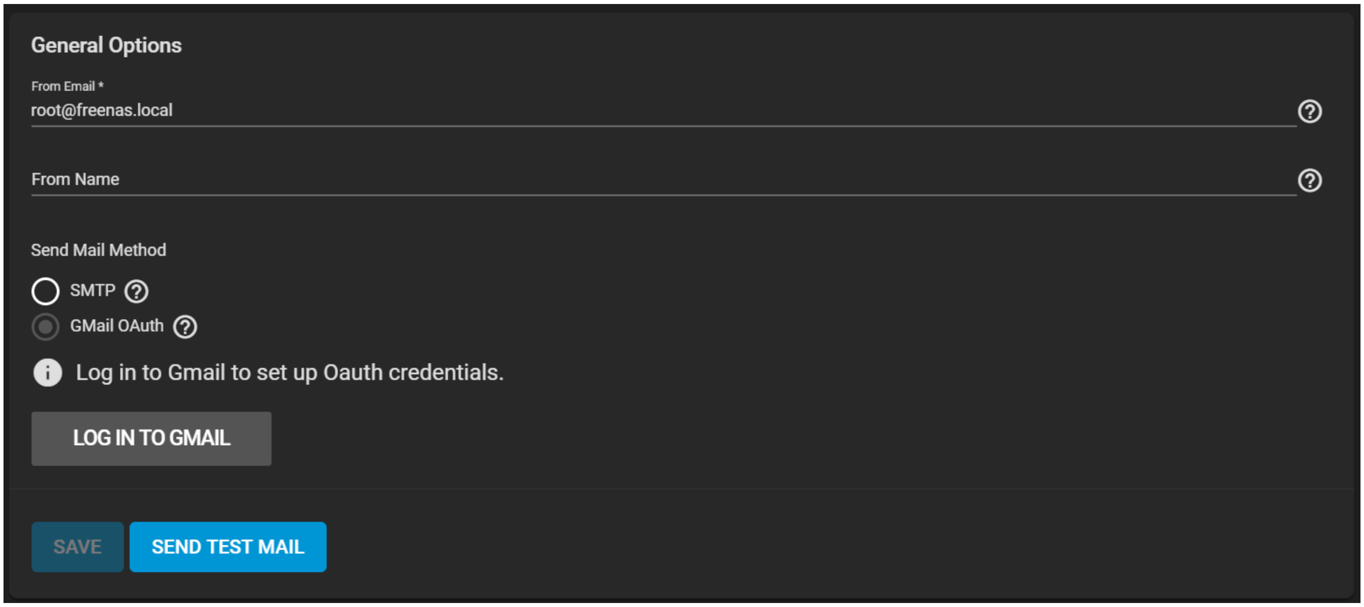
Security
Plain (No Encryption)

□ SMTP Authentication

Name	Description
Outgoing Mail Server	Hostname or IP address of SMTP server used for sending email.
Mail Server Port	SMTP port number. Typically `25`/`465` (secure SMTP), or `587` (submission).
Security	Choose an encryption type. Choices are *Plain (No Encryption)*, *SSL (Implicit TLS)*, or *TLS (STARTTLS)*.
SMTP Authentication	Set when the SMTP server uses authentication credentials. Shows additional credentials options.
Username	Enter the SMTP username when the SMTP server requires authentication.
Password	Enter the SMTP account password if needed for authentication. Only plain text characters (7-bit ASCII) are allowed in passwords. UTF or composed characters are not allowed.

○ GMail OAuth

To use Gmail OAuth, select the option and click **LOG IN TO GMAIL**.



General Options

From Email *
root@freenas.local

From Name

Send Mail Method

○ SMTP
● GMail OAuth

Log in to Gmail to set up Oauth credentials.

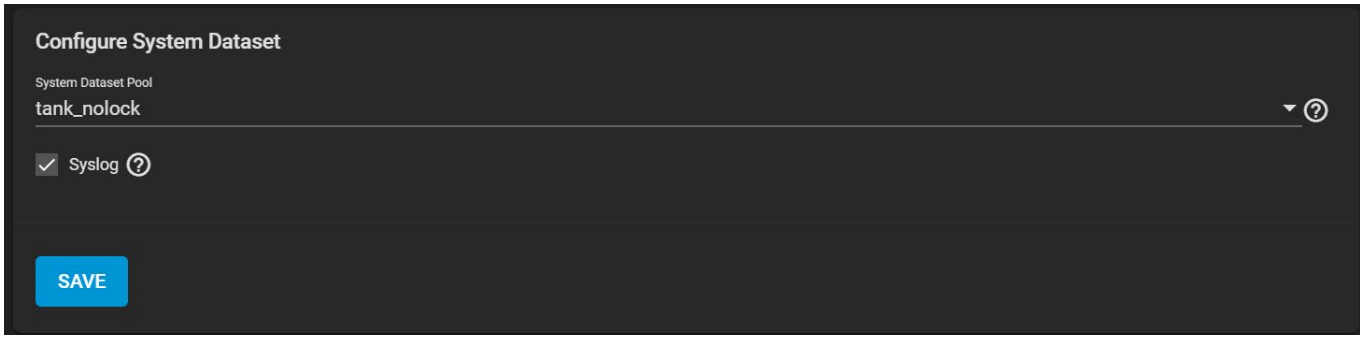
Log into a GMail account as normal for TrueNAS to autoconfigure the connection to GMail.

Click *SEND TEST MAIL* to verify the configured email settings are working. If the test email fails, double-check that the *Email* field of the root user is correctly configured by clicking the **Edit** button for the *root* account in **Accounts > Users**.

3.7 - System Dataset

The system dataset stores debugging core files, encryption keys for encrypted pools, and Samba4 metadata such as the user and group cache and share level permissions.

To view the current location of the system dataset, go to **System > System Dataset**.



Configure System Dataset

System Dataset Pool: tank_nolock

☑ Syslog

Change System Dataset

Users can change the system dataset by selecting an existing pool from the *System Dataset Pool* dropdown.

Users can also move the system dataset to unencrypted pools or encrypted pools that do not have passphrases.

Moving the system dataset to an encrypted pool disables that volume’s passphrase capability.

You cannot move the system dataset to a passphrase-encrypted pool or a read-only pool.

Reboots Required

- The SMB service must restart, which causes a brief outage for any active SMB connections.
- Highly Available TrueNAS systems must reboot the standby controller when the system dataset moves.

If a user changes the pool storing the system dataset later, TrueNAS will migrate the existing data in the system dataset to the new location.

Storing the System Log

Users can store the system log on the system dataset. We recommend users store the log information on the system dataset when the system generates large amounts of data and has limited memory or a limited capacity operating system device.

Set *Syslog* to store the system log on the system dataset. Leave unset to store the system log in /var on the operating system device.

3.8 - Reporting

TrueNAS has a built in reporting engine that gives helpful graphs and information about the system.

What does TrueNAS use for reporting? expand □
TrueNAS uses Graphite for metric gathering and visualizations.

The options in **System > Reporting** control how the graphs in **Reporting** appear:

General Options

Name	Description
Report CPU usage in Percent	Reports CPU usage in percent instead of units of kernel time.
Graphite Separate Instances	Sends the *plugin instance* and *type instance* to Graphite as separate path components: `host.cpu.0.cpu.idle`. Disabling sends the *plugin* and *plugin instance* as one path component and *type* and *type instance* as another: `host.cpu-0.cpu-idle`.
Remote Graphite Server Hostname	Remote Graphite server Hostname or IP address.
Graph age in Months	Maximum time (in months) TrueNAS stores a graph (allowed values are 1-60). Changing this value causes the Confirm RRD Destroy dialog to appear. Changes do not take effect until TrueNAS destroys the existing reporting database.
Number of Graph Points	The number of points for each hourly, daily, weekly, monthly, or yearly graph (allowed values are 1-4096). Changing this value displays the **Confirm RRD Destroy** dialog. Changes do not take effect until TrueNAS destroys the existing reporting database.
Force	Forces TruNAS to add the NTP server, even if it is unreachable.

Report history is cleared when *Report CPU*, *Graph Age*, or *Graph Points* are changed.

Reporting data is saved and preserved across system upgrades and reboots. This allows viewing usage trends over time. This data is frequently written and should not be stored on the boot pool or operating system device. Reporting data is saved in /var/db/collectd/rrd/ .

3.9 - Alert

The alert system integrates with various third-party services. Tuning alerts also helps personalize TrueNAS to any highly-sensitive issues.

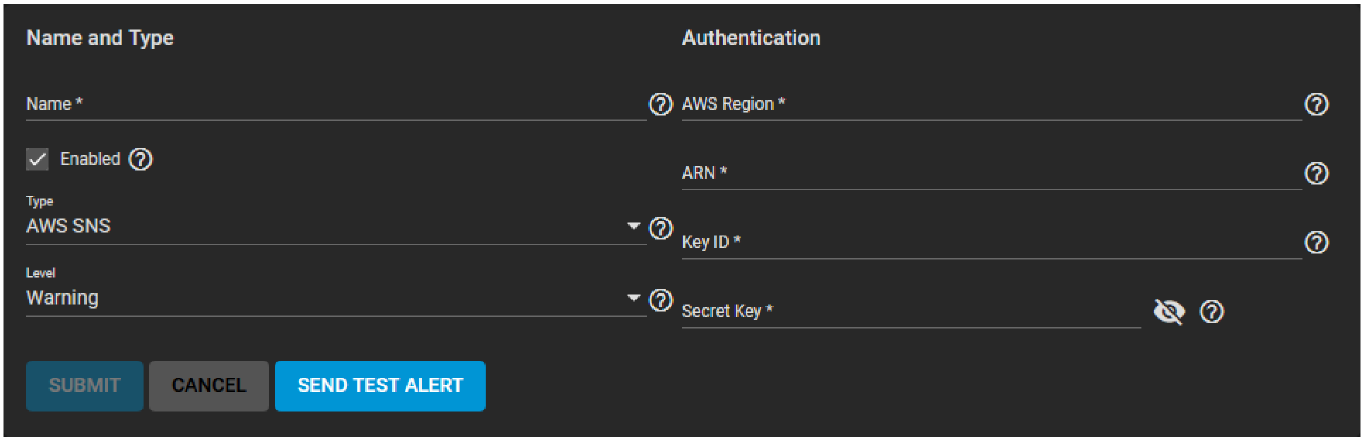
Alert Services

Alert Services are the various methods built into to TrueNAS that can notify you of a system alert.

> Some of alert services are third-party integrations that can charge for message or data usage.

Adding a Service

To add a new alert service, go to **System > Alert Services** and click *ADD*.



Name and Type

Name *

☑ Enabled

Type: AWS SNS

Level: Warning

Authentication

AWS Region *

ARN *

Key ID *

Secret Key *

Name and Type

Name	Description
Name	Name of the new alert service.
Enabled	Unset to disable this service without deleting it.
Type	Choose an alert service to display options for that service.
Level	Select the level of severity.

Choosing a *Type* adds options specific to that alert service:

⊙ AWS

Name	Description
AWS Region	Enter the AWS account region .
ARN	Topic Amazon Resource Name (ARN) for publishing. Example: `arn:aws:sns:us-west-2:111122223333:MyTopic`.
Key ID	Access Key ID for the linked AWS account.

Secret Key	Secret Access Key for the linked AWS account.

- **Email**

Name	Description
Email Address	Enter a valid email address to receive alerts from this system.

- **InfluxDB**

Name	Description
Host	Enter the InfluxDB hostname.
Username	Username for this service.
Password	Enter password.
Database	Name of the InfluxDB database.
Series	InfluxDB time series name for collected points.

- **Mattermost**

Name	Description
Webhook URL	Enter or paste the incoming webhook URL associated with this service.
Username	Mattermost username.
Channel	Name of the channel to receive notifications. This overrides the default channel in the incoming webhook settings.
Icon Url	Icon file to use as the profile picture for new messages. Example: https://mattermost.org/wp-content/uploads/2016/04/icon.png. Requires configuring Mattermost to override profile picture icons.

- **OpsGenie**

Name	Description
API Key	Enter or paste the API key. Find the API key by signing into the OpsGenie web interface and going to Integrations/Configured Integrations. Click the desired integration, Settings, and read the API Key field.
API URL	Leave empty for default OpsGenie API.

- **Pager Duty**

Name	Description
Service Key	Enter or paste the “integration/service” key for this system to access the PagerDuty API.
Client Name	PagerDuty client name.

- **Slack**

Name	Description
Webhook URL	Paste the incoming webhook URL associated with this service.

- **SNMP Trap**

Name	Description
Hostname	Hostname or IP address of the system to receive SNMP trap notifications.
Port	UDP port number on the system receiving SNMP trap notifications. The default is 162.
SNMPv3 Security Model	Enable the SNMPv3 security model.
SNMP Community	Network community string. The community string acts like a user ID or password. A user with the correct community string has access to network information. The default is public. For more information, see this helpful SNMP Community Strings tutorial.

○

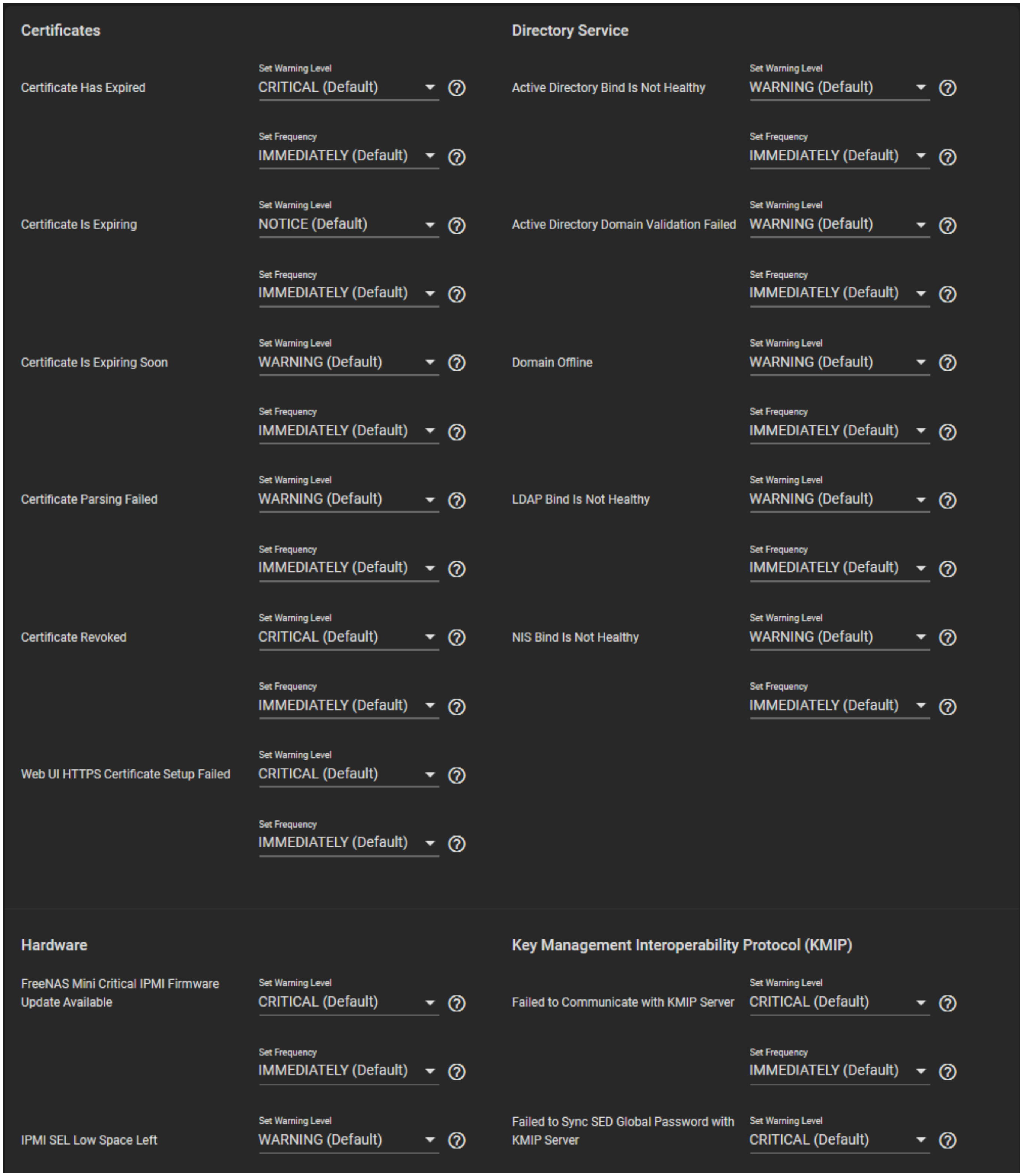
Victor Ops

Name	Description
API Key	Enter or paste the VictorOps API key .
Routing Key	Enter or paste the VictorOps routing key .

Test the service configuration by clicking **SEND TEST ALERT**.

Alert Settings

To modify the default system alerts, go to **System > Alert Settings**.



Certificates

Certificate Has Expired
Set Warning Level: CRITICAL (Default)
Set Frequency: IMMEDIATELY (Default)

Certificate Is Expiring
Set Warning Level: NOTICE (Default)
Set Frequency: IMMEDIATELY (Default)

Certificate Is Expiring Soon
Set Warning Level: WARNING (Default)
Set Frequency: IMMEDIATELY (Default)

Certificate Parsing Failed
Set Warning Level: WARNING (Default)
Set Frequency: IMMEDIATELY (Default)

Certificate Revoked
Set Warning Level: CRITICAL (Default)
Set Frequency: IMMEDIATELY (Default)

Web UI HTTPS Certificate Setup Failed
Set Warning Level: CRITICAL (Default)
Set Frequency: IMMEDIATELY (Default)

Directory Service

Active Directory Bind Is Not Healthy
Set Warning Level: WARNING (Default)
Set Frequency: IMMEDIATELY (Default)

Active Directory Domain Validation Failed
Set Warning Level: WARNING (Default)
Set Frequency: IMMEDIATELY (Default)

Domain Offline
Set Warning Level: WARNING (Default)
Set Frequency: IMMEDIATELY (Default)

LDAP Bind Is Not Healthy
Set Warning Level: WARNING (Default)
Set Frequency: IMMEDIATELY (Default)

NIS Bind Is Not Healthy
Set Warning Level: WARNING (Default)
Set Frequency: IMMEDIATELY (Default)

Hardware

FreeNAS Mini Critical IPMI Firmware Update Available
Set Warning Level: CRITICAL (Default)
Set Frequency: IMMEDIATELY (Default)

IPMI SEL Low Space Left
Set Warning Level: WARNING (Default)

Key Management Interoperability Protocol (KMIP)

Failed to Communicate with KMIP Server
Set Warning Level: CRITICAL (Default)
Set Frequency: IMMEDIATELY (Default)

Failed to Sync SED Global Password with KMIP Server
Set Warning Level: CRITICAL (Default)

The alerts are grouped into sections based on type. For example, alerts that are related to pools appear in the **Storage** alert section.

Options

Name	Description
Set Warning Level	Customizes the importance of the alert. Each level of importance has a different icon and color to express the level of importance: *Info*, *Notice*, *Warning*, *Error*, *Critical* (Default), *Alert*, and *Emergency*.

Set Frequency	Adjust how often alert notifications are sent. Setting the Frequency to NEVER prevents that alert from being added to alert notifications, but the alert can still show in the web interface if it is triggered. Options: *Immediately* (Default), *Hourly*, *Daily*, and *Never*.

Changing any of these options affects every configured alert service.

Alert Warning Levels

Each warning level has a different icon and color to express its importance. To make the system email you when alerts with a specific warning level trigger, set up an email Alert Service with that warning level.

Level	Icon	Alert Notification?
1 INFO	ⓘ	No
2 NOTICE	ⓘ	Yes
3 WARNING	⚠	Yes
4 ERROR	❗	Yes
5 CRITICAL	❗	Yes
6 ALERT	ⓘ	Yes
7 EMERGENCY	ⓘ	Yes

3.10 - Cloud Credentials

To begin integrating TrueNAS with a Cloud Storage provider, register the account credentials on the system. After saving any credentials, a Cloud Sync Task allows sending or receiving data from that Cloud Storage Provider.

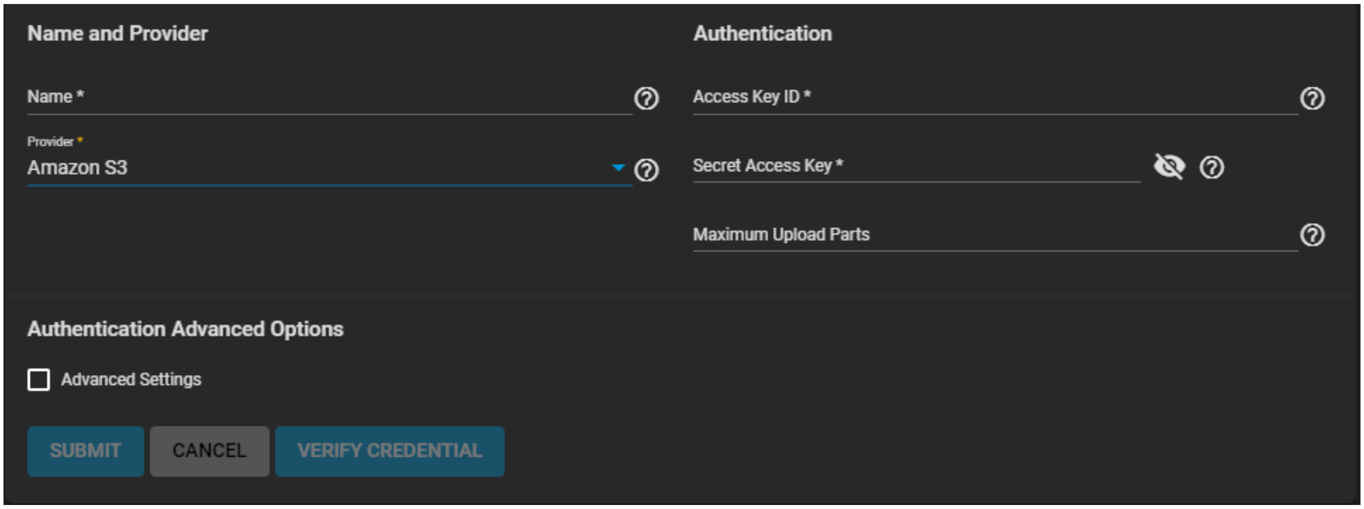
Saving a Cloud Storage Credential

Transferring data from TrueNAS to the Cloud requires saving Cloud Storage Provider credentials on the system.

> **Is this secure?** expand □
> To maximize security, these credentials are encrypted when saved. However, this means that to restore any cloud credentials from a TrueNAS configuration file, you must enable *Export Password Secret Seed* when generating that configuration backup . Remember to protect any downloaded TrueNAS configuration files.

It is recommended to have another browser tab open and logged in to the Cloud Storage Provider account you intend to link with TrueNAS. Some providers require additional information that is generated on the storage provider account page. For example, saving an Amazon S3 credential on TrueNAS could require logging in to the S3 account and generating an access key pair on the *Security Credentials > Access Keys* page.

To save cloud storage provider credentials, go to **System > Cloud Credentials** and click *Add*.



Provider: Amazon S3

Enter a credential *Name* and choose a *Provider*. The rest of the options change according to the chosen *Provider*:

⊙ Amazon S3

Name	Description
Access Key ID	Amazon Web Services Key ID. This is found on Amazon AWS by going through **My account > Security Credentials > Access Keys** (Access Key ID and Secret Access Key). Must be alphanumeric and between 5 and 20 characters.
Secret Access Key	Amazon Web Services password. If the Secret Access Key cannot be found or remembered, go to **My Account > Security Credentials > Access Keys** and create a new key pair. Must be alphanumeric and between 8 and 40 characters.
Maximum Upload Ports	Define the maximum number of chunks for a multipart upload. This can be useful if a service does not support the 10,000 chunk AWS S3 specification.

Amazon S3 Advanced Options

Name	Description
Endpoint URL	S3 API endpoint URL . When using AWS, the endpoint field can be empty to use the default endpoint for the region, and available buckets are automatically fetched. Refer to the AWS Documentation for a list of Simple Storage Service Website Endpoints .
Region	AWS resources in a geographic area . Leave empty to automatically detect the correct public region for the bucket. Entering a private region name allows interacting with Amazon buckets created in that region. For example, enter us-gov-east-1 to discover buckets created in the eastern AWS GovCloud region.
Disable Endpoint Region	Skip automatic detection of the Endpoint URL region. Set this when configuring a custom Endpoint URL.
User Signature Version 2	Force using Signature Version 2 to sign API requests. Set this when configuring a custom Endpoint URL.

○ BackBlaze B2

Name	Description
Key ID	Alphanumeric Backblaze B2 Application Key ID. To generate a new application key, log in to the Backblaze account, go to the App Keys page, and add a new application key. Copy the application keyID string to this field.
Application Key	Backblaze B2 Application Key. To generate a new application key, log in to the Backblaze account, go to the App Keys page, and add a new application key. Copy the applicationKey string to this field.

○ Box

Name	Description
Access Token	A User Access Token for Box. An access token enables Box to verify a request belongs to an authorized session. Example token: T9cE5asGnuyYCCqIZFoWjFHvNbvVqHjl.

○ DropBox

Name	Description
Access Token	Access Token for a Dropbox account. A token must be generated by the Dropbox account before adding it here.

○ FTP

Name	Description
Host	FTP Host to connect to. Example: ftp.example.com.
Port	FTP Port number. Leave blank to use the default port 21.
Username	A username on the FTP Host system. This user must already exist on the FTP Host.
Password	Password for the user account.

○ Google Cloud Storage

Name	Description
Preview JSON Service Account Key	Contents of the uploaded Service Account JSON file.
Choose File	Upload a Google Service Account credential file . The file is created with the Google Cloud Platform Console.

○ Google Drive

Name	Description
Access Token	Token created with Google Drive . Access Tokens expire periodically and must be refreshed.

Team Drive ID	Only needed when connecting to a Team Drive. The ID of the top level folder of the Team Drive.

○ HTTP

Name	Description
URL	HTTP host URL.

○ Hubic

Name	Description
Access Token	Access Token generated by a Hubic account.

○ Mega

Name	Description
Username	MEGA account username.
Password	MEGA account password.

○ Microsoft Azure Blob Storage

Name	Description
Account Name	Microsoft Azure account name.
Account Key	Base64 encoded key for Azure Account

○ Microsoft One Drive

Name	Description
Access Token	Microsoft Onedrive Access Token. Log in to the Microsoft account to add an access token.
Drives List	Drives and IDs registered to the Microsoft account. Selecting a drive also fills the Drive ID field.
Drive Account Type	Type of Microsoft acount. Logging in to a Microsoft account automatically chooses the correct account type. Options: Personal, Business, Document_Library
Drive ID	Unique drive identifier. Log in to a Microsoft account and choose a drive from the Drives List drop-down to add a valid ID.

○ OpenStack Swift

Name	Description
User Name	Openstack user name for login. This is the OS_USERNAME from an OpenStack credentials file.
API Key or Password	Openstack API key or password. This is the OS_PASSWORD from an OpenStack credentials file.
Authentication URL	Authentication URL for the server. This is the OS_AUTH_URL from an OpenStack credentials file.
Auth Version	AuthVersion - optional - set to (1,2,3) if your auth URL has no version (rclone documentation).
Authentication Advanced Options	
Tenant Name	This is the OS_TENANT_NAME from an OpenStack credentials file.
Tenant ID	Tenant ID - optional for v1 auth, this or tenant required otherwise (rclone documentation).
Auth Token	Auth Token from alternate authentication - optional (rclone documentation).

Advanced Options

Name	Description
Region Name	Region name - optional (rclone documentation).
Storage URL	Storage URL - optional (rclone documentation).
Endpoint Type	Endpoint type to choose from the service catalogue. Public is recommended, see the rclone documentation.

○ **pCloud**

Name	Description
Access Token	pCloud Access Token. These tokens can expire and require extension.
Hostname	Enter the hostname to connect to.

○ **SFTP**

Name	Description
Host	SSH Host to connect to.
Port	SSH port number. Leave empty to use the default port 22.
Username	SSH Username.
Password	Password for the SSH Username account.
Private Key ID	Import the private key from an existing SSH keypair or select Generate New to create a new SSH key for this credential.

○ **WebDav**

Name	Description
URL	URL of the HTTP host to connect to.
WebDav Service	Name of the WebDAV site, service, or software being used.
Username	WebDAV account username.
Password	WebDAV account password.

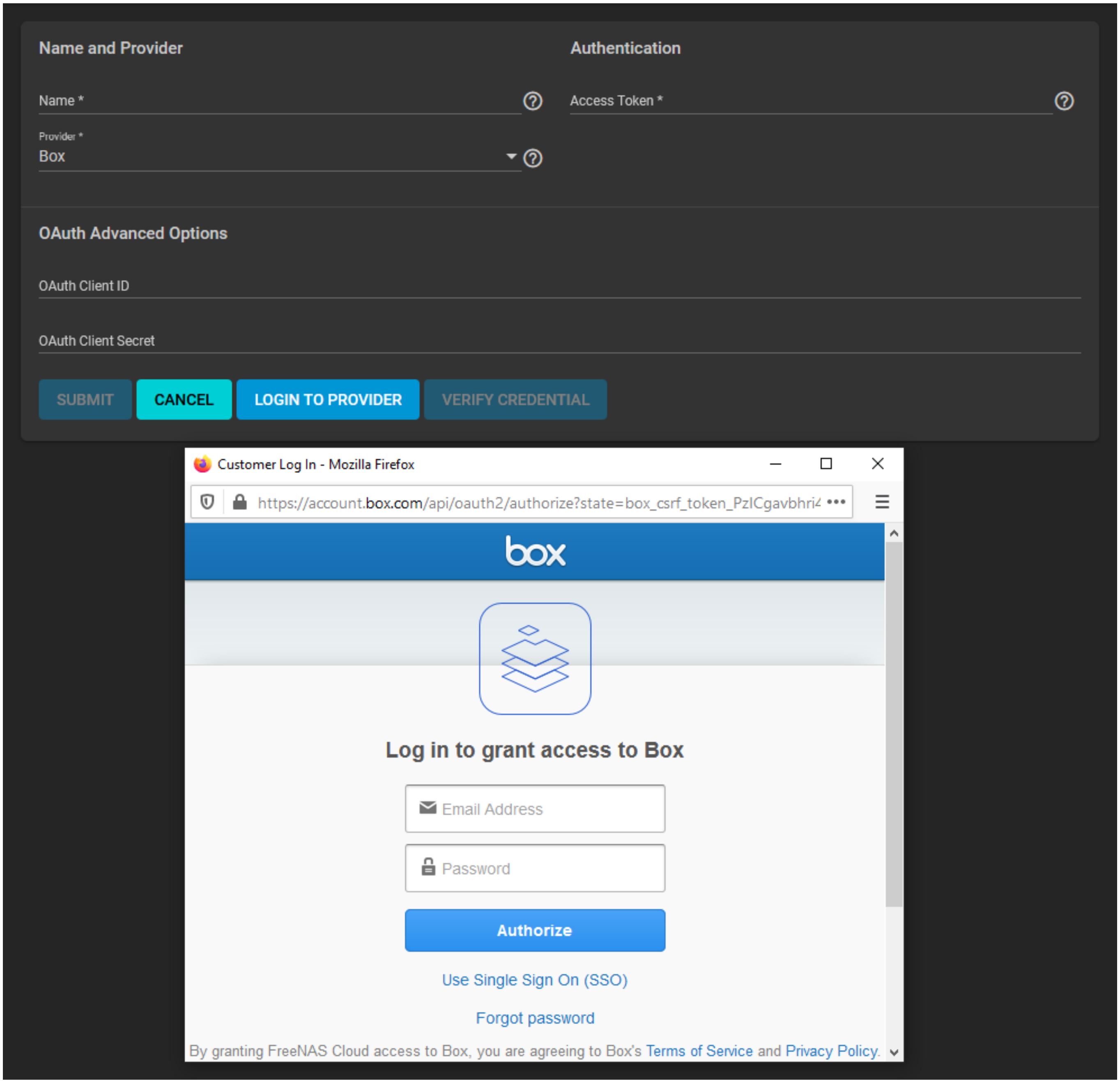
○ **Yandex**

Name	Description
Access Token	Yandex Access Token.

Enter the required *Authentication* strings to enable saving the credential.

Automatic Authentication

Some providers can automatically populate the required *Authentication* strings by logging in to the account. To automatically configure the credential, click *Login to Provider* and entering your account username and password.


Name and Provider
Authentication
Name *
Access Token *
Provider *
Box
OAuth Advanced Options
OAuth Client ID
OAuth Client Secret
SUBMIT
CANCEL
LOGIN TO PROVIDER
VERIFY CREDENTIAL
Customer Log In - Mozilla Firefox
https://account.box.com/api/oauth2/authorize?state=box_csrf_token_PzICgavbhri4
box
Log in to grant access to Box
Email Address
Password
Authorize
Use Single Sign On (SSO)
Forgot password
By granting FreeNAS Cloud access to Box, you are agreeing to Box's Terms of Service and Privacy Policy.

It is recommended to verify the credential before saving it.

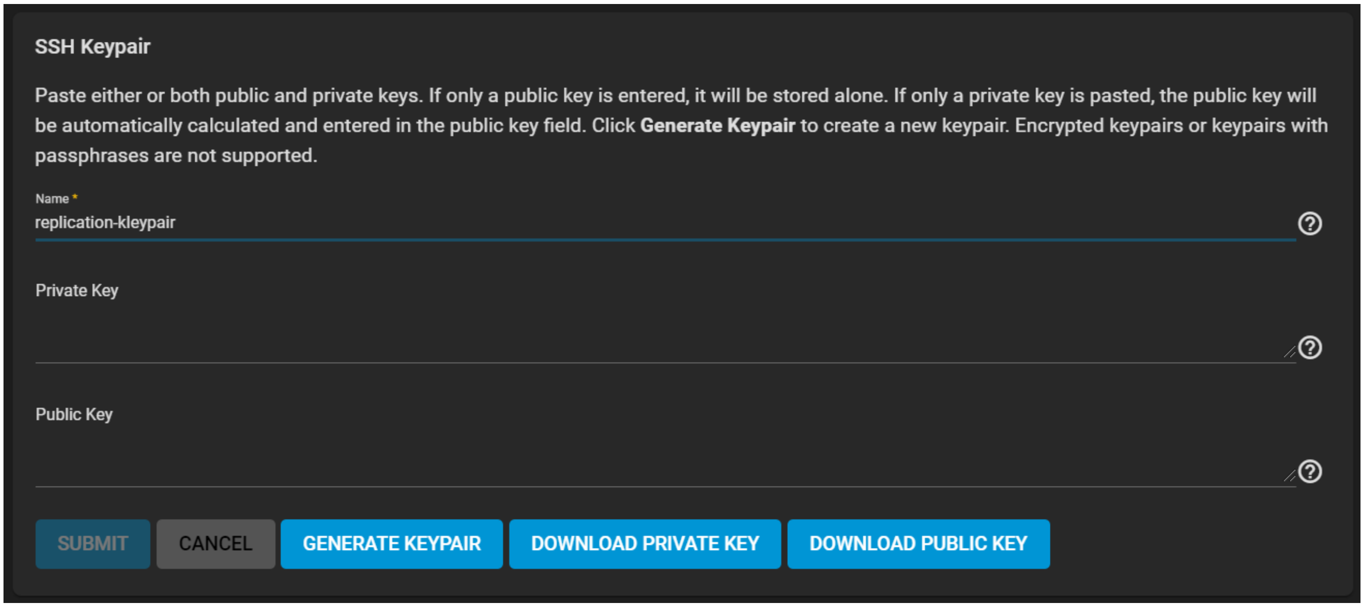
3.11 - SSH

Secure Socket Shell (SSH) is a network protocol that provides a secure method to access and transfer files between two hosts while using an unsecure network. SSH can use user account credentials to establish secure connections, but often uses key pairs shared between host systems for authentication.

Creating an SSH Keypair

TrueNAS generates and stores RSA-encrypted SSH public and private keypairs in **System > SSH Keypairs**. These are generally used when configuring **SSH Connections** or SFTP **Cloud Credentials**. Encrypted keypairs or keypairs with passphrases are not supported.

Keypairs are automatically generated as needed when creating new **SSH Connections** or **Replication** tasks. To manually generate a new keypair, go to **System > SSH Keypairs**, click *ADD*, and give the keypair a unique *Name*.



SSH Keypair

Paste either or both public and private keys. If only a public key is entered, it will be stored alone. If only a private key is pasted, the public key will be automatically calculated and entered in the public key field. Click **Generate Keypair** to create a new keypair. Encrypted keypairs or keypairs with passphrases are not supported.

Name *: replication-kleypair

Private Key:

Public Key:

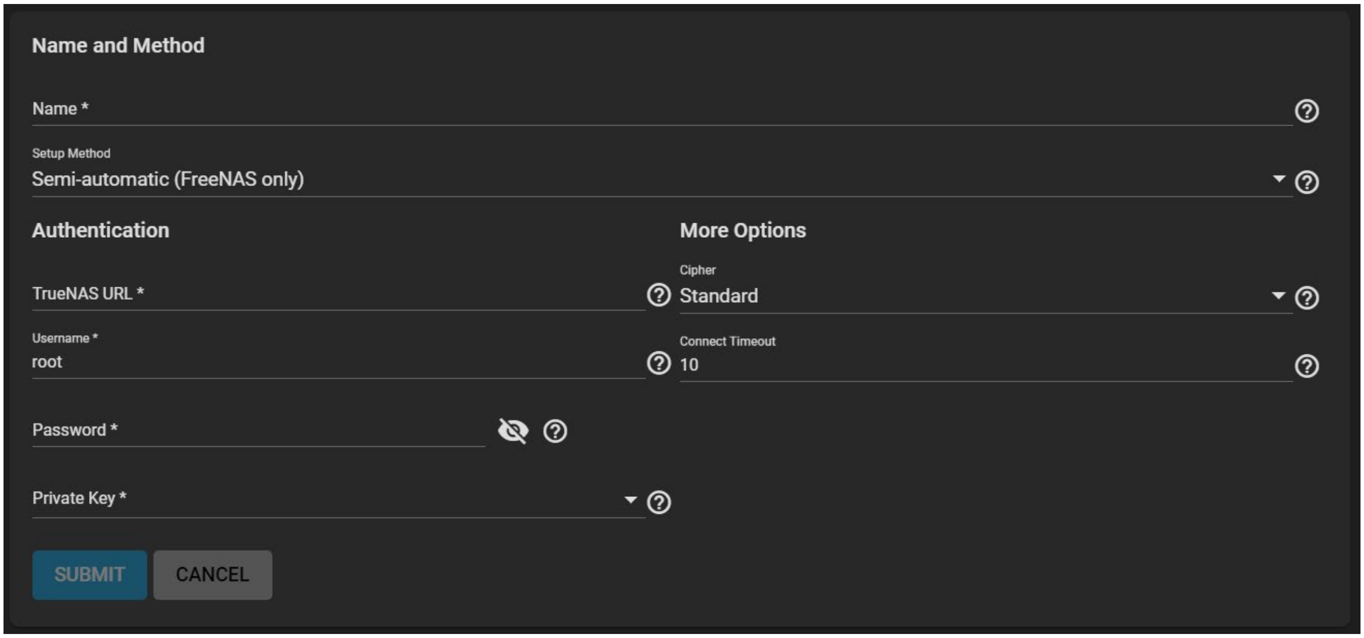
Clicking the button to generate a keypair adds values to the public and private key fields. Copy these strings or download them into text files for later use.

SSH Connections

⊙ Semi-Automatic

TrueNAS offers a semi-automatic setup mode that simplifies setting up an SSH connection with another FreeNAS or TrueNAS system without having to log in to that system to transfer SSH keys. This requires an SSH keypair on the local system and administrator account credentials for the remote TrueNAS. The remote system must also be configured to allow root access with SSH. The keypair can be generated as part of the semiautomatic configuration or manually created in **System > SSH Keypairs**.

Go to **System > SSH Connections** and click **ADD**.



Name and Method

Name *

Setup Method: Semi-automatic (FreeNAS only)

Authentication

TrueNAS URL *

Username *: root

Password *

Private Key *

More Options

Cipher: Standard

Connect Timeout: 10

Name and Method

Name	Description
Name	Name of this SSH connection. SSH connection names must be unique.
Setup Method	*Manual* requires configuring authentication on the remote system. This can include copying SSH keys and modifying the root user account on that system. *Semi-automatic* only works when configuring an SSH connection with a remote TrueNAS system. This method uses the URL and login credentials of the remote system to connect and exchange SSH keys.

Authentication

Name	Description
TrueNAS URL	Hostname or IP address of the remote system. A valid URL scheme is required. Example: `https://10.231.3.76`
Username	Username for logging in to the remote system.
Password	User account password for logging into the remote system.
Private Key	Choose a saved SSH Keypair or select Generate New to create a new keypair and use it for this connection.

More Options

Name	Description
Cipher	*Standard* is most secure, but has the greatest impact on connection speed. *Fast* is less secure than Standard but can give reasonable transfer rates for devices with limited cryptographic speed. *Disabled* removes all security in favor of maximizing connection speed. Disabling the security should only be used within a secure, trusted network.
Connect Timeout	Time (in seconds) before the system stops attempting to establish a connection with the remote system.

Be sure to use a valid URL scheme for the remote TrueNAS URL. Leave the username as *root* and enter the account password for the remote TrueNAS system. The private key can be imported from a previously created SSH keypair or created with a new SSH keypair.

Saving the new configuration automatically opens a connection to the remote TrueNAS and exchanges SSH keys.

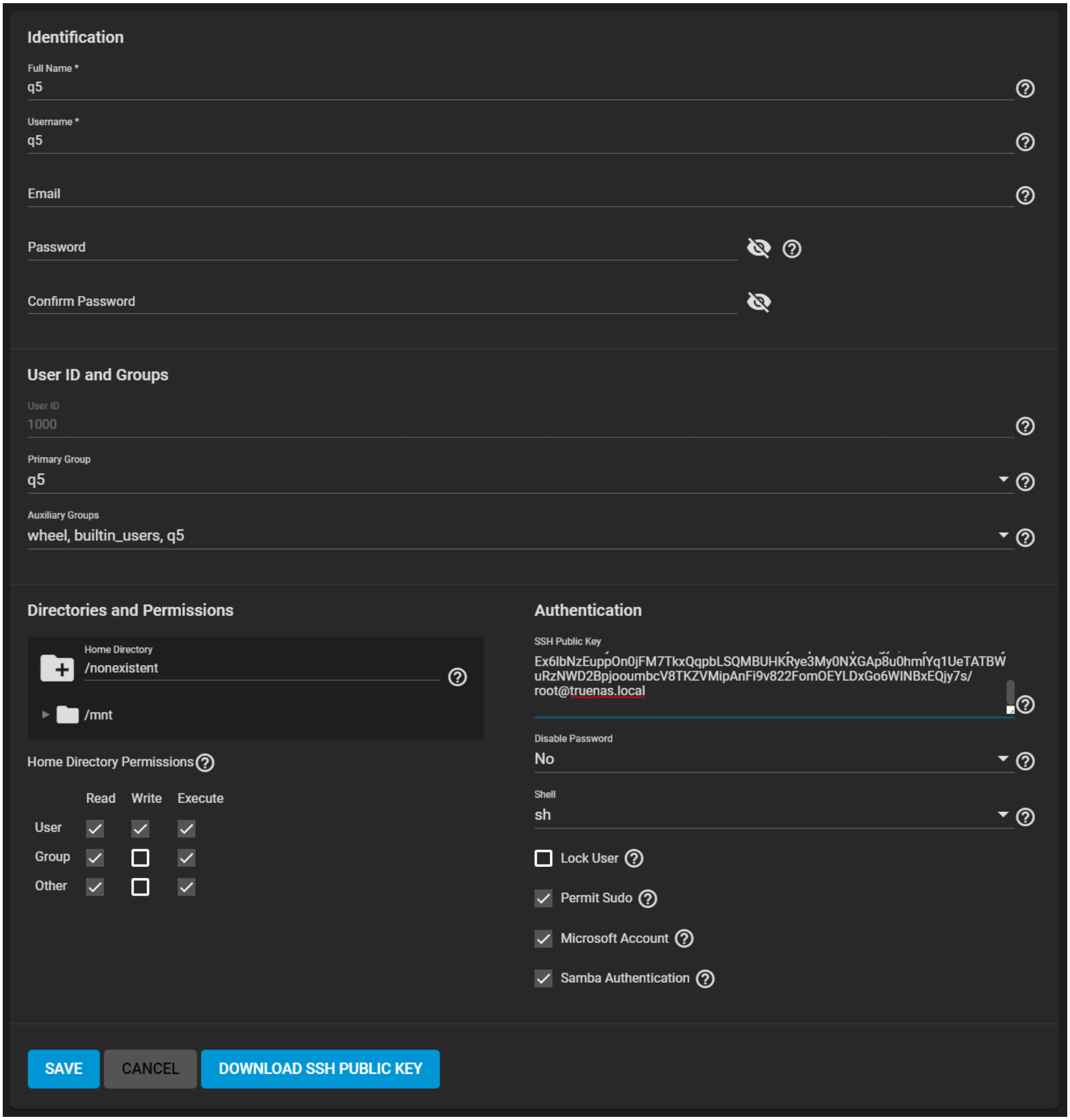
○ **Manual**

Choosing to manually set up the SSH connection requires copying a public encryption key from the local to remote system. This allows a secure connection without a password prompt.

Adding a Public SSH Key to the TrueNAS Root Account

Log in to the TrueNAS system that generated the SSH keypair and go to **System > SSH Keypairs**. Open the keypair to use for the SSH connection and copy the text of the public SSH key or download the public key as a text file.

Log in to the TrueNAS system that needs to register the public key and go to **Accounts > Users**. Edit the *root* account. Paste the SSH public key text into the **SSH Public Key** field.



Identification

Full Name * q5

Username * q5

Email

Password

Confirm Password

User ID and Groups

User ID 1000

Primary Group q5

Auxiliary Groups wheel, builtin_users, q5

Directories and Permissions

Home Directory /nonexistent

Home Directory Permissions

	Read	Write	Execute
User	☑	☑	☑
Group	☑	□	☑
Other	☑	□	☑

Authentication

SSH Public Key Ex6lbNzEuppOn0jFM7TkxQqpbLSQMBUHKRye3My0NXGAp8u0hmlYq1UeTATBW uRzNWD2BpjooumbcV8TKZVMipAnFi9v822FomOEYLDxGo6WINBxEQjy7s/ root@truenas.local

Disable Password No

Shell sh

□ Lock User

☑ Permit Sudo

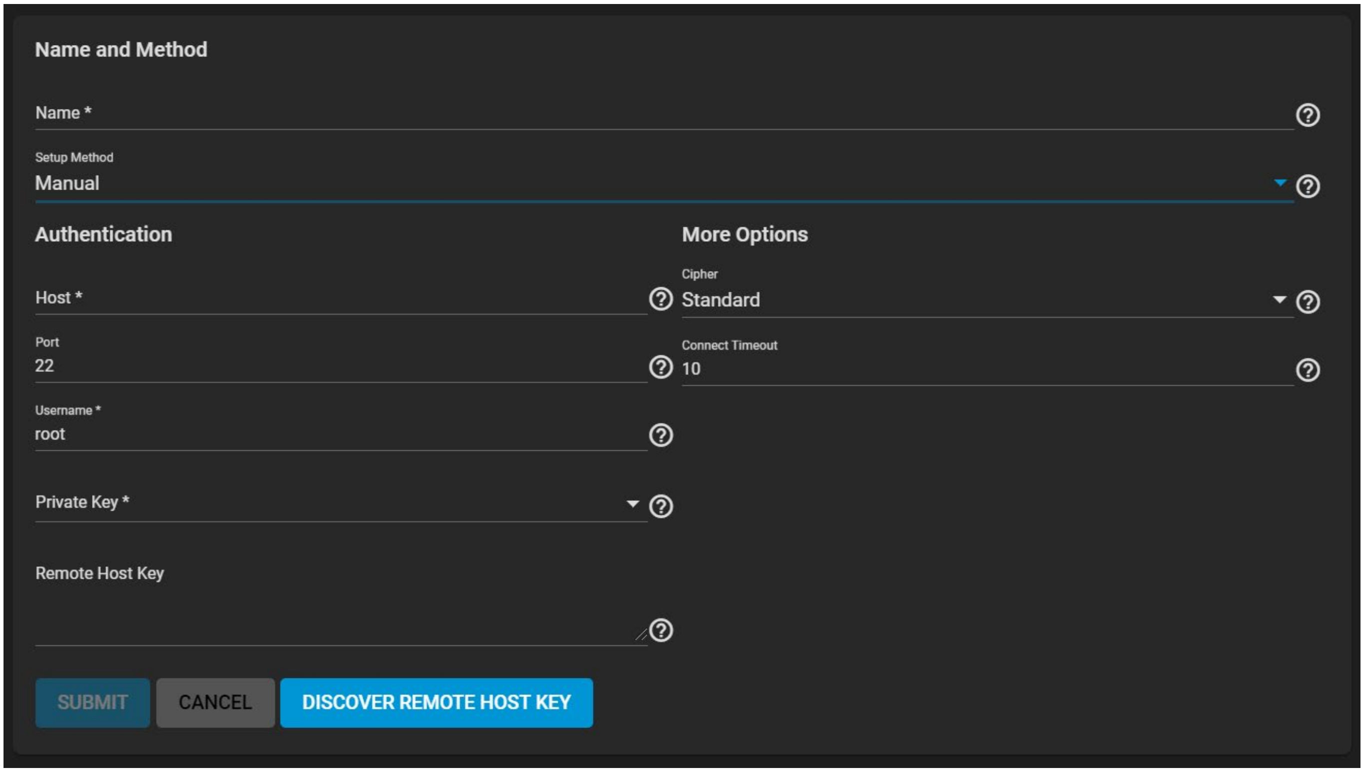
☑ Microsoft Account

☑ Samba Authentication

Start by generating a new SSH keypair in **System > SSH Keypairs**. Copy or download the value for the public key. The public key needs to be added to the remote NAS. When the remote NAS is not a TrueNAS system, please see the documentation for that system for instructions on adding a public SSH key.

Manually Configuring the SSH Connection on the Local TrueNAS

Log back in to the local TrueNAS system and go to **System > SSH Connections** and add a new connection. Change the setup method over to **Manual**.



Name and Method

Name *

Setup Method: Manual

Authentication

Host *

Port: 22

Username *: root

Private Key *

Remote Host Key

More Options

Cipher: Standard

Connect Timeout: 10

Name and Method

Name	Description
Name	Name of this SSH connection. SSH connection names must be unique.
Setup Method	*Manual* requires configuring authentication on the remote system. This can include copying SSH keys and modifying the root user account on that system. *Semi-automatic* only works when configuring an SSH connection with a remote TrueNAS system. This method uses the URL and login credentials of the remote system to connect and exchange SSH keys.

Authentication

Name	Description
Host	Hostname or IP address of the remote system. A valid URL scheme is required. Example: `https://10.231.3.76`
Port	Port number on the remote system to use for the SSH connection.
Username	Username for logging in to the remote system.
Private Key	Choose a saved SSH Keypair or select *Generate New* to create a new keypair and use it for this connection.
Remote Host Key	Remote system SSH key for this system to authenticate the connection. When all other fields are properly configured, click *DISCOVER REMOTE HOST KEY* to query the remote system and automatically populate this field.

Discover Remote Host Key connects to the remote host and attempts to copy the key string to the related TrueNAS field.

More Options

Name	Description

Cipher	*Standard* is most secure, but has the greatest impact on connection speed. *Fast* is less secure than Standard but can give reasonable transfer rates for devices with limited cryptographic speed. *Disabled* removes all security in favor of maximizing connection speed. Disabling the security should only be used within a secure, trusted network.
Connect Timeout	Time (in seconds) before the system stops attempting to establish a connection with the remote system.

Make sure to select the private key from the SSH keypair that was used to transfer the public key on the remote NAS.

3.12 - Tunables

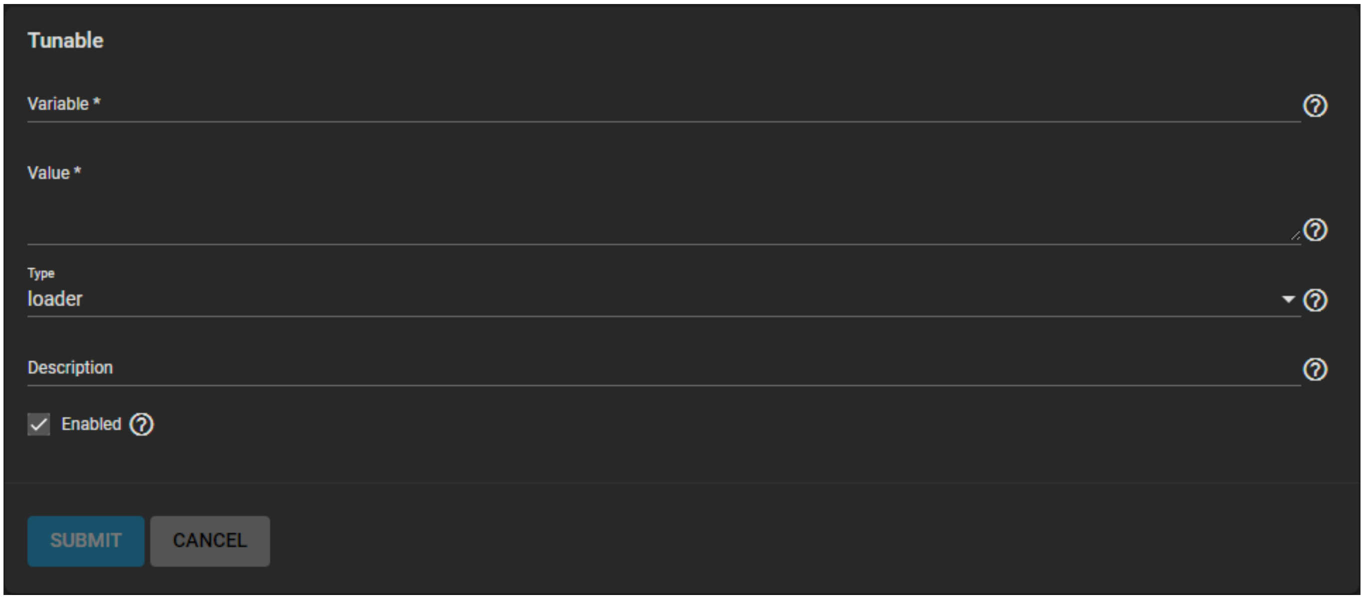
TrueNAS allows you to add system tunables from the web interface. These can be manually defined or TrueNAS can run an autotuning script to attempt to optimize the system. Tunables are used to manage TrueNAS sysctls, loaders, and rc.conf options.

- *loader* : specifies parameters to pass to the kernel or load additional modules at boot time.
- *rc.conf* : enables system services and daemons and only take effect after a reboot.
- *sysctl* : configures kernel parameters while the system is running and generally take effect immediately.

> Adding a sysctl, loader, or rc.conf option is an advanced feature. A sysctl immediately affects the kernel running the TrueNAS system and a loader could adversely affect the ability of the TrueNAS system to successfully boot. Do not create a tunable on a production system before testing the ramifications of that change.

Configuring System Tunables

To configure a tunable, go to **System > Tunables** and click *ADD*.



Type
loader

☑ Enabled

First, select the *Type* of tunable to add or modify. Enter the name of the *loader*, *sysctl*, or *rc.conf* variable to configure.

Next, enter the value to use for the loader, sysctl, or rc.conf. An optional description can be given.

If you wish to create the system tunable but not immediately enable it, unset the *Enable* checkbox. Configured tunables remain in effect until deleted or *Enabled* is unset.

Restarting the TrueNAS system after making sysctl changes is recommended. Some sysctls only take effect at system startup, and restarting the system guarantees that the setting values correspond with what is being used by the running system.

Be careful when adding or editing the default tunables. Changing the default tunables can make the system unusable.

UI Field Reference expand □

Tunable

Name	Description
	Enter the name of the loader, `sysctl`, or rc.conf variable to configure. loader tunables are used to

Variable	specify parameters to pass to the kernel or load additional modules at boot time. rc.conf tunables are for enabling system services and daemons and only take effect after a reboot. sysctl tunables are used to configure kernel parameters while the system is running and generally take effect immediately.
Value	Enter a value to use for the loader , sysctl , or rc.conf variable.
Type	Creating or editing a sysctl immediately updates the Variable to the configured Value. A restart is required to apply loader or rc.conf tunables. Configured tunables remain in effect until deleted or Enabled is unset.
Description	Enter a description of the tunable.
Enabled	Enable this tunable. Unset to disable this tunable without deleting it.

3.13 - Update

Preparing Systems for Updates and Upgrades

Preparation and precautions for a system upgrade, or update, vary. CORE Updates, ENTERPRISE (HA) Updates, and Major Version Upgrades each have several specific things that should be addressed before you proceed.

● **Preparing for CORE Update**

TrueNAS CORE

TrueNAS CORE has an integrated update system to make it easy to keep up to date.

Preparation

It is best to perform updates at times the TrueNAS system is idle, with no clients connected and no scrubs or other disk activity happening. Most updates require a system reboot. Plan updates around scheduled maintenance times to avoid disrupting user activities.

The update process does not proceed unless there is enough free space in the boot pool for the new update files. If a space warning is shown, go to **System > Boot** to remove unneeded boot environments.

Updates and Trains

Cryptographically signed update files are used to update TrueNAS. Update files provide flexibility in deciding when to upgrade the system. Updates are installed in a new Boot Environment, giving you the opportunity to install and test an update, but revert to a previous Boot Environment in **System > Boot** if anything goes wrong.

TrueNAS defines software branches, known as trains. There are several trains available for updates, but the web interface only displays trains that can be selected as an upgrade.

Update trains are labeled with a numeric version followed by a short description. The current version receives regular bug fixes and new features. Supported older versions of TrueNAS only receive maintenance updates. See the Software Development Life Cycle for more details about the development and support timeline for TrueNAS versions.

Several specific words are used to describe the type of train:

STABLE: Bug fixes and new features are available from this train. Upgrades available from a STABLE train are tested and ready to apply to a production environment.

Nightlies: Experimental train used for testing future versions of TrueNAS.

SDK: Software Developer Kit train. This has additional tools for testing and debugging TrueNAS.

> The UI shows a warning when the currently selected train is not suited for production use. Before using a non-production train, be prepared to experience bugs or problems. Testers are encouraged to submit bug reports at https://jira.ixsystems.com .

○ **Preparing for ENTERPRISE (HA) Update**

TrueNAS Enterprise (HA)

Updating a TrueNAS Enterprise system that is configured for High Availability (HA) has a slightly different flow from non-HA systems or TrueNAS Core. The system downloads the update to both controllers, updates and reboots the standby TrueNAS controller, and finally fails over from and updates the active TrueNAS controller.

Preparation

An update usually takes between thirty minutes and an hour. A reboot is required after the update, so it is recommended to schedule updates during a maintenance window, allowing two to three hours to update, test, and possibly roll back if issues appear. On very large systems, a proportionally longer maintenance window is recommended.

For individual support during an upgrade, please contact iXsystems Support to schedule your upgrade.

Contacting iXsystems Support expand □

Customers who purchase iXystems hardware or that want additional support must have a support contract to use iXystems Support Services. The TrueNAS Community forums provides free support for users without an iXsystems Support contract.

Contact Method	Contact Options
Web	https://support.ixsystems.com
Email	support@ixsystems.com
Telephone	Monday - Friday, 6:00AM to 6:00PM Pacific Standard Time: US-only toll-free: 1-855-473-7449 option 2 Local and international: 1-408-943-4100 option 2
Telephone	After Hours (24x7 Gold Level Support only): US-only toll-free: 1-855-499-5131 International: 1-408-878-3140 (international calling rates apply)

Scheduling at least two days in advance of a planned upgrade gives time to make sure a specialist is available for assistance. Updating from earlier than version 9.3 of TrueNAS must be scheduled with iXsystems Support.

The update process will not proceed unless there is enough free space in the boot pool for the new update files. If a space warning is shown, go to **System > Boot** and remove any unneeded boot environments.

Operating system updates only modify the operating system devices and do not affect end-user data on storage drives.

An update could involve upgrading the version of ZFS that is installed on the storage drives. When a ZFS version upgrade is available, an notifications **Alert** appears in the web interface. Upgrading the ZFS version on storage drives is not recommended until it has been verified that rolling back to previous versions of the operating system is not necessary and that swapping the storage drives with another system that has an earlier ZFS version is not needed. After a ZFS version upgrade, the storage devices will not be accessible by earlier TrueNAS versions.

○ **Preparing for Major System Upgrades**

Major Version Upgrades

TrueNAS provides flexibility for keeping the operating system up-to-date:

1. Upgrades to major releases, for example from version 9.3 to 9.10, can still be performed using either an ISO or the web interface. Unless the Release Notes for the new major release indicate that the current version requires an ISO upgrade, either upgrade method can be used.
2. Minor releases have been replaced with signed updates. This means that it is not necessary to wait for a minor release to update the system with a system update or newer versions of drivers and features. It is also no longer necessary to manually download an upgrade file and its associated checksum to update the system.
3. The updater automatically creates a boot environment, making updates a low-risk operation. Boot environments provide the option to return to the previous version of the operating system by rebooting the system and selecting the previous boot environment from the **System > Boot** menu.

The upgrade instructions describe how to use an .iso file to perform a major version upgrade from an earlier version of FreeNAS/TrueNAS. See the Updating article for instructions about using the web interface to keep the system updated.

The upgrade path for major versions of FreeNAS/TrueNAS is **9.3 > 9.10 > 11.1 > 11.3 > 12.0**. It is always recommended to upgrade to a supported version of the software.

Caveats

Be aware of these caveats before attempting a major version upgrade:

Upgrading a data storage pool can make it impossible to go back to a previous version.
For this reason, the update process does not automatically upgrade storage pools, though the system shows an alert when a pool can be upgraded. Unless new ZFS feature flags are needed, it is safe to leave the pool at the current version. If the pool is upgraded, it isn't possible to boot into a previous TrueNAS version that does not support the newer feature flags.

We recommend upgrading Broadcom SAS HBAs to the latest version.

When upgrading from 9.3.x to 9.10, read this [changes FAQ](https://www.truenas.com/docs/files/Notice - 9.3 to 9.10 FAQ.pdf) first.

TrueNAS does not suppport upgrades from FreeNAS 0.7x.
The system has no way to import configuration settings from FreeNAS 0.7x versions. The configuration must be manually recreated. If supported, the FreeNAS 0.7x pools or disks must be manually imported.

TrueNAS does not suppport upgrades on 32-bit hardware.
However, if the system is currently running a 32-bit version of FreeNAS/TrueNAS and the hardware supports 64-bit, the system can be upgraded. Any archived reporting graphs will be lost during the upgrade.

TrueNAS does not suppport UFS.
If the data currently resides on **one** UFS-formatted disk, create a ZFS pool using other disks after the upgrade, then use the instructions in Importing a Disk to mount the UFS-formatted disk and copy the data to the ZFS pool. With only one disk, back up its data to another system or media before the upgrade, format the disk as `ZFS` after the upgrade, then restore the backup. If the data currently resides on a UFS RAID of disks, it is not possible to directly import that data to the ZFS pool. Instead, back up the data before the upgrade, create a ZFS pool after the upgrade, then restore the data from the backup.

TrueNAS 12.0 or newer does not support GELI-encrypted pools. If you have GELI-encrypted pools and are upgrading to TrueNAS 12.0 or newer, you might want to migrate data out of the GELI-encrypted pools into ZFS-encrypted pools. The GELI pools **cannot be converted**; the data must be migrated to a new ZFS pool. See the Encryption article for more details.

Preparation

Before upgrading the operating system, follow these steps:

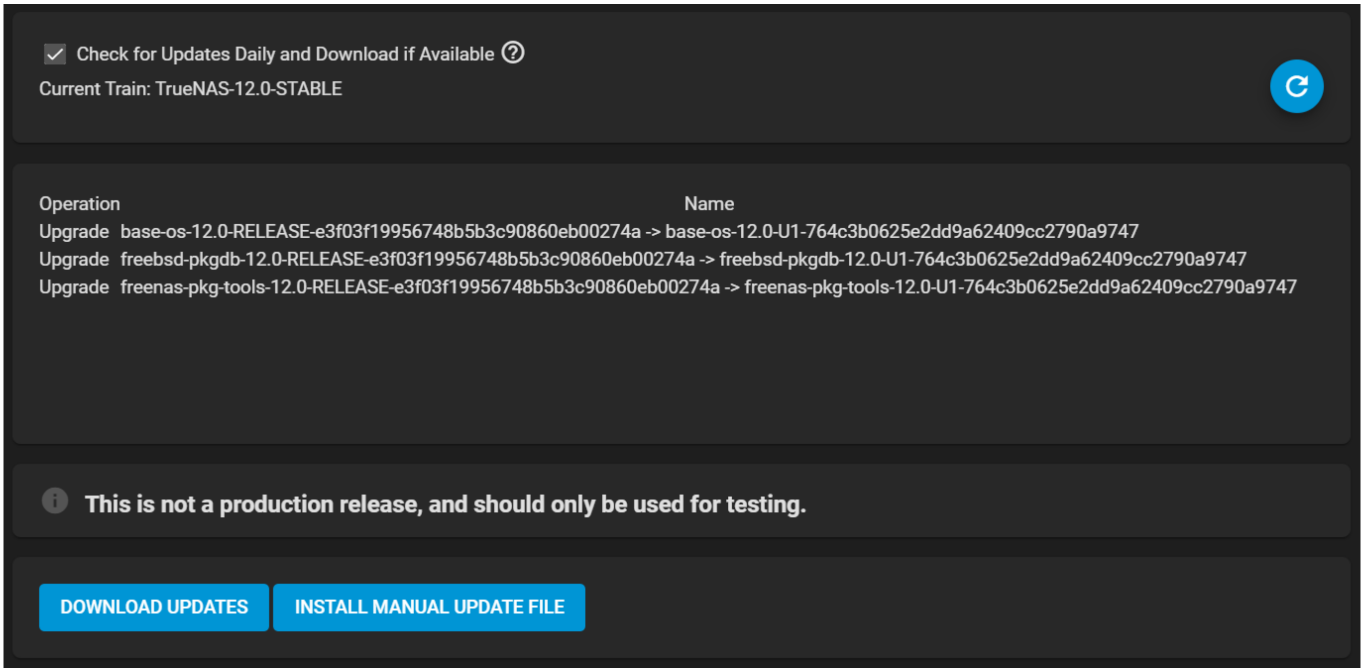
1. Back up the TrueNAS configuration in **System > General > Save Config**.
2. Back up any or have the keys or passphrases for encrypted data available.
3. Warn users that TrueNAS shared data will be unavailable during the upgrade. It is recommended to schedule the upgrade for a time that will least impact users.

4. Stop all system **Services**.

Update and Upgrade Instructions

⊙ Updating CORE

Checking for Updates



☑ Check for Updates Daily and Download if Available

Current Train: TrueNAS-12.0-STABLE

Operation	Name
Upgrade	base-os-12.0-RELEASE-e3f03f19956748b5b3c90860eb00274a -> base-os-12.0-U1-764c3b0625e2dd9a62409cc2790a9747
Upgrade	freebsd-pkgdb-12.0-RELEASE-e3f03f19956748b5b3c90860eb00274a -> freebsd-pkgdb-12.0-U1-764c3b0625e2dd9a62409cc2790a9747
Upgrade	freenas-pkg-tools-12.0-RELEASE-e3f03f19956748b5b3c90860eb00274a -> freenas-pkg-tools-12.0-U1-764c3b0625e2dd9a62409cc2790a9747

This is not a production release, and should only be used for testing.

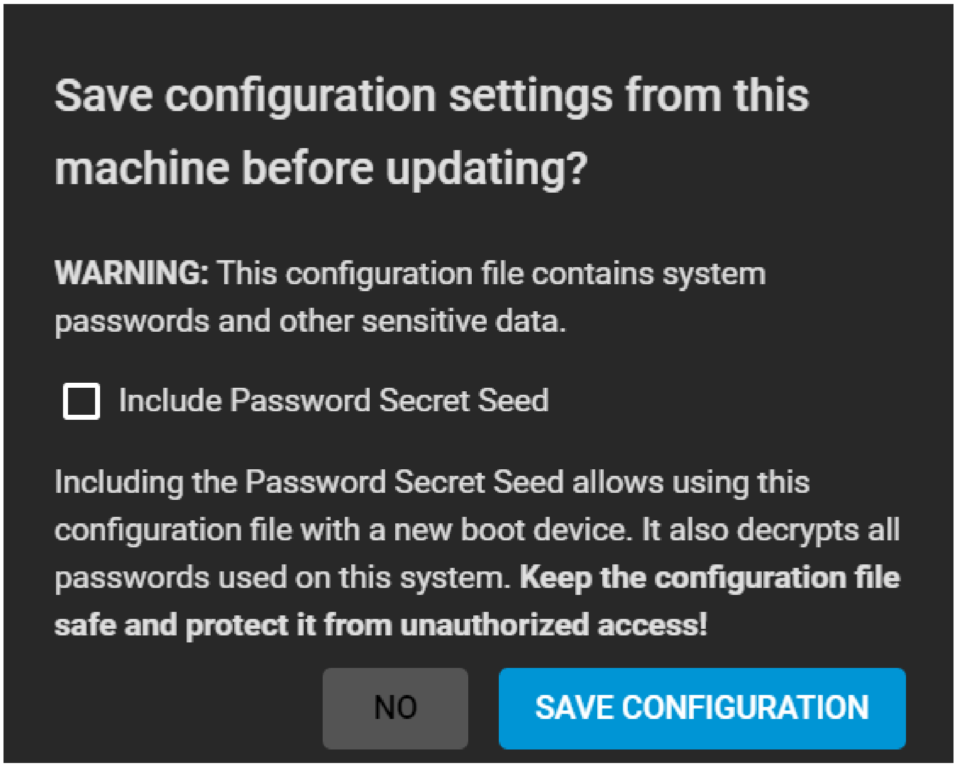
The system checks daily for updates and downloads an update if one is available. An alert is issued when a new update becomes available. The automatic check and download of updates is disabled by unsetting `Check for Updates Daily and Download if Available`. Click ⟳ (Refresh) to perform another check for updates. To change the train, use the drop-down menu to make a different selection.

> The train selector does not allow downgrades. For example, the STABLE train cannot be selected while booted into a Nightly boot environment, or a 9.10 train cannot be selected while booted into a 11 boot environment. To go back to an earlier version after testing or running a more recent version, reboot and select a boot environment for that earlier version. This screen can then be used to check for updates that train.

Information about the update is displayed along with a link to the *release notes*. It is important to read the release notes before updating to determine if any of the changes in that release impact the use of the system.

Saving the Configuration File

A dialog to save the system configuration file appears before installing updates.



Save configuration settings from this machine before updating?

WARNING: This configuration file contains system passwords and other sensitive data.

□ Include Password Secret Seed

Including the Password Secret Seed allows using this configuration file with a new boot device. It also decrypts all passwords used on this system. **Keep the configuration file safe and protect it from unauthorized access!**

Keep the system configuration file secure after saving it. The security information in the configuration file could be used for unauthorized access to your TrueNAS system.

Applying Updates

Make sure the system is in a low-usage state as described above in Preparing for Updates . Click *DOWNLOAD UPDATES* to immediately download and install an update.

The *Save Configuration* dialog appears so the current configuration can be saved to external media.

A confirmation window appears before the update is installed. When *Apply updates and reboot system after downloading* is set, clicking *CONTINUE* downloads and applies the update, then reboots the system. The update can be downloaded for a later manual installation by unsetting *Apply updates and reboot system after downloading*.

APPLY PENDING UPDATE is visible when an update is downloaded and ready to install. Click this button to see a confirmation window. Setting *Confirm* and clicking *CONTINUE* installs the update and reboots the system.

Each update creates a boot environment. If the update process needs more space, it attempts to remove old boot environments. Boot environments marked with the *Keep* attribute as shown in **System > Boot** are not removed. If space for a new boot environment is not available, the upgrade fails. Space on the operating system device can be manually freed by going to **System > Boot** and removing the *Keep* attribute or deleting any boot environments that are no longer needed.

Can I force a full update? expand □

The TrueNAS updater defaults to delta packages for updates. During an update, only files that changed in the base operating system since the previous update are downloaded. Delta update packages are generally preferred over full update packages, providing a faster update and taking less bandwidth. By contrast, a full update package downloads all of the files included in the base system, even if those files have not changed.

While the full package might require more time to install, there are some rare cases where it is necessary, such as when a patch has been applied as a temporary fix to a local system. A patch is a piece of software that is used to fix a bug within the main codebase. While software patches are often used to fix bugs, they can also repair security issues or add new features.

To force a full update, open the web interface **Shell** and enter this command in the console:

```
freenas-update -C /tmp/update-$$ -no-delta -reboot update
```

The updater downloads the full package, which contains all of the files from the latest software release. when the download completes, the system reboots with the standard configuration.

Manual Updates

Updates can also be manually downloaded and applied in **System > Update**.

Manual updates cannot be used to upgrade from older major versions.

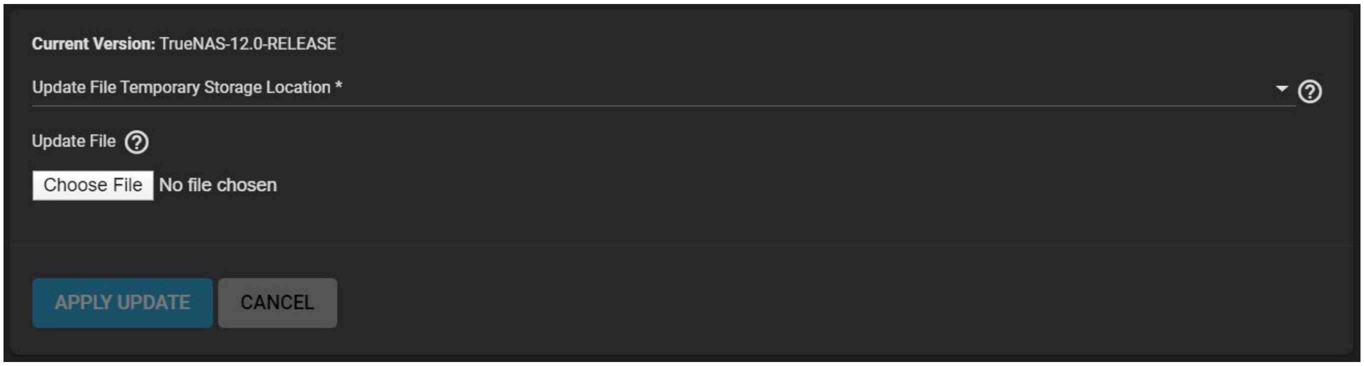
Go to https://download.freenas.org/ and find an update file of the desired version. Manual update file names end with manual-update.tar .

Download the desired update file to your local system. Log in to the TrueNAS web interface and go to **System > Update**. Click *INSTALL MANUAL UPDATE FILE*.

The *Save Configuration* dialog opens. This makes it possible to save a copy of the current configuration to external media for backup in case of an update problem.

After the dialog closes, the manual update screen is shown.

The current version of TrueNAS is shown for verification.



Current Version: TrueNAS-12.0-RELEASE

Select the manual update file that was saved to your local system using *Browse*. Set *Reboot After Update* to reboot the system after the update has been installed. Click *APPLY UPDATE* to begin the update.

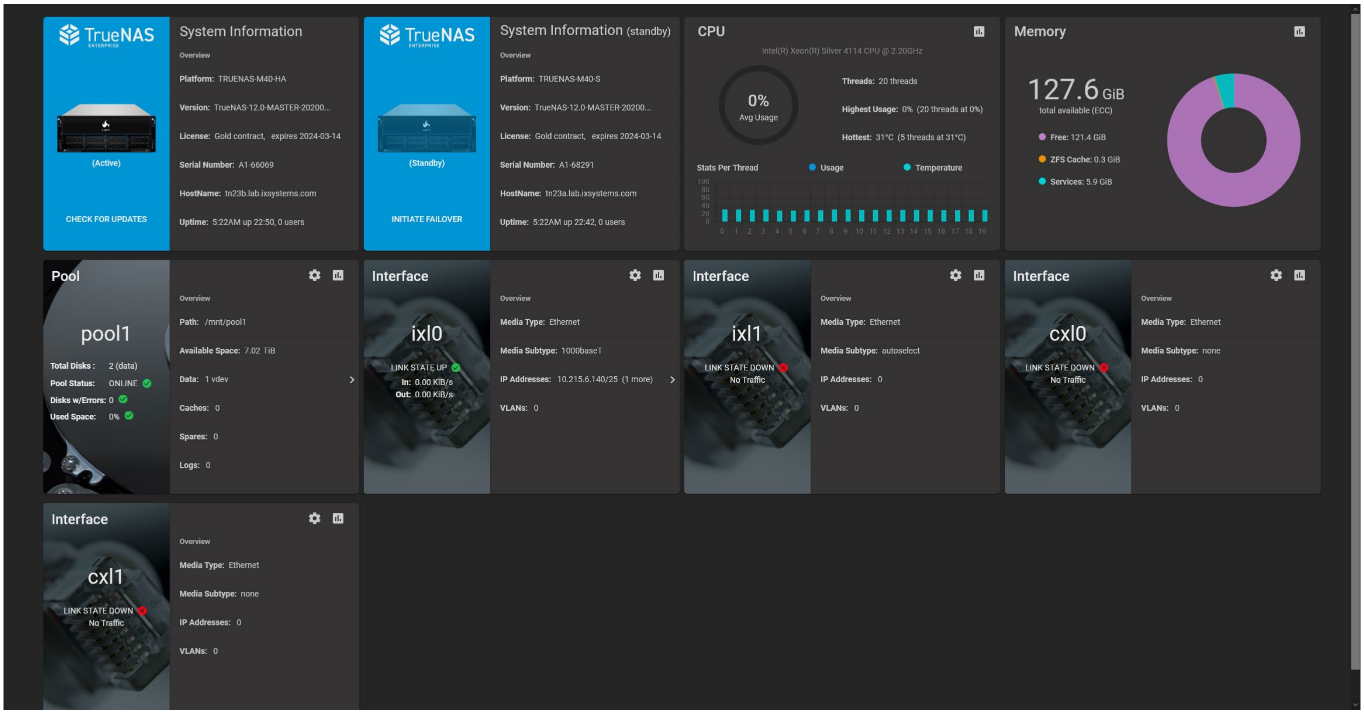
Update in Progress

Starting an update shows a progress dialog. When an update is in progress, the web interface shows an animated system_update_alt icon in the top row. Dialogs also appear in every active web interface session to warn that a system update is in progress. **Do not** interrupt a system update.

○ **Updating ENTERPRISE (HA)**

Starting the Update

In the web interface **Dashboard**, find the entry for the active TrueNAS controller and click *CHECK FOR UPDATES*. This button changes to *UPDATES AVAILABLE* when there is an available update.



System Information

Overview

Platform: TRUENAS-M40-HA

Version: TrueNAS-12.0-MASTER-20200...

License: Gold contract, expires 2024-03-14

Serial Number: A1-66069

HostName: tn23b.lab.ixsystems.com

Uptime: 5:22AM up 22:50, 0 users

System Information (standby)

Overview

Platform: TRUENAS-M40-S

Version: TrueNAS-12.0-MASTER-20200...

License: Gold contract, expires 2024-03-14

Serial Number: A1-68291

HostName: tn23a.lab.ixsystems.com

Uptime: 5:22AM up 22:42, 0 users

CPU

Intel(R) Xeon(R) Silver 4114 CPU @ 2.20GHz

0% Avg Usage

Threads: 20 threads

Highest Usage: 0% (20 threads at 0%)

Hottest: 31°C (5 threads at 31°C)

Memory

127.6 GiB total available (ECC)

● Free: 121.4 GiB

● ZFS Cache: 0.3 GiB

● Services: 5.9 GiB

Pool

pool1

Total Disks : 2 (data)

Pool Status: ONLINE ✓

Disks w/Errors: 0 ✓

Used Space: 0% ✓

Overview

Path: /mnt/pool1

Available Space: 7.02 TiB

Data: 1 vdev

Caches: 0

Spares: 0

Logs: 0

Interface

ixl0

LINK STATE UP ✓

In: 0.00 KiB/s

Out: 0.00 KiB/s

Overview

Media Type: Ethernet

Media Subtype: 1000baseT

IP Addresses: 10.215.6.140/25 (1 more)

VLANs: 0

Interface

ixl1

LINK STATE DOWN ✗

No Traffic

Overview

Media Type: Ethernet

Media Subtype: autoselect

IP Addresses: 0

VLANs: 0

Interface

cxl0

LINK STATE DOWN ✗

No Traffic

Overview

Media Type: Ethernet

Media Subtype: none

IP Addresses: 0

VLANs: 0

Interface

cxl1

LINK STATE DOWN ✗

No Traffic

Overview

Media Type: Ethernet

Media Subtype: none

IP Addresses: 0

VLANs: 0

Clicking the button goes to **System > Update** and shows the option to *Download Updates* or, when the system has already detected and staged an update, *Apply Pending Update*.

When *Download Updates* or *Apply Pending Update* is clicked, it first gives an opportunity to save the current system configuration. Backing up the system configuration is strongly recommended before starting the update. Including the *Password Secret Seed* in the system configuration removes the encryption from sensitive system data, like stored passwords. When enabling this option, take extra precautions to store the downloaded system configuration file in a secure location.

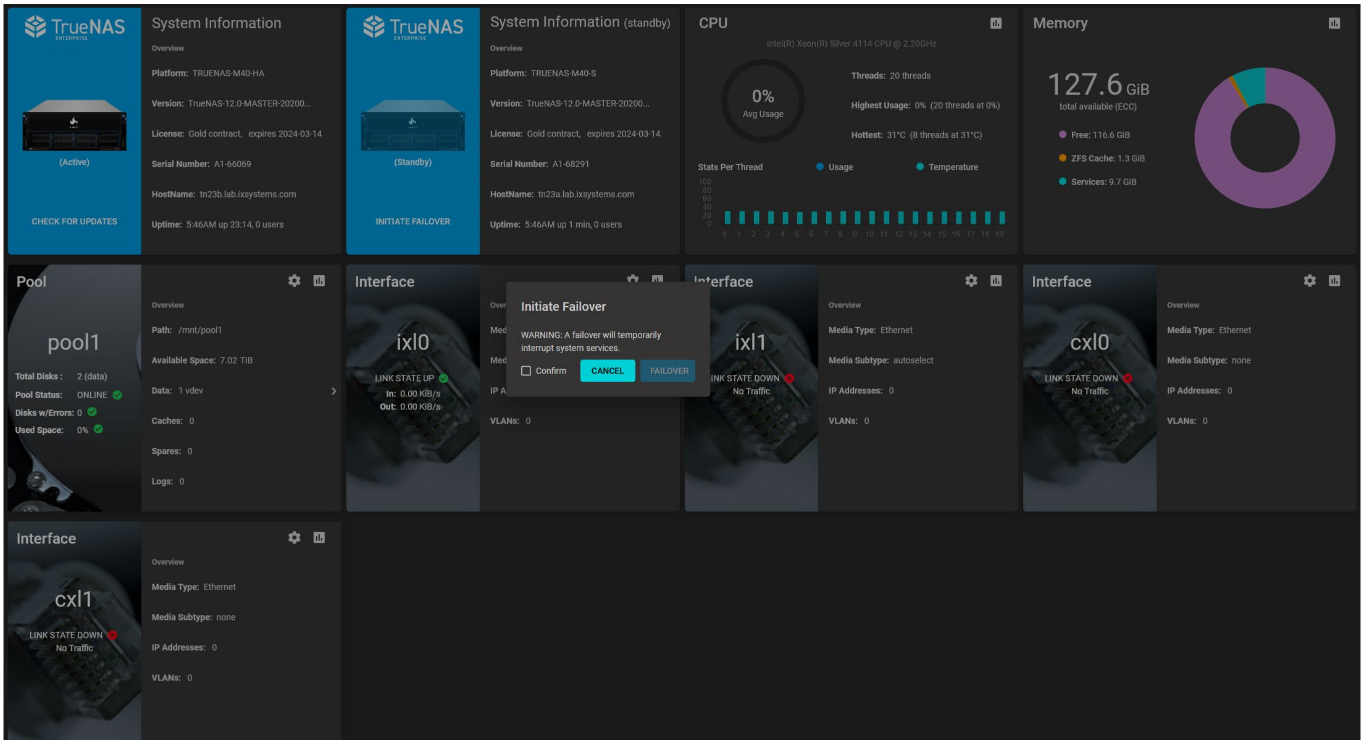
After downloading the system configuration, you can continue to download and/or apply the system update. This will start the process to update and reboot the TrueNAS controllers. HA and other system services will be briefly unavailable.

Other users that are logged in to the web interface will see a warning dialog. A **System Updating** icon is shown in the top bar of the web interface while the update is in progress.

Update progress is shown for both TrueNAS controllers. The standby TrueNAS controller reboots when it is finished updating. This can take several minutes. When the standby controller has finished booting, the system must fail over to update and reboot the active TrueNAS controller.

Fail Over to Complete the Update

To deactivate the active TrueNAS controller and finish the update, go to the **Dashboard**, find the entry for the *Standby* controller, and click *INITIATE FAILOVER*.



Platform: TRUENAS-M40-HA
Version: TrueNAS-12.0-MASTER-20200...
License: Gold contract, expires 2024-03-14
Serial Number: A1-66069
HostName: tn23b.lab.ixsystems.com
Uptime: 5:46AM up 23:14, 0 users

Platform: TRUENAS-M40-S
Version: TrueNAS-12.0-MASTER-20200...
License: Gold contract, expires 2024-03-14
Serial Number: A1-68291
HostName: tn23a.lab.ixsystems.com
Uptime: 5:46AM up 1 min, 0 users

Threads: 20 threads
Highest Usage: 0% (20 threads at 0%)
Hottest: 31°C (8 threads at 31°C)

Free: 116.6 GiB
ZFS Cache: 1.3 GiB
Services: 9.7 GiB

Total Disks : 2 (data)
Pool Status: ONLINE
Disks w/Errors: 0
Used Space: 0%

Path: /mnt/pool1
Available Space: 7.02 TiB
Data: 1 vdev
Caches: 0
Spares: 0
Logs: 0

In: 0.00 KiB/s
Out: 0.00 KiB/s
VLANs: 0

Initiate Failover

WARNING: A failover will temporarily interrupt system services.

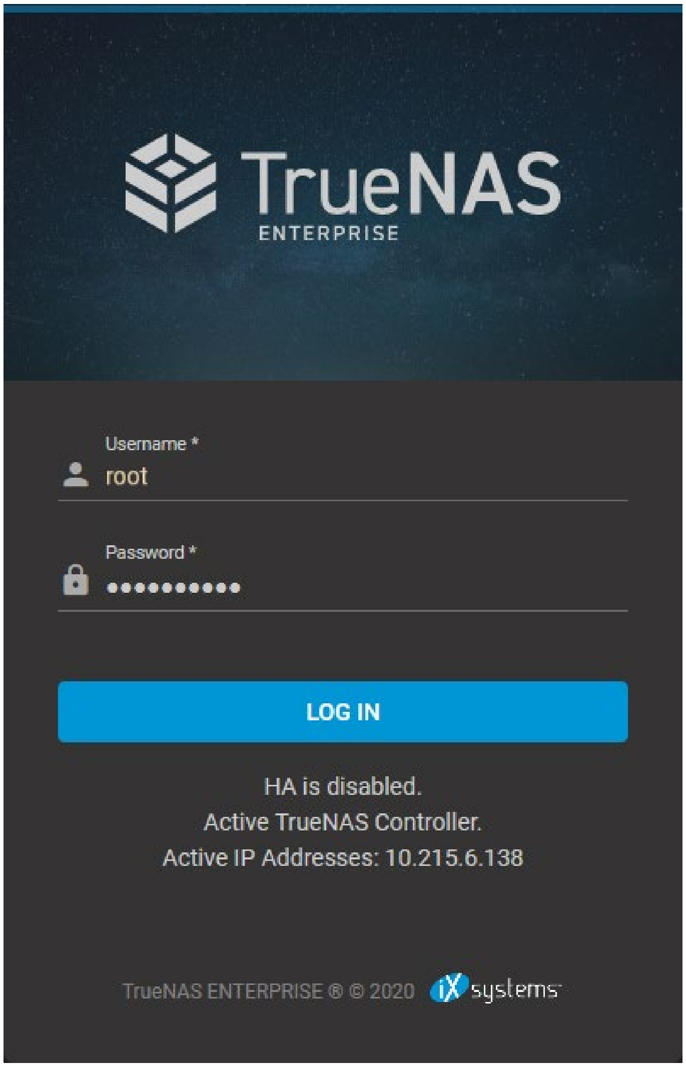
☐ Confirm

Media Type: Ethernet
Media Subtype: autoselect
IP Addresses: 0
VLANs: 0

Media Type: Ethernet
Media Subtype: none
IP Addresses: 0
VLANs: 0

Media Type: Ethernet
Media Subtype: none
IP Addresses: 0
VLANs: 0

Initiating the failover briefly interrupts TrueNAS services and availability. The browser logs out of the web interface while the active TrueNAS controller deactivates and the standby TrueNAS controller is brought online. The web interface login screen reappears when the standby TrueNAS controller finishes activating.



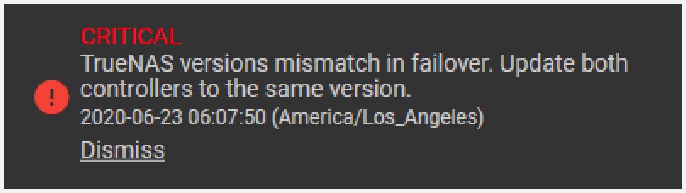
HA is disabled.
Active TrueNAS Controller.
Active IP Addresses: 10.215.6.138

Log in to the web interface and check the cloud HA status in the top toolbar. This icon shows that HA is unavailable while the previously active TrueNAS controller reboots. When HA is available, a dialog asks to finish the update. Click *CONTINUE* to finish updating the previously active TrueNAS controller.

Verify that the update is complete by going to the **Dashboard** and confirming that the *Version* is the same on both TrueNAS controllers.

Reverting an Update expand □

If the update did not install on one of the controllers, the web interface generates an alert about a mismatch between controller versions.

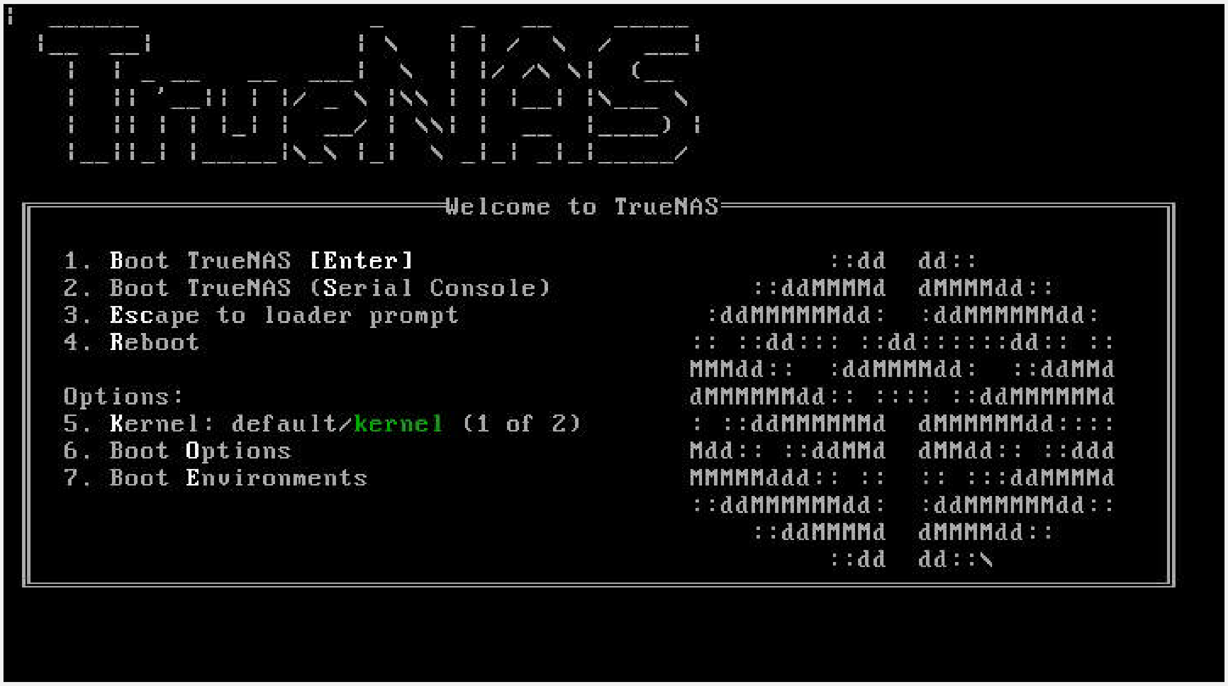


CRITICAL
TrueNAS versions mismatch in failover. Update both controllers to the same version.
2020-06-23 06:07:50 (America/Los_Angeles)
Dismiss

If something else goes wrong with the update, the system generates an alert and writes details to /data/update.failed .

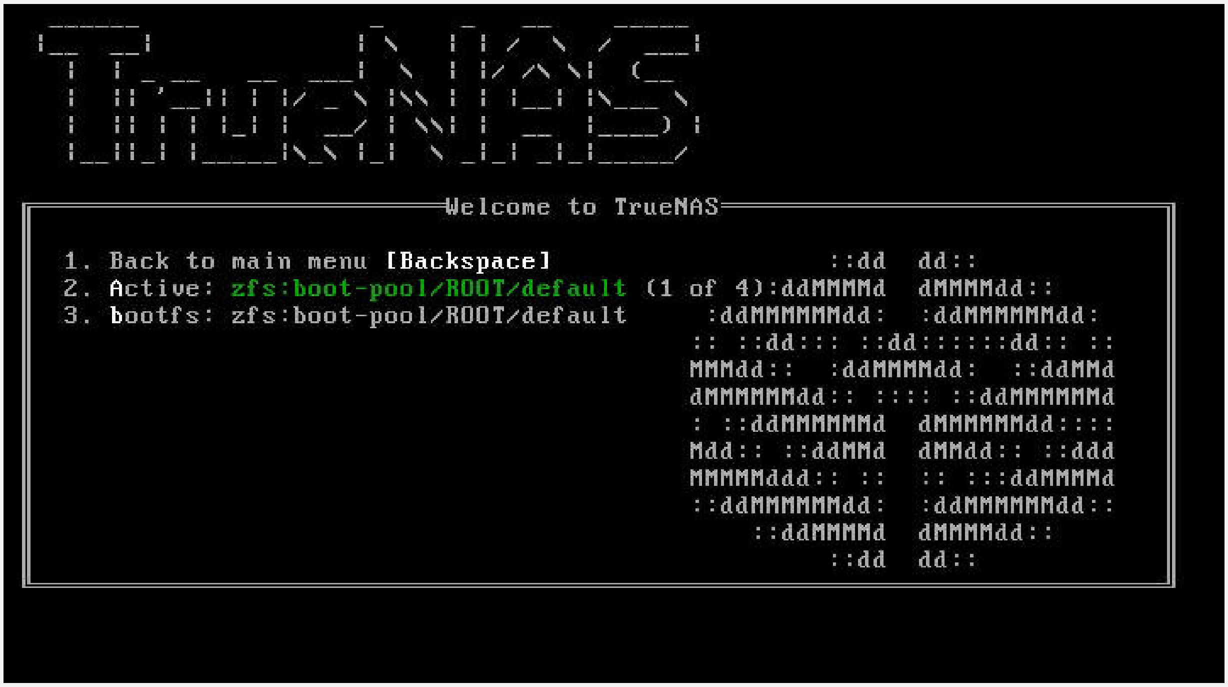
You can return the system to its pre-update state by activating a previous boot environment during system boot. To ensure the versions match, do this procedure for both TrueNAS controllers. This requires physical or IPMI access to the TrueNAS controller console.

Reboot the system and press the space bar when the boot menu appears, pausing the boot process.



```
Welcome to TrueNAS

 1. Boot TrueNAS [Enter]
 2. Boot TrueNAS (Serial Console)
 3. Escape to loader prompt
 4. Reboot

 Options:
 5. Kernel: default/kernel (1 of 2)
 6. Boot Options
 7. Boot Environments
```

Open the *Boot Environments* menu and cycle the *Active* boot environment until one that is dated prior to the update is selected.



```
Welcome to TrueNAS

 1. Back to main menu [Backspace]
 2. Active: zfs:boot-pool/ROOT/default (1 of 4)
 3. bootfs: zfs:boot-pool/ROOT/default
```

Return to the first screen and press `Enter` to boot into the version of TrueNAS that was installed on that date.

Manually Updating an Enterprise HA System expand □

Enterprise customers should contact iX Support for assistance updating their TrueNAS system.

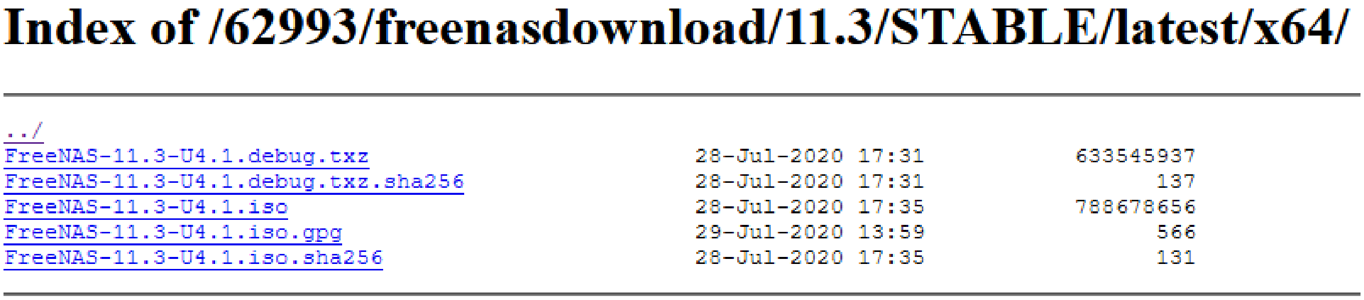
- Download the manual update file located at the [TrueNAS/FreeNAS Download Page](#).
- Go to **System -> Update**.
- Click the *INSTALL MANUAL UPDATE* button.
- Set the *Include Password Secret Seed* checkbox and click the *Save Configuration* button.

- Select the *Update File Temporary Storage Location*, click the *Choose File* button. Select the manual upgrade file that was downloaded. Wait for the file to upload and then click the *APPLY UPDATE* button.
- The Manual update will upload the file, install the file to both controllers, and then reboot the Standby Controller. To complete the upgrade process click the *Close* button in the dialog box. Initiate a failover of the standby controller, as instructed, by clicking *INITIATE FAILOVER* from the Standby Controller's Dashboard card.
- Log into the system.
- Click the *Continue* button at the Pending Upgrade dialog box and the standby controller will reboot completing the upgrade.

○ **Major Version Upgrades**

ISO Upgrades

To upgrade TrueNAS using an .iso file, go to https://www.truenas.com/download-truenas-core/ (TrueNAS CORE latest release) or https://download.freenas.org to download the .iso to the computer that will be used to prepare the installation media. For example, this is the path to download an .iso of the latest FreeNAS 11.3 release:



Index of /62993/freenasdownload/11.3/STABLE/latest/x64/

```
../
FreeNAS-11.3-U4.1.debug.txz                          28-Jul-2020 17:31          633545937
FreeNAS-11.3-U4.1.debug.txz.sha256                   28-Jul-2020 17:31                137
FreeNAS-11.3-U4.1.iso                                28-Jul-2020 17:35          788678656
FreeNAS-11.3-U4.1.iso.gpg                            29-Jul-2020 13:59                566
FreeNAS-11.3-U4.1.iso.sha256                         28-Jul-2020 17:35                131
```

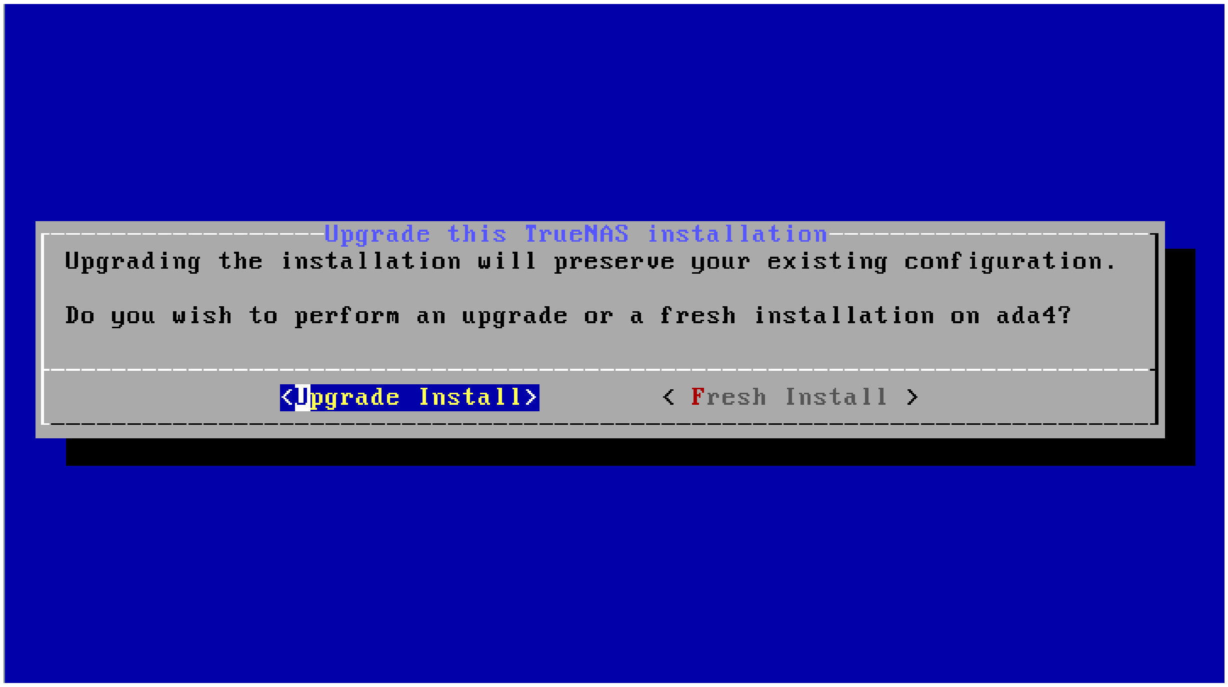
Burn the downloaded .iso file to a CD or USB stick. Refer to the Prepare the Install File instructions in the Installation article for tips about burning the .iso to media using different Operating Systems.

Insert the prepared media into the system and boot from it. The installer waits ten seconds in the installer boot menu before booting the default option. If needed, press `Spacebar` to stop the timer and choose another boot option. After the media finishes booting into the installation menu, press `Enter` to select the default option `1 Install/Upgrade`. The installer presents a screen showing all available drives.

> All drives are shown, including boot drives and storage drives. Only choose boot drives when upgrading. **Choosing the wrong drives to upgrade or install will cause loss of data.** If unsure about which drives contain the TrueNAS operating system, reboot and remove the install media. Log in to the TrueNAS web interface and go to **System > Boot > ACTIONS > Boot Pool Status** to identify the boot drives. More than one drive is shown when a mirror has been used.

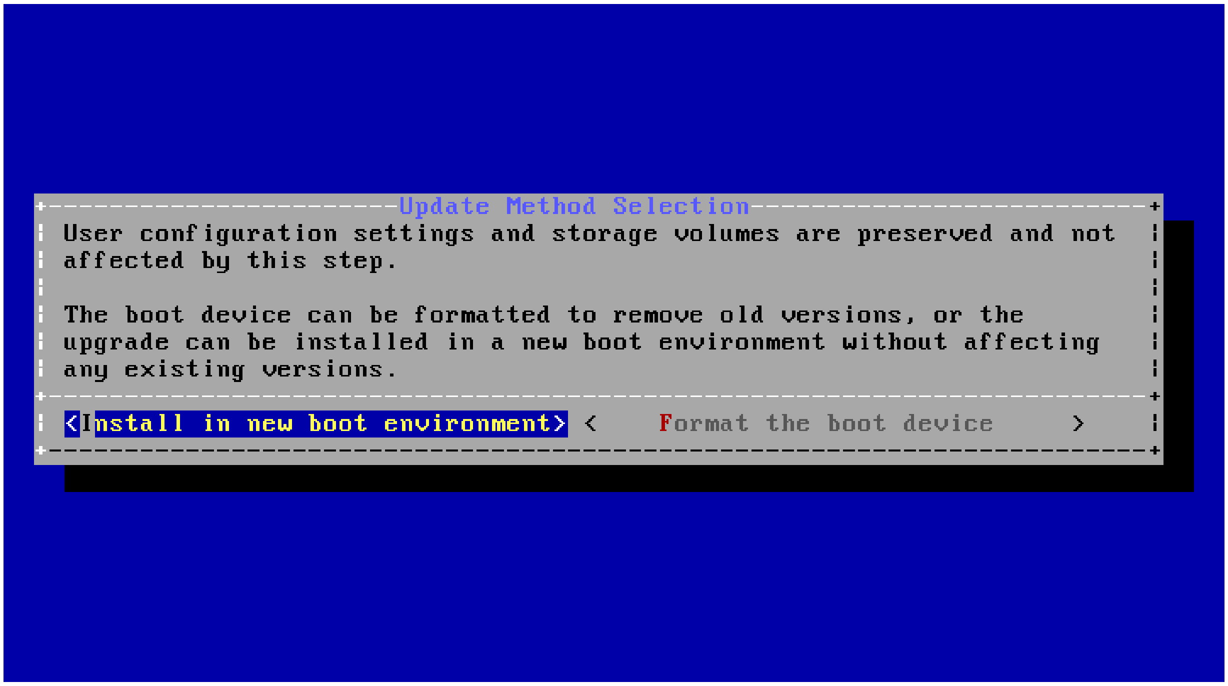
Highlight the drive where TrueNAS is installed and press `Spacebar` to mark it with a star. If a mirror has been used for the operating system, mark all of the drives where the TrueNAS operating system is installed. Press `Enter` when done.

The installer recognizes earlier versions of FreeNAS/TrueNAS installed on the boot drives and asks to either upgrade or do a fresh install:



```
Upgrade this TrueNAS installation
Upgrading the installation will preserve your existing configuration.

Do you wish to perform an upgrade or a fresh installation on ada4?

<Upgrade Install>          < Fresh Install >
```

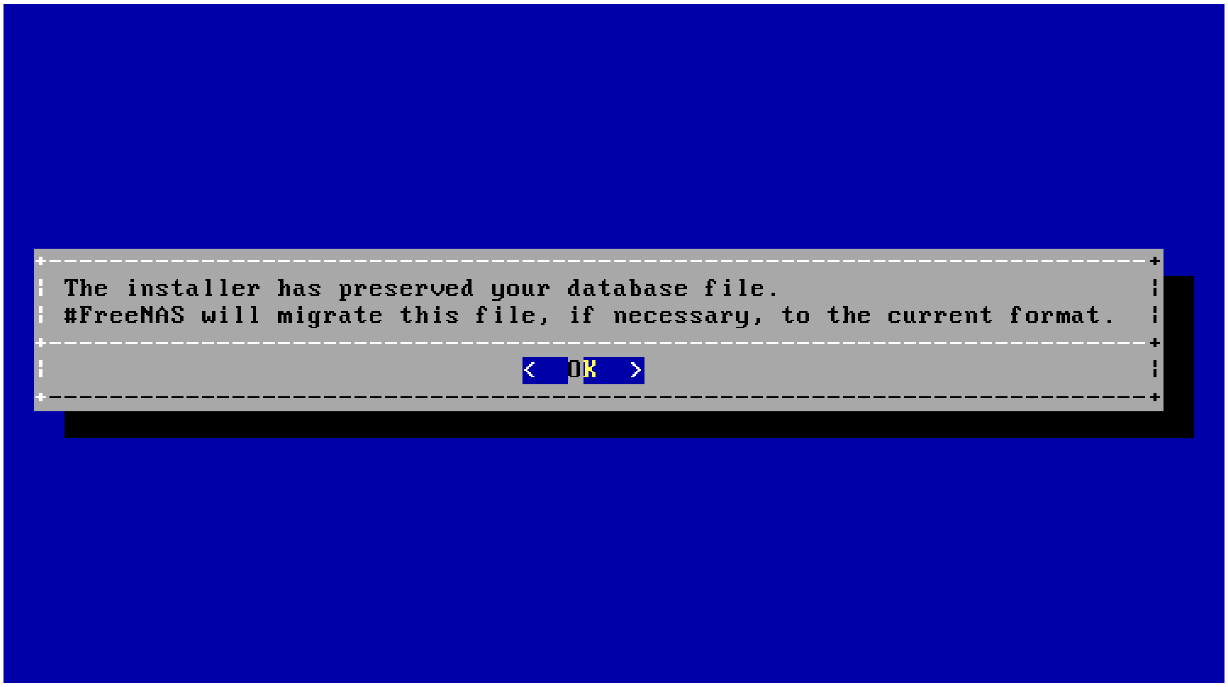
To perform an upgrade, press `Enter` to accept the default `Upgrade Install`. The installer will display another reminder that the operating system should be installed on a disk that is not used for storage.



```
Update Method Selection
User configuration settings and storage volumes are preserved and not
affected by this step.

The boot device can be formatted to remove old versions, or the
upgrade can be installed in a new boot environment without affecting
any existing versions.

<Install in new boot environment> <    Format the boot device      >
```

The updated system can be installed in a new boot environment, or the entire operating system device can be formatted to start fresh. Installing into a new boot environment preserves the old code, allowing a roll-back to previous versions if necessary. Formatting the boot device is usually not necessary but can reclaim space. User data and settings are preserved when installing to a new boot environment and also when formatting the operating system device. Move the highlight to one of the options and press `Enter` to start the upgrade.

The installer unpacks the new image and checks for upgrades to the existing database file. The database file that is preserved and migrated contains your TrueNAS configuration settings.



```
The installer has preserved your database file.
#FreeNAS will migrate this file, if necessary, to the current format.
```

Press `Enter`. TrueNAS indicates that the upgrade is complete and a reboot is required. Press *OK*, highlight `3 Reboot System`, then press `Enter` to reboot the system. If the upgrade installer was booted from CD, remove the CD.

During the reboot there can be a conversion of the previous configuration database to the new version of the database. This happens during the `Applying database schema changes` line in the reboot cycle. This conversion can take a long time to finish, sometimes fifteen minutes or more, and can cause the system to reboot again. The system will start normally afterwards. If database errors are shown but the web interface is accessible, log in, go to **System > General**, and use the **UPLOAD CONFIG** button to upload the configuration backup that was downloaded before starting the upgrade.

3.14 - CAs

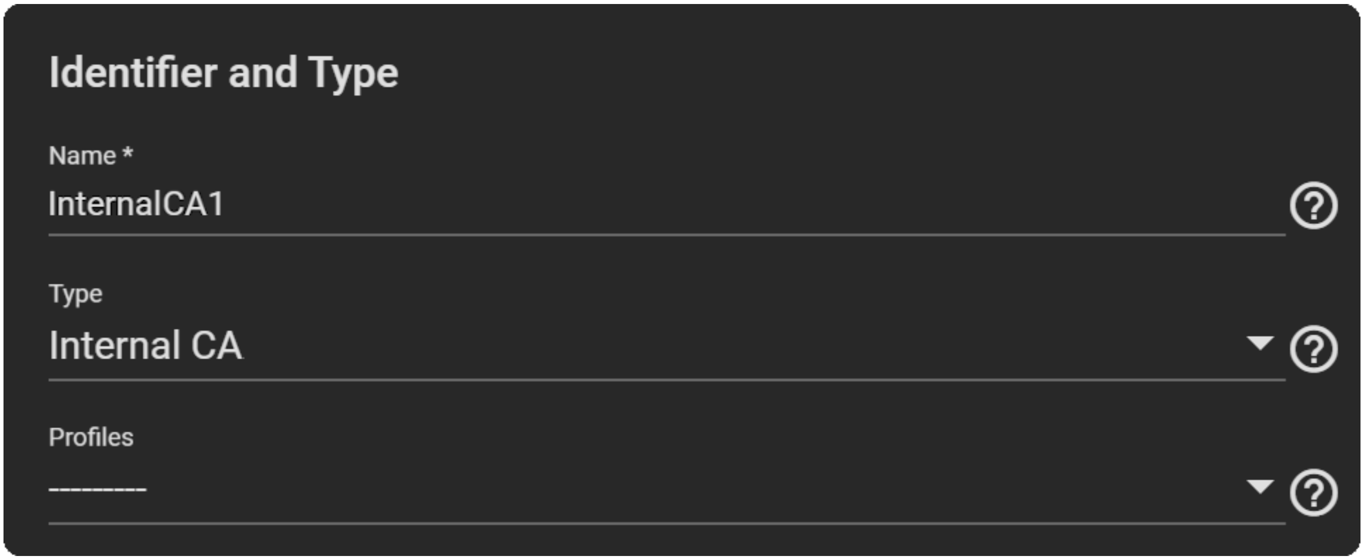
TrueNAS can act as a Certificate Authority (CA). When encrypting SSL or TLS connections to the TrueNAS system, you can either import an existing CA, or create a CA and certificate on the TrueNAS system. This certificate will appear in the drop-down menus for services that support SSL or TLS. To add or import a CA, go to **System > CAs** and click *ADD*. Enter the name for the CA, then choose the *Type*. The three type options are *Internal CA*, *Intermediate CA*, and *Import CA*. The process for each type is slightly different. Use the tabs below to jump to the appropriate section based on your desired type.

⊙ **Internal CA**

Identifier and Type

Select *Internal CA* as the *Type*.

If you want, you can select a profile for the CA. Selecting a profile automatically sets certain options such as *Key Type*, *Key Length*, *Digest Algorithm*, and more. If you would like to set each option manually, do not select a profile from the *Profiles* dropdown.



Identifier and Type

Name *

InternalCA1

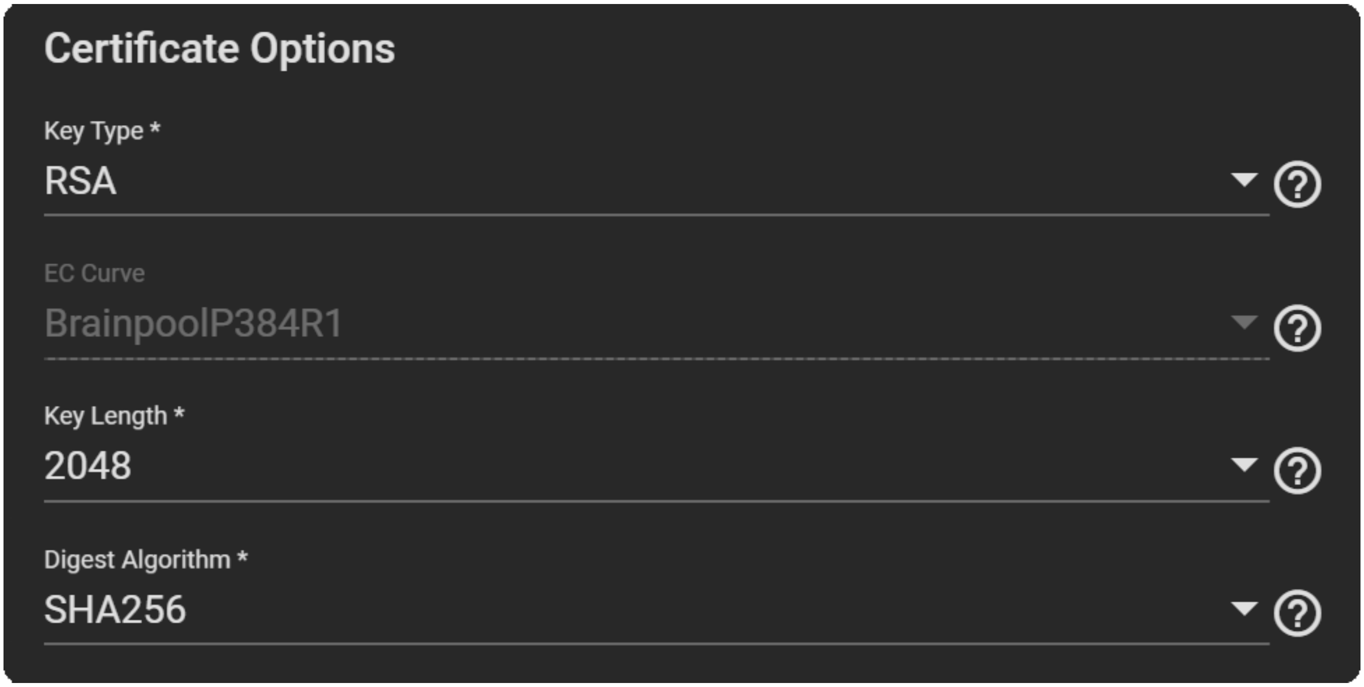
Type

Internal CA

Profiles

Certificate Options

1. Select a *Key Type* from the dropdown. We recommend the *RSA* key type.
2. Select the *Key Length*. We recommend a minimum of *2048* for security reasons.
3. Select a *Digest Algorithm*. We recommend *SHA256*.
4. Enter the *Lifetime* of the CA in days to set how long the CA will remain valid.



Certificate Options

Key Type *
RSA

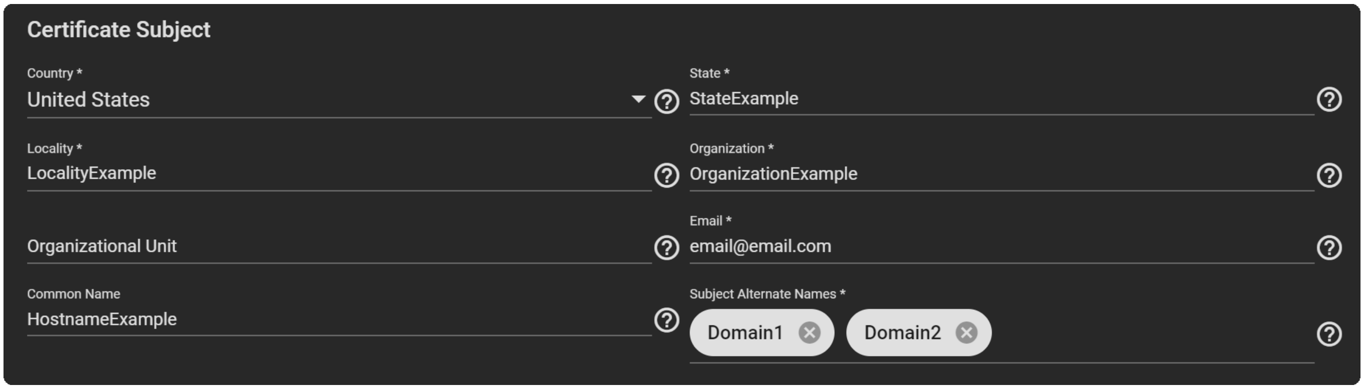
EC Curve
BrainpoolP384R1

Key Length *
2048

Digest Algorithm *
SHA256

Certificate Subject

1. Fill out the geographic information of the certificate by entering the *Country*, *Locality*, *Organizational Unit* (optional), *Common Name*, *State*, *Organization*, *Email*, and *Subject Alternate Names*.
2. The *Common Name* is the fully-qualified hostname (FQDN) and must be unique within a certificate chain.



Certificate Subject

Country *
United States

State *
StateExample

Locality *
LocalityExample

Organization *
OrganizationExample

Organizational Unit

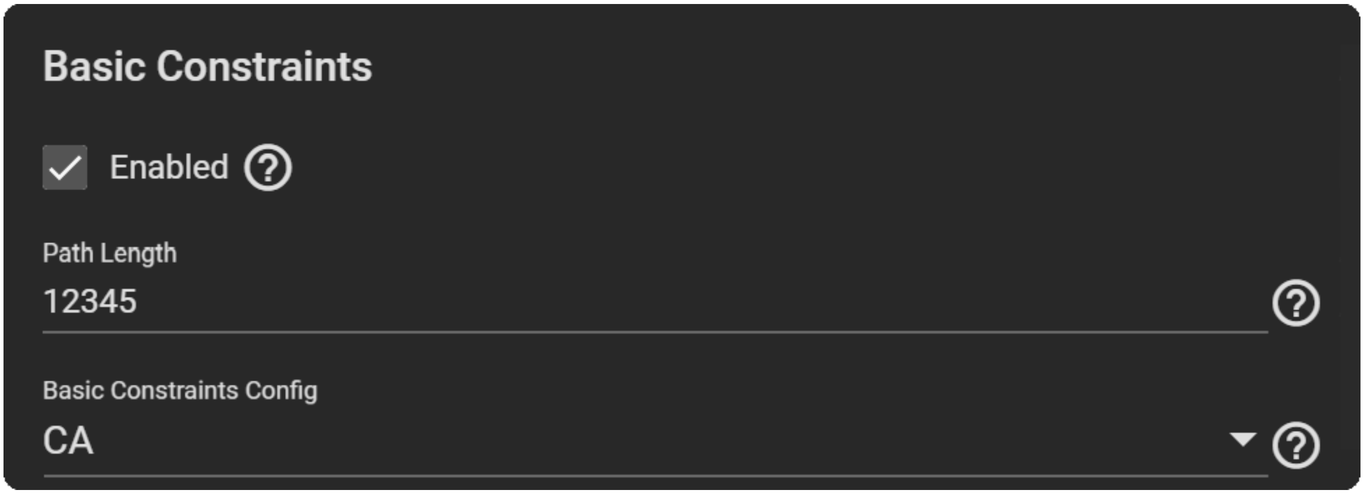
Email *
email@email.com

Common Name
HostnameExample

Subject Alternate Names *
Domain1 Domain2

Basic Constraints

1. If you would like to have *Basic Constraints*, set them to *Enabled* and more options will appear.
2. Set a *Path Length* to determine how many non-self-issued intermediate certificates can follow this certificate in a valid certification path. Entering *0* allows a single additional certificate to follow in the certificate path.
3. Select the *Basic Constraints Config*. You can select more than one from the dropdown.



Basic Constraints

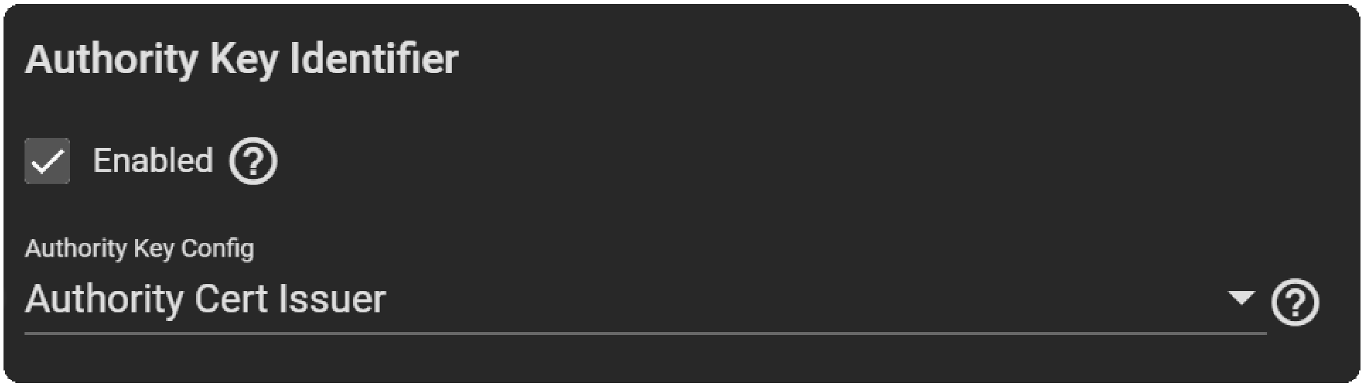
☑ Enabled

Path Length
12345

Basic Constraints Config
CA

Authority Key Identifier

If you want an *Authority Key Identifier*, set it to *Enabled*, then select the *Authority Key Config*. You can select more than one from the dropdown.



Authority Key Identifier

☑ Enabled

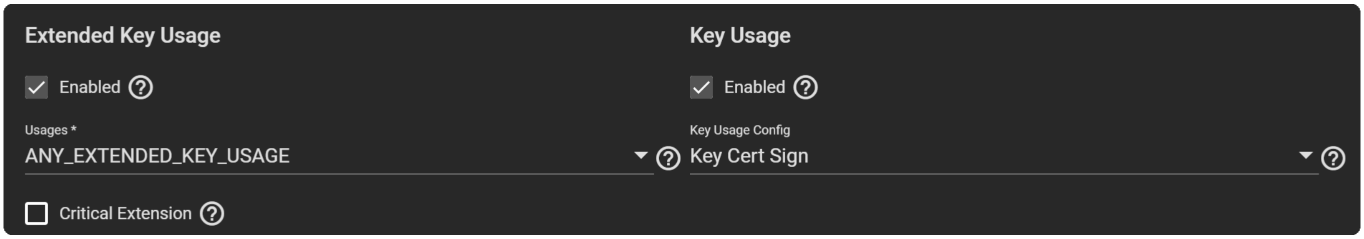
Authority Key Config
Authority Cert Issuer

Key Usage

Extended Key Usage is typically used for end entity certificates.

1. If you want to utilize *Extended Key Usage*, set it to *Enabled*, then select the usage for the public key from the *Usages* dropdown. You can select multiple usages in the dropdown.
2. Enable *Critical Extension* if you want to identify this extension as critical for the certificate. Do not enable *Critical Extension* if *Usages* contains *ANY_EXTENDED_KEY_USAGE*.

> Using both *Extended Key Usage* and *Key Usage* extensions requires that the purpose of the certificate is consistent with both extensions. See RFC 3280, section 4.2.1.13 for more details.



Extended Key Usage

☑ Enabled

Usages *
ANY_EXTENDED_KEY_USAGE

□ Critical Extension

Key Usage

☑ Enabled

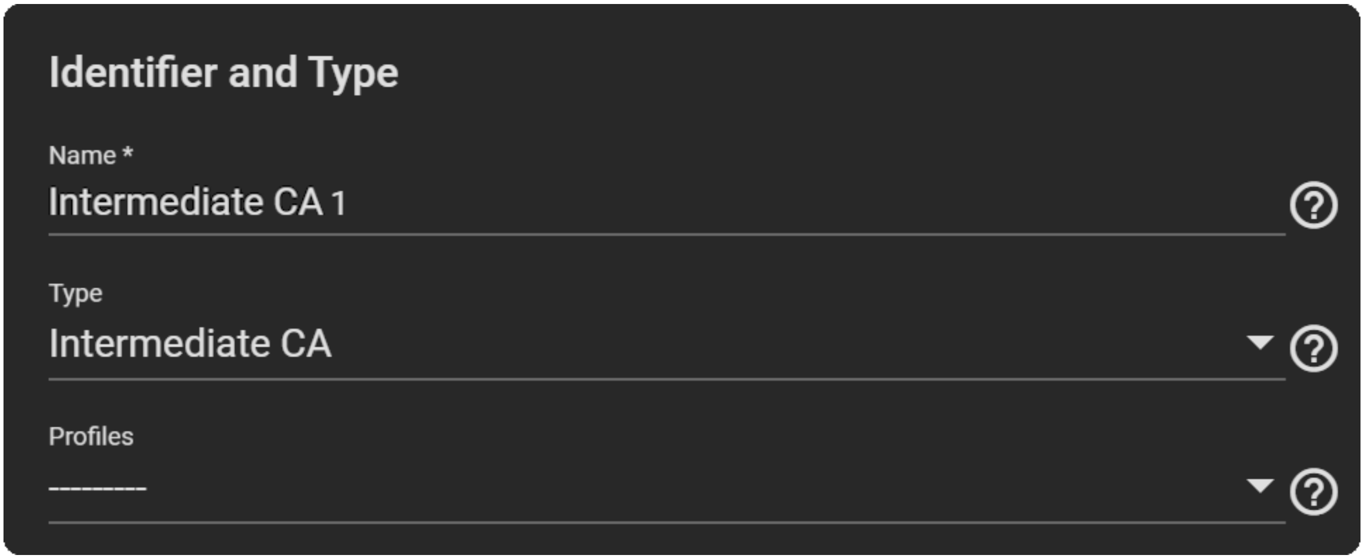
Key Usage Config
Key Cert Sign

○ Intermediate CA

Identifier and Type

Select *Intermediate CA* as the *Type*.

If you want, you can select a profile for the CA. Selecting a profile automatically sets certain options such as *Key Type*, *Key Length*, *Digest Algorithm*, and more. If you would like to set each option manually, do not select a profile from the *Profiles* dropdown.



Identifier and Type

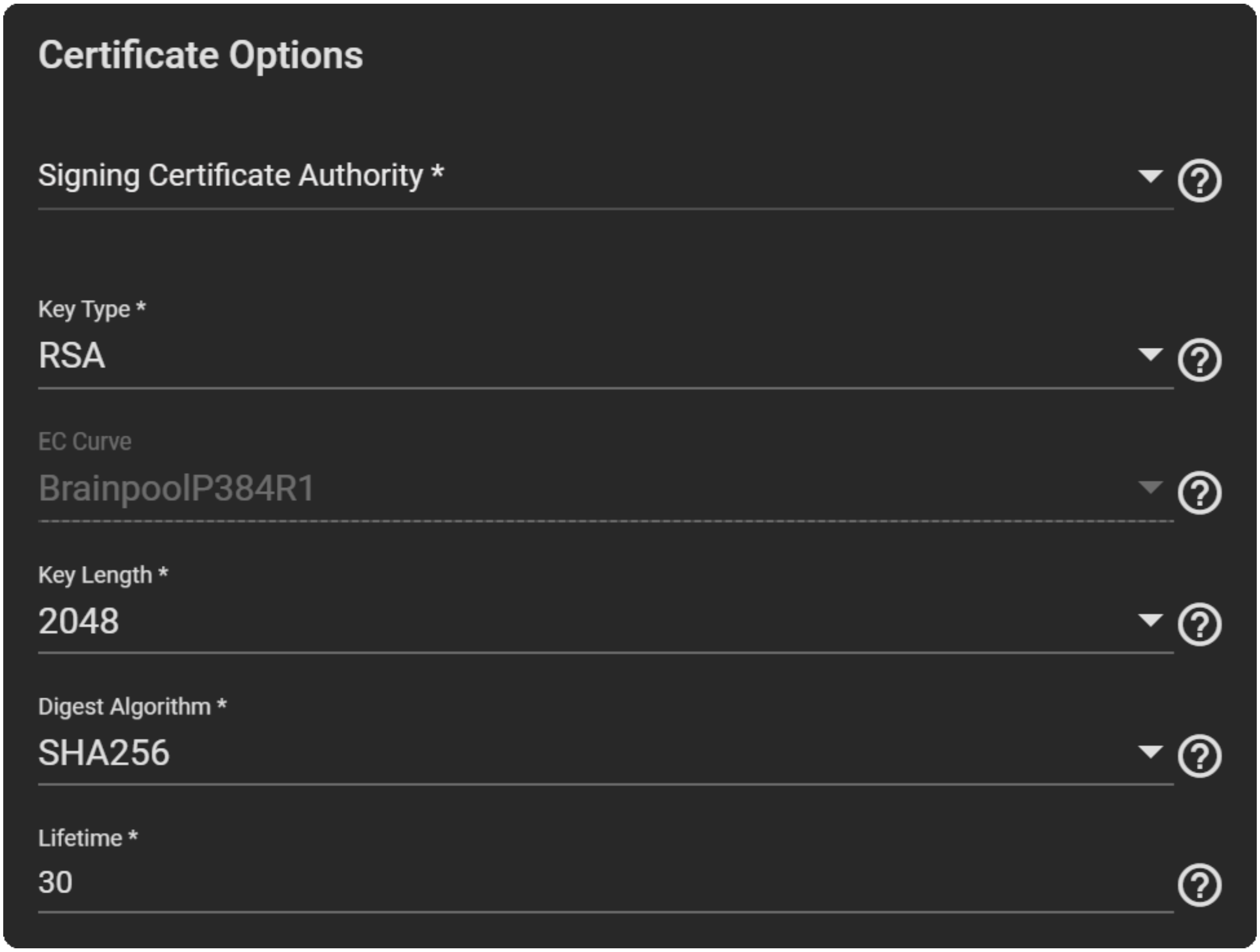
Name *
Intermediate CA 1

Type
Intermediate CA

Profiles

Certificate Options

1. Select a *Signing Certificate Authority* from the dropdown.
2. Select a *Key Type* from the dropdown. We recommend the *RSA* key type.
3. Select the *Key Length*. We recommend a minimum of *2048* for security reasons.
4. Select a *Digest Algorithm*. We recommend *SHA256*.
5. Enter the *Lifetime* of the CA in days to set how long the CA will remain valid.



Certificate Options

Signing Certificate Authority *

Key Type *
RSA

EC Curve
BrainpoolP384R1

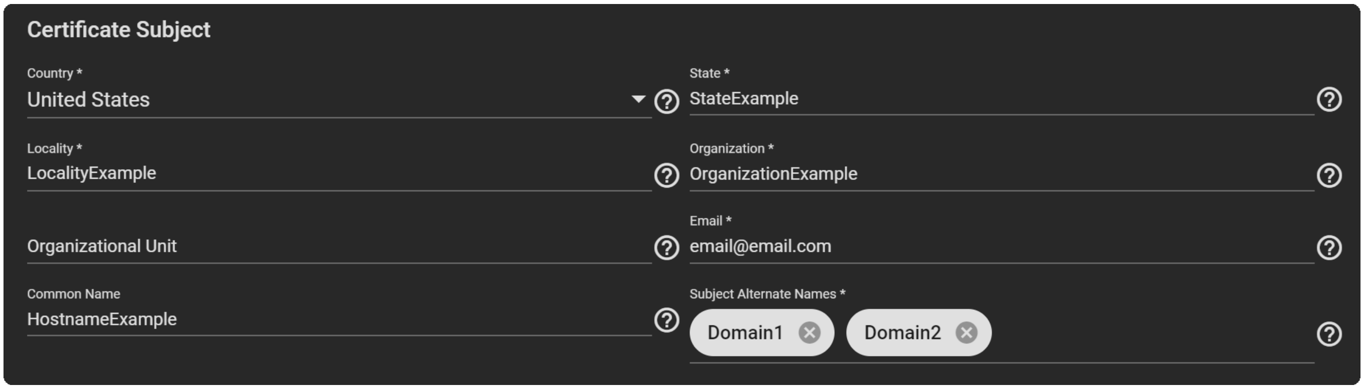
Key Length *
2048

Digest Algorithm *
SHA256

Lifetime *
30

Certificate Subject

1. Fill out the geographic information of the certificate by entering the *Country*, *Locality*, *Organizational Unit* (optional), *Common Name*, *State*, *Organization*, *Email*, and *Subject Alternate Names*.
2. The *Common Name* is the fully-qualified hostname (FQDN) and must be unique within a certificate chain.



Certificate Subject

Country *
United States

State *
StateExample

Locality *
LocalityExample

Organization *
OrganizationExample

Organizational Unit

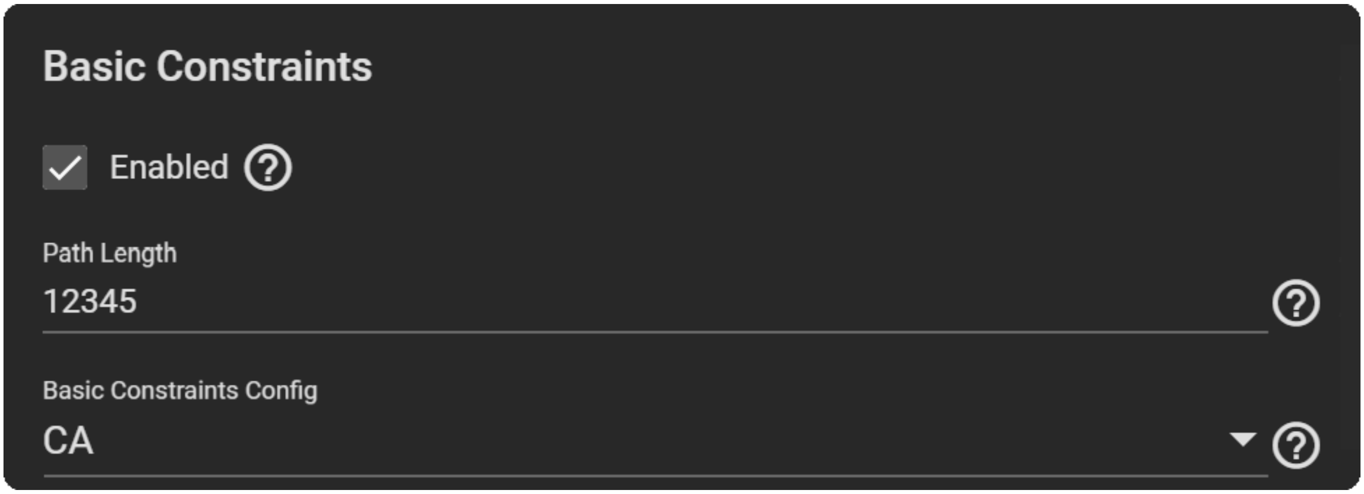
Email *
email@email.com

Common Name
HostnameExample

Subject Alternate Names *
Domain1 ⊗ Domain2 ⊗

Basic Constraints

1. If you would like to have *Basic Constraints*, set them to *Enabled* and more options will appear.
2. Set a *Path Length* to determine how many non-self-issued intermediate certificates can follow this certificate in a valid certification path. Entering *0* allows a single additional certificate to follow in the certificate path.
3. Select the *Basic Constraints Config*. You can select more than one from the dropdown.



Basic Constraints

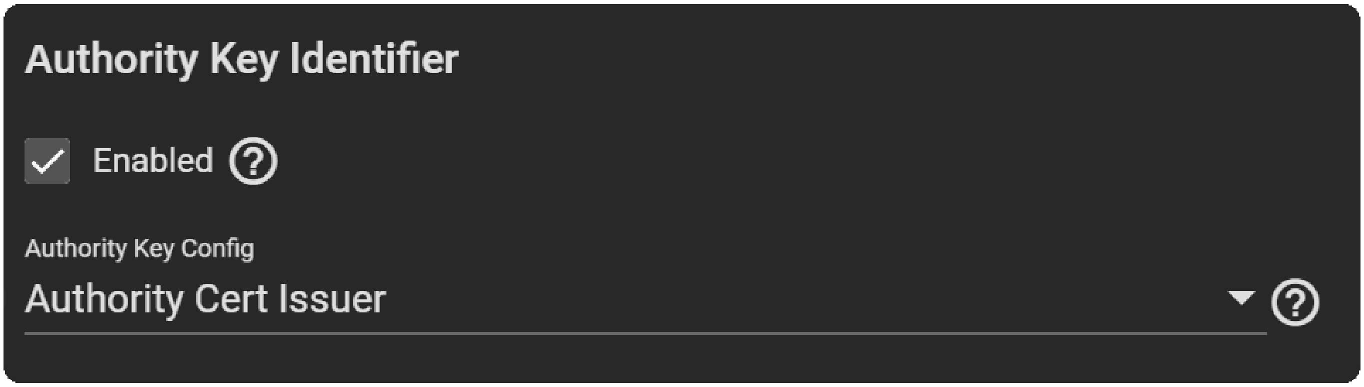
☑ Enabled

Path Length
12345

Basic Constraints Config
CA

Authority Key Identifier

If you want an *Authority Key Identifier*, set it to *Enabled*, then select the *Authority Key Config*. You can select more than one from the dropdown.



Authority Key Identifier

☑ Enabled

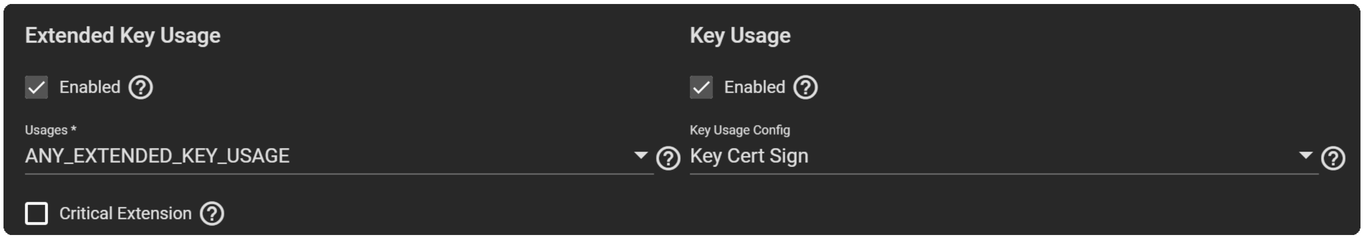
Authority Key Config
Authority Cert Issuer

Key Usage

Extended Key Usage is typically used for end entity certificates.

1. If you want to utilize *Extended Key Usage*, set it to *Enabled*, then select the usage for the public key from the *Usages* dropdown. You can select multiple usages in the dropdown.
2. Enable *Critical Extension* if you want to identify this extension as critical for the certificate. Do not enable *Critical Extension* if *Usages* contains *ANY_EXTENDED_KEY_USAGE*.

> Using both *Extended Key Usage* and *Key Usage* extensions requires that the purpose of the certificate is consistent with both extensions. See RFC 3280, section 4.2.1.13 for more details.



Extended Key Usage

☑ Enabled

Usages *
ANY_EXTENDED_KEY_USAGE

□ Critical Extension

Key Usage

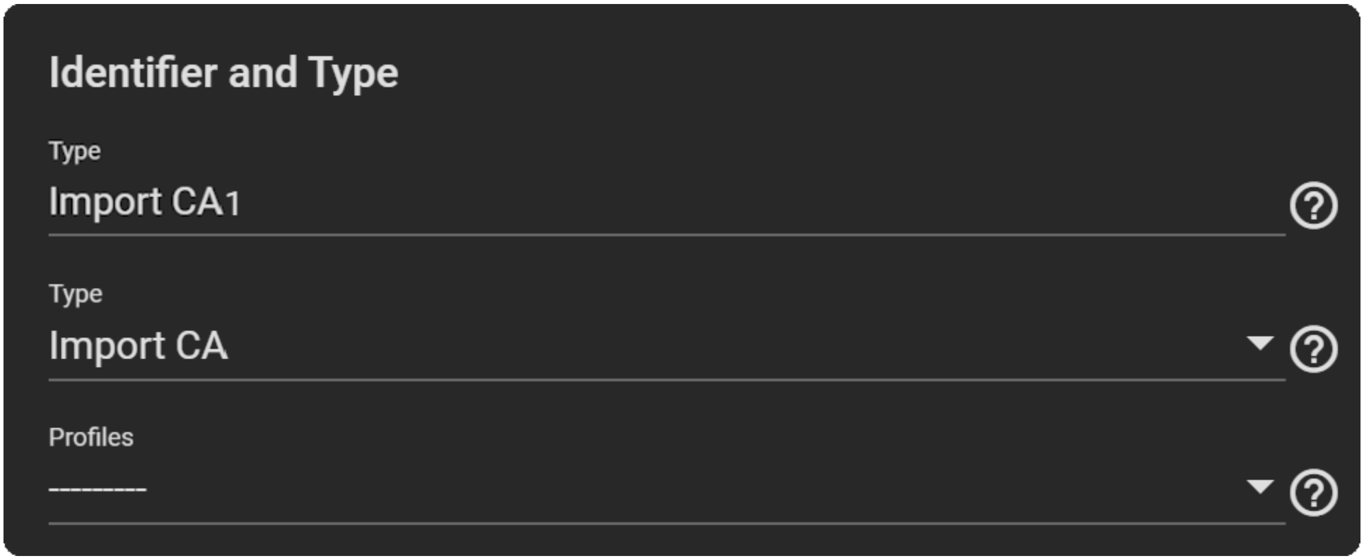
☑ Enabled

Key Usage Config
Key Cert Sign

○ Import CA

Identifier and Type

Select *Import a CA* as the *Type*.



Identifier and Type

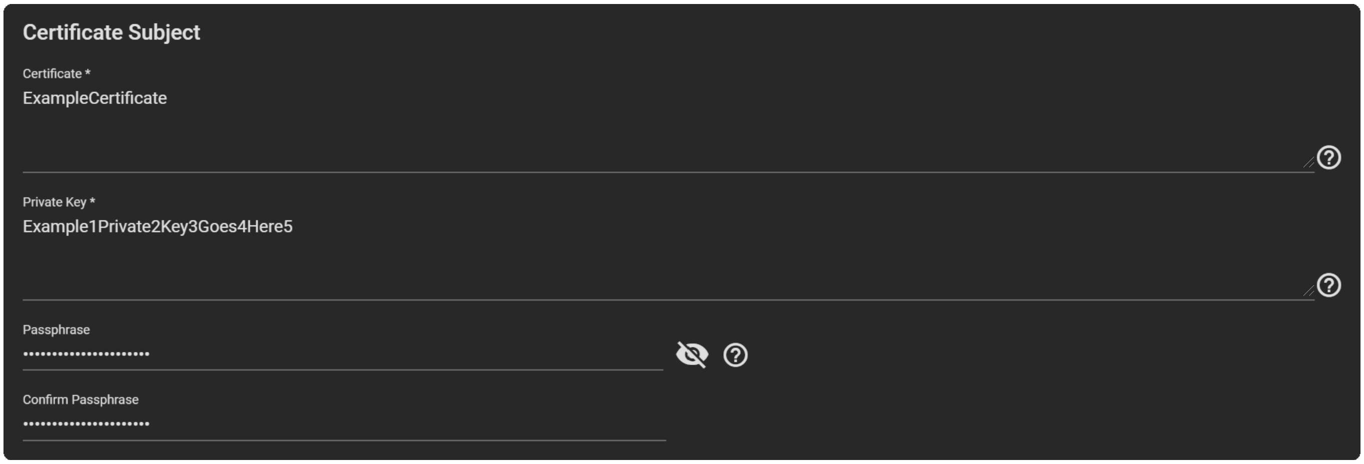
Type
Import CA1

Type
Import CA

Profiles

Certificate Subject

1. Copy the certificate for the CA you want to import and paste it in the *Certificate* field.
2. Paste the *Private Key* associated with the Certificate when available. Provide a key at least 1024 bits long.
3. Enter and confirm the *Passphrase* for the Private Key.



Certificate Subject

Certificate *
ExampleCertificate

Private Key *
Example1Private2Key3Goes4Here5

Passphrase
••••••••••••••••••••••

Confirm Passphrase
••••••••••••••••••••••

3.15 - Certificates

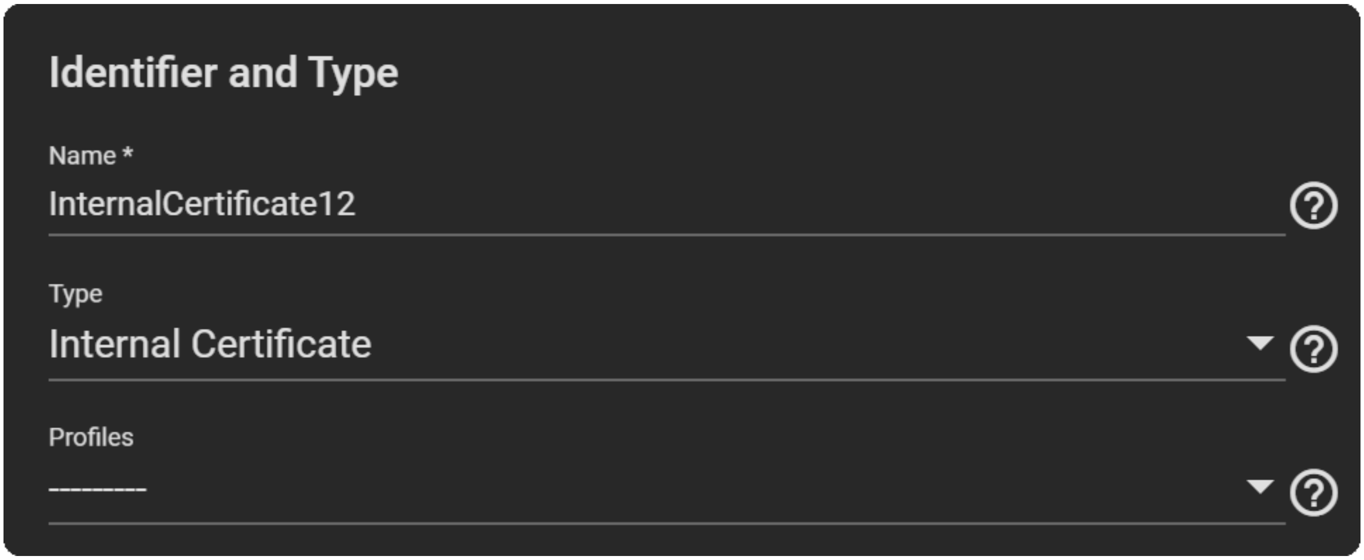
By default, TrueNAS comes equipped with an internal, self-signed certificate that enables encrypted access to the web interface. You can either import or create a Certificate or Signing Request by navigating to **System > Certificates** and clicking *ADD*. Enter the name for the certificate, then choose the *Type*. The four options are *Internal Certificate*, *Certificate Signing Request* (CSR), *Import Certificate*, and *Import Certificate Signing Request*. The process for each type is slightly different. Use the tabs below to jump to the appropriate section based on your desired type.

⊙ **Internal**

Identifier and Type

Select *Internal Certificate* as the *Type*.

If you want, you can select a profile for the CA. Selecting a profile automatically sets certain options such as *Key Type*, *Key Length*, *Digest Algorithm*, and more. If you would like to set each option manually, do not select a profile from the *Profiles* dropdown.



Identifier and Type

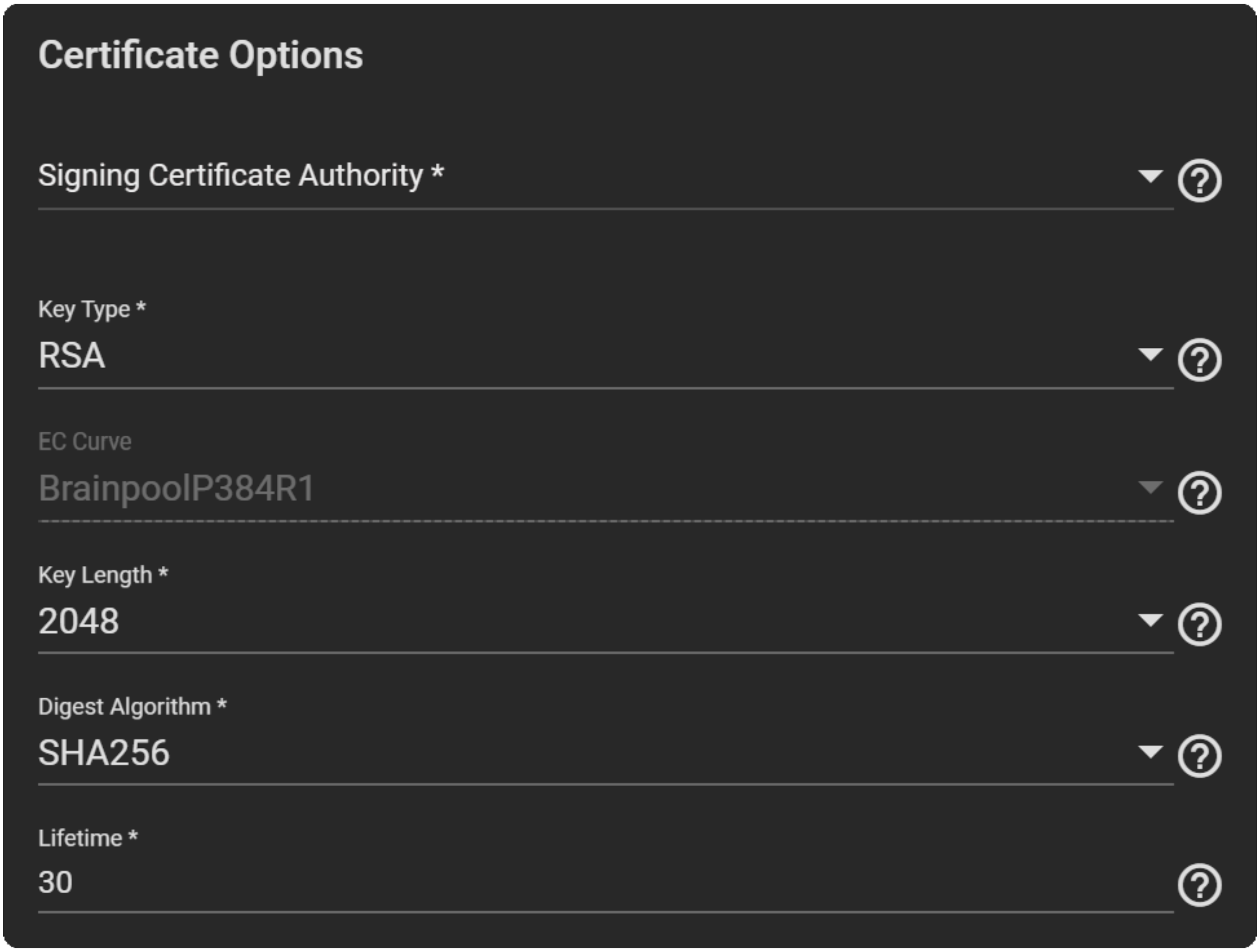
Name *
InternalCertificate12

Type
Internal Certificate

Profiles

Certificate Options

1. Select a *Signing Certificate Authority* from the dropdown.
2. Select a *Key Type* from the dropdown. We recommend the *RSA* key type.
3. Select the *Key Length*. We recommend a minimum of *2048* for security reasons.
4. Select a *Digest Algorithm*. We recommend *SHA256*.
5. Enter the *Lifetime* of the CA in days to set how long the CA will remain valid.



Certificate Options

Signing Certificate Authority *

Key Type *
RSA

EC Curve
BrainpoolP384R1

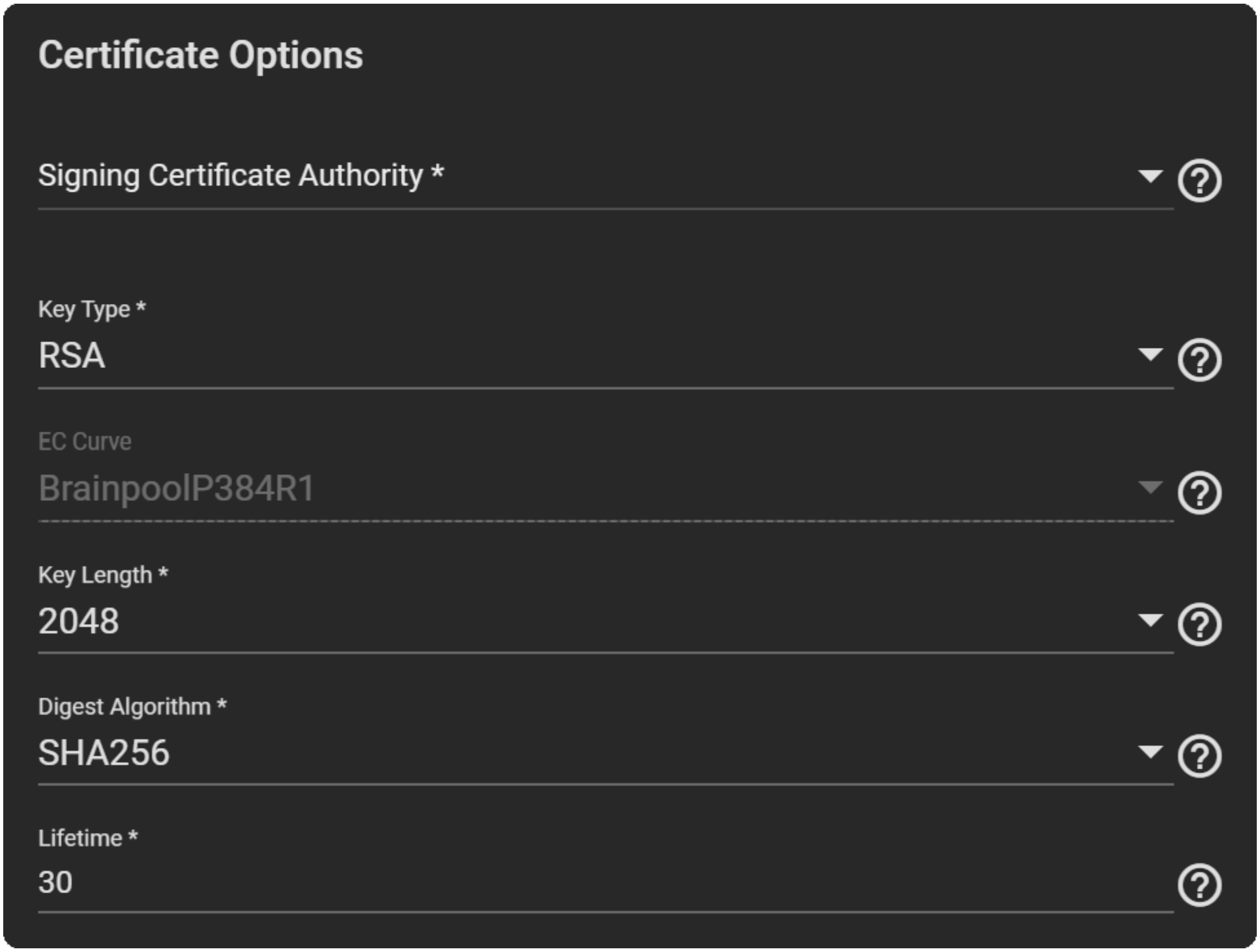
Key Length *
2048

Digest Algorithm *
SHA256

Lifetime *
30

Certificate Subject

1. Fill out the geographic information of the certificate by entering the *Country*, *Locality*, *Organizational Unit* (optional), *Common Name*, *State*, *Organization*, *Email*, and *Subject Alternate Names*.
2. The *Common Name* is the [fully-qualified hostname (FQDN)] and must be unique within a certificate chain.



Certificate Options

Signing Certificate Authority *

Key Type *
RSA

EC Curve
BrainpoolP384R1

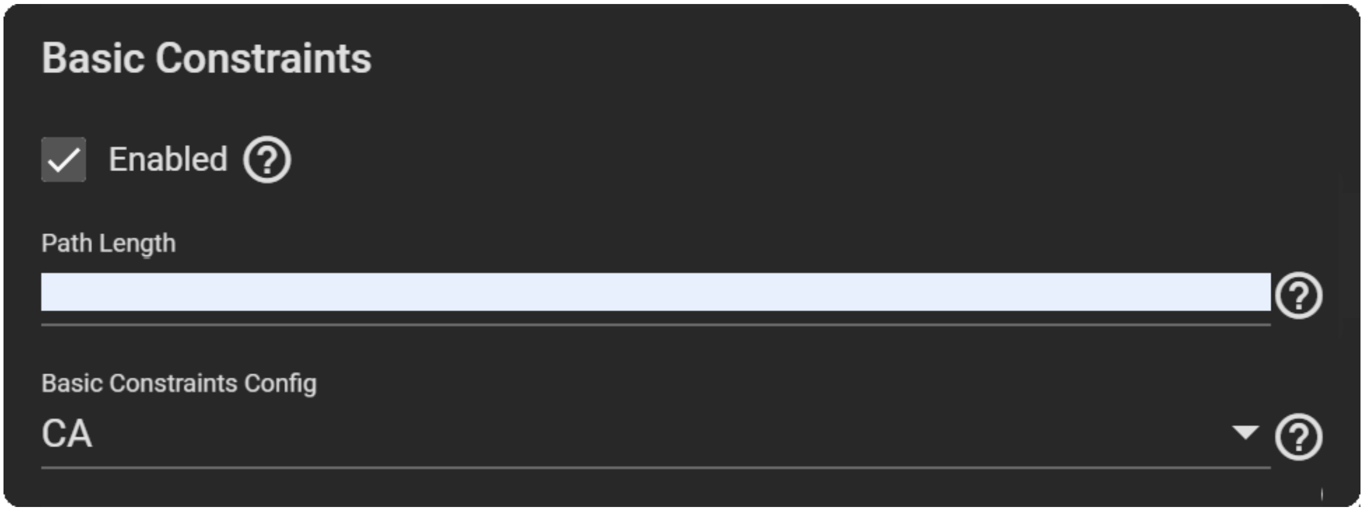
Key Length *
2048

Digest Algorithm *
SHA256

Lifetime *
30

Basic Constraints

1. If you would like to have *Basic Constraints*, set them to *Enabled* and more options will appear.
2. Set a *Path Length* to determine how many non-self-issued intermediate certificates can follow this certificate in a valid certification path. Entering *0* allows a single additional certificate to follow in the certificate path.
3. Select the *Basic Constraints Config*. You can select more than one from the dropdown.



Basic Constraints

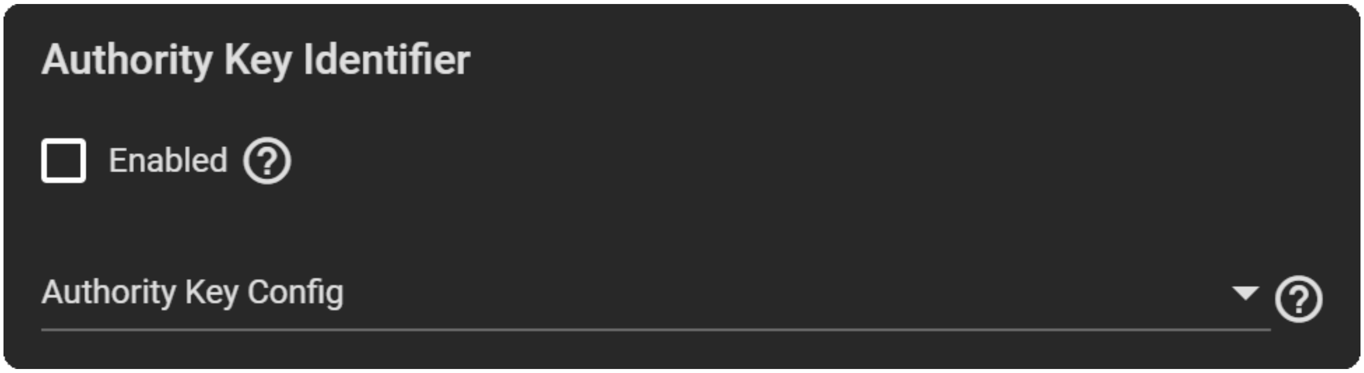
☑ Enabled

Path Length

Basic Constraints Config
CA

Authority Key Identifier

If you want an *Authority Key Identifier*, set it to *Enabled*, then select the *Authority Key Config*. You can select more than one from the dropdown.


Authority Key Identifier

□ Enabled

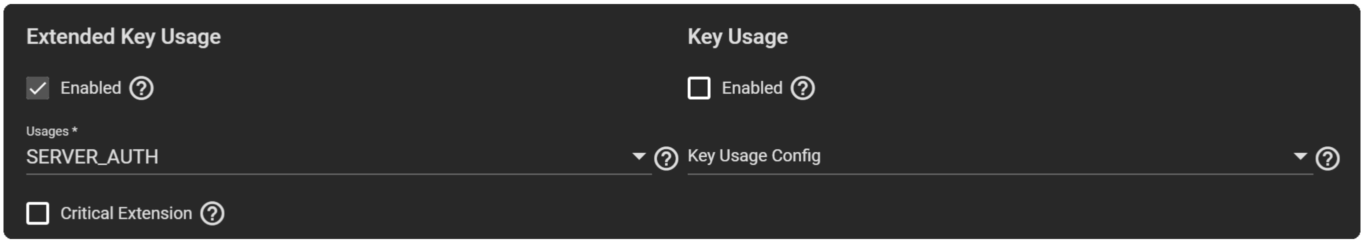
Authority Key Config

Key Usage

Extended Key Usage is typically used for end entity certificates.

1. If you want to utilize *Extended Key Usage*, set it to *Enabled*, then select the usage for the public key from the *Usages* dropdown. You can select multiple usages in the dropdown.
2. Enable *Critical Extension* if you want to identify this extension as critical for the certificate. Do not enable *Critical Extension* if *Usages* contains *ANY_EXTENDED_KEY_USAGE*.

> Using both *Extended Key Usage* and *Key Usage* extensions requires that the purpose of the certificate is consistent with both extensions. See RFC 3280, section 4.2.1.13 for more details.


Extended Key Usage

☑ Enabled

Usages *
SERVER_AUTH

□ Critical Extension

Key Usage

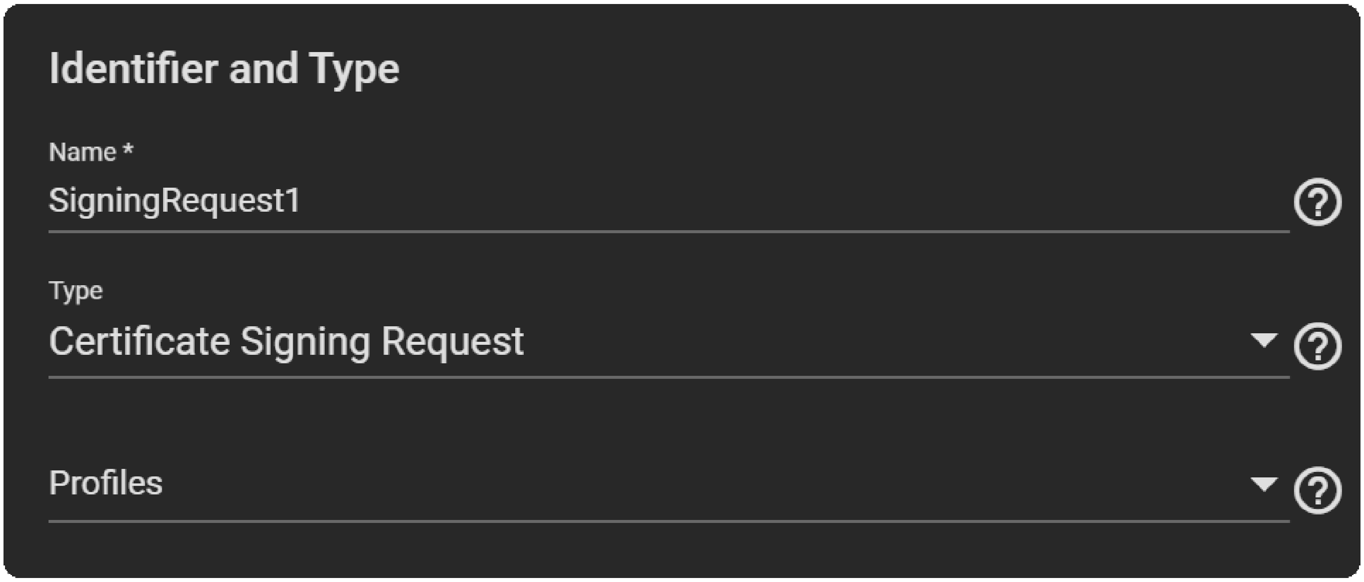
□ Enabled

Key Usage Config

○ Certificate Signing Request

Identifier and Type

1. Select *Certificate Signing Request* as the *Type*.
2. If you want, you can select a profile for the CA. Selecting a profile automatically sets certain options such as *Key Type*, *Key Length*, and *Digest Algorithm*. If you would like to set options manually, do not select a profile from the *Profiles* dropdown.



Identifier and Type

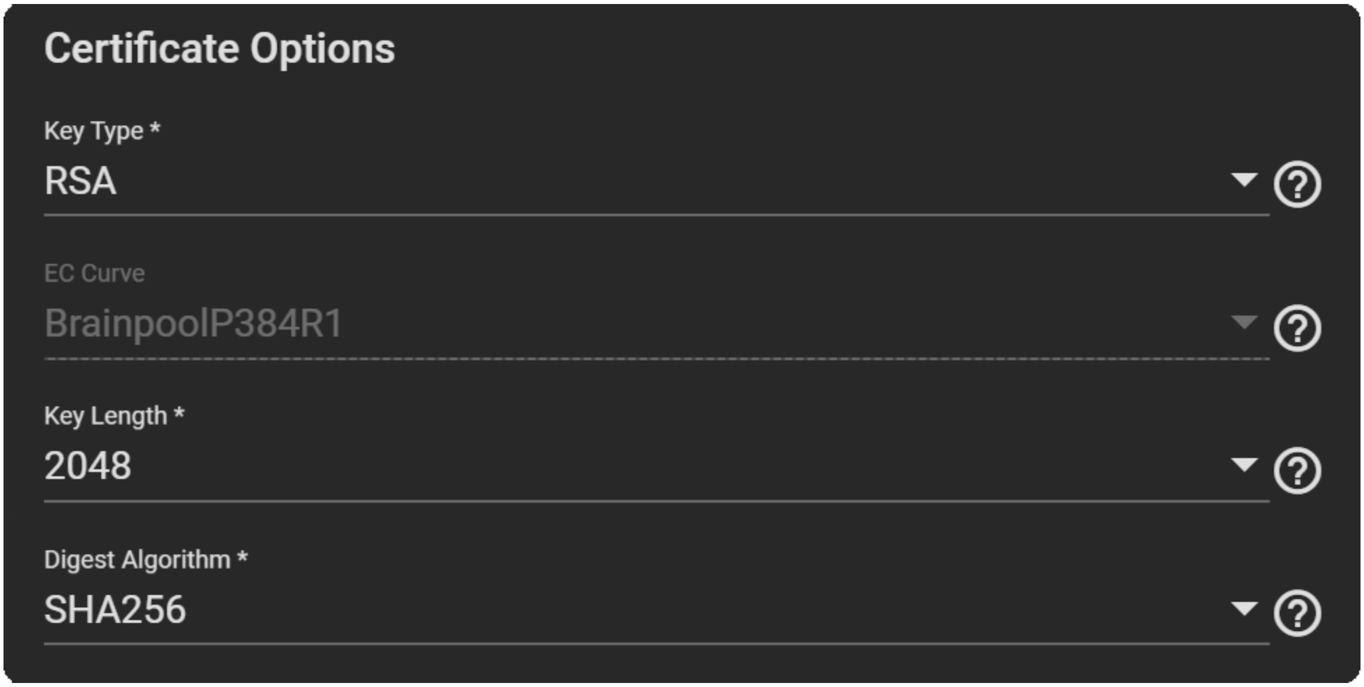
Name *
SigningRequest1

Type
Certificate Signing Request

Profiles

Certificate Options

1. Select a *Key Type* from the dropdown. We recommend the *RSA* key type.
2. Select a *Digest Algorithm*. We recommend *SHA256*.



Certificate Options

Key Type *
RSA

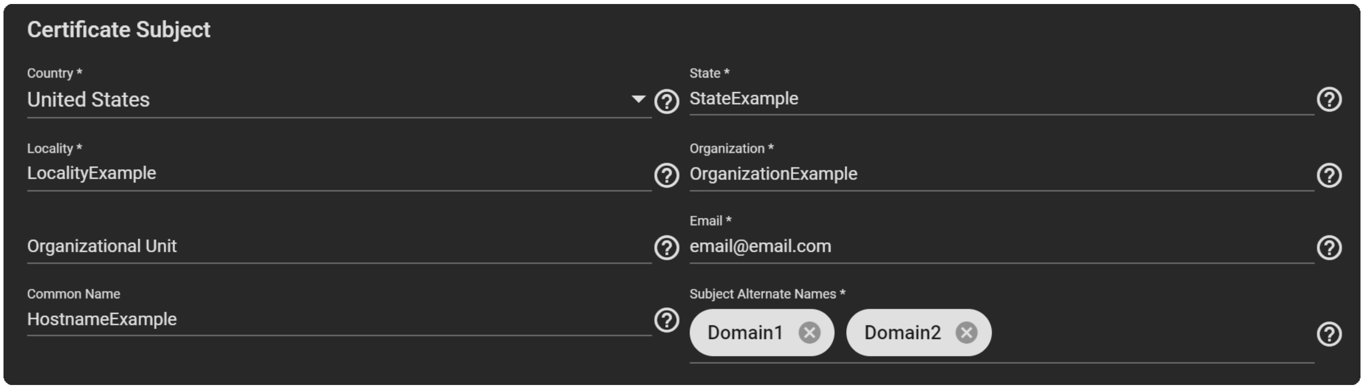
EC Curve
BrainpoolP384R1

Key Length *
2048

Digest Algorithm *
SHA256

Certificate Subject

Fill out the geographic information of the certificate by entering the *Country*, *Locality*, *Organizational Unit* (optional), *Common Name*, *State*, *Organization*, *Email*, and *Subject Alternate Names*. The *Common Name* is the fully-qualified hostname (FQDN) and must be unique within a certificate chain.



Certificate Subject

Country * United States

State * StateExample

Locality * LocalityExample

Organization * OrganizationExample

Organizational Unit

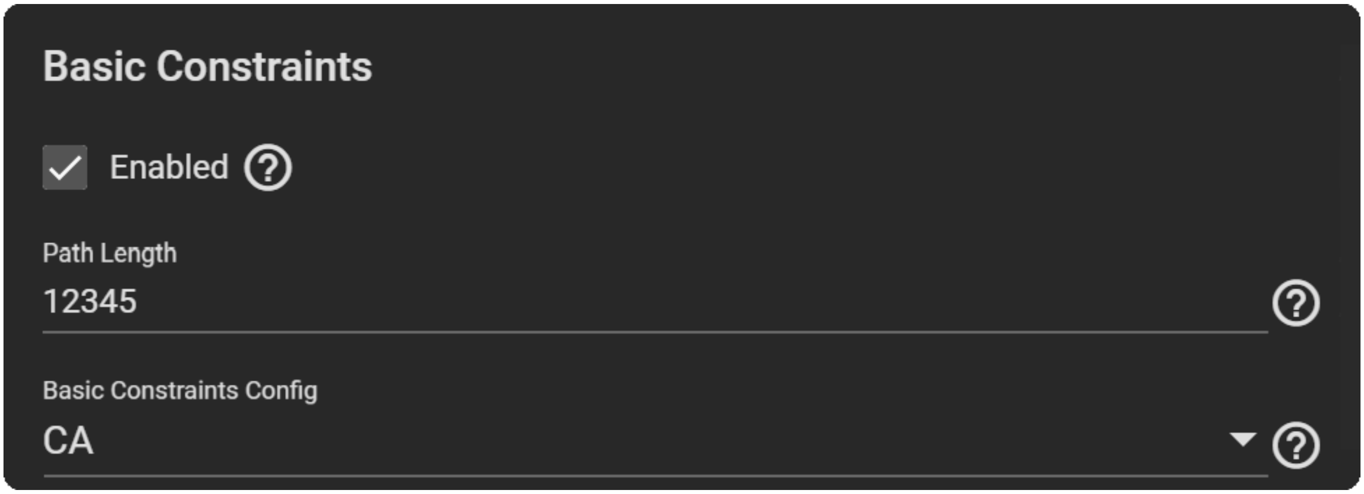
Email * email@email.com

Common Name HostnameExample

Subject Alternate Names * Domain1 Domain2

Basic Constraints

1. If you would like to have *Basic Constraints*, set them to *Enabled* and more options will appear.
2. Set a *Path Length* to determine how many non-self-issued intermediate certificates can follow this certificate in a valid certification path. Entering *0* allows a single additional certificate to follow in the certificate path.
3. Select the *Basic Constraints Config*. You can select more than one from the dropdown.



Basic Constraints

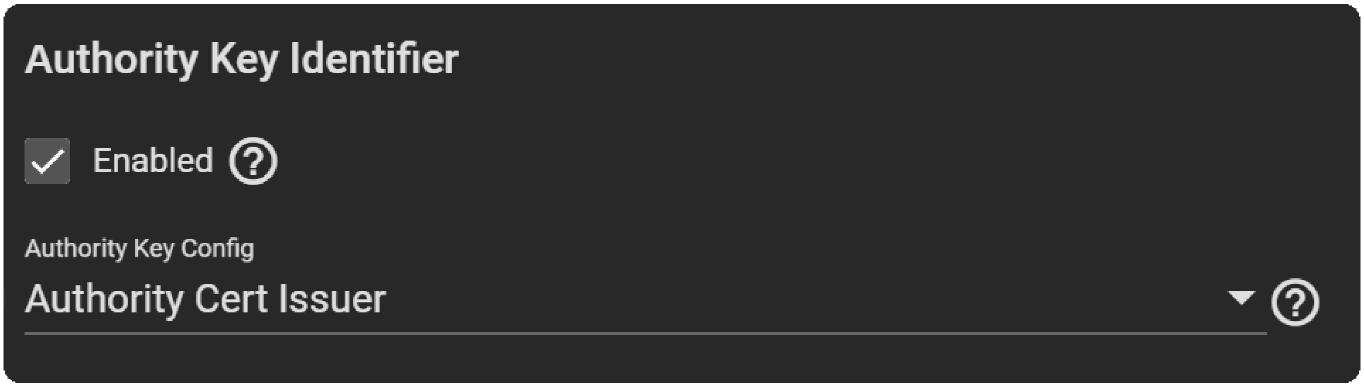
☑ Enabled

Path Length 12345

Basic Constraints Config CA

Authority Key Identifier

If you want an *Authority Key Identifier*, set it to *Enabled*, then select the *Authority Key Config*. You can select more than one from the dropdown.



Authority Key Identifier

☑ Enabled

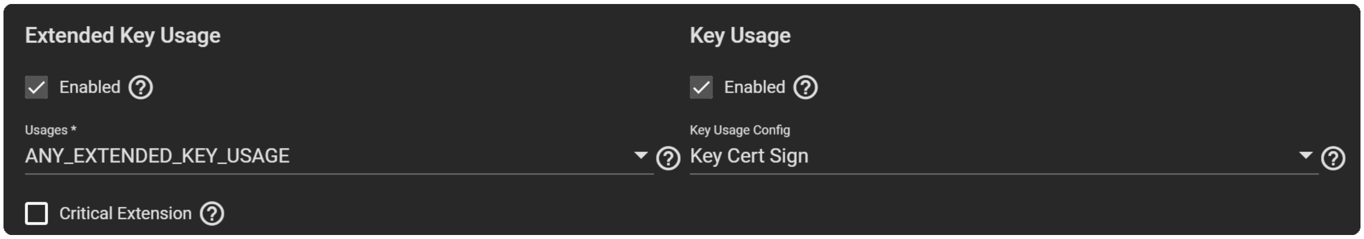
Authority Key Config Authority Cert Issuer

Key Usage

1. Extended Key Usage is typically used for end entity certificates. If you want to utilize *Extended Key Usage*, set it to *Enabled*, then select the usage for the public key from the *Usages* dropdown. You can select multiple usages in the dropdown.

2. Do not set the *Critical Extension* when the *Usages* contains *ANY_EXTENDED_KEY_USAGE*.

> Using both *Extended Key Usage* and *Key Usage* extensions requires that the purpose of the certificate is consistent with both extensions. See RFC 3280, section 4.2.1.13 for more details.



Extended Key Usage

☑ Enabled

Usages *
ANY_EXTENDED_KEY_USAGE

□ Critical Extension

Key Usage

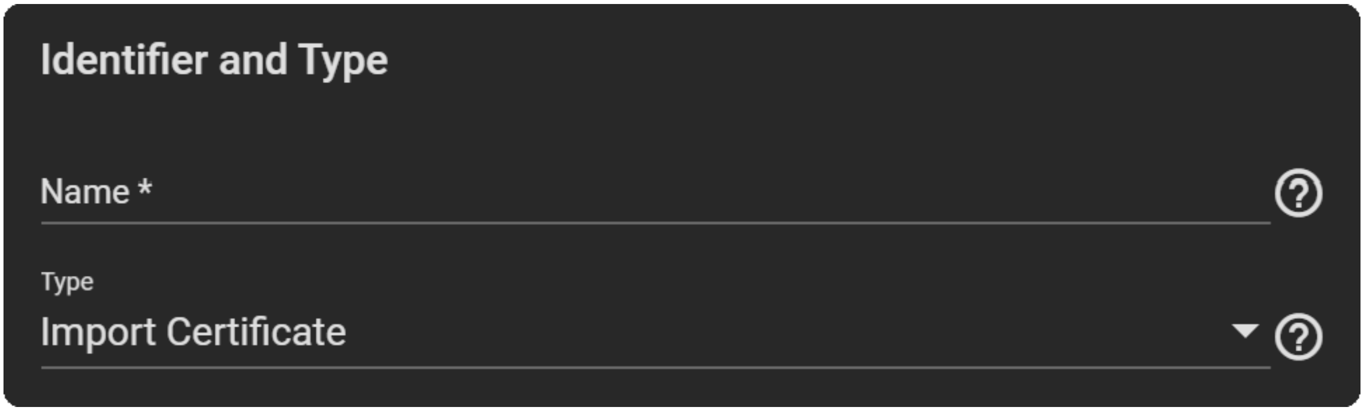
☑ Enabled

Key Usage Config
Key Cert Sign

- **Import Certificate**

Identifier and Type

Select *Import Certificate* as the *Type*.



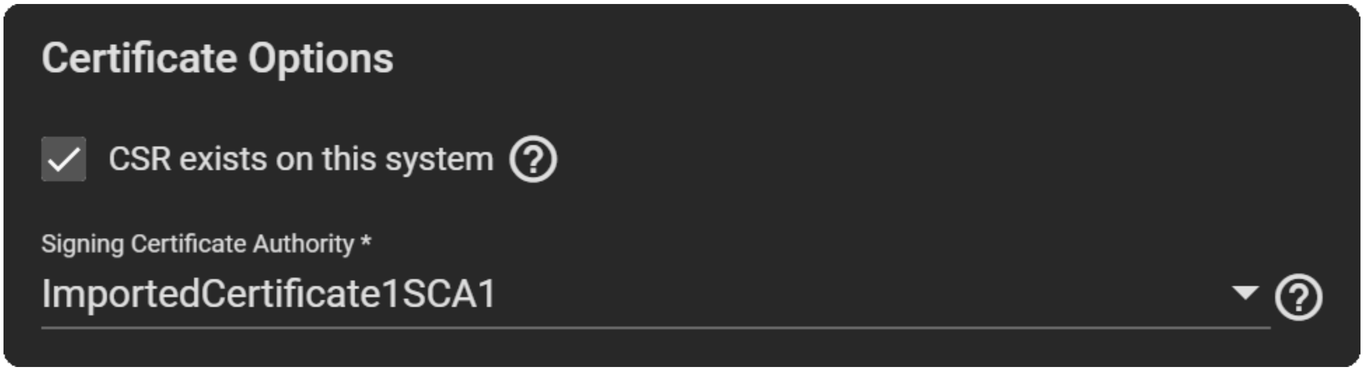
Identifier and Type

Name *

Type
Import Certificate

Certificate Options

If you want to import a CSR that is already on the system, enable *CSR exists on this system*, then select the one you want to use from the drop-down.



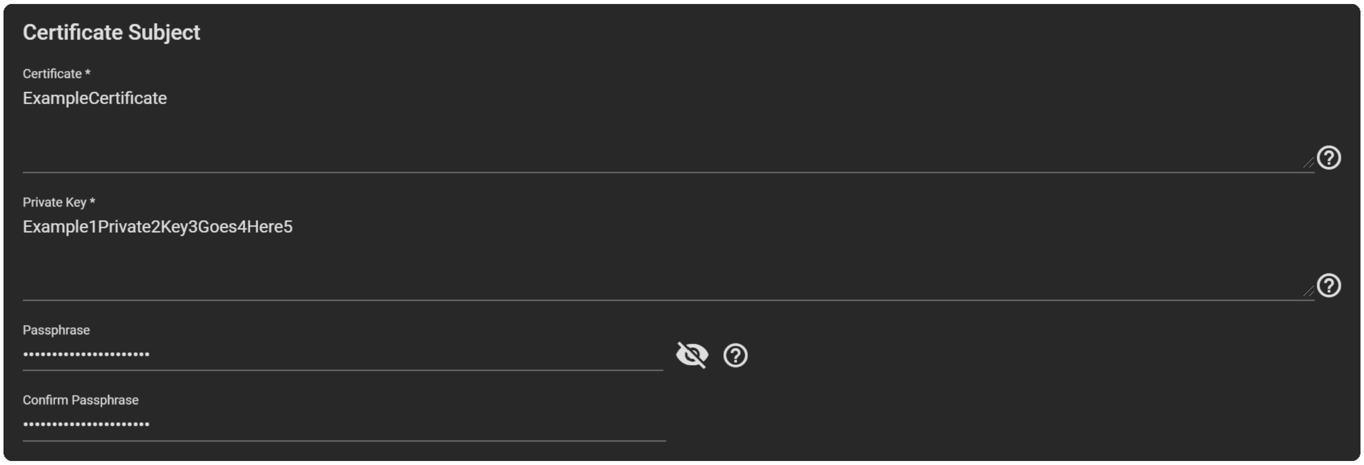
Certificate Options

☑ CSR exists on this system

Signing Certificate Authority *
ImportedCertificate1SCA1

Certificate Subject

1. Copy the certificate for the CA you want to import and paste it in the *Certificate* field.
2. Paste the *Private Key* associated with the Certificate when available. Provide a key at least 1024 bits long.
3. Enter and confirm the *Passphrase* for the Private Key.



Certificate Subject

Certificate *
ExampleCertificate

Private Key *
Example1Private2Key3Goes4Here5

Passphrase
•••••••••••••••••••••

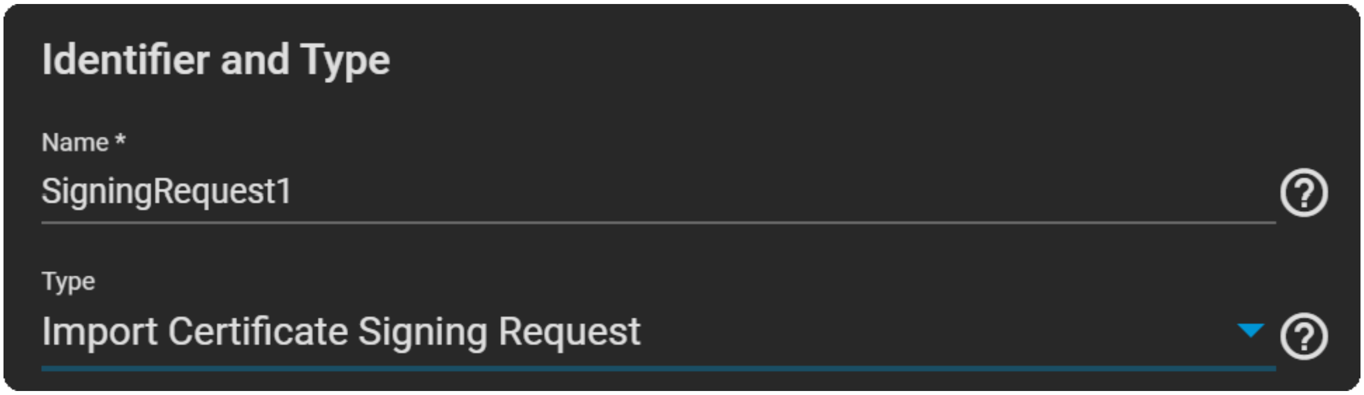
Confirm Passphrase
•••••••••••••••••••••

○ **Import Certificate Signing Request**

Import Certificate Signing Request

Identifier and Type

Select *Import Certificate* as the *Type*.



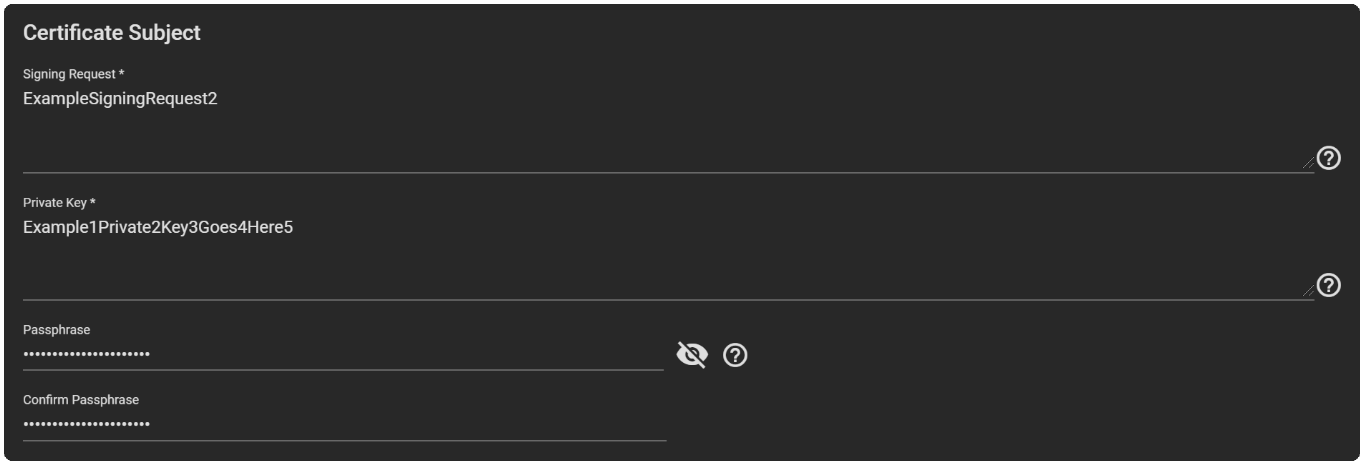
Identifier and Type

Name *
SigningRequest1

Type
Import Certificate Signing Request

Certificate Subject

1. Copy the contents of the Certificate Signing Request you want to import and paste it in the *Signing Request* field.
2. Paste the *Private Key* associated with the Certificate when available. Provide a key at least 1024 bits long.
3. Enter and confirm the *Passphrase* for the Private Key.



Certificate Subject

Signing Request *
ExampleSigningRequest2

Private Key *
Example1Private2Key3Goes4Here5

Passphrase
•••••••••••••••••••••

Confirm Passphrase
•••••••••••••••••••••

3.16 - ACME DNS

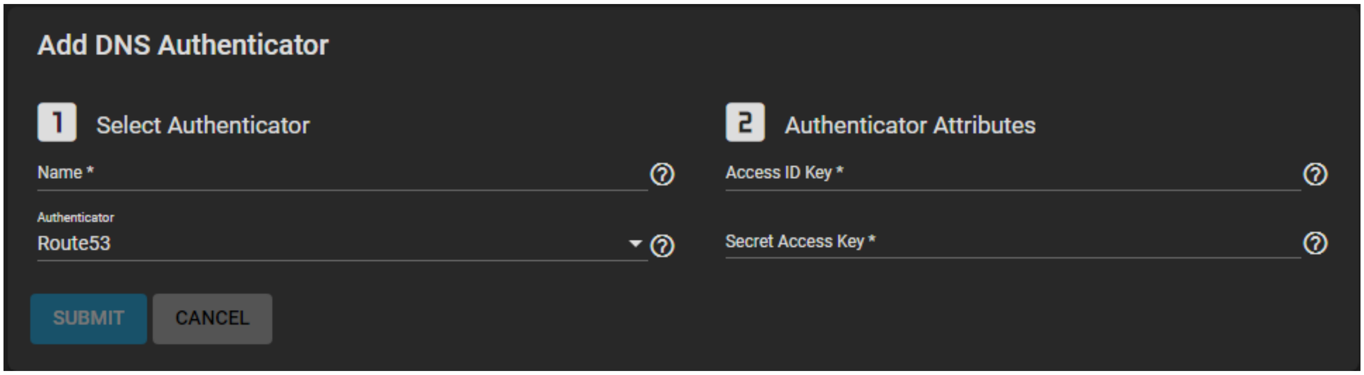
This feature is only available in the open source supported TrueNAS CORE.

Automatic Certificate Management Environment (ACME) is available for automating certificate issuing and renewal. The user must verify ownership of the domain before certificate automation is allowed.

An ACME DNS Authenticator is required to configure ACME certificate automation. This also requires a Certificate Signing Request.

ACME DNS Authenticators

Go to **System > ACME DNS** and click *ADD*.



Add DNS Authenticator

1 Select Authenticator

Name *

Authenticator: Route53

2 Authenticator Attributes

Access ID Key *

Secret Access Key *

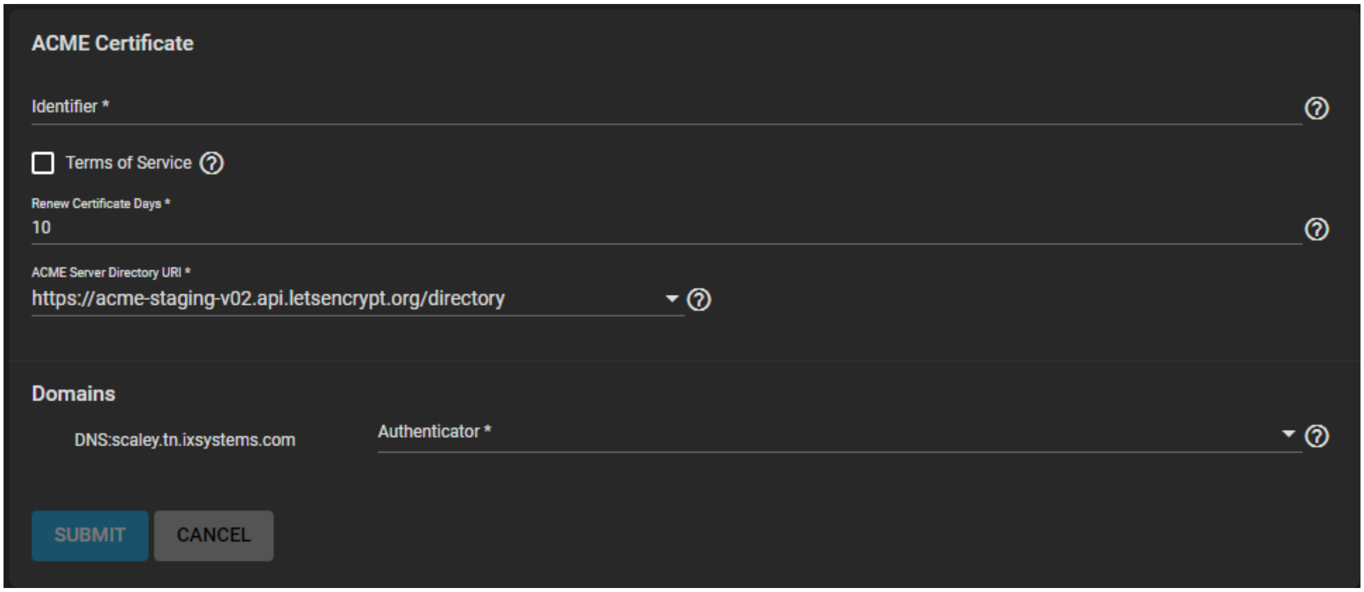
Enter a name for the authenticator. This is only used to identify the authenticator in the TrueNAS web interface. Choose a DNS provider and configure any required *Authenticator Attributes*:

- *Route 53*: Amazon DNS web service. Requires entering an Amazon account *Access ID Key* and *Secret Access Key*. See the AWS documentation for more details about generating these keys.

Click *SUBMIT* to register the DNS Authenticator and add it to the list of authenticator options for ACME Certificates.

Creating ACME Certificates

ACME certificates can be created for existing certificate signing requests. These certificates use an ACME DNS authenticator to confirm domain ownership, then are automatically issued and renewed. To create a new ACME certificate, go to **System > Certificates**, click □ (Options) for an existing certificate signing request, and click *Create ACME Certificate*.



ACME Certificate

Identifier *

□ Terms of Service

Renew Certificate Days * 10

ACME Server Directory URI * https://acme-staging-v02.api.letsencrypt.org/directory

Domains

DNS:scaley.tn.ixsystems.com Authenticator *

Name	Description
Identifier	Internal identifier of the certificate. Only alphanumeric characters, dash (-), and underline (_) are allowed.
Terms of Service	Please accept the terms of service for the given ACME Server.
Renew Certificate Day	Number of days to renew certificate before expiring.
ACME Server Directory URI	URI of the ACME Server Directory. Choose a preconfigured URI or enter a custom URI.
Authenticator for *Domain Name* (*Domain Name* dynamically changes)	Authenticator to validate the domain. Choose a previously configured ACME DNS authenticator.

3.17 - KMIP

KMIP is only available for TrueNAS Enterprise licensed systems. Please contact the iXsystems Sales Team to inquire about purchasing TrueNAS Enterprise licenses.

The Key Management Interoperability Protocol (KMIP) is an extensible client/server communication protocol for the storage and maintenance of keys, certificates, and secret objects. KMIP on TrueNAS Enterprise is used to integrate the system within an existing centralized key management infrastructure and use a single trusted source for creating, using, and destroying SED passwords and ZFS encryption keys.

Keys can be created on a single server and then retrieved by TrueNAS. Keys wrapped within keys, symmetric, and asymmetric keys are supported. Alternately, KMIP can be used for clients to ask a server to encrypt or decrypt data without the client ever having direct access to a key. KMIP also can be used to sign certificates.

Requirements expand □
You will need to have a KMIP server available with certificate authorities and certificates that can be imported into TrueNAS. Have the KMIP server configuration open in a separate browser tab or copy the KMIP server certificate string and private key string to later paste into the TrueNAS web interface. This helps simplify the TrueNAS connection process.

Connecting TrueNAS to a KMIP Server

To connect TrueNAS to a KMIP server, import a Certificate Authority (CA) and Certificate from the KMIP server, then configure the KMIP options.

How do I import these? expand □

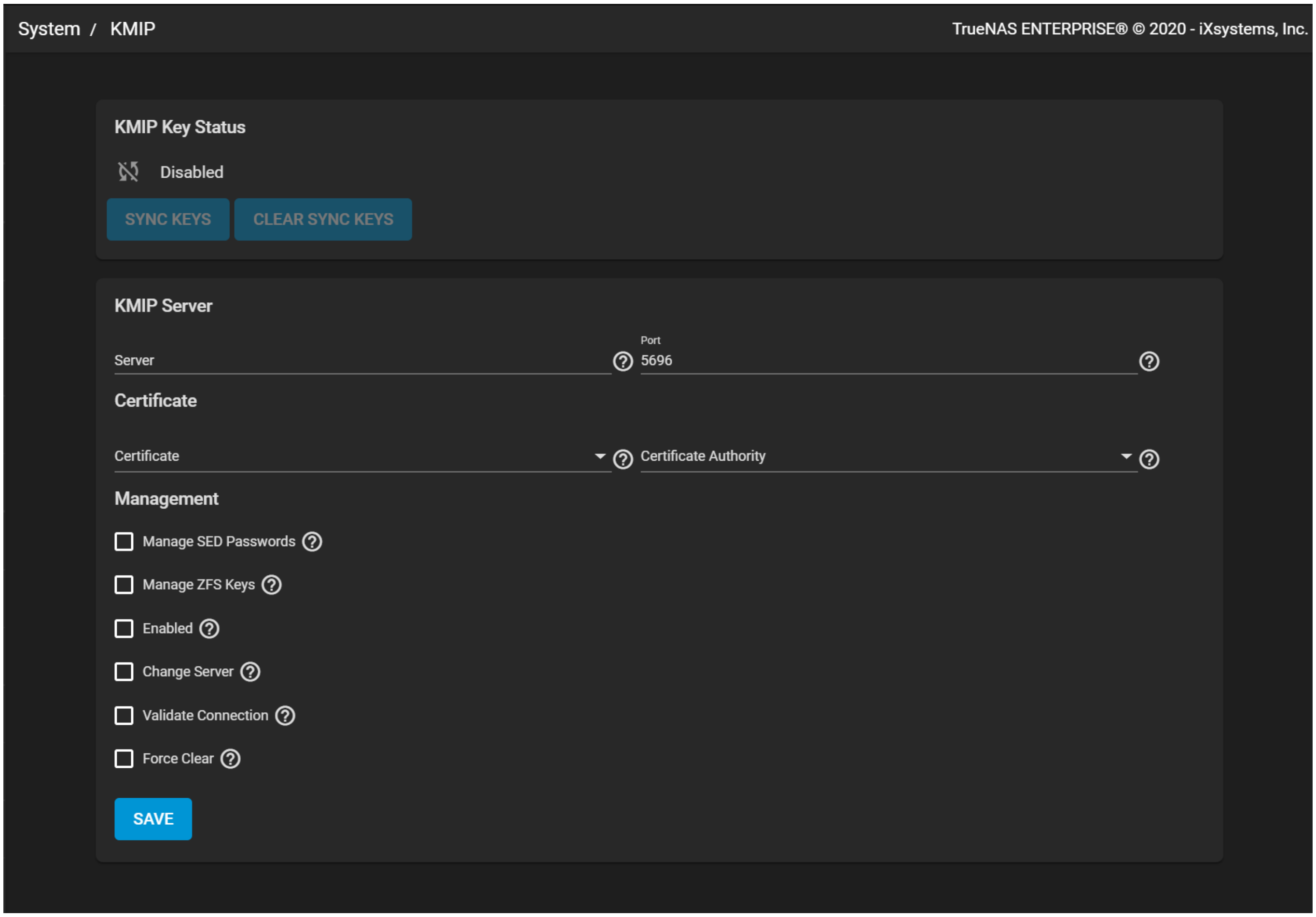
Log in to the TrueNAS web interface and go to **System** > **CAs** and click *ADD*. In the *Type* drop down menu, select *Import CA*. Enter a memorable *Name* for the CA, then paste the KMIP server *Certificate* and *Private Key* strings into the related fields. Leave the *Passphrase* empty and click *Submit*.

Next, go to **System** > **Certificates** and click *ADD*. In the *Type* drop down menu, select *Import Certificate*. Enter a memorable *Name* for the certificate and paste the KMIP server *Certificate* and *Private Key* strings into the related TrueNAS fields. Leave the *Passphrase* empty and click *Submit*.

For security reasons, it is strongly recommended to protect the CA and Certificate values.

Configuring KMIP in TrueNAS

Go to **System > KMIP** to complete the configuration.



KMIP Key Status

Disabled

KMIP Server

Server

Port: 5696

Certificate

Certificate

Certificate Authority

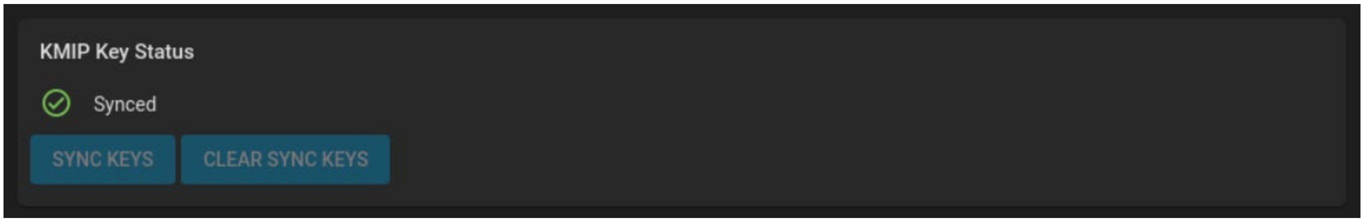
Management

- □ Manage SED Passwords
- □ Manage ZFS Keys
- □ Enabled
- □ Change Server
- □ Validate Connection
- □ Force Clear

Enter the central key server *Server* host name or IP address and the number of an open connection *Port* on the key server. Select the *Certificate* and *Certificate Authority* that were just imported from the central key server. To check that the Certificate and CA chain is correct, set *Validate Connection* and click *SAVE*.

When the certificate chain is verified, choose the encryption values, SED passwords, or ZFS data pool encryption keys to move to the central key server. Set *Enabled* to begin moving the passwords and keys immediately after clicking *SAVE*.

Refreshing the **KMIP** page shows the current **KMIP Key Status**.



KMIP Key Status

✓ Synced

To cancel a pending key synchronization, set *Force Clear* and click *SAVE*.

3.18 - Failover (HA)

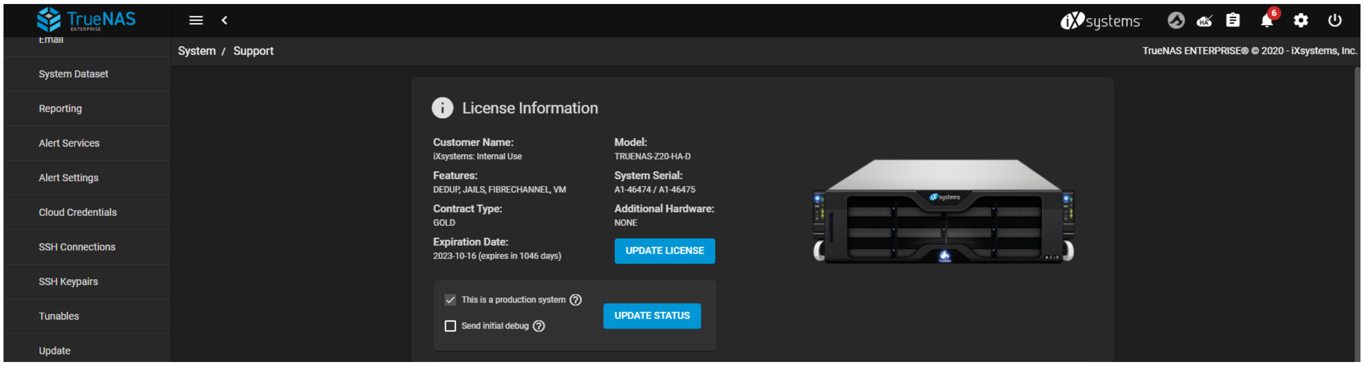
Warning: To avoid the potential for data loss, iXsystems must be contacted before replacing a controller or upgrading to High Availability.

Process Summary expand □

- **System > Support**
  - Update license
- **Network > Global Configuration**
  - Set the hostnames for both TrueNAS controllers
  - Set a virtual hostname
- **Network > Interfaces**
  - Interfaces cannot be edited when HA is enabled
  - Define the failover group
  - Set IP addresses for the controllers
  - Set the virtual IP address
    - This IP address is used to log in to the web interface from this point forward
- **System > Failover**
  - Designate the default TrueNAS controller
  - Define how long to wait after a network interruption to trigger a failover

Configuring High Availability (HA)

To configure HA, turn on both units in the array and log in to the web interface for one of the units. If this is the first login, the UI shows a dialog to upload the TrueNAS Enterprise License. Otherwise, go to **System > Support** and update the license.



System / Support

TrueNAS ENTERPRISE® © 2020 - iXsystems, Inc.

License Information

Customer Name: iXsystems: Internal Use

Model: TRUENAS-Z20-HA-D

Features: DEDUP, JAILS, FIBRECHANNEL, VM

System Serial: A1-46474 / A1-46475

Contract Type: GOLD

Additional Hardware: NONE

Expiration Date: 2023-10-16 (expires in 1046 days)

UPDATE LICENSE

☑ This is a production system

☐ Send initial debug

UPDATE STATUS

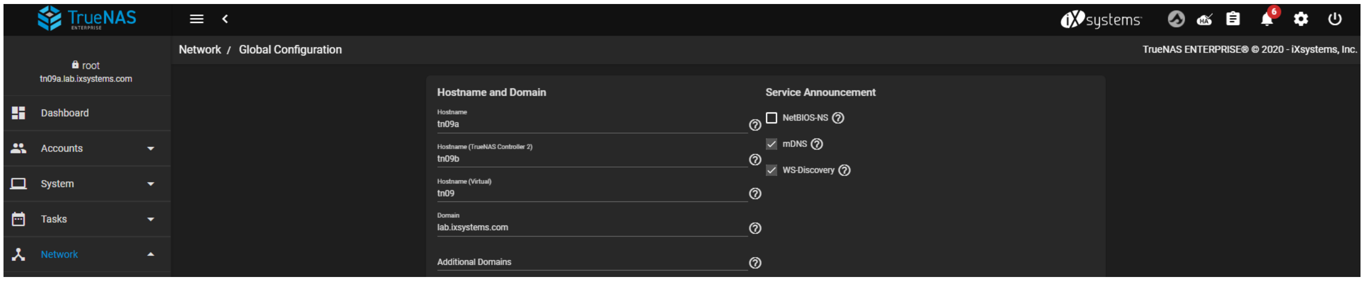
Paste the HA license received from iXsystems and save it. The license contains the serial numbers for both units in the chassis. Activating an HA license adds the **System > Failover** screen and modifies fields throughout the UI so that hostnames and IP addresses can be configured for both controllers.

After HA is configured, an icon shows when HA is active or unavailable. When HA is disabled by the system administrator, the status icon changes to show HA is unavailable. If the standby TrueNAS controller is not available because it is powered off, still starting up, disconnected from the network, or if failover has not been configured, the status icon changes to show HA is unavailable. HA also becomes unavailable if a different number of disks are connected to each controller.

If both TrueNAS controllers reboot simultaneously, the passphrase for an encrypted pool must be entered at the web interface login screen.

Networking

To make sure system networking is configured for HA, first go to **Network > Global Configuration**.



Hostname and Domain

Hostname: tn09a

Hostname (TrueNAS Controller 2): tn09b

Hostname (Virtual): tn09

Domain: lab.ixsystems.com

Additional Domains

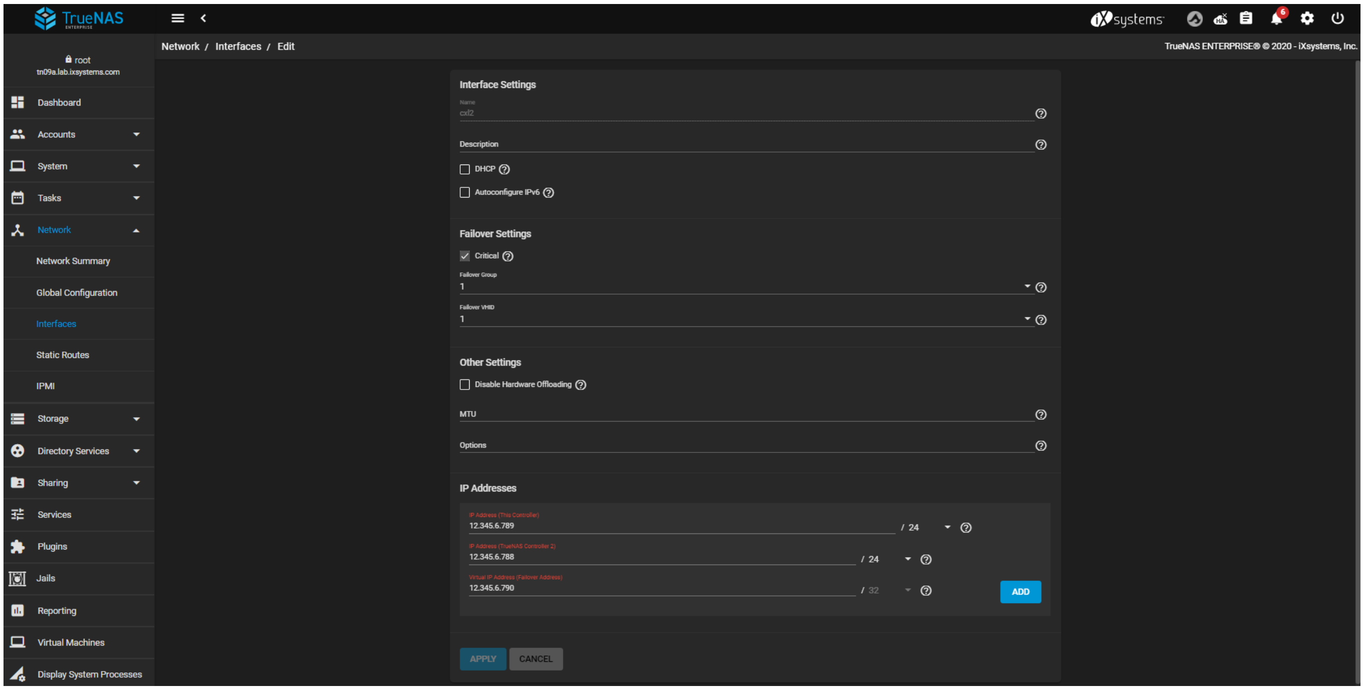
Service Announcement

☐ NetBIOS-NS
☑ mDNS
☑ WS-Discovery

You can set the host names for both controllers and a virtual host name that reaches whichever controller is currently active.

Next, go to **Network > Interfaces** and edit the primary interface.

> Editing interfaces is disabled when HA is active. To disable HA, go to **System > Failover** and disable failover. Edit the interface, then reactivate failover immediately. TrueNAS automatically synchronizes the configuration changes to the standby controller



Interface Settings

Name: cxl2

Description

☐ DHCP
☐ Autoconfigure IPv6

Failover Settings

☑ Critical

Failover Group: 1

Failover VHID: 1

Other Settings

☐ Disable Hardware Offloading

MTU

Options

IP Addresses

IP Address (This Controller): 12.345.6.789 / 24

IP Address (TrueNAS Controller 2): 12.345.6.788 / 24

Virtual IP Address (Failover Address): 12.345.6.790 / 32

You can designate the interface as critical for failover and combine multiple interfaces into a failover group. There are also options to configure IP addresses for each controller and a virtual IP address with virtual host ID to use for administrative access.

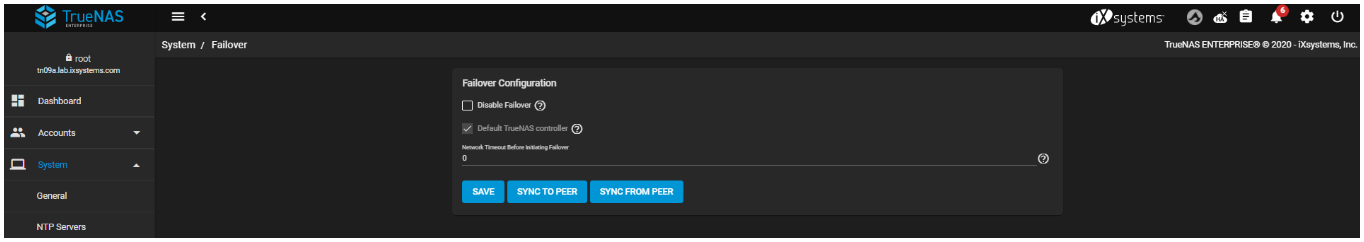
After the network configuration is complete, log out and log back in, this time using the virtual IP address. Pools and shares can now be configured as usual and configuration automatically synchronizes between the active and standby TrueNAS controllers.

All subsequent logins should use the virtual IP address. Connecting directly to the standby TrueNAS controller with a browser does not allow web interface logins.

When troubleshooting HA networking, the `ifconfig` command adds two additional fields to the output to help with failover troubleshooting: **CriticalGroup*n*** and **Interlink**.

Failover

To make general changes to the Failover settings, go to **System > Failover**



Failover Configuration

□ Disable Failover

☑ Default TrueNAS controller

Network Timeout Before Initiating Failover: 0

You can manually disable failover on this screen.

Make sure to set one of the controllers as the default, so that the default controller becomes active when both boot simultaneously. Booting an HA pair with failover disabled causes both TrueNAS controllers to come up in standby mode. In this situation, the web interface shows an option to force a TrueNAS controller to become active.

To have the system wait to failover during a network timeout, replace *0* with a new number of seconds.

> Do not *sync* the TrueNAS configuration unless directed by an iXsystems Support Engineer! TrueNAS is designed to automatically synchronize the system configuration and the manual sync options are only for dangerous or high-risk troubleshooting situations.

3.19 - Support

There are a number of options to get support for your TrueNAS installation. TrueNAS CORE users can engage with the TrueNAS community to answer questions and resolve issues, while TrueNAS Enterprise hardware customers can also access the fast and effective support directly provided by iXsystems.

Support Options

⊙ TrueNAS CORE

There are a number of resources available to TrueNAS CORE users for answering usage questions or troubleshooting system configurations. It is always recommended to search through the software documentation and community resources for answers to these questions.

Users are also welcome to report bugs, vote for, or suggest new TrueNAS features in the project Jira instance.

Customers who purchase iXystems hardware or that want additional support must have a support contract to use iXystems Support Services.

TrueNAS Community

The TrueNAS Community is an active online resource for asking questions, troubleshooting issues, and sharing information with other TrueNAS users. Registration is required for posting. New users are encouraged to provide a brief introduction of themselves and to review the forum rules before posting.

Community Resources are user contributed articles about every facet of using TrueNAS. They are organized into broad categories and incorporate a community rating system to better highlight content that the whole community finds helpful.

Social Media

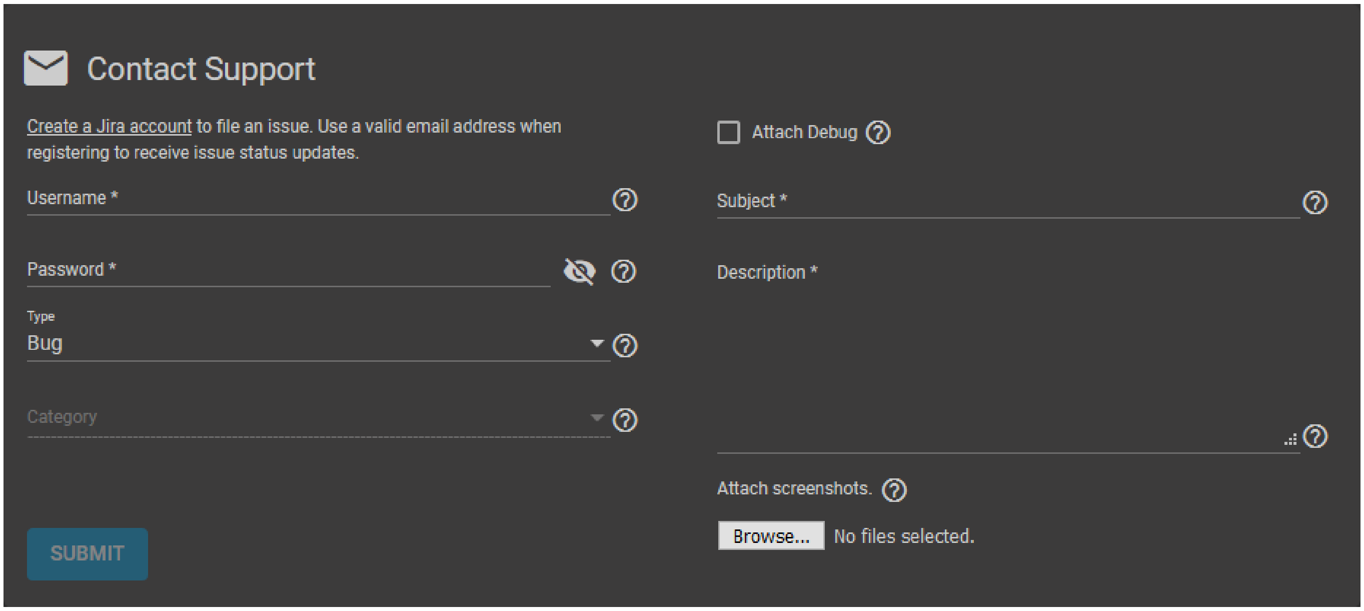
You are always welcome to network with other TrueNAS users using the various social media platforms!

- Reddit
- Twitter
- LinkedIn
- Facebook

Reporting a Bug

If you encounter a bug or other issue while using TrueNAS, create a bug report in the TrueNAS Jira Project . The web interface provides a form to report issues without having to log out. It is recommended to search the project first to see if the issue is already reported. You need to create a Jira account before creating a bug ticket.

To report an issue using the web interface, go to **System > Support**.



Create a Jira account to file an issue. Use a valid email address when registering to receive issue status updates.

Type
Bug

Enter your Jira information in the **Username** and **Password** fields to verify your account credentials and activate the **Submit** button. The **Category** dropdown list has a large number of options. Choose the category that best fits where you encountered the issue.

Attach a debug file and any screenshot to your bug ticket helps speed up the response and resolution to find and fix the bug. Debug files are always attached to the ticket privately and are deleted when the ticket is resolved.

Keep the information in **Subject** brief and informative. Provide a short, descriptive subject to help the community find and respond to your issue. The information in **Description** should contain more details about the problem. It is recommended to keep the description less than three paragraphs and include any steps to reproduce the issue or error.

Creating a Debug File

The TrueNAS web interface allows users to save debugging information to a text file.

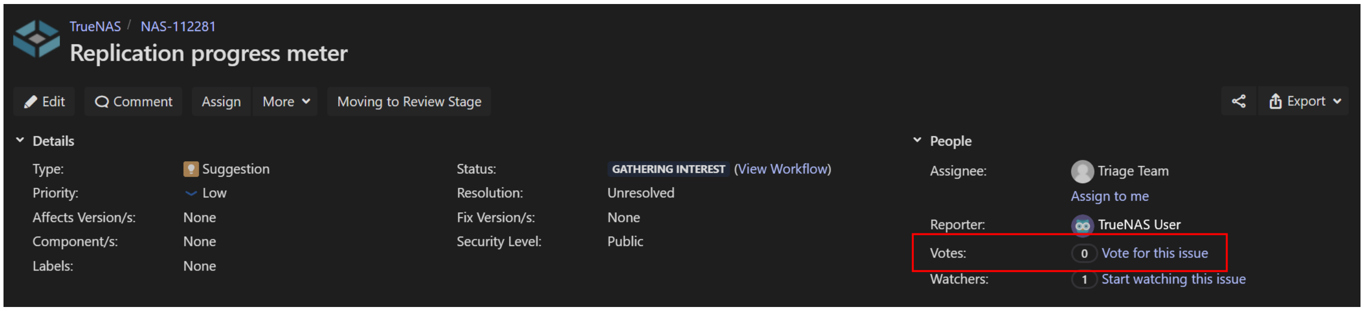
Go to **System > Advanced** (or **System Settings > Advanced** in TrueNAS SCALE) and click **SAVE DEBUG**. Click **PROCEED** to generate the debug file. You cannot click options in the web interface while generating the debug file. A dialogue box displays debug file creation progress.

After generating the debug file, TrueNAS prompts you to save it to your local system (e.g. Downloads), or it automatically downloads to your specified downloaded files location.

Debugging information is collected by the `freenas-debug` command-line utility. A copy of the information is saved to /var/tmp/fndebug .

Suggest New Features

Want to see a new feature added to TrueNAS? You can see and vote for community-proposed features in the TrueNAS Jira project and make your feature suggestions. To see the list of community-proposed features, go to the TrueNAS Jira project and search for open suggestions . If you find a suggestion that you want to see implemented, open that ticket and click **Vote for this issue** in the **People** section.



TrueNAS / NAS-112281

Replication progress meter

Details

Type: Suggestion

Priority: Low

Affects Version/s: None

Component/s: None

Labels: None

Status: GATHERING INTEREST (View Workflow)

Resolution: Unresolved

Fix Version/s: None

Security Level: Public

People

Assignee: Triage Team

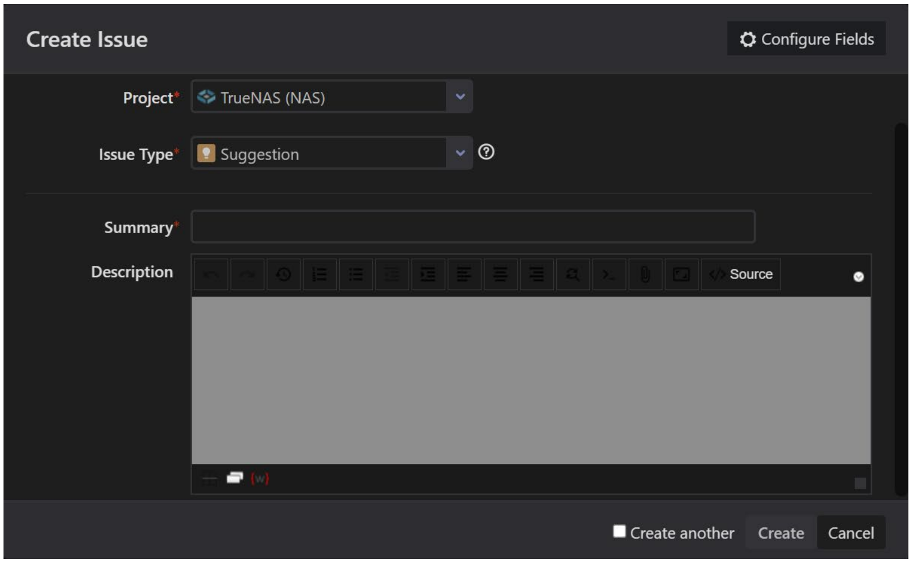
Assign to me

Reporter: TrueNAS User

Votes: 0 Vote for this issue

Watchers: 1 Start watching this issue

To suggest a new feature, go to https://jira.ixsystems.com/projects/NAS/ , log in to your Jira account, and click **Create**.



Create Issue

Project* TrueNAS (NAS)

Issue Type* Suggestion

Summary*

Description

Enter a brief description for the new feature you’d like to see added to the software in the **Summary** section. After creating your feature suggestion, it moves to the **Gathering Interest** stage, where the community can review and vote for the feature. After gathering enough interest, the TrueNAS Release Council reviews the suggestion for feasibility and to determin where to add the feature in the software roadmap.

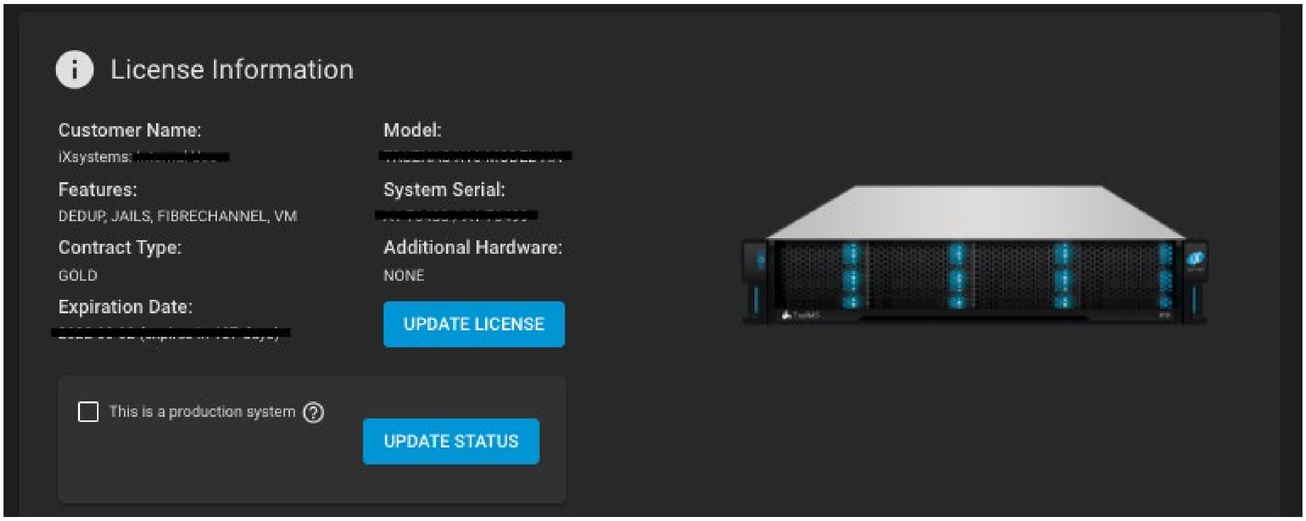
○ TrueNAS Enterprise

In addition to all the TrueNAS CORE support options, TrueNAS Enterprise customers who purchase hardware from iXsystems can receive assistance from iXsystems if an issue occurs with the system.

Silver and Gold level Support customers can also enable Proactive Support on their hardware to automatically notify iXsystems if an issue occurs. To find more details about the different Warranty and Service Level Agreement (SLA) options available, see https://www.ixsystems.com/support/ .

License Information

The **License Information** area contains the system model, serial numbers, additional hardware, licensed features, support contract type, and support contract expiration date information. The ability to mark the system as a production system is also available.



License Information

Customer Name:
iXsystems: [redacted]

Model:
[redacted]

Features:
DEDUP, JAILS, FIBRECHANNEL, VM

System Serial:
[redacted]

Contract Type:
GOLD

Additional Hardware:
NONE

Expiration Date:
[redacted]

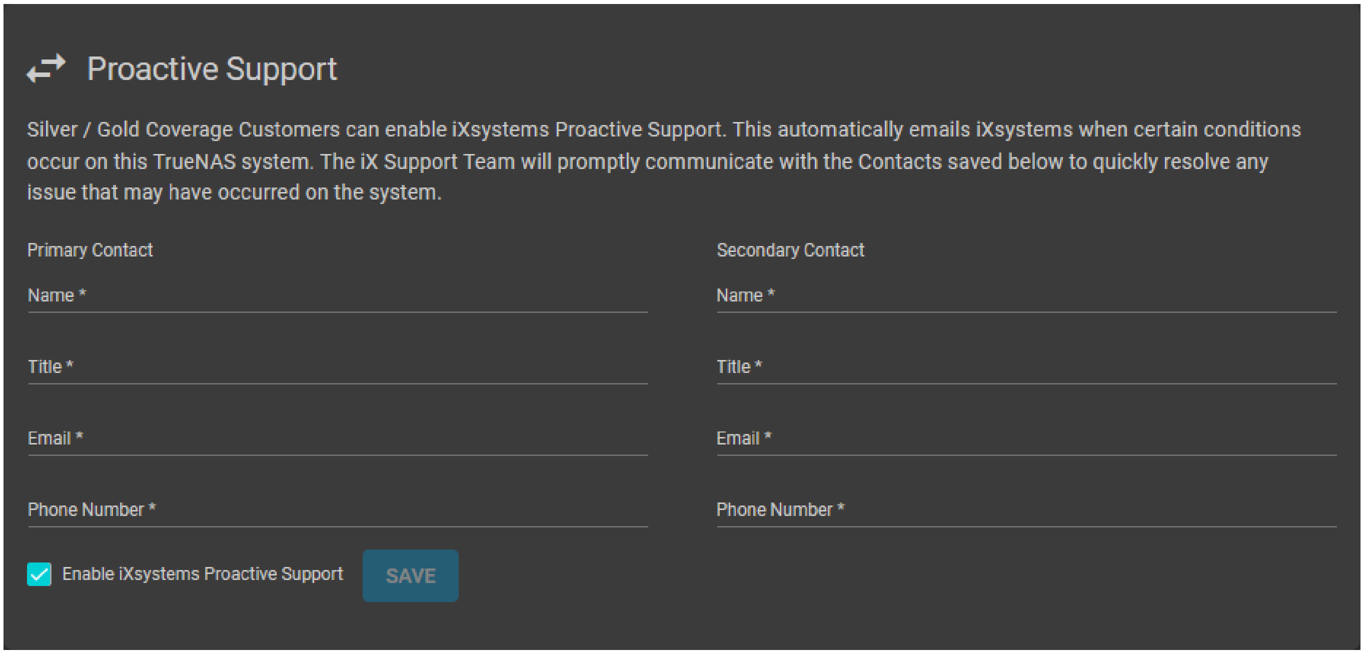
☐ This is a production system

Production System Reporting

When the system is ready to be in production, update the status by selecting the **This is a production system** checkbox and clicking the **Update Status** button. This sends an email to Support declaring that the system is in production. There is also an option to include a debug in this email that could assist support in the future.

Configuring Proactive Support

Proactive Support notifies iXsystems by email whenever hardware conditions on the system require attention. This feature is available to iXsystems Silver and Gold Support customers.



Proactive Support

Silver / Gold Coverage Customers can enable iXsystems Proactive Support. This automatically emails iXsystems when certain conditions occur on this TrueNAS system. The iX Support Team will promptly communicate with the Contacts saved below to quickly resolve any issue that may have occurred on the system.

Primary Contact

Name *

Title *

Email *

Phone Number *

Secondary Contact

Name *

Title *

Email *

Phone Number *

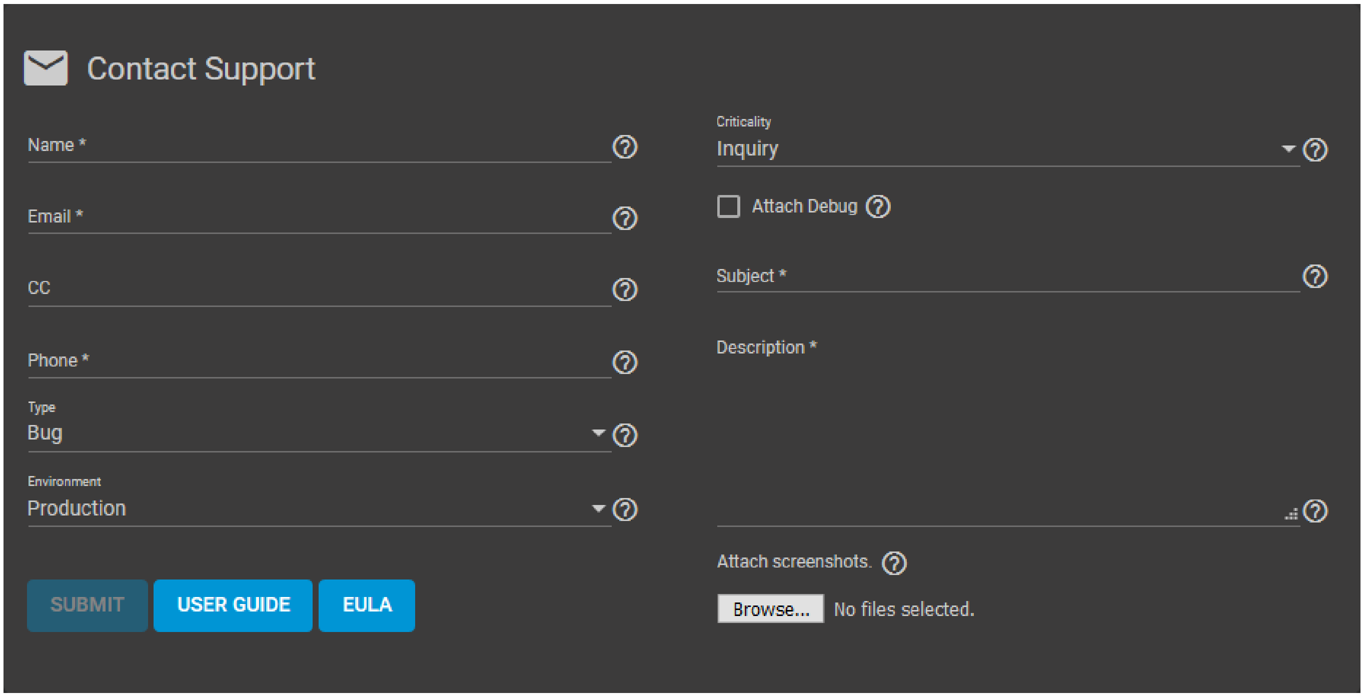
☑ Enable iXsystems Proactive Support

Be sure to add valid email addresses and phone numbers for the contacts to be quickly notified of any issues.

You can also enable automatic iXsystesms support alerts in the system console menu (`/etc/netcli` in the **Shell**). Failover on TrueNAS High Availability systems must be disabled before activating automatic alerts. To use the web interface to disable failover, go to **System > Failover**.

Filing a Support Ticket

TrueNAS Enterprise customers can file tickets directly with iXsystems Support by going to **System > Support** in the web interface.



Type: Bug

Environment: Production

Criticality: Inquiry

□ Attach Debug

No files selected.

Enter a valid email and phone number. iXsystems Support uses this information to respond to and resolve the issue. You can also indicate the system current use and identify how critical the issue is to system usability.

Attaching a debug and screenshots is always recommended to help speed up diagnosing and resolving the issue. It is also helpful to provide a brief summary in the **Subject** and **Description** fields that describes the problem and any steps to reproduce the issue.

Click **SUBMIT** to generate and send the support ticket to iXsystems. This process can take several minutes while information is collected and sent. TrueNAS sends an email alert if ticket creation fails while Proactive Support is active.

After the new ticket is created, the URL displays which allows you to view or update the ticket with more information. An iXsystems Support account is required to view the ticket. Click the URL to log in or register with the support portal. Use the same e-mail address submitted with the ticket when registering.

Contacting iXsystems Support

Customers who purchase iXystems hardware or that want additional support must have a support contract to use iXystems Support Services. The TrueNAS Community forums provides free support for users without an iXsystems Support contract.

Contact Method	Contact Options
Web	https://support.ixsystems.com
Email	support@ixsystems.com
Telephone	Monday - Friday, 6:00AM to 6:00PM Pacific Standard Time: US-only toll-free: 1-855-473-7449 option 2 Local and international: 1-408-943-4100 option 2
Telephone	After Hours (24x7 Gold Level Support only): US-only toll-free: 1-855-499-5131 International: 1-408-878-3140 (international calling rates apply)

3.20 - 2FA (Two-Factor Authentication)

For increased security, two-factor authentication is highly desirable. TrueNAS offers Two-Factor Authentication (2FA) to ensure that a compromised administrator (*root*) password cannot be used by itself to gain access to the administrator interface. You need a mobile device with the current time and date that has Google Authenticator installed to use 2FA.

> Two-Factor authentication is time based and requires that the system is set correctly. Making sure NTP is functional before enabling is strongly recommended!

What is 2FA and why would I want to enable it? expand □

Two-Factor Authentication (2FA) is an extra layer of security that is added to your system to prevent someone from logging in, even if they have your password. This extra security measure requires you to verify your identity using a randomized 6-digit code that is re-generated every 30 seconds, unless the interval is modified, to use when you to log in.

Benefits

- 2FA provides an extra layer of security: By requiring a second form of identification 2FA decreases the probability that an a unauthorized user can gain access to the system. An unauthorized user won't have the second element required to authenticate their login.

- Increase productivity and flexibility: As the workforce becomes more mobile, employees can securely access systems from virtually any device or location-without putting sensitive information at risk.

- Internet access on the TrueNAS system is not required to use 2FA.

Drawbacks

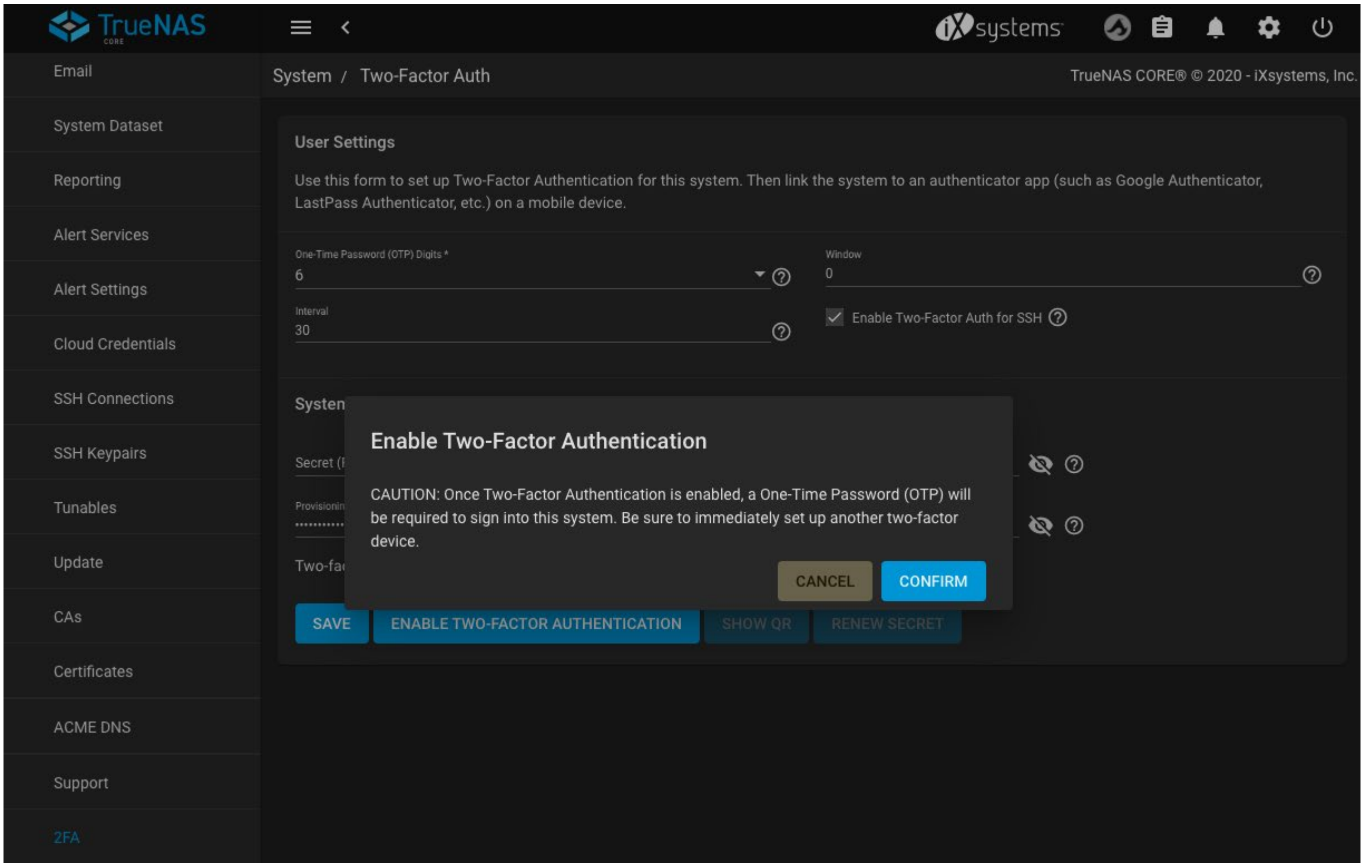
- An app is required to access the generated 2FA Code.

- If the the 2FA code isn't working, or there is no access to the 2FA Password, the system is inaccessable through the UI and SSH (if that option has been set).

  > When the mobile device with the authenication app isn't available, access the system CLI to bypass 2FA. This requires administrative IPMI or physical access to the system.

To unlock 2FA in the cli, enter: `midclt call auth.twofactor.update '{ "enabled":false }'`

2FA Options



System / Two-Factor Auth

TrueNAS CORE® © 2020 - iXsystems, Inc.

User Settings

Use this form to set up Two-Factor Authentication for this system. Then link the system to an authenticator app (such as Google Authenticator, LastPass Authenticator, etc.) on a mobile device.

One-Time Password (OTP) Digits * 6

Window 0

Interval 30

☑ Enable Two-Factor Auth for SSH

Systen

Secret (

Provisionin ••••••••••

Two-fa

Enable Two-Factor Authentication

CAUTION: Once Two-Factor Authentication is enabled, a One-Time Password (OTP) will be required to sign into this system. Be sure to immediately set up another two-factor device.

Two-factor authentication is time-based and requires that the system time is set correctly.

User Settings

Name	Description
One Time Password (OTP) Digits	The number of digits in the One-Time Password. The default is 6, which is Google's standard OTP length. Check your app/device settings before selecting this.
Interval	The lifespan (in seconds) of each OTP. Default is 30 seconds. The minimum is 5 seconds.
Window	Extends password validity beyond the *Interval* setting. For example, 1 means that one password before and after the current one is valid, leaving three valid passwords. Extending the window is useful in high-latency situations.
Enable Two-Factor Auth for SSH	Enable 2FA for system SSH access. We recommend leaving this DISABLED until after you successfully test 2FA with the UI.

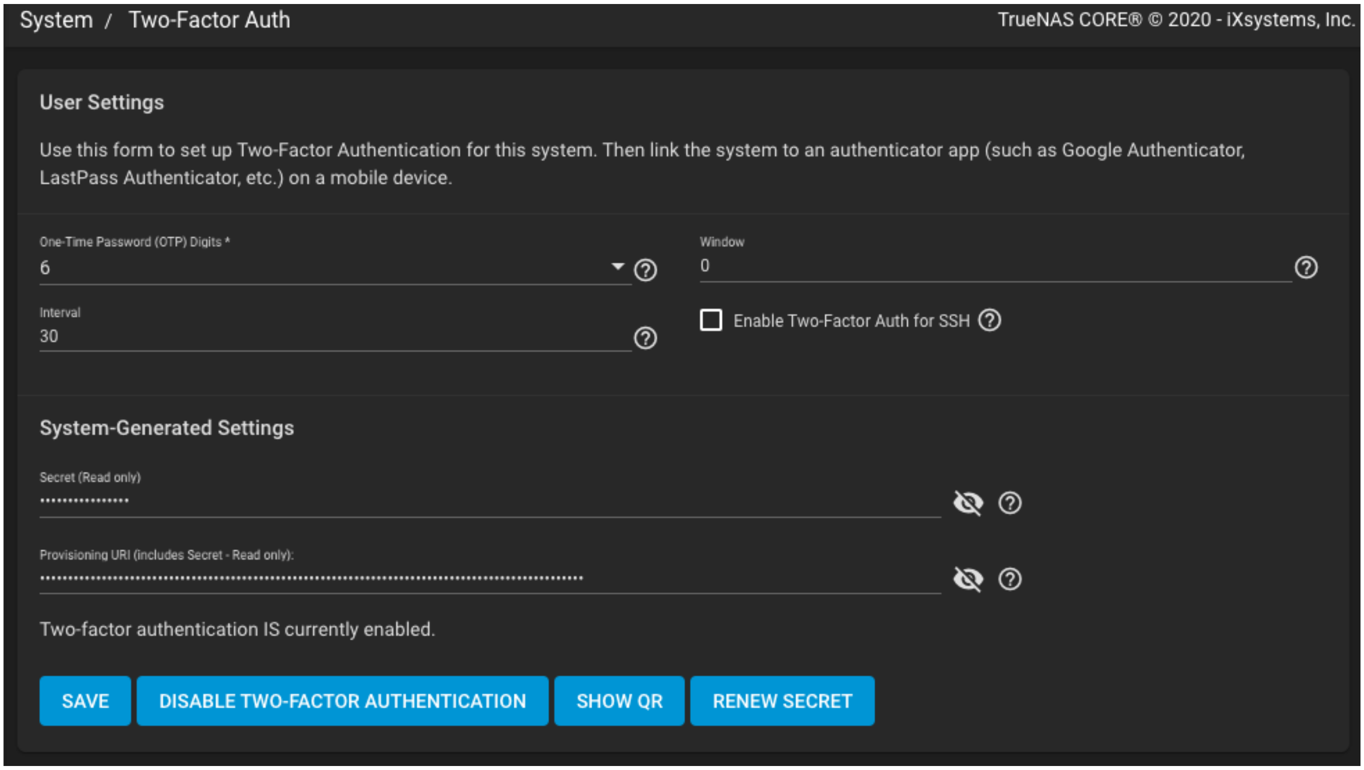
System Generated Settings

Name	Description
Secret (Read-only)	The secret TrueNAS creates and uses to generate OTPs when you first enable 2FA.
Provisioning URI (includes Secret - Read-only)	The URI used to provision an OTP. TrueNAS encodes the URI (which contains the secret) in a QR Code. To set up an OTP app like Google Authenticator, use the app to scan the QR code or enter the secret manually into the app. TrueNAS produces the URI when you first activate 2FA.

Enabling Two-Factor Authentication.

Set up a second 2FA device as a backup before proceeding.

- Go to **System > 2FA**.
- Click *Enable Two Factor Authentication* and *Save*.



System / Two-Factor Auth

TrueNAS CORE® © 2020 - iXsystems, Inc.

User Settings

Use this form to set up Two-Factor Authentication for this system. Then link the system to an authenticator app (such as Google Authenticator, LastPass Authenticator, etc.) on a mobile device.

One-Time Password (OTP) Digits * 6

Window 0

Interval 30

□ Enable Two-Factor Auth for SSH

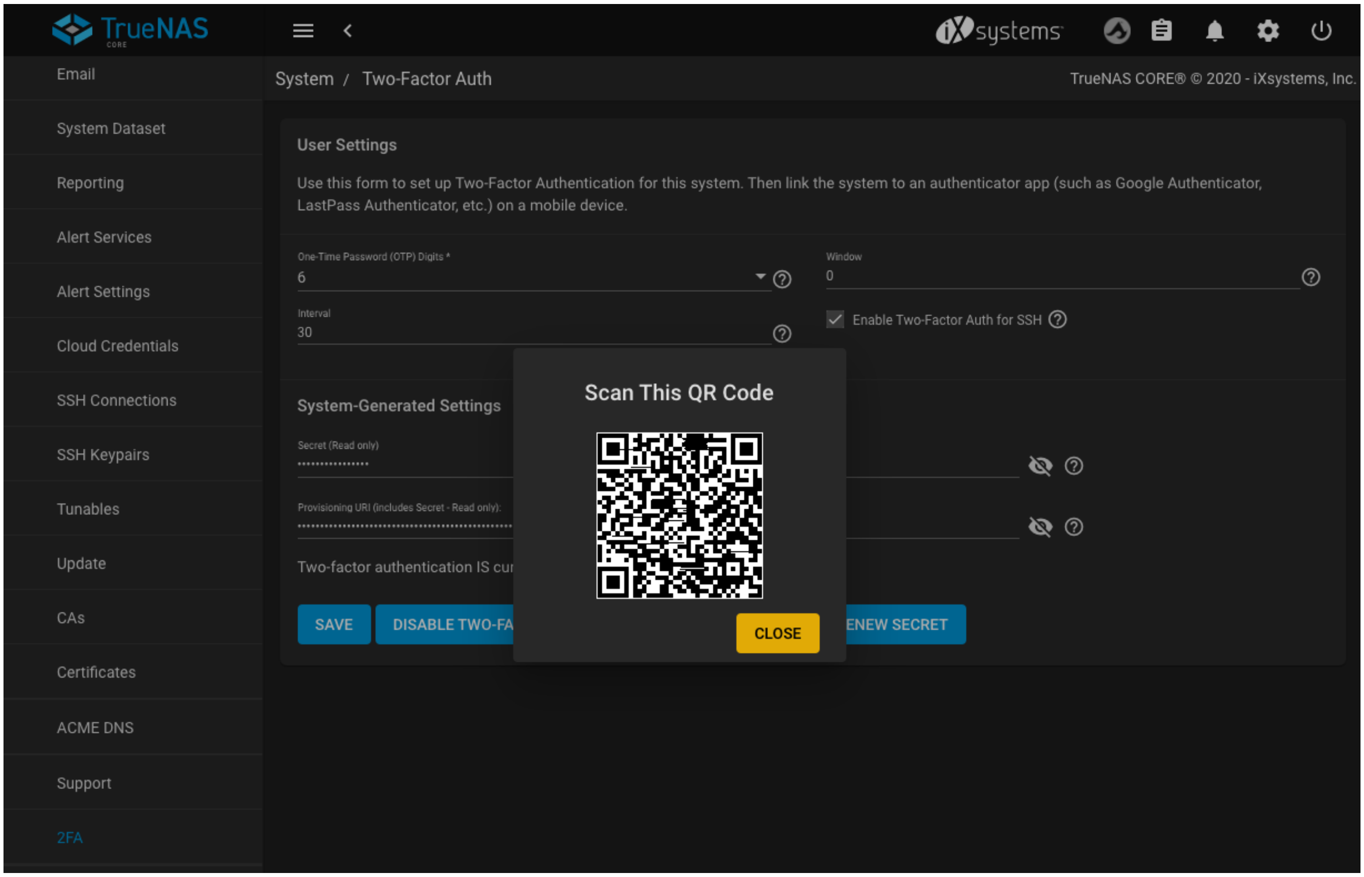
System-Generated Settings

Secret (Read only) ••••••••••••••••

Provisioning URI (includes Secret - Read only): ••

Two-factor authentication IS currently enabled.

- Click *Confirm*.
- Click *Show QR*.



System / Two-Factor Auth

TrueNAS CORE® © 2020 - iXsystems, Inc.

User Settings

Use this form to set up Two-Factor Authentication for this system. Then link the system to an authenticator app (such as Google Authenticator, LastPass Authenticator, etc.) on a mobile device.

One-Time Password (OTP) Digits * 6

Window 0

Interval 30

☑ Enable Two-Factor Auth for SSH

System-Generated Settings

Secret (Read only) ••••••••••••••••

Provisioning URI (includes Secret - Read only): ••

Two-factor authentication IS cur

Scan This QR Code

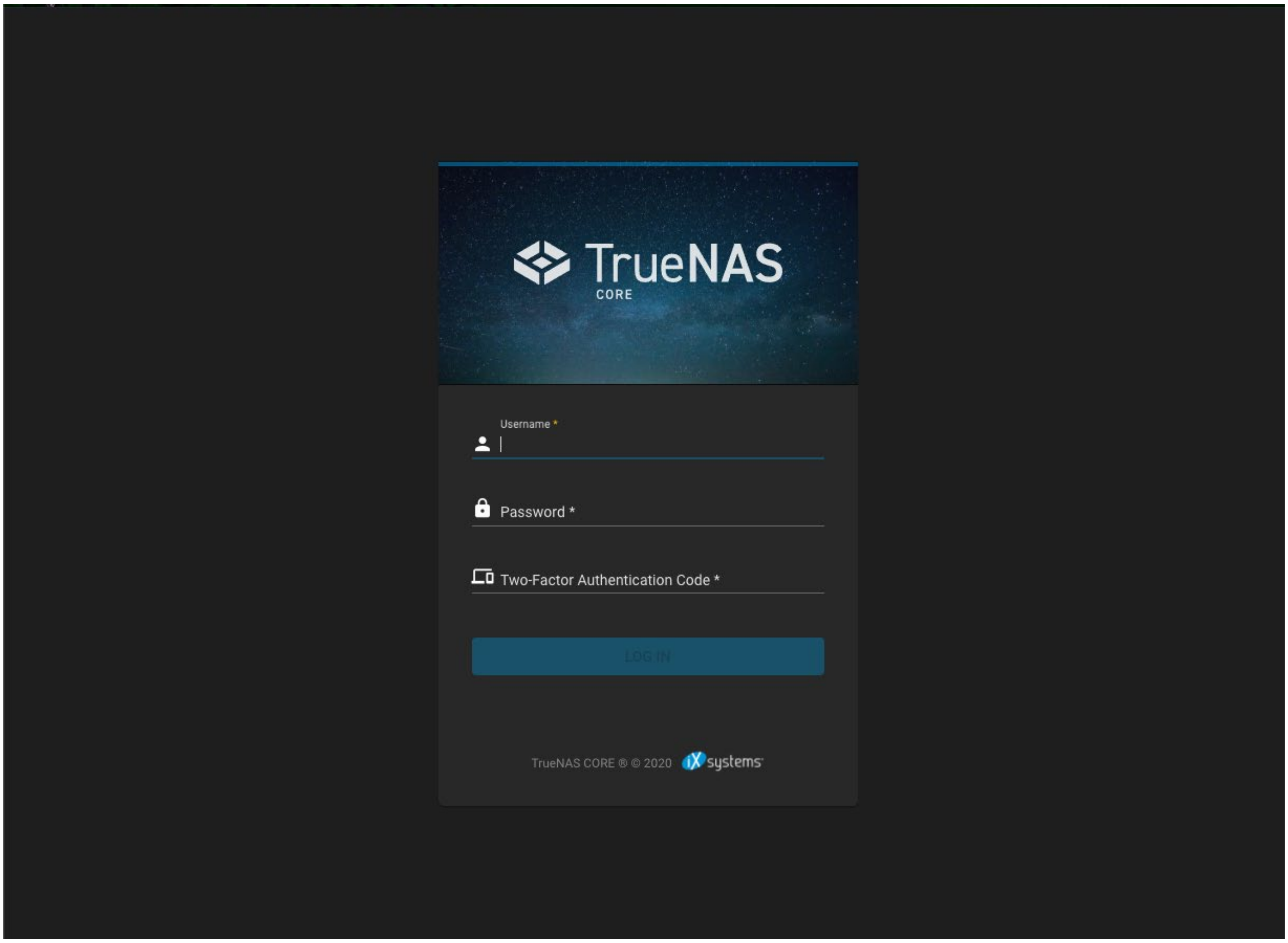
- On the mobile device start Google Authentication and scan the QR code.

Using 2FA to Log in to TrueNAS

Enabling 2FA changes the log in process for both the TrueNAS web interface and SSH logins:

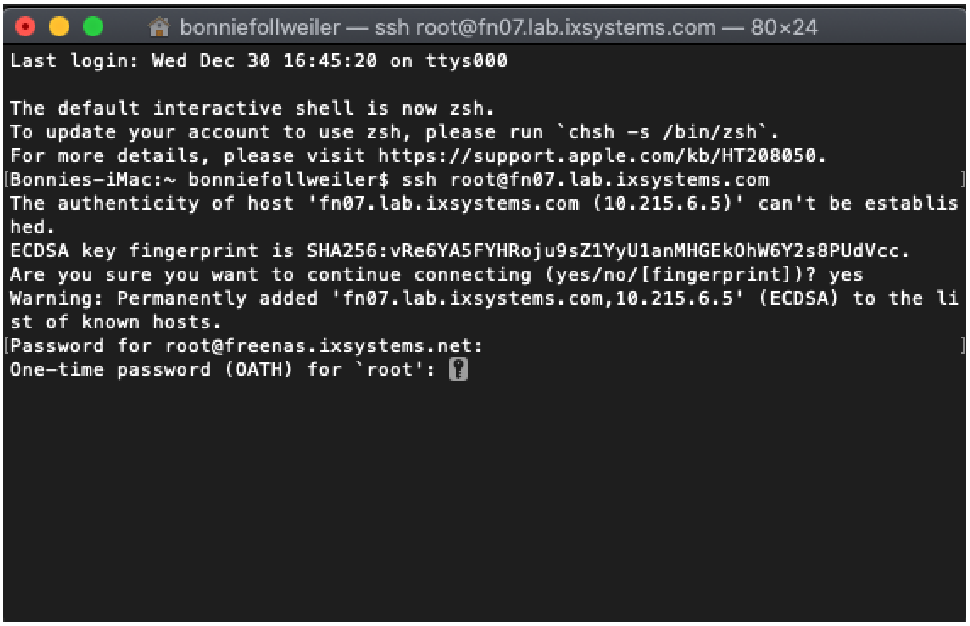
⊙ Web Interface

- The log in screen adds another field for the randomized authenticator code. If this field isn't immediately visible, try refreshing the browser.
- Enter the code on the mobile device (complete without the space) in the login window with the *root Username* and *Password*.



SSH Logins

- Confirm that *Enable Two-Factor Auth for SSH* is set in **System > 2FA**.
- Go to **Services > SSH** and edit the service. Set *Log in with root password* and *SAVE*. Toggle the **SSH** service and wait for the status to show that it is **Running**.
- Open the Google Authentication app on your mobile device.
- Open a Terminal window and SSH into the system using the system hostname or IP address, *root* account username and password, and the 2FA code from the mobile device.



```
Last login: Wed Dec 30 16:45:20 on ttys000

The default interactive shell is now zsh.
To update your account to use zsh, please run `chsh -s /bin/zsh`.
For more details, please visit https://support.apple.com/kb/HT208050.
Bonnies-iMac:~ bonniefollweiler$ ssh root@fn07.lab.ixsystems.com
The authenticity of host 'fn07.lab.ixsystems.com (10.215.6.5)' can't be establis
hed.
ECDSA key fingerprint is SHA256:vRe6YA5FYHRoju9sZ1YyU1anMHGEkOhW6Y2s8PUdVcc.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'fn07.lab.ixsystems.com,10.215.6.5' (ECDSA) to the li
st of known hosts.
Password for root@freenas.ixsystems.net:
One-time password (OATH) for `root':
```

4 - Tasks

TrueNAS includes an easy to use interface for common tasks a sysadmin needs to preform on a NAS on a regular basis. These can roughly be broken down into three groups.

- System level tasks
  - Cron Jobs
  - Init and Shutdown scripts
  - S.M.A.R.T. tests
- Data backup tasks
  - Rsync tasks
  - Cloud Sync tasks
- ZFS tasks
  - Snapshots
  - Resilvers
  - Scrubs
  - Replication

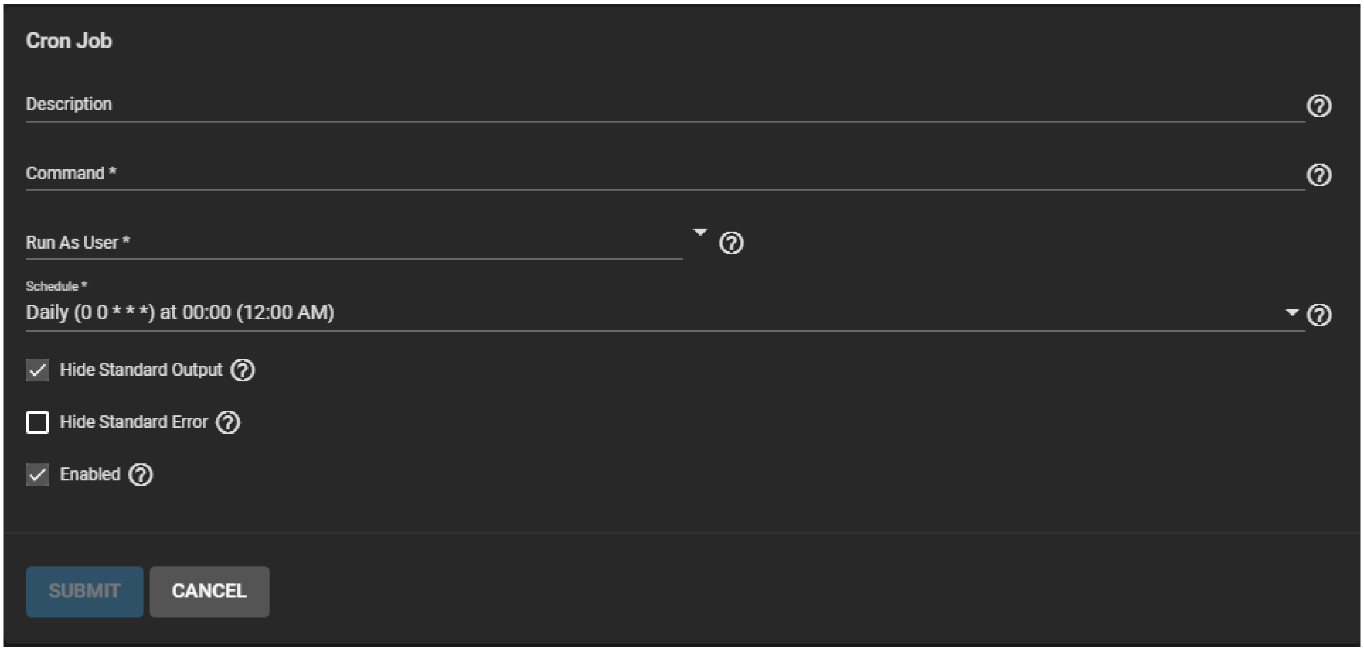
Ready to get started? Choose a topic or article from the left-side Navigation pane. Click the **<** symbol to expand the menu to show the topics under this section.

4.1 - Cron Jobs

TrueNAS allows users to run specific commands or scripts on a regular schedule using cron(8) . This can be helpful for running repetitive tasks.

Creating a Cron Job

To create a cron job, go to **Tasks > Cron Jobs** and click *ADD*.



Cron Job

Description

Command *

Run As User *

Schedule *
Daily (0 0 * * *) at 00:00 (12:00 AM)

☑ Hide Standard Output

☐ Hide Standard Error

☑ Enabled

The *Description* helps identify the cron job's purpose and is optional.

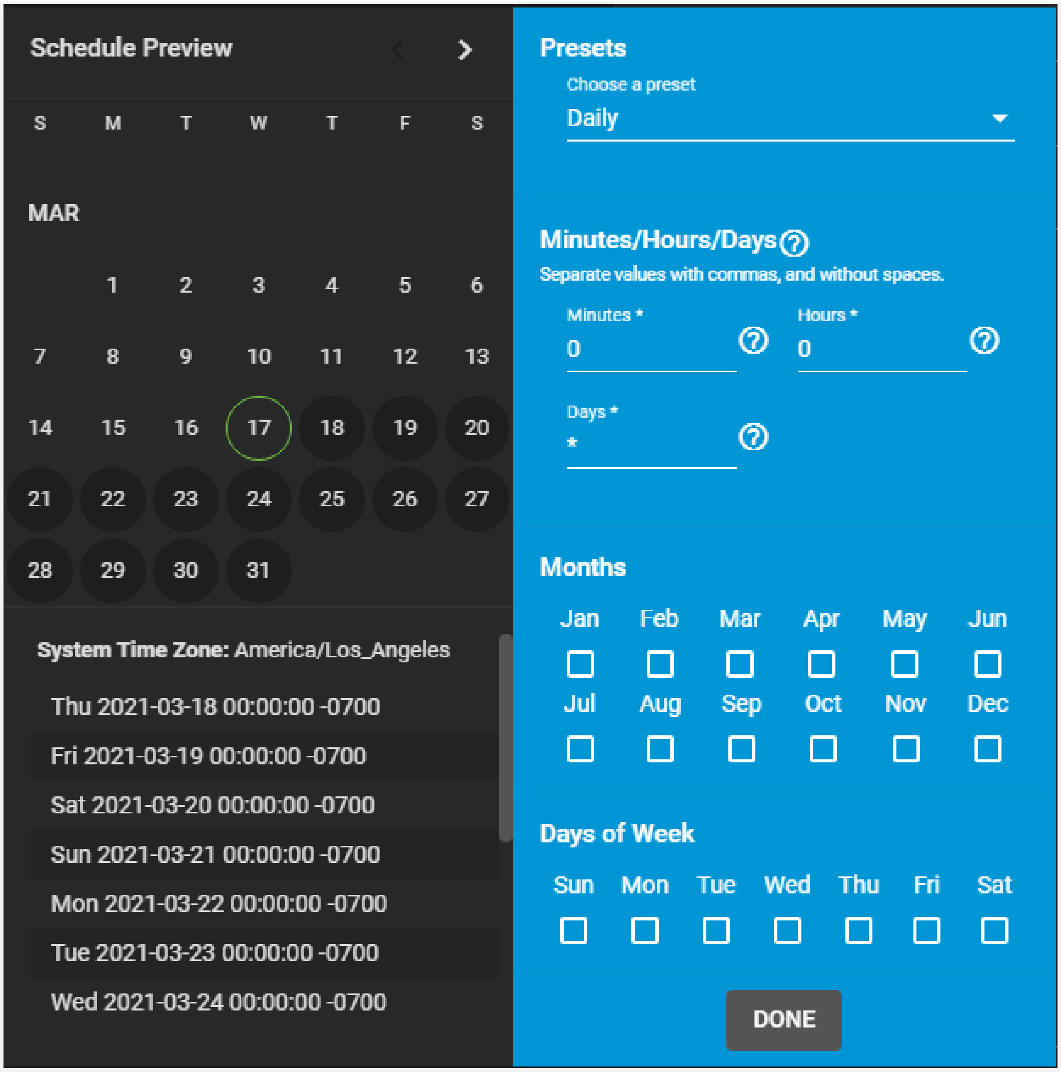
Next, enter the exact *Command* to run on the *Schedule*. Alternately, enter the path to a script file to run instead of a specific command.

> Don't forget to define the shell type when using a path to a script file. For example, a script written for `sh` must be specified as `sh /mnt/pool1/helloWorld.sh`.

Select an existing TrueNAS user account with the necessary permissions to run the command or script.

Next, define the *Command Schedule*. Various preset schedules are available. There is also an advanced scheduler for very specific schedule requirements.

Advanced Scheduler expand □



Choose a preset: Daily

Minutes *: 0

Hours *: 0

Days *: *

Months: Jan □ Feb □ Mar □ Apr □ May □ Jun □ Jul □ Aug □ Sep □ Oct □ Nov □ Dec □

Days of Week: Sun □ Mon □ Tue □ Wed □ Thu □ Fri □ Sat □

System Time Zone: America/Los_Angeles

```
Thu 2021-03-18 00:00:00 -0700
Fri 2021-03-19 00:00:00 -0700
Sat 2021-03-20 00:00:00 -0700
Sun 2021-03-21 00:00:00 -0700
Mon 2021-03-22 00:00:00 -0700
Tue 2021-03-23 00:00:00 -0700
Wed 2021-03-24 00:00:00 -0700
```

Choosing a **Presets** option populates the rest of the fields. To customize a schedule, enter crontab values for the `Minutes/Hours/Days`.

These fields accept standard cron values. The simplest option is to enter a single number in the field. The task runs when the time value matches that number. For example, entering *10* means that the job runs when the time is ten minutes past the hour.

An asterisk (`*`) means match all values.

Specific time ranges are set by entering hyphenated number values. For example, entering *30-35* in the **Minutes** field sets the task to run at minutes 30, 31, 32, 33, 34, and 35.

You can also enter lists of values. Enter individual values separated by a comma (`,`). For example, entering *1,14* in the **Hours** field means the task runs at 1:00 AM (0100) and 2:00 PM (1400).

A slash (`/`) designates a step value. For example, while entering `*` in **Days** means the task runs every day of the month, `*/2` means the task runs every other day.

Combining all the above examples together creates a schedule running a task each minute from 1:30-1:35 AM and 2:30-2:35 PM every other day.

There is an option to select which **Months** the task runs. Leaving each month unset is the same as selecting every month.

The **Days of Week** schedules the task to run on specific days. This is in addition to any listed days. For example, entering *1* in **Days** and setting *Wed* for **Days of Week** creates a schedule that starts a task on the first day of the month *and* every Wednesday of the month.

The **Schedule Preview** displays when the current settings mean the task runs.

Examples of CRON syntax

Syntax	Meaning	Examples
*	Every item.	* (minutes) = every minute of the hour. * (days) = every day.
*/N	Every Nth item.	*/15 (minutes) = every 15th minute of the hour (every quarter hour). */3 (days) = every 3rd day. */3 (months) = every 3rd month.
Comma and hyphen/dash	Each stated item (comma) Each item in a range (hyphen/dash).	1,31 (minutes) = on the 1st and 31st minute of the hour. 1-3,31 (minutes) = on the 1st to 3rd minutes inclusive, and the 31st minute, of the hour. mon-fri (days) = every Monday to Friday inclusive (every weekday). mar,jun,sep,dec (months) = every March, June, September, December.

Days can be specified as days of month, or days of week.

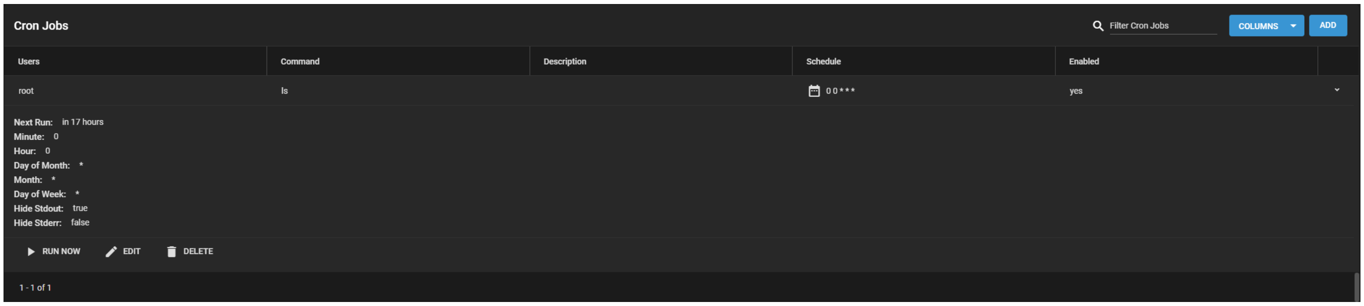
With these options, you can create flexible schedules similar to these examples:

Desired schedule	Values to enter
3 times a day (at midnight, 08:00 and 16:00)	months=*; days=*; hours=0/8 or 0,8,16; minutes=0 (Meaning: every day of every month, when hours=0/8/16 and minutes=0)
Every Monday, Wednesday and Friday, at 8.30 pm	months=*; days=mon,wed,fri; hours=20; minutes=30
1st and 15th day of the month, during October to June, at 00:01 am	months=oct-dec,jan-jun; days=1,15; hours=0; minutes=1
Every 15 minutes during the working week, which is 8am - 7pm (08:00 - 19:00) Monday to Friday	Note that this requires two tasks to achieve: (1) months=*; days=mon-fri; hours=8-18; minutes=*/15 (2) months=*; days=mon-fri; hours=19; minutes=0 We need the second scheduled item, to execute at 19:00, otherwise we would stop at 18:45. Another workaround would be to stop at 18:45 or 19:45 rather than 19:00.

Additional Options: When *Hide standard output* (stdout) is unset, any standard output is mailed to the user account used to run the command.
When *Hide Standard Error* (stderr) is unset, any error output is mailed to the user account used to run the command. This can be useful to help debug the command or script if an error occurs.
Unsetting *Enabled* only keeps the task from automatically running. You can still save the cron job and run it manually.

Managing a Cron Job

To see all created cron jobs, go to **Tasks > Cron Jobs**. Click the □ next to an entry to see details and options.



Cron Jobs

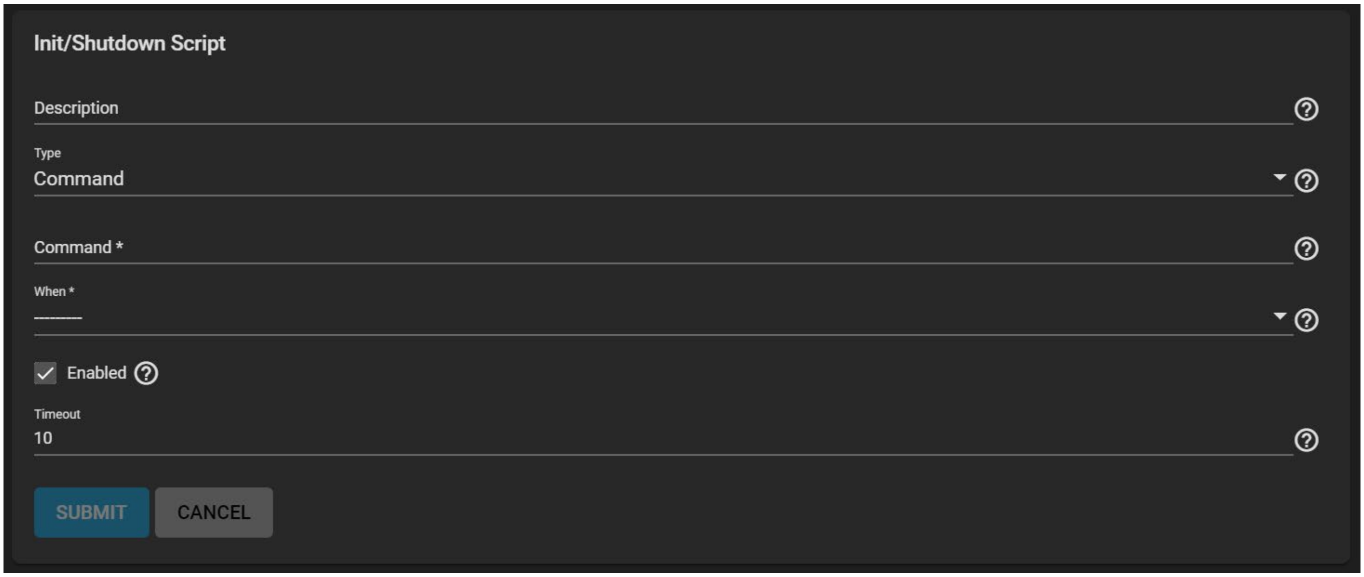
Users	Command	Description	Schedule	Enabled
root	ls		0 0 * * *	yes

Next Run: in 17 hours
Minute: 0
Hour: 0
Day of Month: *
Month: *
Day of Week: *
Hide Stdout: true
Hide Stderr: false

Clicking *RUN NOW* immediately starts the job *Command*, separately from any *Schedule*. *EDIT* changes any setting available during task creation. *DELETE* removes the cron job from TrueNAS. Once a cron job is deleted, the job configuration cannot be restored.

4.2 - Init/Shutdown Scripts

TrueNAS can schedule commands or scripts to run at system startup or shutdown. To create a new script, go to **Tasks > Init/Shutdown Scripts** and click *ADD*.



Init/Shutdown Script

Description

Type
Command

Command *

When *

☑ Enabled

Timeout
10

Init/Shutdown Script

Name	Description
Description	Comments about this script.
Type	Select Command for an executable or Script for an executable script.
Command	Enter the command with any options. When *Script* is selected, click the folder to define the path to the script file.
When	*Pre Init* is early in the boot process, after mounting filesystems and starting networking. *Post Init* is at the end of the boot process, before TrueNAS services start. *Shutdown* is during the system power off process.
Enabled	Enable this task. Unset to disable the task without deleting it.
Timeout	Automatically stop the script or command after the specified seconds.

Can I use a path for the Command? expand □

You can also include the full path to a command in the entry. Scheduled commands must be in the default path. The path can be tested with `which {COMMAND}` in the **Shell**. When available, the path to the command is shown:

```
[root@freenas ~]# which ls
/bin/ls
```

Always test the script first to verify it is executable and achieves the desired results. All init/shutdown scripts are run with `sh`.

All saved Init/Shutdown tasks are shown in **Tasks > Init/Shutdown Scripts**. Click □ (Options) next to a task to *EDIT* or *DELETE* that task.

4.3 - Rsync Tasks

You often need to copy data to another system for backup or when migrating to a new system. A fast and secure way of doing this is by using rsync. These instructions assume that both sides of the rsync task, host and remote, use a TrueNAS systems.

Basic Requirements

Rysnc requires a dataset with the needed data on the host or remote system. Rsync provides the ability to either push or pull data. When using the **Rsync Tasks** function to push, data is copied from a host system to a remote system. When using the Rsync Tasks function to pull, it pulls data from a remote system and puts it on the host system.

The remote system must have the rsync service activated. Additional requirements are listed further down for either rsynch module or SSH tasks.

Creating an Rsync Task

Go to **Tasks > Rsync Tasks** and click **ADD**. The **Rsync Mode** field has two primary rsync modes: **Module** and **SSH**. Each mode has different requirements. See the related tab for eac rsync mode.

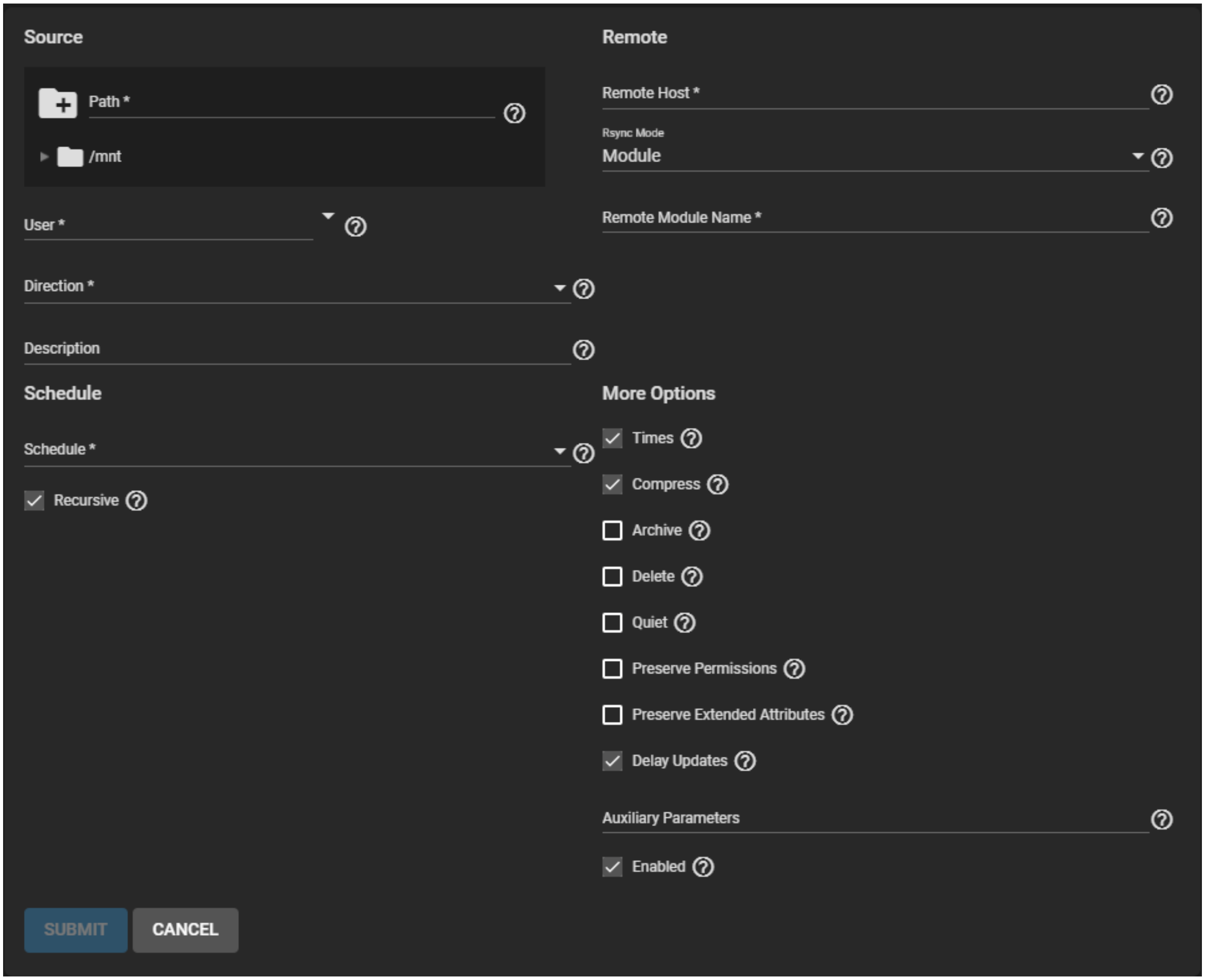
⊙ **Module**

Module Requirements

Before you create an rsync task on the host system, you must create a module on the remote system. When TrueNAS is the remote system, create a module. Go to **Services** and click edit for the rsync service. Click the **Rsync Module** tab, then click **ADD**. See the specific configuration instructions in the Rsync Service section of this article.

Rsync Module Process

Log in to the host system interface, go to **Tasks > Rsync Tasks**, and click **ADD**.



Source

Path *

/mnt

User *

Direction *

Description

Schedule

Schedule *

☑ Recursive

Remote

Remote Host *

Rsync Mode: Module

Remote Module Name *

More Options

☑ Times

☑ Compress

☐ Archive

☐ Delete

☐ Quiet

☐ Preserve Permissions

☐ Preserve Extended Attributes

☑ Delay Updates

Auxiliary Parameters

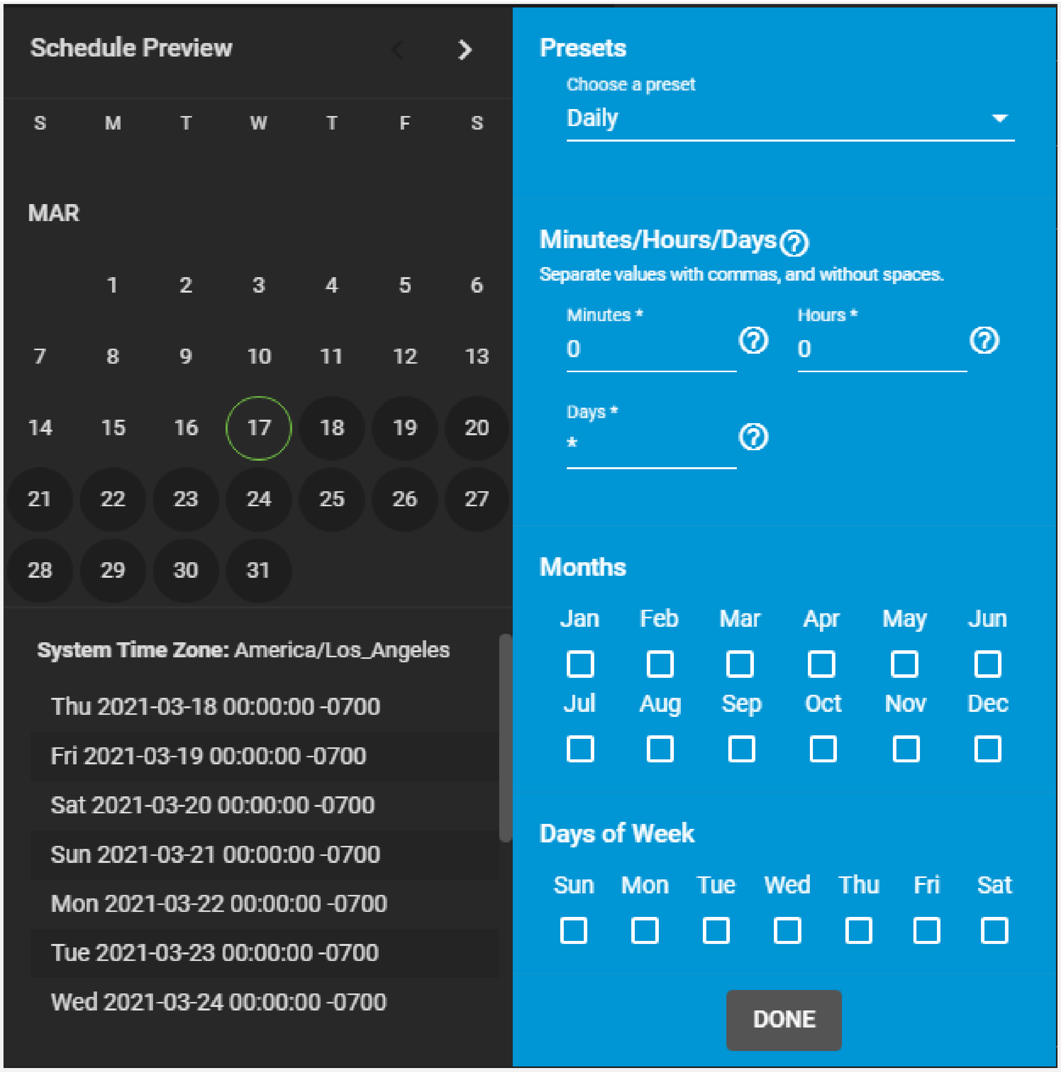
☑ Enabled

SUBMIT CANCEL

Select the source dataset to use with the rsync task and a user account to run the rsync task. Choose a direction for the rsync task.

Select a schedule for the rsync task. If you need a custom schedule, select **Custom**.

Advanced Scheduler expand □



Schedule Preview

S	M	T	W	T	F	S
MAR						
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

System Time Zone: America/Los_Angeles

```
Thu 2021-03-18 00:00:00 -0700
Fri 2021-03-19 00:00:00 -0700
Sat 2021-03-20 00:00:00 -0700
Sun 2021-03-21 00:00:00 -0700
Mon 2021-03-22 00:00:00 -0700
Tue 2021-03-23 00:00:00 -0700
Wed 2021-03-24 00:00:00 -0700
```

Presets

Choose a preset: Daily

Minutes/Hours/Days

Separate values with commas, and without spaces.

Minutes *: 0

Hours *: 0

Days *: *

Months

Jan	Feb	Mar	Apr	May	Jun
☐	☐	☐	☐	☐	☐
Jul	Aug	Sep	Oct	Nov	Dec
☐	☐	☐	☐	☐	☐

Days of Week

Sun	Mon	Tue	Wed	Thu	Fri	Sat
☐	☐	☐	☐	☐	☐	☐

Choosing a **Presets** option populates the rest of the fields. To customize a schedule, enter crontab values for the `Minutes/Hours/Days`.

These fields accept standard cron values. The simplest option is to enter a single number in the field. The task runs when the time value matches that number. For example, entering *10* means that the job runs when the time is ten minutes past the hour.

An asterisk (`*`) means match all values.

Specific time ranges are set by entering hyphenated number values. For example, entering *30-35* in the **Minutes** field sets the task to run at minutes 30, 31, 32, 33, 34, and 35.

You can also enter lists of values. Enter individual values separated by a comma (`,`). For example, entering *1,14* in the **Hours** field means the task runs at 1:00 AM (0100) and 2:00 PM (1400).

A slash (`/`) designates a step value. For example, while entering `*` in **Days** means the task runs every day of the month, `*/2` means the task runs every other day.

Combining all the above examples together creates a schedule running a task each minute from 1:30-1:35 AM and 2:30-2:35 PM every other day.

There is an option to select which **Months** the task runs. Leaving each month unset is the same as selecting every month.

The **Days of Week** schedules the task to run on specific days. This is in addition to any listed days. For example, entering *1* in **Days** and setting *Wed* for **Days of Week** creates a schedule that starts a task on the first day of the month *and* every Wednesday of the month.

The **Schedule Preview** displays when the current settings mean the task runs.

Examples of CRON syntax

Syntax	Meaning	Examples
*	Every item.	* (minutes) = every minute of the hour. * (days) = every day.
*/N	Every Nth item.	*/15 (minutes) = every 15th minute of the hour (every quarter hour). */3 (days) = every 3rd day. */3 (months) = every 3rd month.
Comma and hyphen/dash	Each stated item (comma) Each item in a range (hyphen/dash).	1,31 (minutes) = on the 1st and 31st minute of the hour. 1-3,31 (minutes) = on the 1st to 3rd minutes inclusive, and the 31st minute, of the hour. mon-fri (days) = every Monday to Friday inclusive (every weekday). mar,jun,sep,dec (months) = every March, June, September, December.

Days can be specified as days of month, or days of week.

With these options, you can create flexible schedules similar to these examples:

Desired schedule	Values to enter
3 times a day (at midnight, 08:00 and 16:00)	months=*; days=*; hours=0/8 or 0,8,16; minutes=0 (Meaning: every day of every month, when hours=0/8/16 and minutes=0)
Every Monday, Wednesday and Friday, at 8.30 pm	months=*; days=mon,wed,fri; hours=20; minutes=30
1st and 15th day of the month, during October to June, at 00:01 am	months=oct-dec,jan-jun; days=1,15; hours=0; minutes=1
Every 15 minutes during the working week, which is 8am - 7pm (08:00 - 19:00) Monday to Friday	Note that this requires two tasks to achieve: (1) months=*; days=mon-fri; hours=8-18; minutes=*/15 (2) months=*; days=mon-fri; hours=19; minutes=0 We need the second scheduled item, to execute at 19:00, otherwise we would stop at 18:45. Another workaround would be to stop at 18:45 or 19:45 rather than 19:00.

Next, enter the **Remote Host** IP address or hostname. Use the format *username@remote_host* when the username differs from the host entered into the **Remote Host** field. Select **Module** on the **Rsync Mode** drop-down. Enter the **Remote Module Name** exactly as it appears on the remote system.

Configure the remaining options according to your specific needs.

Options expand □

Source

Name	Description
Path	Browse to the path to be copied. FreeBSD file path limits apply. Other operating systems can have different limits which might affect how they can be used as sources or destinations.
User	Select the user to run the rsync task. The user selected must have permissions to write to the

	specified directory on the remote host.
Direction	Direct the flow of data to the remote host. During a *push*, the dataset transfers to the remote module. During a *pull*, the dataset stores files from the *remote* system.
Description	Enter a description of the rsync task.

Schedule

Name	Description
Schedule	Select a schedule preset or choose Custom to open the advanced scheduler.
Recursive	Set to include all subdirectories of the specified directory. When unset, only the specified directory is included.

Remote

Name	Description
Remote Host	Enter the IP address or hostname of the remote system that will store the copy. Use the format username@remote_host if the username differs on the remote host.
Rsync Mode	Choose to either use a custom-defined remote module of the rsync server or to use an SSH configuration for the rsync task.

More Options

Name	Description
Times	Set to preserve modification times of files.
Compress	Set to reduce the size of data to transmit. Recommended for slow connections.
Archive	When set, rsync is run recursively, preserving symlinks, permissions, modification times, group, and special files. When run as root, owner, device files, and special files are also preserved. Equivalent to passing the flags `-rlptgoD` to rsync.
Delete	Delete files in the destination directory that do not exist in the source directory.
Quiet	Set to suppress informational messages from the remote server.
Preserve Permissions	Set to preserve original file permissions. This is useful when the user is set to root.
Preserve Extended Attributes	Extended attributes are preserved, but must be supported by both systems.
Delay Updates	Set to save the temporary file from each updated file to a holding directory until the end of the transfer when all transferred files are renamed into place.
Auxiliary Parameters	Additional rsync(1) options to include. Separate entries by pressing Enter. Note: The “ ” *character must be escaped with a backslash* (\.txt) or used inside single quotes ('*.txt').
Enabled	Enable this rsync task. Unset to disable this rsync task without deleting it.

The **Module** mode adds the **Remote Module Name** field to the **Remote** section:

You must define at least one module in rsyncd.conf(5) of the rsync server or in the rsync modules of another system.

If the **Enable** checkbox is not selected it disables the task schedule, but you can still save the rsync task and run it manually.

○ **SSH**

SSH Requirements

The remote system must have SSH enabled. To enable SSH in TrueNAS, go to **Services** and toggle **SSH** on.

The *host* system needs an established SSH connection to the remote for the rsync task. To create the connection, go to **System > SSH Connections** and click **Add**. Populate the SSH configuration screen fields as follows: Select **Semi-automatic** for the **Setup Method** and set **Private Ke *y* to **Generate New**.

Can this be set up in a command line instead? expand □

To use a command line, go to the **Shell** on the host system. When a TrueNAS account other than root manages the rsync task, enter `su - {USERNAME}`, where *{USERNAME}* is the TrueNAS user account that runs the rsync task. Enter `ssh-keygen -t rsa` to create the key pair. When prompted for a password, press `Enter` without setting a password (a password breaks the automated task). Here is an example of running the command:

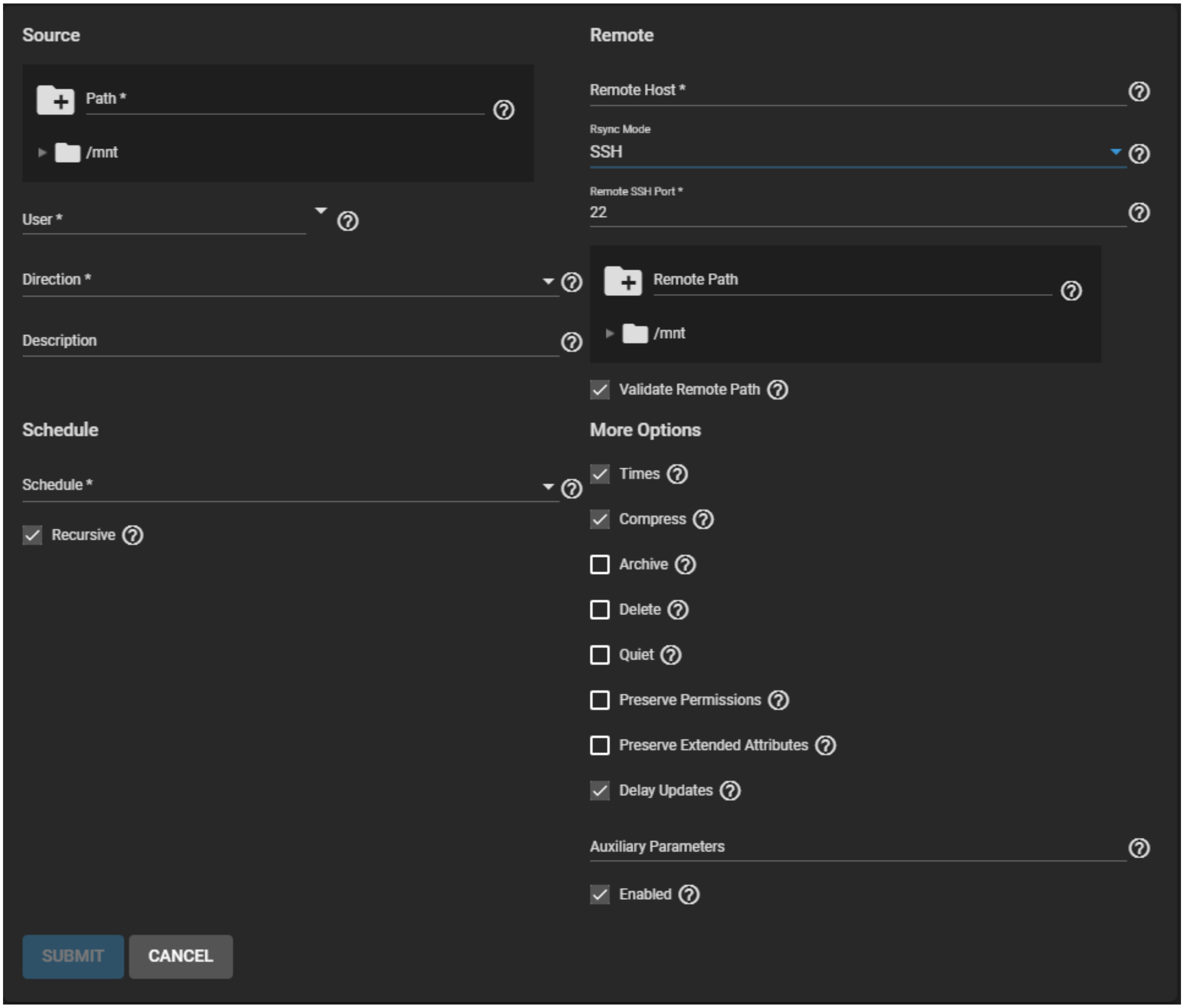
```
truenas# ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/root/.ssh/id_rsa):
Created directory '/root/.ssh'.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /root/.ssh/id_rsa.
Your public key has been saved in /root/.ssh/id_rsa.pub.
The key fingerprint is:
SHA256:NZMgbuPvTHeEqi3SA/U5wW8un6AWrx8ZsRQdbJJHmR4 tester@truenas.local
The key's randomart image is:
+---[RSA 2048]----+
|      . o=o+     |
|     . .ooE.     |
|      +.o==.     |
|     o.oo+.+     |
|     ...S+. .    |
|    . ..++o.     |
|     o oB+. .    |
|    . =Bo+.o     |
|     o+==oo      |
+----[SHA256]-----+
```

The default public key location is ~/.ssh/id_rsa.pub . Enter `cat ~/.ssh/id_rsa.pub` to see the key and copy the file contents. Copy it to the corresponding user account on the remote system in **Accounts > Users**. Click **EDIT** and paste the key in **SSH Public Key**.

Next, copy the host key from the remote system to the host system user's .ssh/known_hosts directory, using `ssh-keyscan`. On the host system, open the **Shell** and enter `ssh-keyscan -t rsa {remoteIPaddress} >> {userknown_hostsDir}` where *{remoteIPaddress}* is the remote system IP address and *{userknown_hostsDir}* is the known_hosts directory on the host system. Example: `ssh-keyscan -t rsa 192.168.2.6 >> /root/.ssh/known_hosts`.

SSH Mode Process

Go to **Tasks > Rsync Tasks** and click **ADD**.



Source

Path *

/mnt

User *

Direction *

Description

Schedule

Schedule *

☑ Recursive

Remote

Remote Host *

Rsync Mode
SSH

Remote SSH Port *
22

Remote Path

/mnt

☑ Validate Remote Path

More Options

☑ Times

☑ Compress

☐ Archive

☐ Delete

☐ Quiet

☐ Preserve Permissions

☐ Preserve Extended Attributes

☑ Delay Updates

Auxiliary Parameters

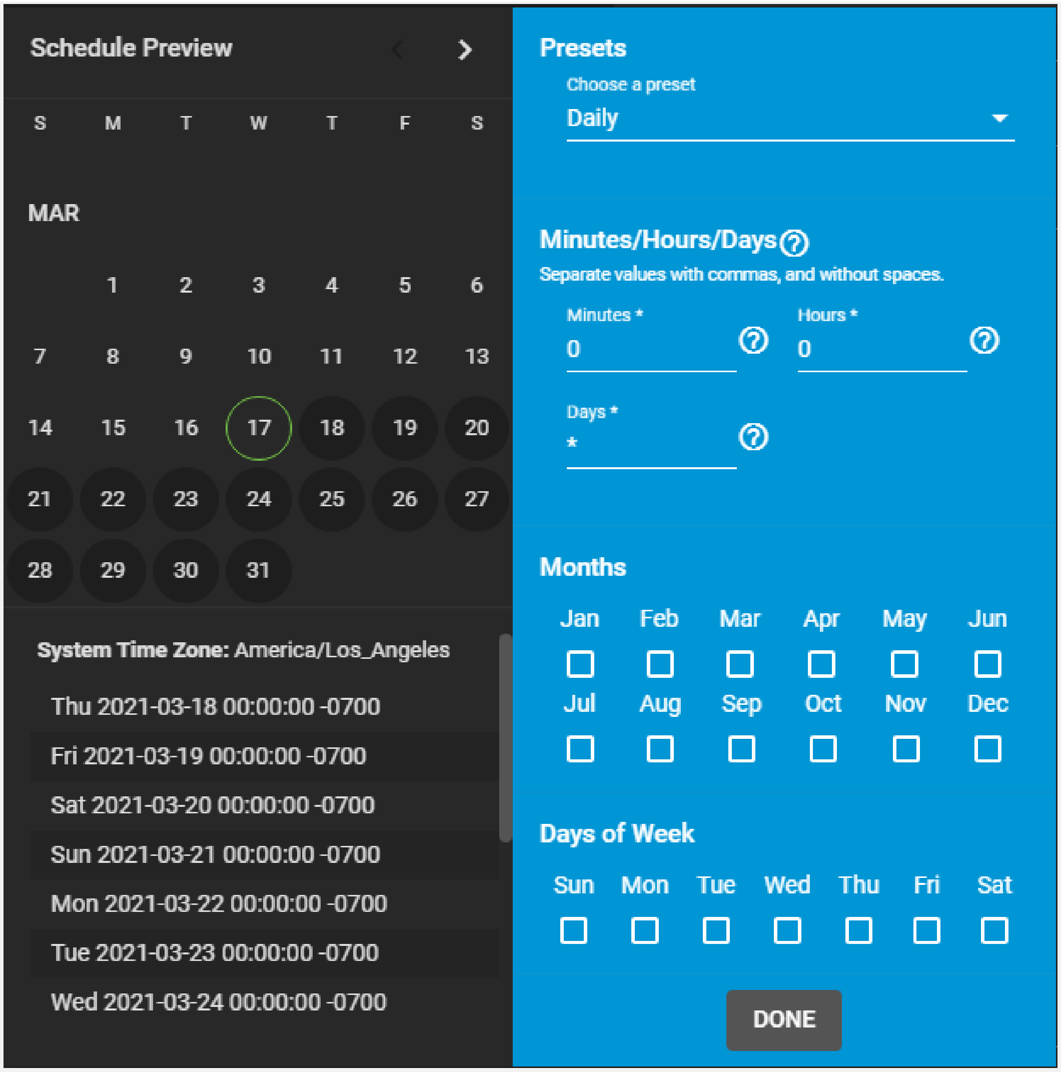
☑ Enabled

Configure the SSH settings first by selecting **SSH** in the **Rsync Mode** drop-down and typing the **Port** number and **Remote Path**.

Next, define the **Source** dataset to use for the rsync task and select a **User** account. The **User** field entry must be identical to the SSH Connection **Username**.

Choose a **Direction** for the rsync task, either **Push** or **Pull** and then define the task **Schedule**. If you need a custom schedule, select **Custom**.

Advanced Scheduler expand □



Choose a preset: Daily

Separate values with commas, and without spaces.

Minutes *: 0

Hours *: 0

Days *: *

System Time Zone: America/Los_Angeles

```
Thu 2021-03-18 00:00:00 -0700
Fri 2021-03-19 00:00:00 -0700
Sat 2021-03-20 00:00:00 -0700
Sun 2021-03-21 00:00:00 -0700
Mon 2021-03-22 00:00:00 -0700
Tue 2021-03-23 00:00:00 -0700
Wed 2021-03-24 00:00:00 -0700
```

Choosing a **Presets** option populates the rest of the fields. To customize a schedule, enter crontab values for the `Minutes/Hours/Days`.

These fields accept standard cron values. The simplest option is to enter a single number in the field. The task runs when the time value matches that number. For example, entering *10* means that the job runs when the time is ten minutes past the hour.

An asterisk (`*`) means match all values.

Specific time ranges are set by entering hyphenated number values. For example, entering *30-35* in the **Minutes** field sets the task to run at minutes 30, 31, 32, 33, 34, and 35.

You can also enter lists of values. Enter individual values separated by a comma (`,`). For example, entering *1,14* in the **Hours** field means the task runs at 1:00 AM (0100) and 2:00 PM (1400).

A slash (`/`) designates a step value. For example, while entering `*` in **Days** means the task runs every day of the month, `*/2` means the task runs every other day.

Combining all the above examples together creates a schedule running a task each minute from 1:30-1:35 AM and 2:30-2:35 PM every other day.

There is an option to select which **Months** the task runs. Leaving each month unset is the same as selecting every month.

The **Days of Week** schedules the task to run on specific days. This is in addition to any listed days. For example, entering *1* in **Days** and setting *Wed* for **Days of Week** creates a schedule that starts a task on the first day of the month *and* every Wednesday of the month.

The **Schedule Preview** displays when the current settings mean the task runs.

Examples of CRON syntax

Syntax	Meaning	Examples
*	Every item.	* (minutes) = every minute of the hour. * (days) = every day.
*/N	Every Nth item.	*/15 (minutes) = every 15th minute of the hour (every quarter hour). */3 (days) = every 3rd day. */3 (months) = every 3rd month.
Comma and hyphen/dash	Each stated item (comma) Each item in a range (hyphen/dash).	1,31 (minutes) = on the 1st and 31st minute of the hour. 1-3,31 (minutes) = on the 1st to 3rd minutes inclusive, and the 31st minute, of the hour. mon-fri (days) = every Monday to Friday inclusive (every weekday). mar,jun,sep,dec (months) = every March, June, September, December.

Days can be specified as days of month, or days of week.

With these options, you can create flexible schedules similar to these examples:

Desired schedule	Values to enter
3 times a day (at midnight, 08:00 and 16:00)	months=*; days=*; hours=0/8 or 0,8,16; minutes=0 (Meaning: every day of every month, when hours=0/8/16 and minutes=0)
Every Monday, Wednesday and Friday, at 8.30 pm	months=*; days=mon,wed,fri; hours=20; minutes=30
1st and 15th day of the month, during October to June, at 00:01 am	months=oct-dec,jan-jun; days=1,15; hours=0; minutes=1
Every 15 minutes during the working week, which is 8am - 7pm (08:00 - 19:00) Monday to Friday	Note that this requires two tasks to achieve: (1) months=*; days=mon-fri; hours=8-18; minutes=*/15 (2) months=*; days=mon-fri; hours=19; minutes=0 We need the second scheduled item, to execute at 19:00, otherwise we would stop at 18:45. Another workaround would be to stop at 18:45 or 19:45 rather than 19:00.

Next, enter the **Remote Host** IP address or hostname. Use the format *username@remote_host* if the username differs on the remote host. Configure the remaining options according to your specific needs.

Options expand □

Source

Name	Description
Path	Browse to the path to be copied. FreeBSD file path limits apply. Other operating systems can have different limits which might affect how they can be used as sources or destinations.
User	Select the user to run the rsync task. The user selected must have permissions to write to the specified directory on the remote host.
Direction	Direct the flow of data to the remote host. During a *push*, the dataset transfers to the remote module. During a *pull*, the dataset stores files from the *remote* system.

Description	Enter a description of the rsync task.

Schedule

Name	Description
Schedule	Select a schedule preset or choose Custom to open the advanced scheduler.
Recursive	Set to include all subdirectories of the specified directory. When unset, only the specified directory is included.

Remote

Name	Description
Remote Host	Enter the IP address or hostname of the remote system that will store the copy. Use the format username@remote_host if the username differs on the remote host.
Rsync Mode	Choose to either use a custom-defined remote module of the rsync server or to use an SSH configuration for the rsync task.

More Options

Name	Description
Times	Set to preserve modification times of files.
Compress	Set to reduce the size of data to transmit. Recommended for slow connections.
Archive	When set, rsync is run recursively, preserving symlinks, permissions, modification times, group, and special files. When run as root, owner, device files, and special files are also preserved. Equivalent to passing the flags `-rlptgoD` to rsync.
Delete	Delete files in the destination directory that do not exist in the source directory.
Quiet	Set to suppress informational messages from the remote server.
Preserve Permissions	Set to preserve original file permissions. This is useful when the user is set to root.
Preserve Extended Attributes	Extended attributes are preserved, but must be supported by both systems.
Delay Updates	Set to save the temporary file from each updated file to a holding directory until the end of the transfer when all transferred files are renamed into place.
Auxiliary Parameters	Additional rsync(1) options to include. Separate entries by pressing Enter. Note: The “ ” *character must be escaped with a backslash* (\.txt) or used inside single quotes ('*.txt').
Enabled	Enable this rsync task. Unset to disable this rsync task without deleting it.

Additional options for the **SSH Rsync Mod *e*:

- **Remote SSH Port** : Enter the SSH port number of the remote system. By default, *22* is reserved in TrueNAS.
- **Remote Path** : Browse to the existing path on the remote host to sync with. Maximum path length is *255* characters.
- **Validate Remote Path** : Set to automatically create the defined **Remote Path** when it does not exist.

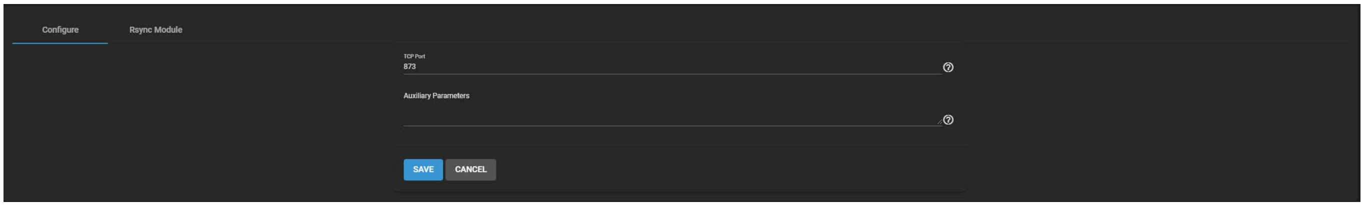
If the **Enabled** checkbox is not selected it disables the task schedule without deleting the configuration. You can still run the rsync task by going to **Tasks > Rsync Tasks** and clicking □, then the **RUN NOW** play_arrow icon.

Rsync Service and Modules

The rsync task does not work unless the related system service is turned on. To turn the rsync service on, go to **Services** and toggle **rsync** on. To activate the service whenever TrueNAS boots, select the **Start Automatically** checkbox.

Click the edit to configure the service on the **Services > Rsync** screen. There are two sections for rsync configuration: basic **Configure** options and **Rsync Module** creation and management.

⊙ Configure



TCP Port
873

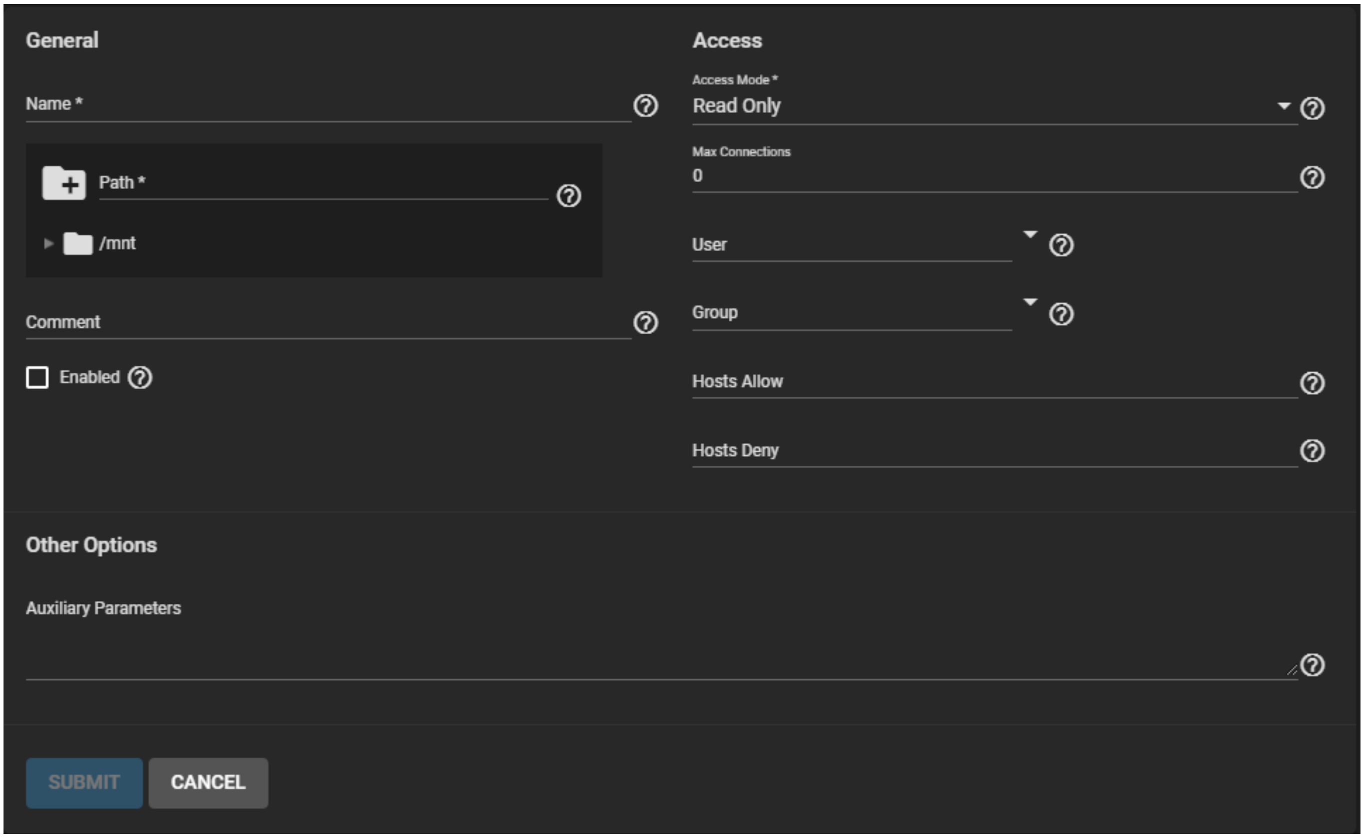
Auxiliary Parameters

Name	Description
TCP Port	rsyncd listens on this port.
Auxiliary Parameters	Enter any additional parameters from rsyncd.conf(5) .

Use the default settings unless a specific change is required. Remember to click **SAVE** after changing any settings.

○ Rsync Module

All created modules are listed on the **Rsync Module** tab. To create a new module, click **ADD**.



Access Mode *
Read Only

Max Connections
0

General

Name	Description

Name	Module name that matches the name requested by the rsync client.
Path	Browse to the pool or dataset to store received data.
Comment	Describe this module.
Enabled	Activate this module for use with Rsync. Unset this field to deactivate the module without completely removing it.

Access

Name	Description
Access Mode	Choose permissions for this rsync module.
Max Connections	Maximum number of connections to this module. 0 is unlimited.
User	TrueNAS user account that runs the rsync command during file transfers to and from this module.
Group	TrueNAS group account that runs the rsync command during file transfers to and from this module.
Hosts Allow	From rsyncd.conf(5) . A list of patterns to match with the hostname and IP address of a connecting client. The connection is rejected if no patterns match. Separate entries by pressing `Enter`.
Hosts Deny	From rsyncd.conf(5) . A list of patterns to match with the hostname and IP address of a connecting client. The connection is rejected when the patterns match. Separate entries by pressing `Enter`.

Other Options

Name	Description
Auxiliary Parameters	Enter any additional parameters from rsyncd.conf(5) .

> When a **Hosts Allow** list is defined, *only* the IPs and hostnames on the list are able to connect to the module.

To **EDIT** or **DELETE** a module, go to the **Rsync Modules** list and click □ for an entry.

4.4 - S.M.A.R.T. Tests

S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology) is an industry standard for disk monitoring and testing. Disks can be monitored for problems using several different kinds of self-tests. TrueNAS can adjust when and how alerts for S.M.A.R.T. are issued. When S.M.A.R.T. monitoring reports an issue, we recommend you replace that disk. Most modern ATA, IDE, and SCSI-3 hard drives support S.M.A.R.T. Refer to your respective drive documentation for confirmation.

S.M.A.R.T. tests are run on a disk. Running tests can reduce drive performance, so we recommend scheduling tests when the system is in a low-usage state. Avoid scheduling disk-intensive tests at the same time! For example, S.M.A.R.T. tests should not be scheduled on the same day as a disk scrub or resilver.

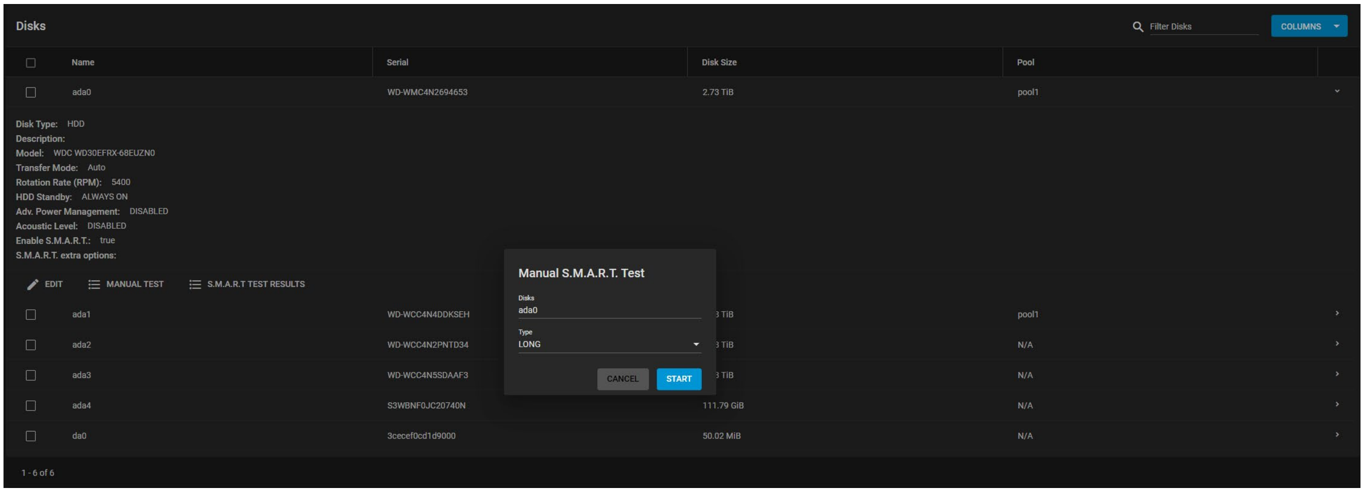
How do I check or change S.M.A.R.T. testing for a disk? expand □

Go to **Storage > Disks** and click chevron_right to expand an entry. *Enable S.M.A.R.T.* shows as *true* or *false*.

To enable or disable testing, click *EDIT DISK(S)* and find the *Enable S.M.A.R.T.* option.

Manual S.M.A.R.T. Test

To quickly test a disk for errors, go to **Storage > Disks** and select the disks to be tested. After selecting the desired disks, click *MANUAL TEST*.



Disks

□	Name	Serial	Disk Size	Pool
□	ada0	WD-WMC4N2694653	2.73 TiB	pool1
□	ada1	WD-WCC4N4DDKSEH	3 TiB	pool1
□	ada2	WD-WCC4N2PNTD34	3 TiB	N/A
□	ada3	WD-WCC4N5SDAAF3	3 TiB	N/A
□	ada4	S3WBNF0JC20740N	111.79 GiB	N/A
□	da0	3cecef0cd1d9000	50.02 MiB	N/A

Disk Type: HDD
Description:
Model: WDC WD30EFRX-68EUZN0
Transfer Mode: Auto
Rotation Rate (RPM): 5400
HDD Standby: ALWAYS ON
Adv. Power Management: DISABLED
Acoustic Level: DISABLED
Enable S.M.A.R.T.: true
S.M.A.R.T. extra options:

1 - 6 of 6

Manual S.M.A.R.T. Test

Disks: ada0
Type: LONG

Next, select the test *Type*. Each test type can be slightly different based on the drive connection, ATA or SCSI:

⊙ ATA

- *Long* - runs SMART Extended Self Test. This will scan the entire disk surface and can take many hours on large-volume disks.
- *Short* - runs SMART Short Self Test (usually under ten minutes). These are basic disk tests that vary by manufacturer.
- *Conveyance* - runs a SMART Conveyance Self Test. This self-test routine is intended to identify damage incurred during transporting of the device. This self-test routine requires only minutes to complete.
- *Offline* - runs SMART Immediate Offline Test. The effects of this test are visible only in that it updates the SMART Attribute values, and if the test finds errors, they appear in the SMART error log.

○ **SCSI**

- *Long* - runs the “Background long” self-test.
- *Short* - runs the “Background short” self-test.
- *Offline* - runs the default self test in foreground. No entry is placed in the self test log.

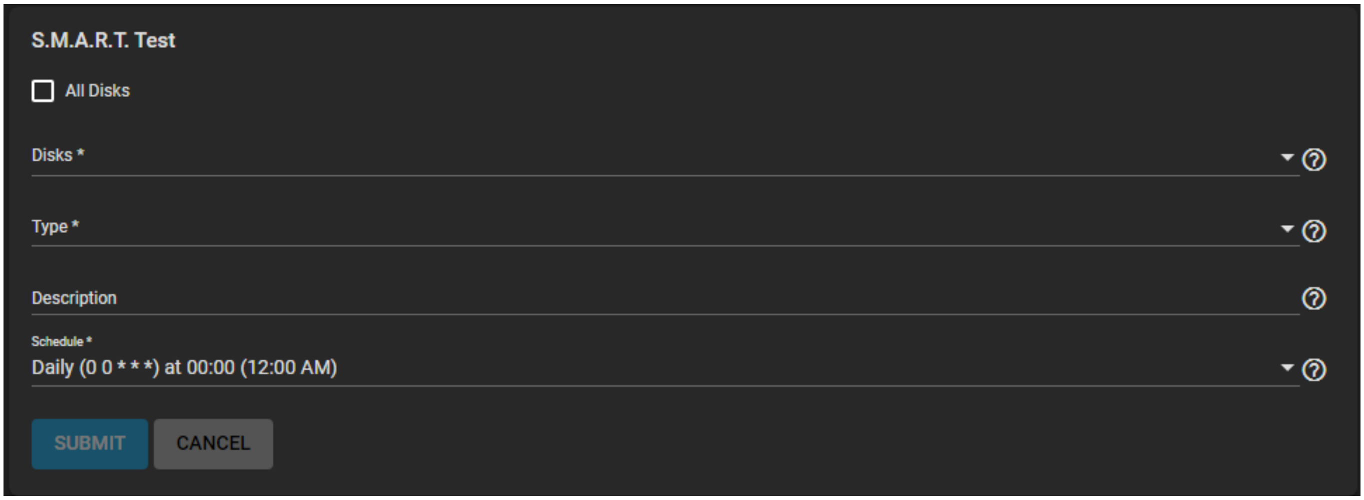
For more information, refer to smartctl(8) .

Click **START** to begin the test. Depending on the test type you choose, the test can take some time to complete. TrueNAS generates alerts when tests discover issues.

Where can I view the test results? expand □
Go to **Storage > Disks**, expand an entry, and click *S.M.A.R.T. TEST RESULTS*. From the **Shell**, use `smartctl` and the name of the drive: `smartctl -l selftest /dev/ada0`.

Automatic S.M.A.R.T. Tests

To schedule recurring S.M.A.R.T. tests, go to **Tasks > S.M.A.R.T. Tests** and click *ADD*.



S.M.A.R.T. Test

□ All Disks

Disks *

Type *

Description

Schedule *
Daily (0 0 * * *) at 00:00 (12:00 AM)

Specific Options expand □

Name	Description
All Disks	Setting *All Disks* includes every disk with S.M.A.R.T. enabled. Leave unset to choose which *Disks* to test.
Disks	Select the disks to monitor.
Type	Choose the test type. See smartctl(8) for descriptions of each type. Some types degrade performance or take disks offline.
Description	Enter information about the S.M.A.R.T. test.
Schedule	The time the test runs. Choose a preset or select *Custom* to open the advanced scheduler.

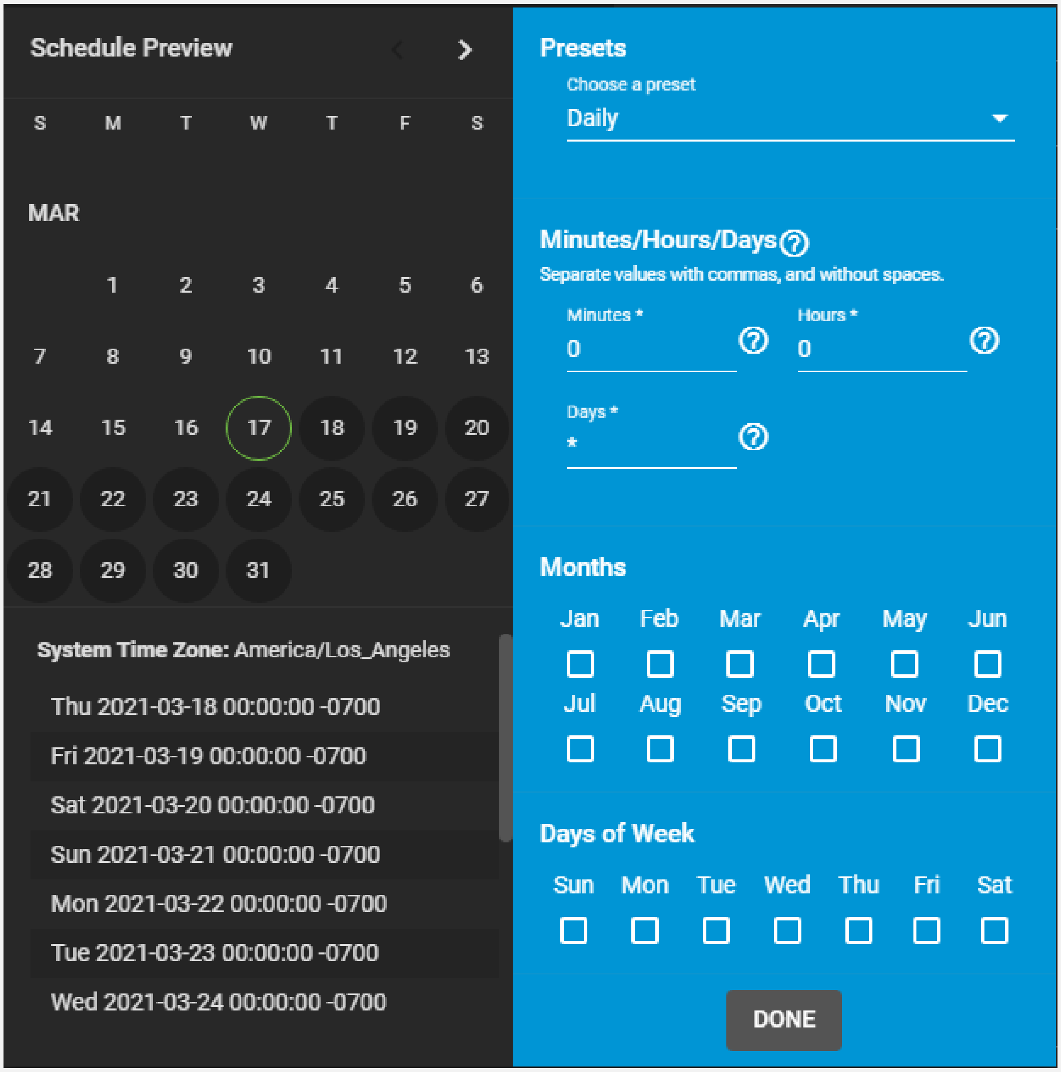
Choose the *Disks* to test, *Type* of test to run, and *Schedule* for the task.

SMART tests can offline disks! Avoid scheduling S.M.A.R.T. tests simultaneously with scrub or resilver operations.

When the test must run on a very specific *Schedule*, set this to *Custom* to open the advanced scheduler.

□

Advanced Scheduler expand



S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

System Time Zone: America/Los_Angeles

Thu 2021-03-18 00:00:00 -0700
Fri 2021-03-19 00:00:00 -0700
Sat 2021-03-20 00:00:00 -0700
Sun 2021-03-21 00:00:00 -0700
Mon 2021-03-22 00:00:00 -0700
Tue 2021-03-23 00:00:00 -0700
Wed 2021-03-24 00:00:00 -0700

Choose a preset: Daily

Separate values with commas, and without spaces.

Minutes *: 0
Hours *: 0
Days *: *

Jan	Feb	Mar	Apr	May	Jun
□	□	□	□	□	□
Jul	Aug	Sep	Oct	Nov	Dec
□	□	□	□	□	□

Sun	Mon	Tue	Wed	Thu	Fri	Sat
□	□	□	□	□	□	□

Choosing a **Presets** option populates the rest of the fields. To customize a schedule, enter crontab values for the `Minutes/Hours/Days`.

These fields accept standard cron values. The simplest option is to enter a single number in the field. The task runs when the time value matches that number. For example, entering *10* means that the job runs when the time is ten minutes past the hour.

An asterisk (`*`) means match all values.

Specific time ranges are set by entering hyphenated number values. For example, entering *30-35* in the **Minutes** field sets the task to run at minutes 30, 31, 32, 33, 34, and 35.

You can also enter lists of values. Enter individual values separated by a comma (`,`). For example, entering *1,14* in the **Hours** field means the task runs at 1:00 AM (0100) and 2:00 PM (1400).

A slash (`/`) designates a step value. For example, while entering `*` in **Days** means the task runs every day of the month, `*/2` means the task runs every other day.

Combining all the above examples together creates a schedule running a task each minute from 1:30-1:35 AM and 2:30-2:35 PM every other day.

There is an option to select which **Months** the task runs. Leaving each month unset is the same as selecting every month.

The **Days of Week** schedules the task to run on specific days. This is in addition to any listed days. For example, entering *1* in **Days** and setting *Wed* for **Days of Week** creates a schedule that starts a task on the first day of the month *and* every Wednesday of the month.

The **Schedule Preview** displays when the current settings mean the task runs.

Examples of CRON syntax

Syntax	Meaning	Examples
*	Every item.	* (minutes) = every minute of the hour. * (days) = every day.
*/N	Every N th item.	*/15 (minutes) = every 15th minute of the hour (every quarter hour). */3 (days) = every 3rd day. */3 (months) = every 3rd month.
Comma and hyphen/dash	Each stated item (comma) Each item in a range (hyphen/dash).	1,31 (minutes) = on the 1st and 31st minute of the hour. 1-3,31 (minutes) = on the 1st to 3rd minutes inclusive, and the 31st minute, of the hour. mon-fri (days) = every Monday to Friday inclusive (every weekday). mar,jun,sep,dec (months) = every March, June, September, December.

Days can be specified as days of month, or days of week.

With these options, you can create flexible schedules similar to these examples:

Desired schedule	Values to enter
3 times a day (at midnight, 08:00 and 16:00)	months=*; days=*; hours=0/8 or 0,8,16; minutes=0 (Meaning: every day of every month, when hours=0/8/16 and minutes=0)
Every Monday, Wednesday and Friday, at 8.30 pm	months=*; days=mon,wed,fri; hours=20; minutes=30
1st and 15th day of the month, during October to June, at 00:01 am	months=oct-dec,jan-jun; days=1,15; hours=0; minutes=1
Every 15 minutes during the working week, which is 8am - 7pm (08:00 - 19:00) Monday to Friday	Note that this requires two tasks to achieve: (1) months=*; days=mon-fri; hours=8-18; minutes=*/15 (2) months=*; days=mon-fri; hours=19; minutes=0 We need the second scheduled item, to execute at 19:00, otherwise we would stop at 18:45. Another workaround would be to stop at 18:45 or 19:45 rather than 19:00.

Saved schedules appear in the **Tasks > S.M.A.R.T. Tests** list.

CLI expand □

To verify the schedule is saved, you can open the shell and enter `smartd -q showtests`.

Service Options

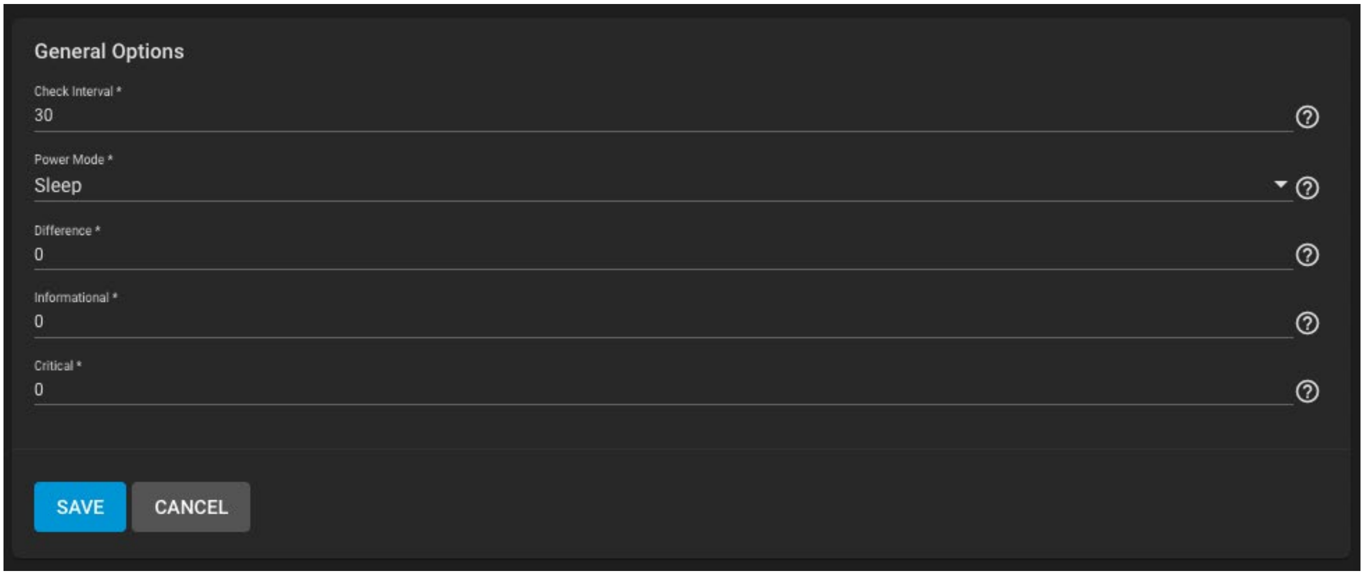
The S.M.A.R.T. service must be enabled for automatic S.M.A.R.T. tests to run.

RAID controllers? expand □

Disable the S.M.A.R.T. service when disks are controlled by a RAID controller. The controller monitors S.M.A.R.T. separately and marks disks as a **Predictive Failure** on a test failure.

To start the S.M.A.R.T. service, go to **Services** and toggle *S.M.A.R.T.*. To start the service during the TrueNAS boot process, set *Start Automatically*.

Configure the S.M.A.R.T. service by clicking edit.



General Options

Check Interval *
30

Power Mode *
Sleep

Difference *
0

Informational *
0

Critical *
0

Name	Description
Check Interval	Minutes for smartd to wake up and check if any tests should run.
Power Mode	S.M.A.R.T. only tests when the Power Mode is Never.
Difference	Degrees in Celsius. S.M.A.R.T. reports if a drive's temperature has changed by N degrees Celsius since the last report.
Informational	Threshold temperature in Celsius. S.M.A.R.T. will message with a LOG_INFO log level if the temperature is above the threshold.
Critical	Threshold temperature in Celsius. S.M.A.R.T. will message with a LOG_CRIT log level and send an email if the temperature is above the threshold.

Don't forget to click *SAVE* after changing any settings.

4.5 - Periodic Snapshot Tasks

A periodic snapshot task allows scheduling the creation of read only versions of pools and datasets at a given point in time.

How should I use snapshots? expand □

Snapshots do not make not copies of the data so creating one is quick and if little data changed, they take very little space. It is common to take frequent snapshots as soon as every 15 minutes, even for large and active pools. A snapshot where no files changed takes no storage space, but as files changes happen, the snapshot size changes to reflect the size of the changes. In the same way as all pool data, after deleting the last reference to the data you recover the space.

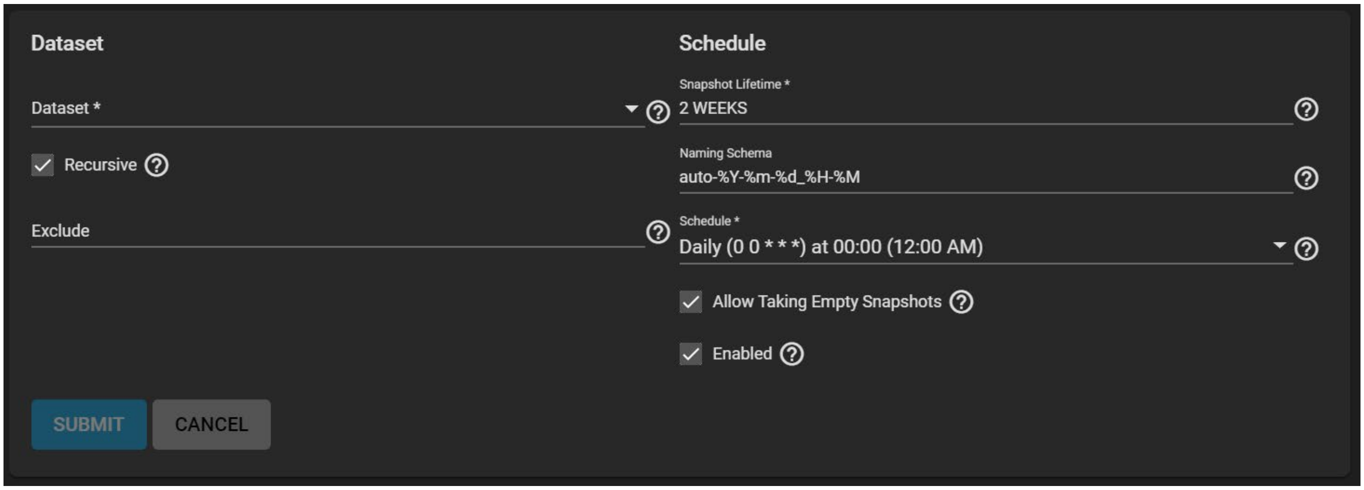
Snapshots keep a history of files, providing a way to recover an older copy or even a deleted file. For this reason, many administrators take snapshots often, store them for a period of time, and store them on another system, typically using the **Replication Tasks** function. Such a strategy allows the administrator to roll the system back to a specific point in time. If there is a catastrophic loss, an off-site snapshot can restore data up to the time of the last snapshot.

Creating a Periodic Snapshot Task

Any required datasets or zvols must exist before creating a snapshot task.

Process

Go to **Tasks > Periodic Snapshot Tasks** and click **ADD**.



Dataset

Dataset *

☑ Recursive

Exclude

Schedule

Snapshot Lifetime *: 2 WEEKS

Naming Schema: auto-%Y-%m-%d_%H-%M

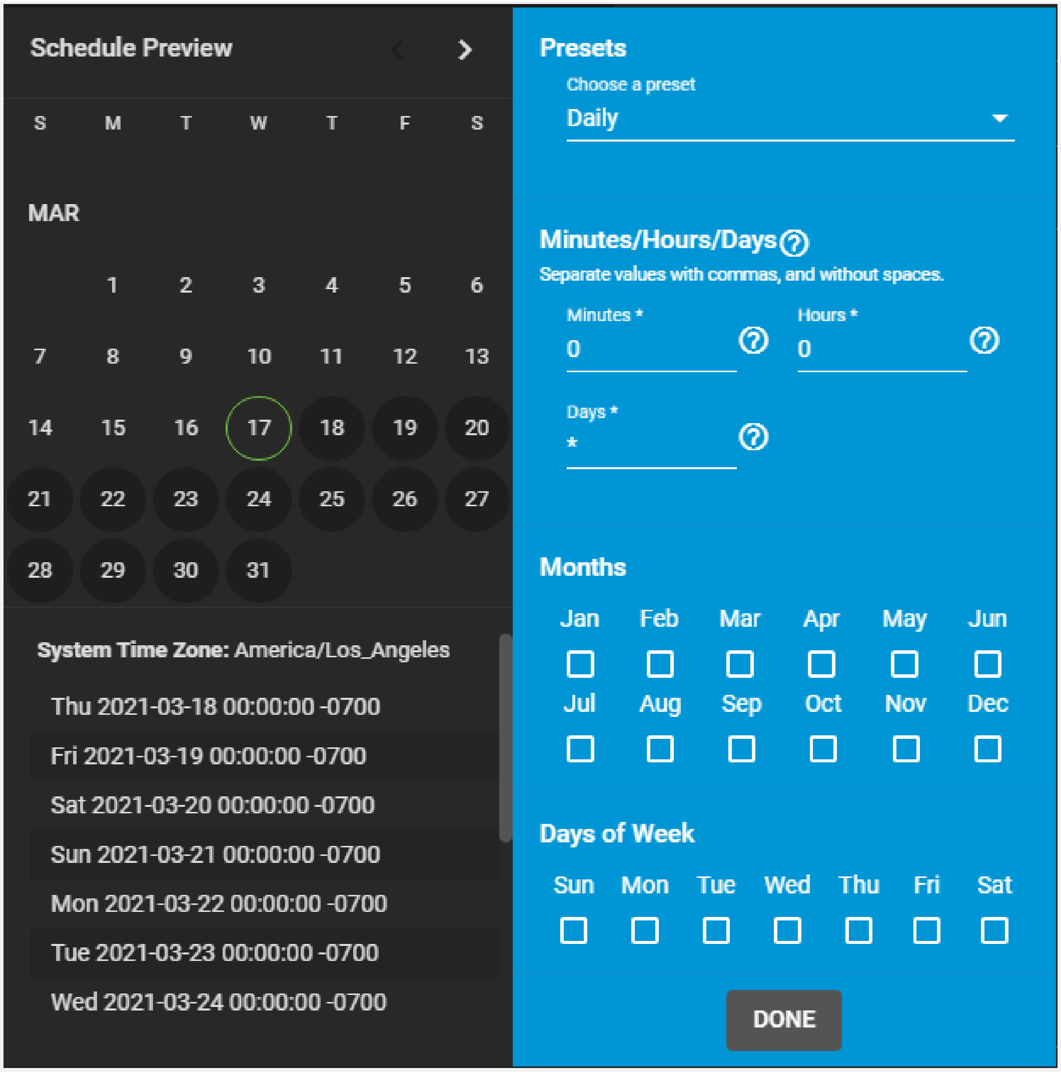
Schedule *: Daily (0 0 * * *) at 00:00 (12:00 AM)

☑ Allow Taking Empty Snapshots

☑ Enabled

Choose the dataset (or zvol) to schedule as a regular back up with snapshots and how long to store snapshots. Define the task **Schedule**. If you need a specific schedule, choose **Custom** and use the Advanced Scheduler section below.

Advanced Scheduler expand □



Presets

Choose a preset: Daily

Minutes/Hours/Days

Separate values with commas, and without spaces.

Minutes *: 0

Hours *: 0

Days *: *

System Time Zone: America/Los_Angeles

```
Thu 2021-03-18 00:00:00 -0700
Fri 2021-03-19 00:00:00 -0700
Sat 2021-03-20 00:00:00 -0700
Sun 2021-03-21 00:00:00 -0700
Mon 2021-03-22 00:00:00 -0700
Tue 2021-03-23 00:00:00 -0700
Wed 2021-03-24 00:00:00 -0700
```

Choosing a **Presets** option populates the rest of the fields. To customize a schedule, enter crontab values for the `Minutes/Hours/Days`.

These fields accept standard cron values. The simplest option is to enter a single number in the field. The task runs when the time value matches that number. For example, entering *10* means that the job runs when the time is ten minutes past the hour.

An asterisk (`*`) means match all values.

Specific time ranges are set by entering hyphenated number values. For example, entering *30-35* in the **Minutes** field sets the task to run at minutes 30, 31, 32, 33, 34, and 35.

You can also enter lists of values. Enter individual values separated by a comma (`,`). For example, entering *1,14* in the **Hours** field means the task runs at 1:00 AM (0100) and 2:00 PM (1400).

A slash (`/`) designates a step value. For example, while entering `*` in **Days** means the task runs every day of the month, `*/2` means the task runs every other day.

Combining all the above examples together creates a schedule running a task each minute from 1:30-1:35 AM and 2:30-2:35 PM every other day.

There is an option to select which **Months** the task runs. Leaving each month unset is the same as selecting every month.

The **Days of Week** schedules the task to run on specific days. This is in addition to any listed days. For example, entering *1* in **Days** and setting *Wed* for **Days of Week** creates a schedule that starts a task on the first day of the month *and* every Wednesday of the month.

The **Schedule Preview** displays when the current settings mean the task runs.

Examples of CRON syntax

Syntax	Meaning	Examples
*	Every item.	* (minutes) = every minute of the hour. * (days) = every day.
*/N	Every N th item.	*/15 (minutes) = every 15th minute of the hour (every quarter hour). */3 (days) = every 3rd day. */3 (months) = every 3rd month.
Comma and hyphen/dash	Each stated item (comma) Each item in a range (hyphen/dash).	1,31 (minutes) = on the 1st and 31st minute of the hour. 1-3,31 (minutes) = on the 1st to 3rd minutes inclusive, and the 31st minute, of the hour. mon-fri (days) = every Monday to Friday inclusive (every weekday). mar,jun,sep,dec (months) = every March, June, September, December.

Days can be specified as days of month, or days of week.

With these options, you can create flexible schedules similar to these examples:

Desired schedule	Values to enter
3 times a day (at midnight, 08:00 and 16:00)	months=*; days=*; hours=0/8 or 0,8,16; minutes=0 (Meaning: every day of every month, when hours=0/8/16 and minutes=0)
Every Monday, Wednesday and Friday, at 8.30 pm	months=*; days=mon,wed,fri; hours=20; minutes=30
1st and 15th day of the month, during October to June, at 00:01 am	months=oct-dec,jan-jun; days=1,15; hours=0; minutes=1
Every 15 minutes during the working week, which is 8am - 7pm (08:00 - 19:00) Monday to Friday	Note that this requires two tasks to achieve: (1) months=*; days=mon-fri; hours=8-18; minutes=*/15 (2) months=*; days=mon-fri; hours=19; minutes=0 We need the second scheduled item, to execute at 19:00, otherwise we would stop at 18:45. Another workaround would be to stop at 18:45 or 19:45 rather than 19:00.

Configure the remaining options for your use case.

Specific Options expand □

Dataset

Name	Description
Dataset	Select a pool, dataset, or zvol.
Recursive	Set to take separate snapshots of the dataset and each of its child datasets. Leave unset to take a single snapshot only of the specified dataset without child datasets.
Exclude	Exclude specific child datasets from the snapshot. Use with recursive snapshots. List paths to any child datasets to exclude. Example: `pool1/dataset1/child1`. A recursive snapshot of pool1/dataset1 will include all child datasets except child1. Separate entries by pressing Enter.

Schedule

Name	Description
Snapshot Lifetime	Define a length of time to retain the snapshot on this system using a numeric value and a single lowercase letter for units. Examples: *3h* is three hours, *1m* is one month, and *1y* is one year. Does not accept Minute values. After the time expires, the snapshot is removed. Snapshots which have been replicated to other systems are not affected.
Naming Schema	Snapshot name format string. The default is `auto-%Y-%m-%d_%H-%M`. Must include the strings `%Y`, `%m`, `%d`, `%H`, and `%M`, which are replaced with the four-digit year, month, day of month, hour, and minute as defined in strftime(3) . For example, snapshots of *pool1* with a Naming Schema of `customsnap-%Y%m%d.%H%M` have names like *pool1@customsnap-20190315.0527*.
Schedule	Choose one of the presets or *Custom* to use the advanced scheduler.
Allow Taking Empty Snapshots	Creates dataset snapshots even when there have been no changes to the dataset from the last snapshot. Recommended for long-term restore points, multiple snapshot tasks pointed at the same datasets, or compatibility with snapshot schedules or replications created in TrueNAS 11.2 and earlier. For example, allowing empty snapshots for a monthly snapshot schedule allows that monthly snapshot to be taken, even when a daily snapshot task has already taken a snapshot of any changes to the dataset.
Enabled	To activate this periodic snapshot schedule, set this option. To disable this task without deleting it, unset this option.

Naming Schemas

The **Naming Schema** determines how automated snapshot names generate. A valid schema requires the *%Y* (year), *%m* (month), *%d* (day), *%H* (hour), and *%M* (minute) time strings, but you can add more identifiers to the schema too, using any identifiers from the Python strptime function .

For **Periodic Snapshot Tasks** used to set up a replication task with the **Replication Task** function:

You can use custom naming schemas for full backup replication tasks. If you are going to use the snapshot for an incremental replication tasks, use the default naming schema. Go to Using a Custom Schema for additional information.

This uses some letters differently from POSIX (Unix) time functions. For example, including `%z` (time zone) ensures that snapshots do not have naming conflicts when daylight time starts and ends, and *%S* (second) adds finer time granularity.

Examples:

Naming Scheme	Snapshot Names Look Like
replicationsnaps-1wklife-%Y%m%d_%H:%M	`replicationsnaps-1wklife-20210120_00:00`, `replicationsnaps-1wklife-20210120_06:00`
autosnap_%Y.%m.%d-%H.%M.%S-%z	`autosnap_2021.01.20-00.00.00-EST`, `autosnap_2021.01.20-06.00.00-EST`

When referencing snapshots from a Windows computer, avoid using characters like `:` that are invalid in a Windows file path. Some applications limit filename or path length, and there might be limitations related to spaces and other characters. Always consider future uses and ensure the name given to a periodic snapshot is acceptable.

Snapshot Lifetimes

TrueNAS deletes snapshots when they reach the end of their life and preserves snapshots when at least one periodic task requires it. For example, you have two schedules created where one schedule takes a snapshot every hour and keeps them for a week, and the other takes a snapshot every day and keeps them for 3 years. Each has an hourly snapshot taken. After a week, snapshots created at *01.00* through *23.00* get deleted, but you keep snapshots timed at *00.00* because they are necessary for the second periodic task. These snapshots get destroyed at the end of 3 years.

Click **SUBMIT** to save this task and add it to the list in **Tasks > Periodic Snapshot Tasks**. You'll find any snapshots taken using this task in **Storage > Snapshots**.

To check the log for a saved snapshot schedule, go to **Tasks > Periodic Snapshot Tasks** and click the task **State**.

4.6 - Replication Tasks

The ZFS file system provides ability to create a snapshot of the file system contents and transfer the snapshot to another machine to recreate the file system on another machine. Snapshots can be created at any time and as many snapshots can be created as needed. By utilizing replication sysadmins can achieve synchronization between one or more machines.

ZFS replication relies on periodic ZFS snapshots. ZFS snapshots are an inherent feature from the ZFS file system, and are a point-in-time state of the existing ZFS file system. Snapshot can be triggered manually or scheduled. Once the ZFS replication task has been configured, the selected snapshot or snapshots will be replicated to the target ZFS dataset. Usually, the target ZFS dataset is on a secondary TrueNAS storage server, serving as a disaster recovery platform.

Ready to get started? Choose a topic or article from the left-side Navigation pane. Click the **<** symbol to expand the menu to show the topics under this section.

4.6.1 - Local

- - Quick Backups with the Replication Wizard

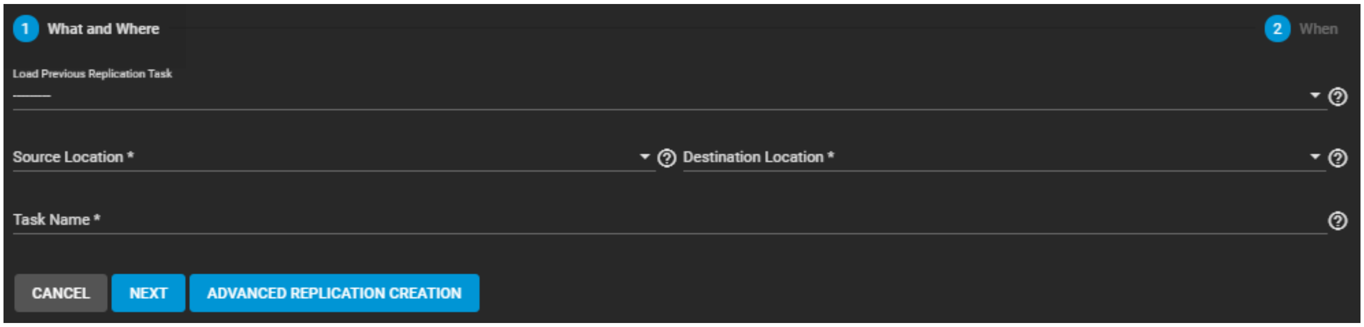
Process Summary expand □

Process Summary

- Requirements: Storage pools and datasets created in **Storage > Pools**.
- Go to **Tasks > Replication Tasks** and click *ADD*
  - Choose Sources
    - Set the source location to the local system
    - Use the file browser or type paths to the sources
  - Define a Destination path
    - Set the destination location to the local system
    - Select or manually define a path to the single destination location for the snapshot copies.
  - Set the Replication schedule to run once
  - Define how long the snapshots will be stored in the Destination
  - Clicking *START REPLICATION* immediately snapshots the chosen Sources and copies those snapshots to the Destination
    - Dialog might ask to delete existing snapshots from the Destination. Be sure that all important important data is protected before deleting anything.
- Clicking the task *State* shows the logs for that replication task.

Quick Backups with the Replication Wizard

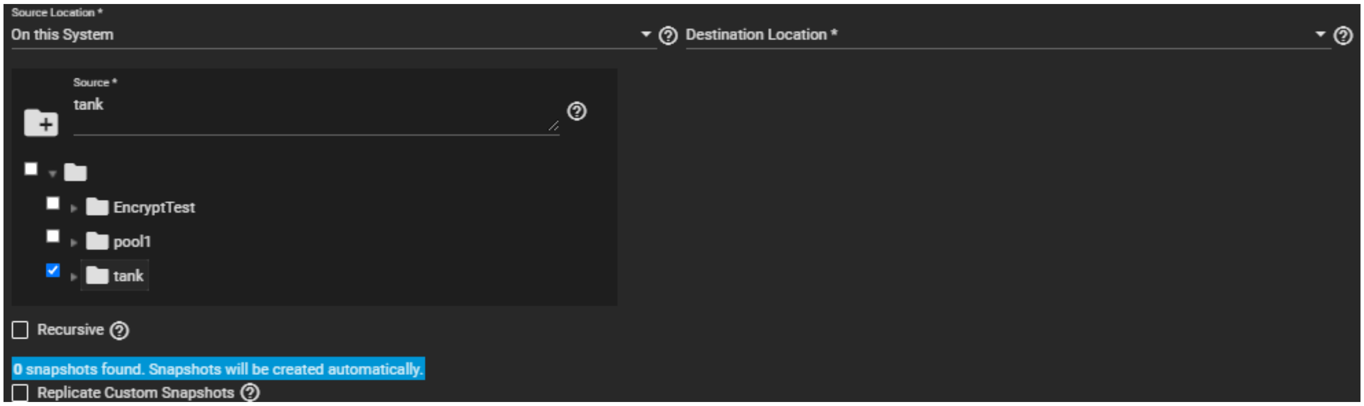
TrueNAS provides a wizard for quickly configuring different simple replication scenarios.



While we recommend regularly scheduled replications to a remote location as the optimal backup scenario, the wizard can very quickly create and copy ZFS snapshots to another location on the same system. This is useful when no remote backup locations are available, or when a disk is in immediate danger of failure.

The only thing you'll need before creating a quick local replication are datasets or zvols in a storage pool to use as the replication source and (preferably) a second storage pool to use for storing replicated snapshots. You can set up the local replication entirely in the Replication Wizard.

To open the Replication Wizard, go to **Tasks > Replication Tasks** and click *ADD*. Set the source location to the local system and pick which datasets to snapshot. The wizard takes new snapshots of the sources when no existing source snapshots are found.
Enabling *Recursive* replicates all snapshots contained within the selected source dataset snapshots. Local sources can also use a naming schema to identify any custom snapshots to include in the replication. A naming schema is a collection of strftime time and date strings and any identifiers that a user might have added to the snapshot name.


Source Location *
On this System

Destination Location *

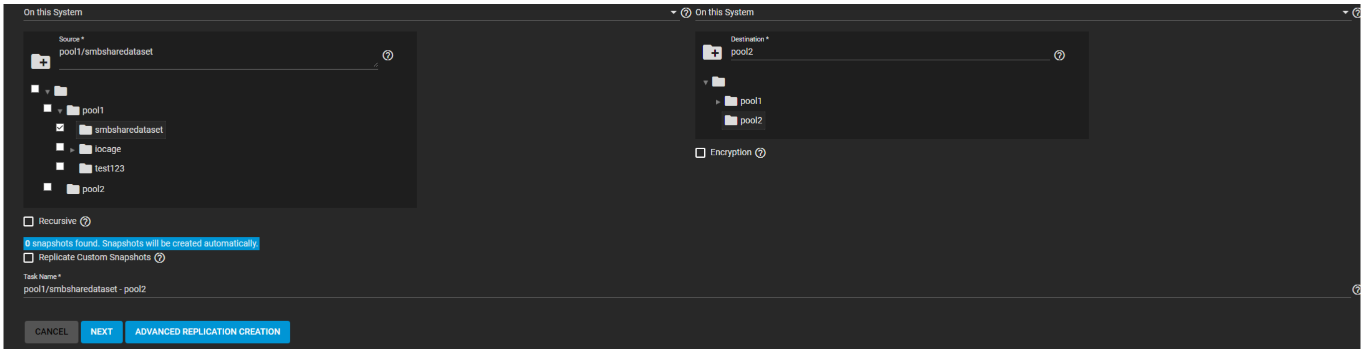
Source *
tank

□ Recursive

0 snapshots found. Snapshots will be created automatically.

□ Replicate Custom Snapshots

Set the destination to the local system and define the path to the storage location for replicated snapshots. When manually defining the destination, be sure to type the full path to the destination location.


On this System

On this System

Source *
pool1/smbsharedataset

Destination *
pool2

□ Encryption

□ Recursive

0 snapshots found. Snapshots will be created automatically.

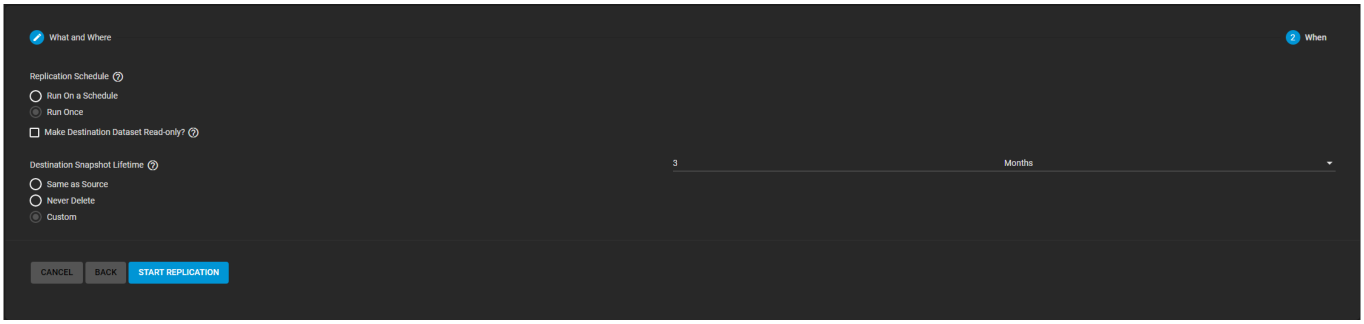
□ Replicate Custom Snapshots

Task Name *
pool1/smbsharedataset - pool2

TrueNAS suggests a default name for the task based on the selected source and destination locations, but you can type your own name for the replication. You can load any saved replication task into the wizard to make creating new replication schedules even easier.

You can define a specific schedule for this replication or choose to run it immediately after saving the new task. Unscheduled tasks are still saved in the replication task list and can be run manually or edited later to add a schedule.

The destination lifetime is how long copied snapshots are stored in the destination before they are deleted. We usually recommend defining a snapshot lifetime to prevent storage issues. Choosing to keep snapshots indefinitely can require you to manually clean old snapshots from the system if or when the destination fills to capacity.



Replication Schedule
○ Run On a Schedule
● Run Once

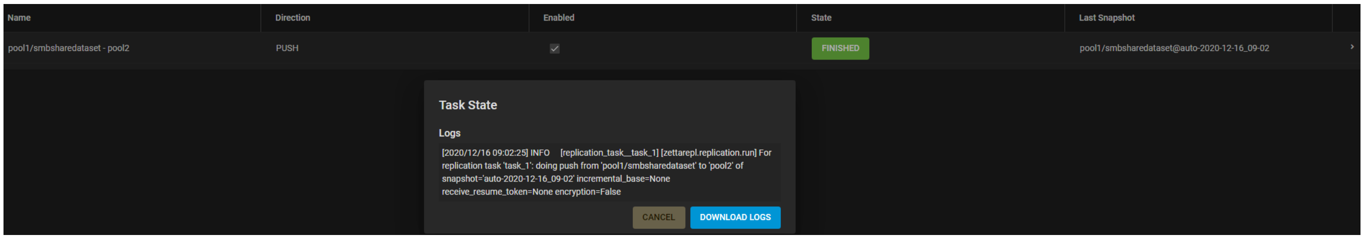
□ Make Destination Dataset Read-only?

Destination Snapshot Lifetime
○ Same as Source
○ Never Delete
● Custom

3 Months

Clicking *START REPLICATION* saves the new task and immediately attempts to replicate snapshots to the destination. When TrueNAS detects that the destination already has unrelated snapshots, it will ask to delete the unrelated snapshots and do a full copy of the new snapshots. This can delete important data, so be sure any existing snapshots can be deleted or are backed up in another location.

The simple replication is added to the Replication task list and will show that it is currently running. Clicking the task state shows the replication log with an option to download the log to your local system.



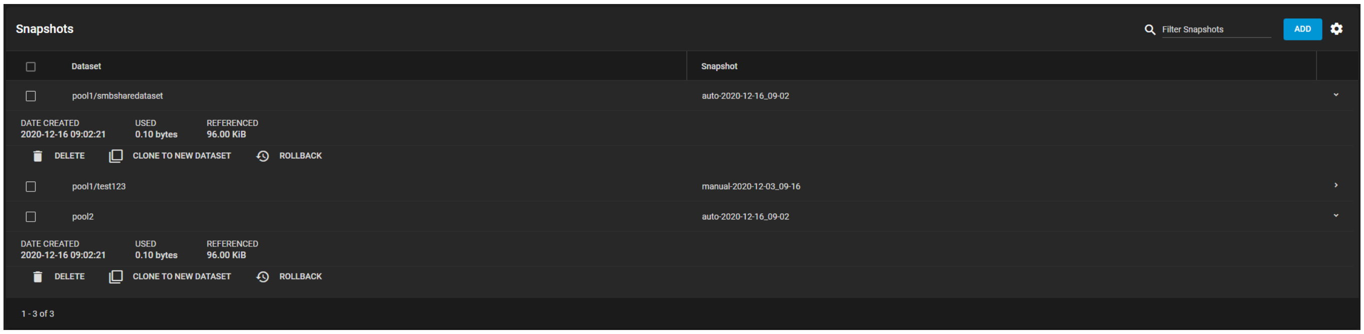
Name	Direction	Enabled	State	Last Snapshot
pool1/smbsharedataset - pool2	PUSH	☑	FINISHED	pool1/smbsharedataset@auto-2020-12-16_09-02

Task State

Logs

```
[2020/12/16 09:02:25] INFO    [replication_task__task_1] [zettarepl.replication.run] For
replication task 'task_1': doing push from 'pool1/smbsharedataset' to 'pool2' of
snapshot='auto-2020-12-16_09-02' incremental_base=None
receive_resume_token=None encryption=False
```

To confirm that snapshots have been replicated, go to **Storage > Snapshots** and verify the destination dataset has new snapshots with correct timestamps.



Snapshots

□	Dataset	Snapshot
□	pool1/smbsharedataset	auto-2020-12-16_09-02
□	pool1/test123	manual-2020-12-03_09-16
□	pool2	auto-2020-12-16_09-02

pool1/smbsharedataset:

DATE CREATED	USED	REFERENCED
2020-12-16 09:02:21	0.10 bytes	96.00 KiB

pool2:

DATE CREATED	USED	REFERENCED
2020-12-16 09:02:21	0.10 bytes	96.00 KiB

4.6.2 - Remote

Configure SSH and automatic dataset snapshots in TrueNAS before creating a remote replication task. This ensures that both systems can connect to each other and new snapshots are regularly available for replication.

To streamline creating simple replication configurations, the replication wizard assists with creating a new SSH connection and automatically creates a periodic snapshot task for sources that have no existing snapshots.

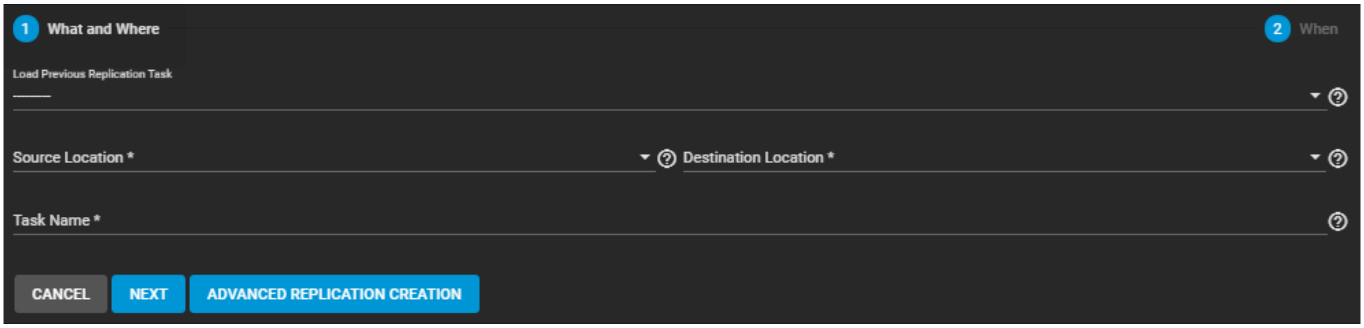
Process Summary expand □

Process Summary

- **Tasks > Replication Tasks**
  - Choose sources for snapshot replication.
    - Remote sources require an SSH connection.
    - TrueNAS shows how many snapshots will be replicated.
  - Define the snapshot destination.
    - A remote destination requires an SSH connection.
    - Choose destination or define manually by typing a path.
      - Adding a new name on the end of the path creates a new dataset.
  - Choose replication security.
    - We always recommend Replication with encryption.
    - Disabling encryption is only meant for absolutely secure networks.
  - Schedule the replication.
    - Schedule can be standardized presets or a custom defined schedule.
    - Running once runs the replication immediately after creation.
      - Task is still saved and can be rerun or edited.
  - Choose how long to keep the replicated snapshots.

Creating a Remote Replication Task

To create a new replication, go to **Tasks > Replication Tasks** and click *ADD*.

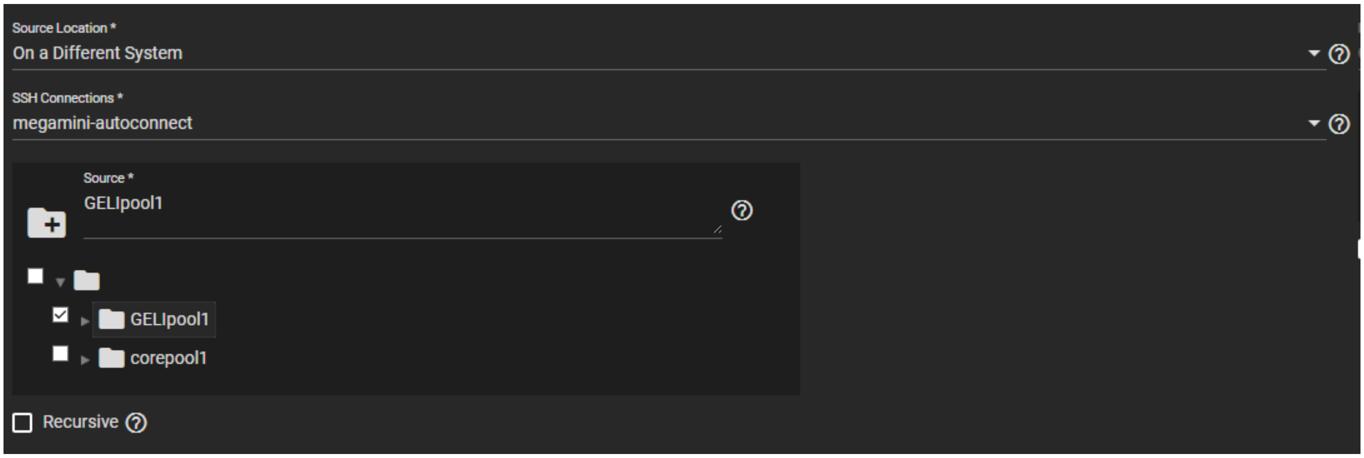


You can load any saved replication to prepopulate the wizard with that configuration. Saving changes to the configuration creates a new replication task without altering the task that was loaded into the wizard. This saves some time when creating multiple replication tasks between the same two systems.

⊙ Sources

Start by configuring the replication sources. Sources are the datasets or zvols with snapshots to use for replication. Choosing a remote source requires selecting an SSH connection to that system. Expanding the directory browser shows the current datasets or zvols that are available for replication. You can select multiple sources or manually type the names into the field.

TrueNAS shows how many snapshots are available for replication. We recommend you manually snapshot the sources or create a periodic snapshot task *before* creating the replication task. However, when the sources are on the local system and don't have any existing snapshots, TrueNAS can create a basic periodic snapshot task and snapshot the sources immediately before starting the replication. Enabling *Recursive* replicates all snapshots contained within the selected source dataset snapshots.



Source Location *
On a Different System

SSH Connections *
megamini-autoconnect

Source *
GELIpool1

□ ▾
☑ ▸ GELIpool1
□ ▸ corepool1

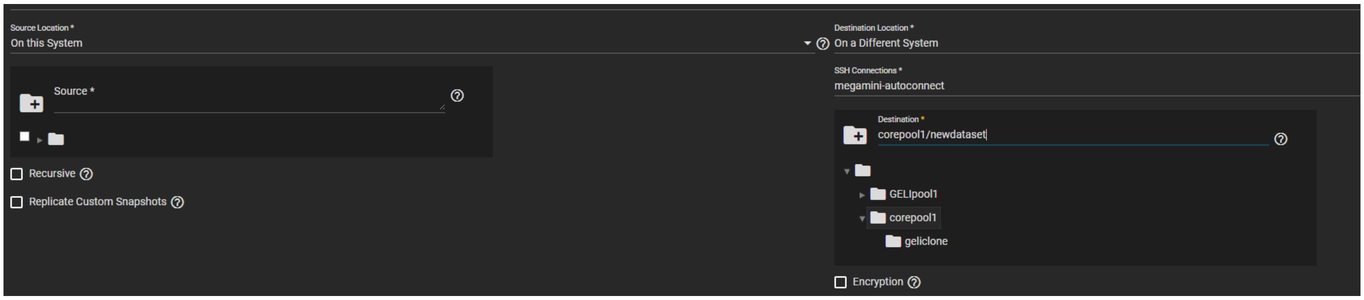
□ Recursive

Remote sources require entering a *snapshot naming schema* to identify the snapshots to replicate. A naming schema is a collection of strftime time and date strings and any identifiers that a user might have added to the snapshot name.

Local sources can also use a naming schema to identify any custom snapshots to include in the replication.

○ Destination

The destination is where replicated snapshots are stored. Choosing a remote destination requires an SSH connection to that system. Expanding the directory browser shows the current datasets that are available for replication. You can select a destination dataset or manually type a path in the field. Zvols cannot be used as a remote replication destination. Adding a name to the end of the path creates a new dataset in that location.



Source Location *
On this System

Source *

□ ▸

□ Recursive

□ Replicate Custom Snapshots

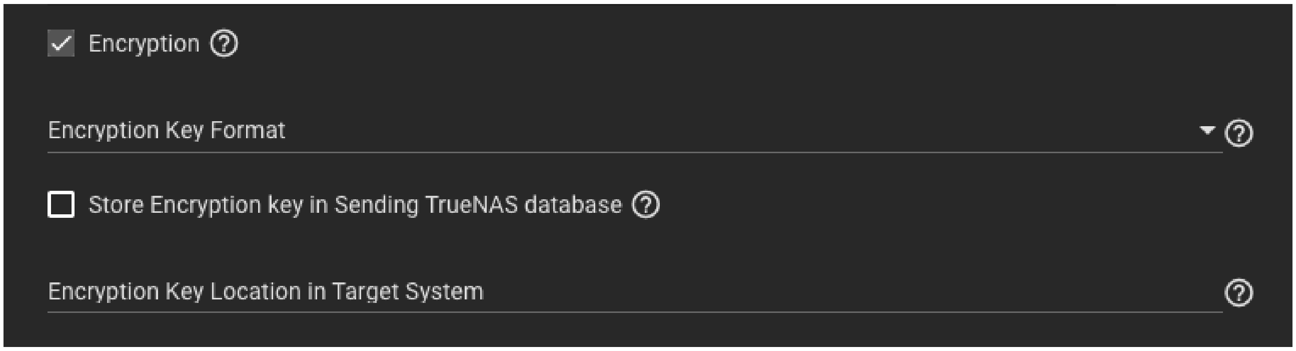
Destination Location *
On a Different System

SSH Connections *
megamini-autoconnect

Destination *
corepool1/newdataset

▾
▸ GELIpool1
▾ corepool1
geliclone

□ Encryption



☑ Encryption

Encryption Key Format

□ Store Encryption key in Sending TrueNAS database

Encryption Key Location in Target System

Encryption: To use encryption when replicating data check the Encryption box. Once the box is checked additional encryption options will become available.

- *Ecryption Key Format* allows the user to choose between a Hex (base 16 numeral) or Passphrase (alphanumeric) style encryption key.

- *Store Encryption key in Sending TrueNAS database* allows the user to either store the Encryption key in the sending TrueNAS database (box checked) or choose a temporary location for the encryption key that will decrypt replicated data (box unchecked).

Security and Task Name

> Using encryption for SSH transfer security is always recommended.

In situations where two systems within an absolutely secure network are used for replication, disabling encryption speeds up the transfer. However, the data is completely unprotected from malicious sources.

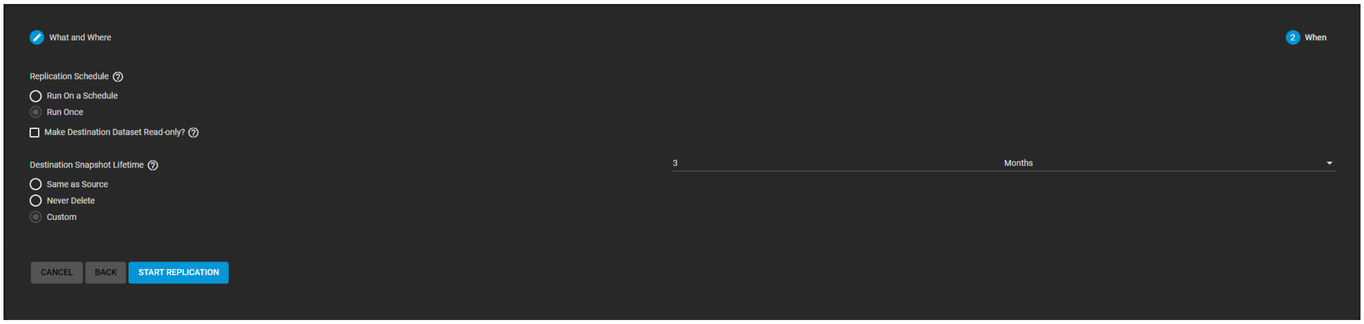
Choosing no encryption for the task is the same as choosing the *SSH+NETCAT* transport method from the advanced options screen. NETCAT uses common port settings, but these can be overriden by switching to the advanced options screen or editing the task after creation.

TrueNAS suggests a name based off the selected sources and destination, but this can be overwritten with a custom name.

Schedule and Lifetime

Adding a schedule automates the task to run according to your chosen times. You can choose between a number of preset schedules or create a custom schedule for when the replication will run. Choosing to run the replication once will run the replication immediately after saving the task, but any additional replications must be triggered manually.

Finally, define how long you want to keep snapshots on the destination system. We generally recommend defining snapshot lifetime to prevent cluttering the system with obsolete snapshots.



What and Where — 2 When

Replication Schedule ?
○ Run On a Schedule
● Run Once

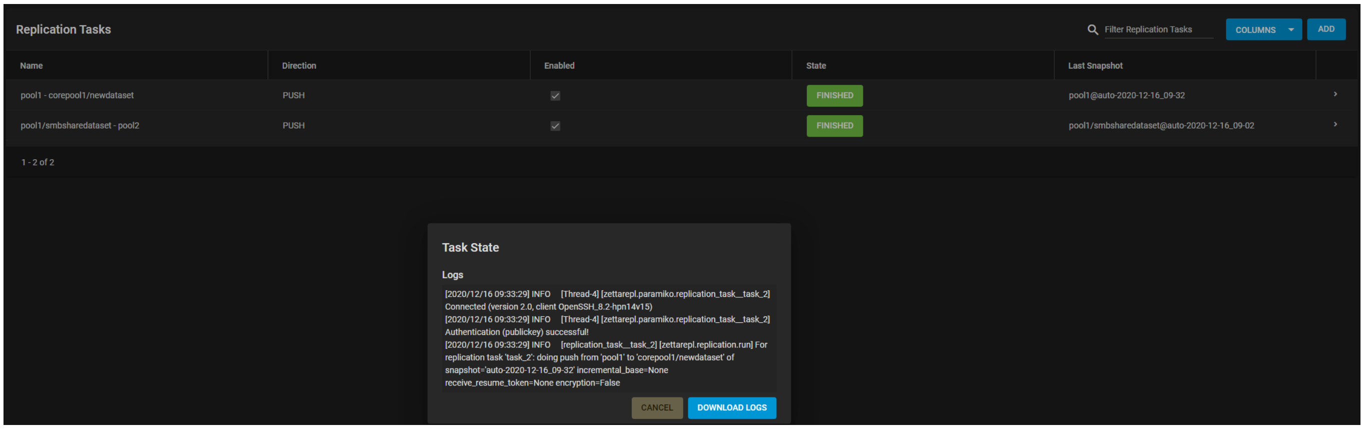
□ Make Destination Dataset Read-only? ?

Destination Snapshot Lifetime ?
○ Same as Source
○ Never Delete
● Custom

3 Months

Starting the Replication

Start Replication saves the new replication task. New tasks are enabled by default and activate according to their schedule or immediately when no schedule was chosen. The first time a replication task runs, it takes longer because the snapshots must be copied entirely fresh to the destination. Later replications run faster, as only the subsequent changes to snapshots are replicated. Clicking the task state opens the log for that task.



Replication Tasks

Name	Direction	Enabled	State	Last Snapshot
pool1 - corepool1/newdataset	PUSH	✓	FINISHED	pool1@auto-2020-12-16_09-32
pool1/smbsharedataset - pool2	PUSH	✓	FINISHED	pool1/smbsharedataset@auto-2020-12-16_09-02

1 - 2 of 2

Task State

Logs

```
[2020/12/16 09:33:29] INFO    [Thread-4] [zettarepl.paramiko.replication_task__task_2]
Connected (version 2.0, client OpenSSH_8.2-hpn14v15)
[2020/12/16 09:33:29] INFO    [Thread-4] [zettarepl.paramiko.replication_task__task_2]
Authentication (publickey) successful!
[2020/12/16 09:33:29] INFO    [replication_task__task_2] [zettarepl.replication.run] For
replication task 'task_2': doing push from 'pool1' to 'corepool1/newdataset' of
snapshot='auto-2020-12-16_09-32' incremental_base=None
receive_resume_token=None encryption=False
```

4.6.3 - Advanced

- - Creating an Advanced Replication Task

Requirements:

- Storage pools with datasets and data to snapshot.
- SSH configured with a connection to the remote system saved in **System > SSH Connections**.
- Dataset snapshot task saved in **Tasks > Periodic Snapshot Tasks**.

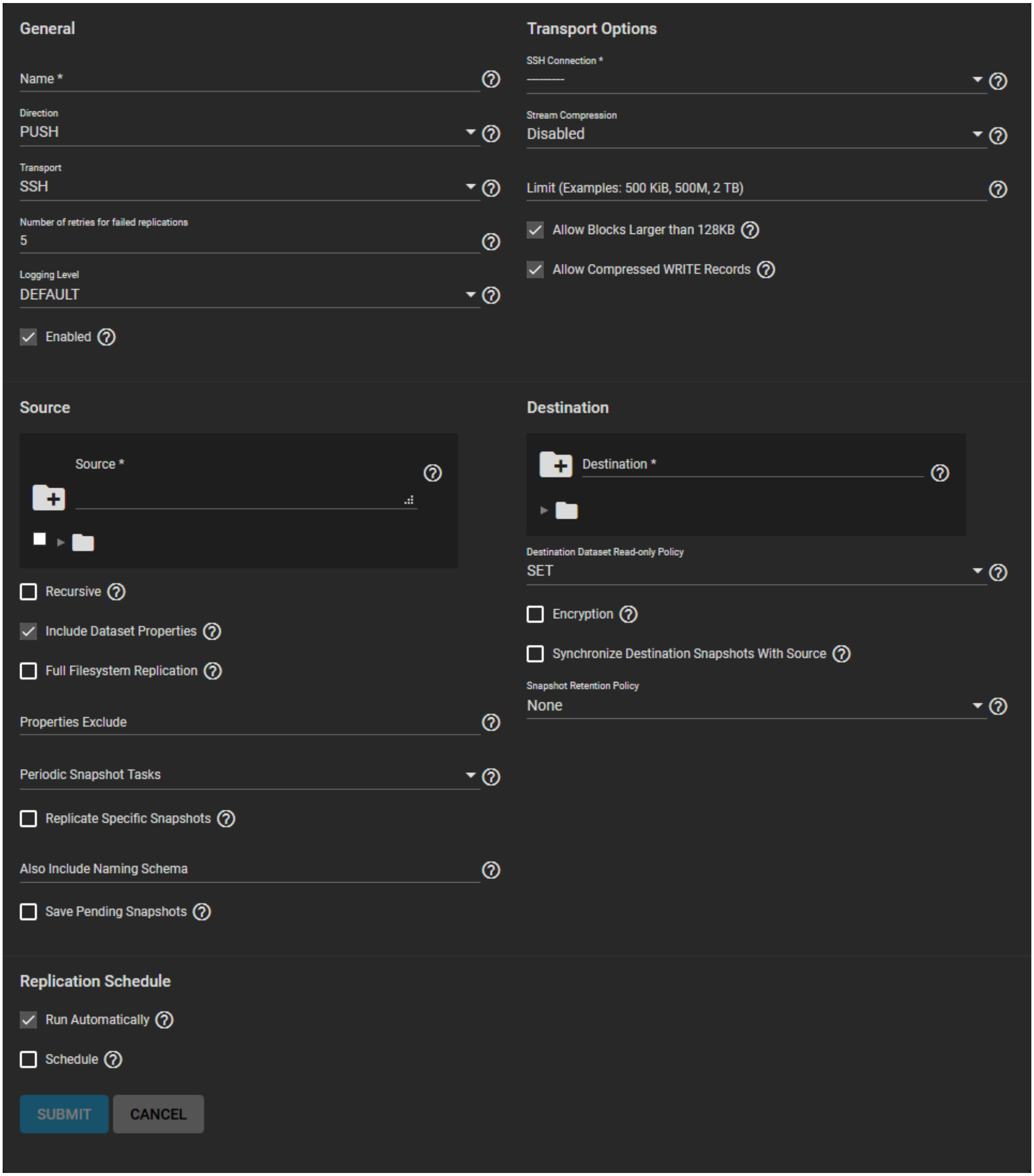
Process Summary expand □

Go to **Tasks > Replication Tasks** and click *ADD*, then select *ADVANCED REPLICATION CREATION*.

- General Options:
  - Name the task.
  - Select Push or Pull for the local system.
  - Select a replication transport method.
    - SSH is recommended.
    - SSH+Netcat is used for secured networks.
    - Local is for in-system replication.
- Configure the replication transport method:
  - Remote options require an SSH connection.
  - SSH+Netcat requires defining netcat ports and addresses.
- Sources:
  - Select sources for replication.
  - Choose a periodic snapshot task as the source of snapshots to replicate.
  - Remote sources require defining a snapshot naming schema.
- Destination:
  - Remote destination requires an SSH connection.
  - Select a destination or type a path in the field.
  - Define how long to keep snapshots in the destination.
- Scheduling:
  - Run automatically starts the replication after a related periodic snapshot task completes.
  - To automate the task according to its own schedule, set that option and define a schedule for the replication task.

Creating an Advanced Replication Task

To use the advanced editor to create a replication task, go to **Tasks > Replication Tasks**, click *ADD* to open the Wizard, then click *ADVANCED REPLICATION CREATION*.


General

Name *

Direction: PUSH

Transport: SSH

Number of retries for failed replications: 5

Logging Level: DEFAULT

☑ Enabled

Transport Options

SSH Connection *: ---------

Stream Compression: Disabled

Limit (Examples: 500 KiB, 500M, 2 TB)

☑ Allow Blocks Larger than 128KB

☑ Allow Compressed WRITE Records

Source

Source *

☐ Recursive

☑ Include Dataset Properties

☐ Full Filesystem Replication

Properties Exclude

Periodic Snapshot Tasks

☐ Replicate Specific Snapshots

Also Include Naming Schema

☐ Save Pending Snapshots

Destination

Destination *

Destination Dataset Read-only Policy: SET

☐ Encryption

☐ Synchronize Destination Snapshots With Source

Snapshot Retention Policy: None

Replication Schedule

☑ Run Automatically

☐ Schedule

Options are grouped together by category. Options can appear, disappear, or be disabled depending on the configuration choices you make. Start by configuring the *General* options first, then the *Transport* options before configuring replication *Sources* and *Destination*.

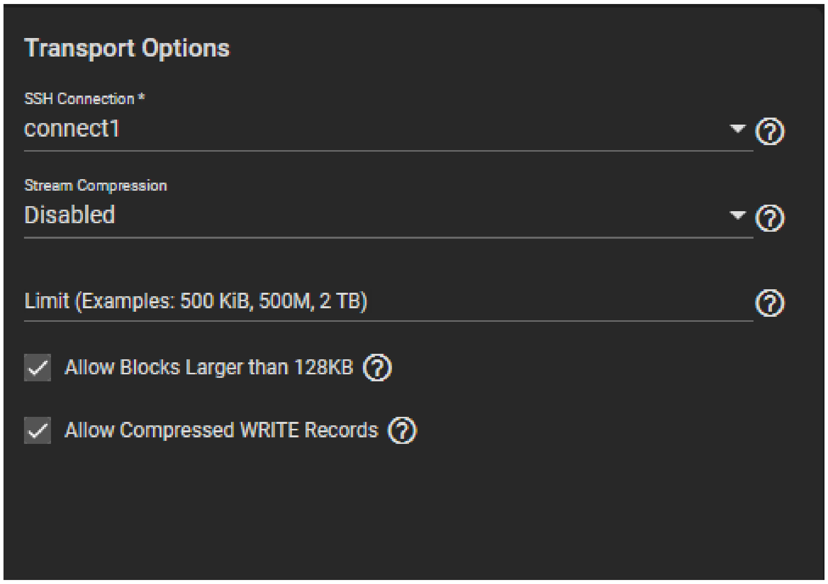
Name the task. Each task name must be unique, and we recommend you name it in a way that makes it easy to remember what the task is doing.

Choose whether the local system is sending (*Push*) or receiving data (*Pull*) and decide what *Transport* method to use for the replication before configuring the other sections.

⊙ Transport Options

The *Transport* selector determines the method to use for the replication: *SSH* is the standard option for sending or receiving data from a remote system, but *SSH+NETCAT* is available as a faster option for replications that take place within completely secure networks. *Local* is only used for replicating data to another location on the same system.

With *SSH*-based replications, configure the transport method by selecting the **SSH Connection** to the remote system that will send or receive snapshots. Options for compressing data, adding a bandwidth limit, or other data stream customizations are available. *Stream Compression* options are only available when using SSH. Before enabling *Compressed WRITE Records*, verify that the destination system also supports compressed WRITE records.



Transport Options

SSH Connection *
connect1

Stream Compression
Disabled

Limit (Examples: 500 KiB, 500M, 2 TB)

☑ Allow Blocks Larger than 128KB

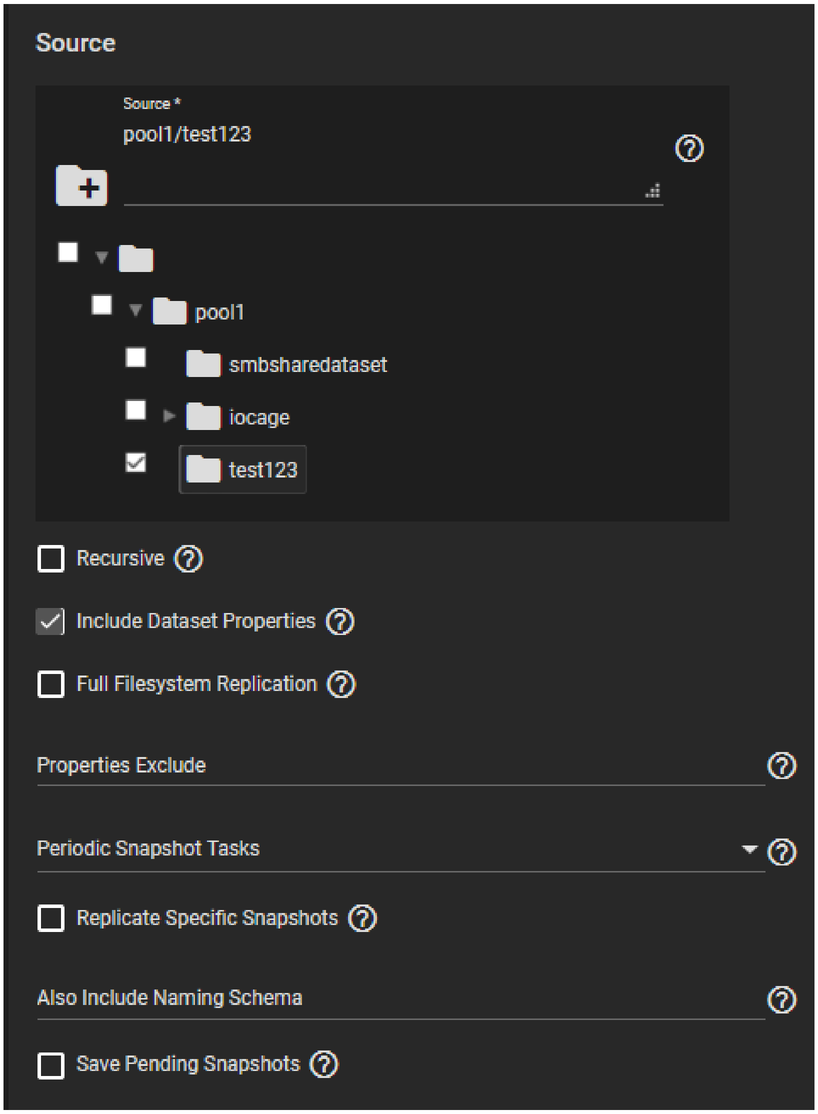
☑ Allow Compressed WRITE Records

For *SSH+NETCAT* replications, you also need to define the addresses and ports to use for the Netcat connection.

> *Allow Blocks Larger than 128KB* is a one-way toggle. Replication tasks using large block replication will only continue to work as long as this option remains enabled.

○ Source

The replication *Source* is the datasets or zvols to use for replication. Select the sources to use for this replication task by opening the file browser or entering dataset names in the field. Pulling snapshots from a remote source requires a valid **SSH Connection** before the file browser can show any directories. If the file browser shows a connection error after selecting the correct **SSH Connection**, you might need to log in to the remote system and make sure it is configured to allow SSH connections. In TrueNAS, this is done by going to the **Services** screen, checking the **SSH** service configuration, and starting the service.



Source

Source *

pool1/test123

☐ ▾
☐ ▾ pool1
☐ smbsharedataset
☐ ▸ iocage
☑ test123

☐ Recursive

☑ Include Dataset Properties

☐ Full Filesystem Replication

Properties Exclude

Periodic Snapshot Tasks ▾

☐ Replicate Specific Snapshots

Also Include Naming Schema

☐ Save Pending Snapshots

By default, the replication task will use snapshots to quickly transfer data to the receiving system. When **Full Filesystem Replication** is set, the chosen **Source** is completely replicated, including all dataset properties, snapshots, child datasets, and clones. When choosing this option, it is recommended to allocate additional time for the replication task to run. Leaving **Full Filesystem Replication** unset but setting **Include Dataset Properties** will include just the dataset properties in the snapshots to be replicated. Additional options allow you to recursively replicate child dataset snapshots or exclude specific child datasets or properties from the replication.

Local sources are replicated by snapshots that were generated from a periodic snapshot task and/or from a defined naming schema that matches manually created snapshots. Remote sources require entering a snapshot naming schema to identify the snapshots to replicate. A naming schema is a collection of strftime time and date strings and any identifiers that a user might have added to the snapshot name. For example, entering the naming schema `custom-%Y-%m-%d_%H-%M` finds and replicates snapshots like `custom-2020-03-25_09-15`. Multiple schemas can be entered by pressing `Enter` to separate each schema.

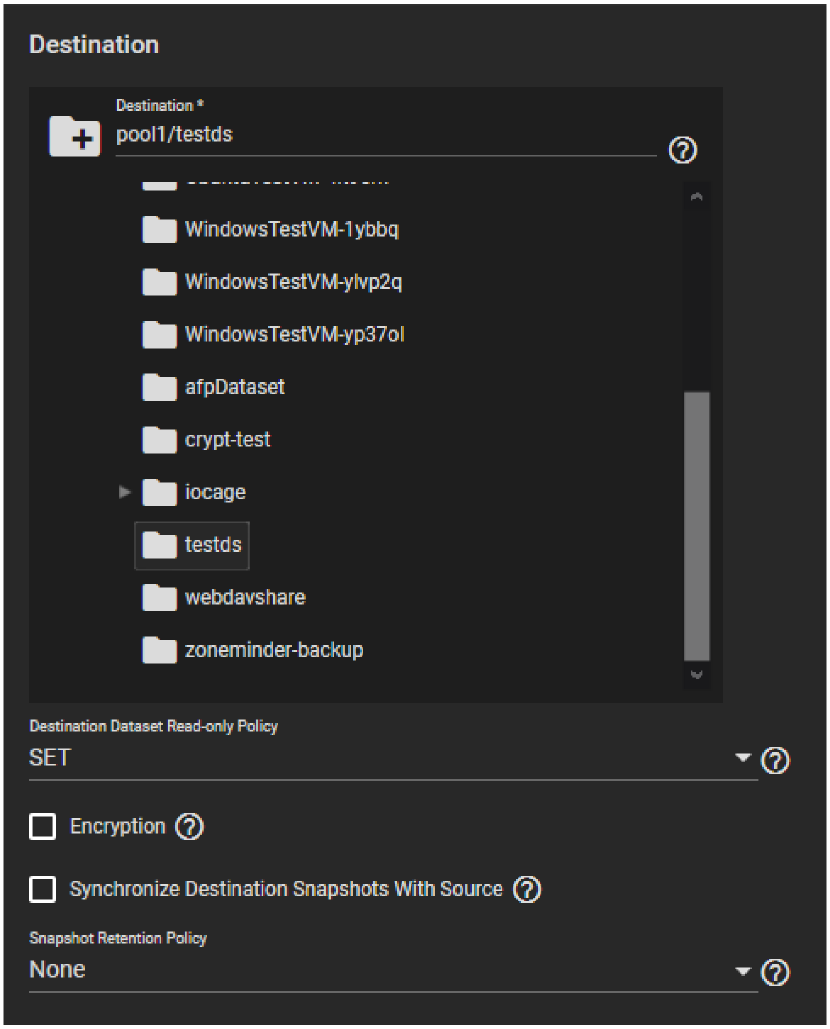
To define specific snapshots from the periodic task to use for the replication, set *Replicate Specific Snapshots* and enter a schedule. The only periodically generated snapshots that will be included in the replication task are those that match your defined schedule. Alternately, you can use your *Replication Schedule* to determine which snapshots are replicated by setting *Run Automatically*, *Only Replicate Snapshots Matching Schedule*, and defining when the replication task will run.

When a replication task is having difficulty completing, it is a good idea to set *Save Pending Snapshots*. This prevents the source TrueNAS from automatically deleting any snapshots that are failing to replicate to the destination system.

○ Destination

The destination is where replicated data is stored. Choosing a remote destination requires an [SSH Connection]() to that system. Expanding the file browser shows the current datasets that are available on the destination system. You can click a destination or manually type a path in the field. Adding a name to the end of the path creates a new dataset in that location.

DO NOT use zvols for a remote destination



Destination

Destination *
pool1/testds

Destination Dataset Read-only Policy
SET

☐ Encryption

☐ Synchronize Destination Snapshots With Source

Snapshot Retention Policy
None

By default, the destination dataset is *SET* to be **read-only** after the replication is complete. You can change the *Destination Dataset Read-only Policy* to only start replication when the destination is read-only (*REQUIRE*) or to disable checking the dataset's read-only state (*IGNORE*).

Encryption adds another layer of security to replicated data by encrypting the data before transfer and decrypting it on the destination system. Setting the checkbox adds more options to choose between using a *HEX* key or defining your own encryption *PASSPHRASE*. The encryption key can be stored either in the TrueNAS system database or in a custom-defined location.

Synchronizing Destination Snapshots With Source **destroys** any snapshots in the destination that do not match the source snapshots. TrueNAS also does a full replication of the source snapshots as if the replication task had never been run before, which can lead to excessive bandwidth consumption. This can be a very destructive option, so be sure that any snapshots that will be deleted from the destination are obsolete or otherwise backed up in a different location.

Defining the *Snapshot Retention Policy* is generally recommended to prevent cluttering the system with obsolete snapshots. Choosing *Same as Source* will keep the snapshots on the destination system for the same amount of time as the defined *Snapshot Lifetime* from the source system periodic snapshot task. You can also define your own

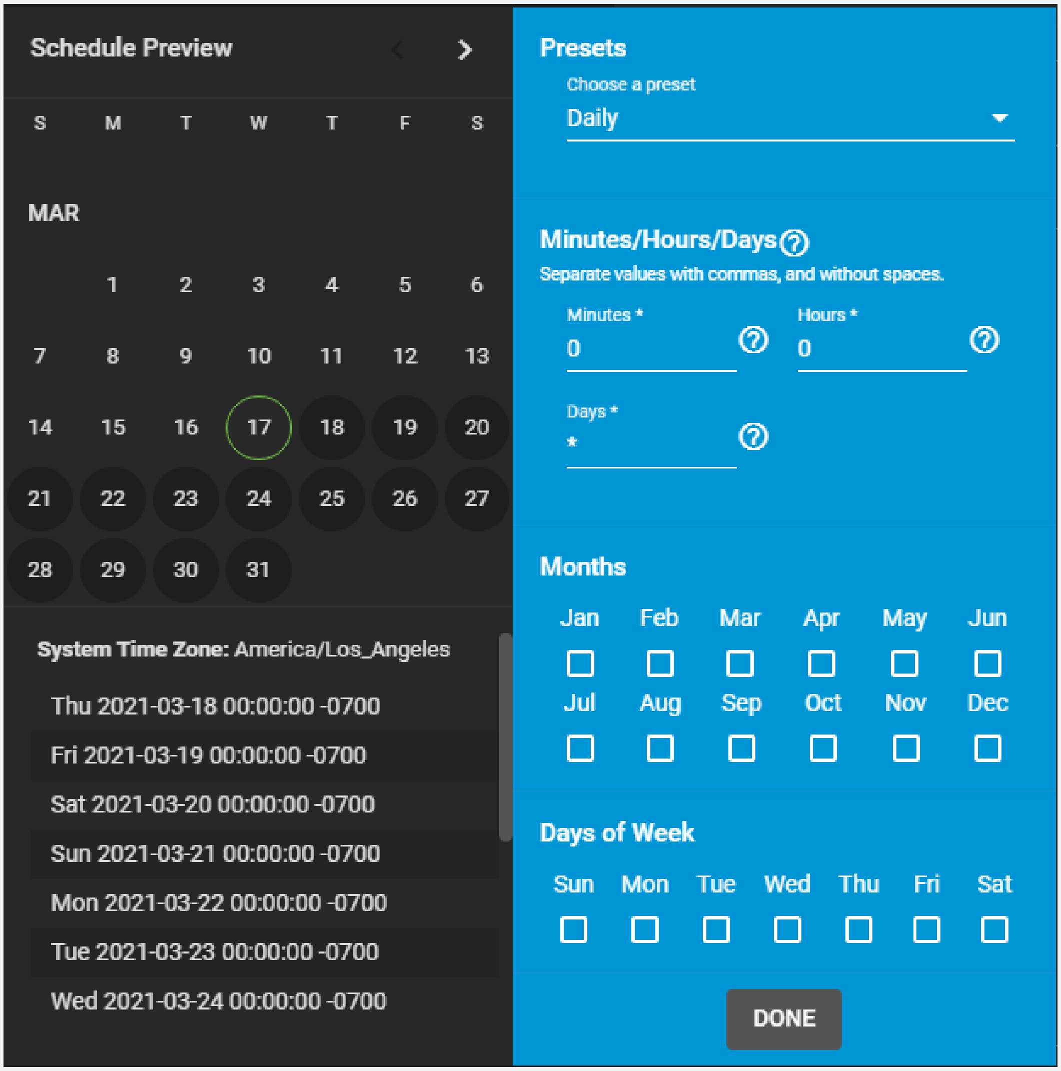
Custom lifetime for snapshots on the destination system.

○ Schedule

By default, setting the task to *Run Automatically* starts the replication immediately after the related periodic snapshot task is complete.

Setting the *Schedule* checkbox allows scheduling the replication to run at a separate time. A specific time must be defined for the replication task to run. It is recommended to choose a time frame that both gives the replication task enough time to finish and is during a time of day when network traffic for both source and destination systems is minimal. Using the custom scheduler is recommended when you need to fine-tune an exact time or day for the replication.

Advanced Scheduler expand □



Schedule Preview

MAR

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

System Time Zone: America/Los_Angeles

Thu 2021-03-18 00:00:00 -0700
Fri 2021-03-19 00:00:00 -0700
Sat 2021-03-20 00:00:00 -0700
Sun 2021-03-21 00:00:00 -0700
Mon 2021-03-22 00:00:00 -0700
Tue 2021-03-23 00:00:00 -0700
Wed 2021-03-24 00:00:00 -0700

Presets

Choose a preset: Daily

Minutes/Hours/Days

Separate values with commas, and without spaces.

Minutes *: 0

Hours *: 0

Days *: *

Months

Jan □ Feb □ Mar □ Apr □ May □ Jun □
Jul □ Aug □ Sep □ Oct □ Nov □ Dec □

Days of Week

Sun □ Mon □ Tue □ Wed □ Thu □ Fri □ Sat □

DONE

Choosing a **Presets** option populates the rest of the fields. To customize a schedule, enter crontab values for the `Minutes/Hours/Days`.

These fields accept standard cron values. The simplest option is to enter a single number in the field. The task runs when the time value matches that number. For example, entering *10* means that the job runs when the time is ten minutes past the hour.

An asterisk (`*`) means match all values.

Specific time ranges are set by entering hyphenated number values. For example, entering *30-35* in the **Minutes** field sets the task to run at minutes 30, 31, 32, 33, 34, and 35.

You can also enter lists of values. Enter individual values separated by a comma (,). For example, entering *1,14* in the **Hours** field means the task runs at 1:00 AM (0100) and 2:00 PM (1400).

A slash (/) designates a step value. For example, while entering * in **Days** means the task runs every day of the month, */2 means the task runs every other day.

Combining all the above examples together creates a schedule running a task each minute from 1:30-1:35 AM and 2:30-2:35 PM every other day.

There is an option to select which **Months** the task runs. Leaving each month unset is the same as selecting every month.

The **Days of Week** schedules the task to run on specific days. This is in addition to any listed days. For example, entering *1* in **Days** and setting *Wed* for **Days of Week** creates a schedule that starts a task on the first day of the month *and* every Wednesday of the month.

The **Schedule Preview** displays when the current settings mean the task runs.

Examples of CRON syntax

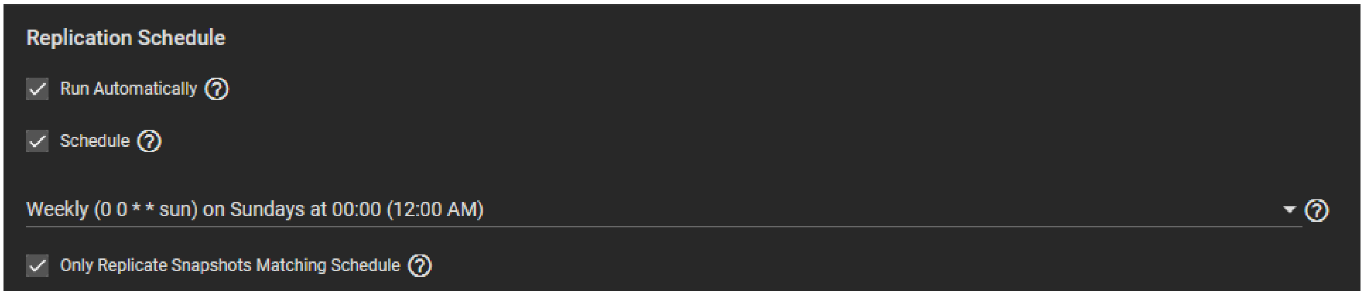
Syntax	Meaning	Examples
*	Every item.	* (minutes) = every minute of the hour. * (days) = every day.
*/N	Every N th item.	*/15 (minutes) = every 15th minute of the hour (every quarter hour). */3 (days) = every 3rd day. */3 (months) = every 3rd month.
Comma and hyphen/dash	Each stated item (comma) Each item in a range (hyphen/dash).	1,31 (minutes) = on the 1st and 31st minute of the hour. 1-3,31 (minutes) = on the 1st to 3rd minutes inclusive, and the 31st minute, of the hour. mon-fri (days) = every Monday to Friday inclusive (every weekday). mar,jun,sep,dec (months) = every March, June, September, December.

Days can be specified as days of month, or days of week.

With these options, you can create flexible schedules similar to these examples:

Desired schedule	Values to enter
3 times a day (at midnight, 08:00 and 16:00)	months=*; days=*; hours=0/8 or 0,8,16; minutes=0 (Meaning: every day of every month, when hours=0/8/16 and minutes=0)
Every Monday, Wednesday and Friday, at 8.30 pm	months=*; days=mon,wed,fri; hours=20; minutes=30
1st and 15th day of the month, during October to June, at 00:01 am	months=oct-dec,jan-jun; days=1,15; hours=0; minutes=1
Every 15 minutes during the working week, which is 8am - 7pm (08:00 - 19:00) Monday to Friday	Note that this requires two tasks to achieve: (1) months=*; days=mon-fri; hours=8-18; minutes=*/15 (2) months=*; days=mon-fri; hours=19; minutes=0 We need the second scheduled item, to execute at 19:00, otherwise we would stop at 18:45. Another workaround would be to stop at 18:45 or 19:45 rather than 19:00.

Setting *Only Replicate Snapshots Matching Schedule* restricts the replication to only replicate those snapshots created at the same time as the replication schedule.



Replication Schedule

☑ Run Automatically

☑ Schedule

Weekly (0 0 * * sun) on Sundays at 00:00 (12:00 AM)

☑ Only Replicate Snapshots Matching Schedule

4.6.4 - Troubleshooting Tips

This article contains some advice for investigating or solving issues with a Replication task.

Using a Custom Schema

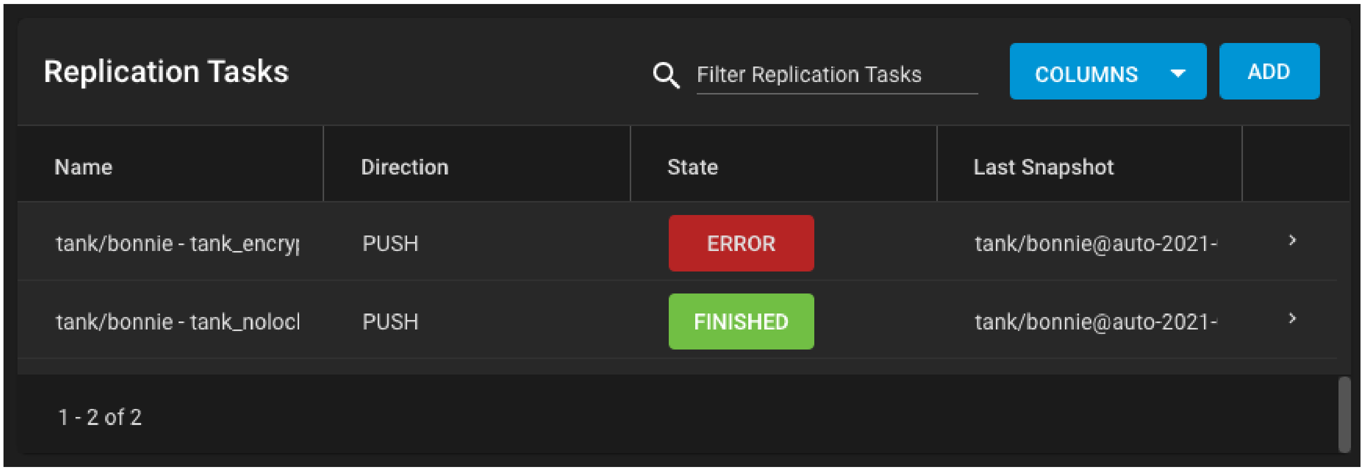
Snapshot Tasks that have been set up, or imported, with a custom schema name can be used for “full backup” replication tasks. Incremental replication tasks will not work.

There are several ways that a custom schema can be created:

- A ZFS dataset with snapshots has been imported into TrueNAS with a schema that doesn’t match the Truenas schema.
- A custom schema name has been created in the **Snapshot Task**. This occurs when the *Naming Schema* field in a **Periodic Snapshot Task** is used and the name of the schema is something other than the default.

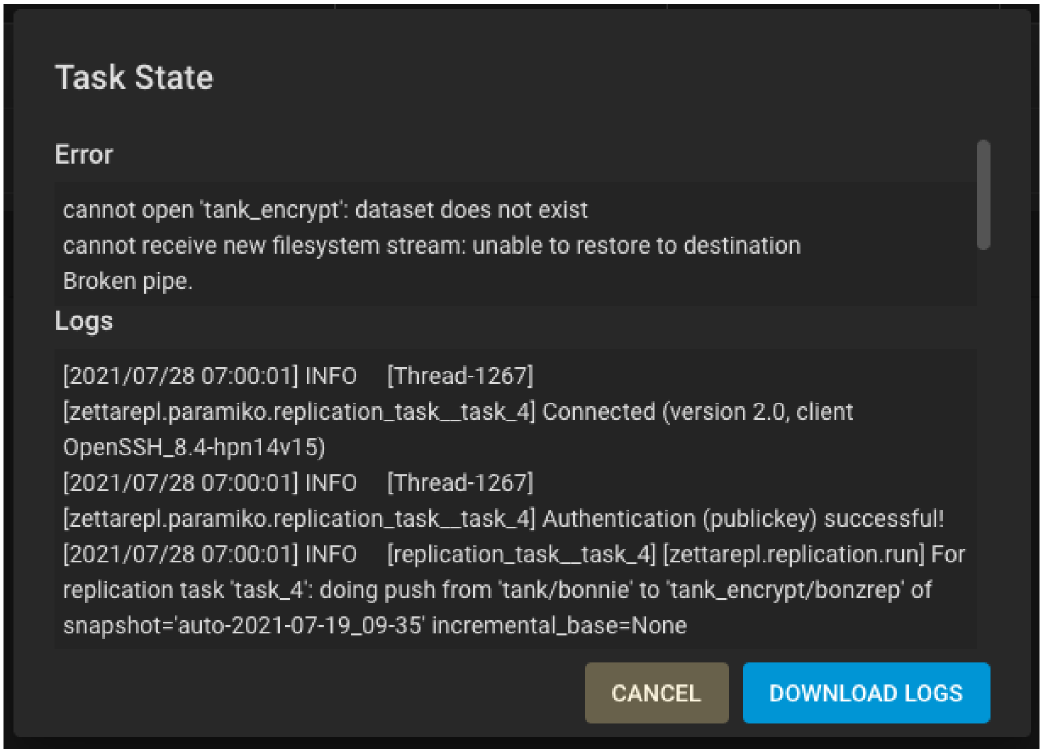
Replication Task Log

To view and download the replication task log, go to **Tasks > Replication Tasks**. Click on the *state* of the replication task.



Name	Direction	State	Last Snapshot	
tank/bonnie - tank_encry|	PUSH	ERROR	tank/bonnie@auto-2021-	›
tank/bonnie - tank_nolocl	PUSH	FINISHED	tank/bonnie@auto-2021-	›

1 - 2 of 2



Error

```
cannot open 'tank_encrypt': dataset does not exist
cannot receive new filesystem stream: unable to restore to destination
Broken pipe.
```

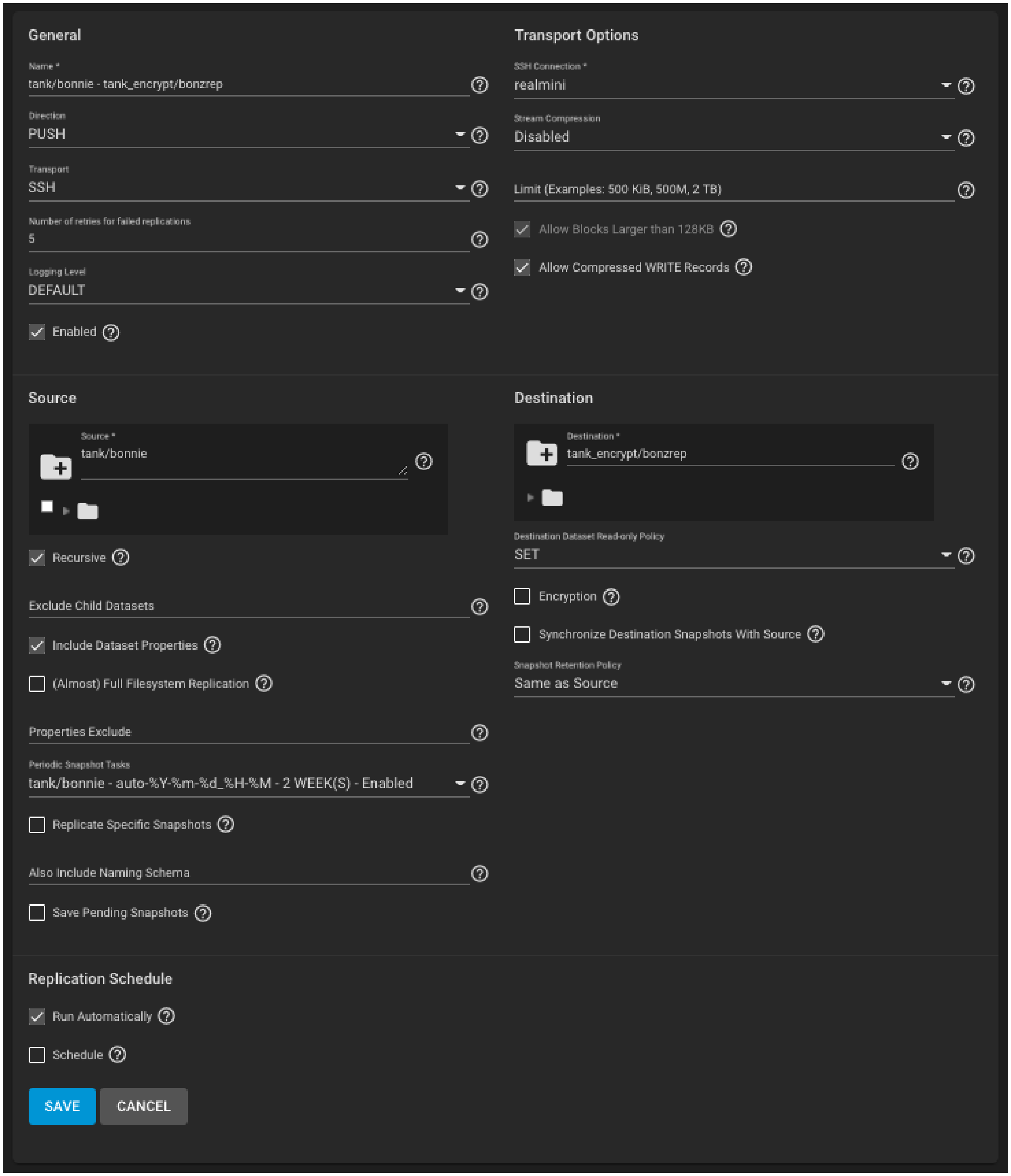
Logs

```
[2021/07/28 07:00:01] INFO     [Thread-1267]
[zettarepl.paramiko.replication_task__task_4] Connected (version 2.0, client
OpenSSH_8.4-hpn14v15)
[2021/07/28 07:00:01] INFO     [Thread-1267]
[zettarepl.paramiko.replication_task__task_4] Authentication (publickey) successful!
[2021/07/28 07:00:01] INFO     [replication_task__task_4] [zettarepl.replication.run] For
replication task 'task_4': doing push from 'tank/bonnie' to 'tank_encrypt/bonzrep' of
snapshot='auto-2021-07-19_09-35' incremental_base=None
```

Click the *DOWNLOAD LOGS* button to download the log file.

Editing a Replication Task

To edit the replication task, go to **Tasks > Replication Tasks**. Click the > to expand the replication task information, then click **EDIT**.



General

Name *
tank/bonnie - tank_encrypt/bonzrep

Direction
PUSH

Transport
SSH

Number of retries for failed replications
5

Logging Level
DEFAULT

☑ Enabled

Transport Options

SSH Connection *
realmini

Stream Compression
Disabled

Limit (Examples: 500 KiB, 500M, 2 TB)

☑ Allow Blocks Larger than 128KB

☑ Allow Compressed WRITE Records

Source

Source *
tank/bonnie

☑ Recursive

Exclude Child Datasets

☑ Include Dataset Properties

☐ (Almost) Full Filesystem Replication

Properties Exclude

Periodic Snapshot Tasks
tank/bonnie - auto-%Y-%m-%d_%H-%M - 2 WEEK(S) - Enabled

☐ Replicate Specific Snapshots

Also Include Naming Schema

☐ Save Pending Snapshots

Destination

Destination *
tank_encrypt/bonzrep

Destination Dataset Read-only Policy
SET

☐ Encryption

☐ Synchronize Destination Snapshots With Source

Snapshot Retention Policy
Same as Source

Replication Schedule

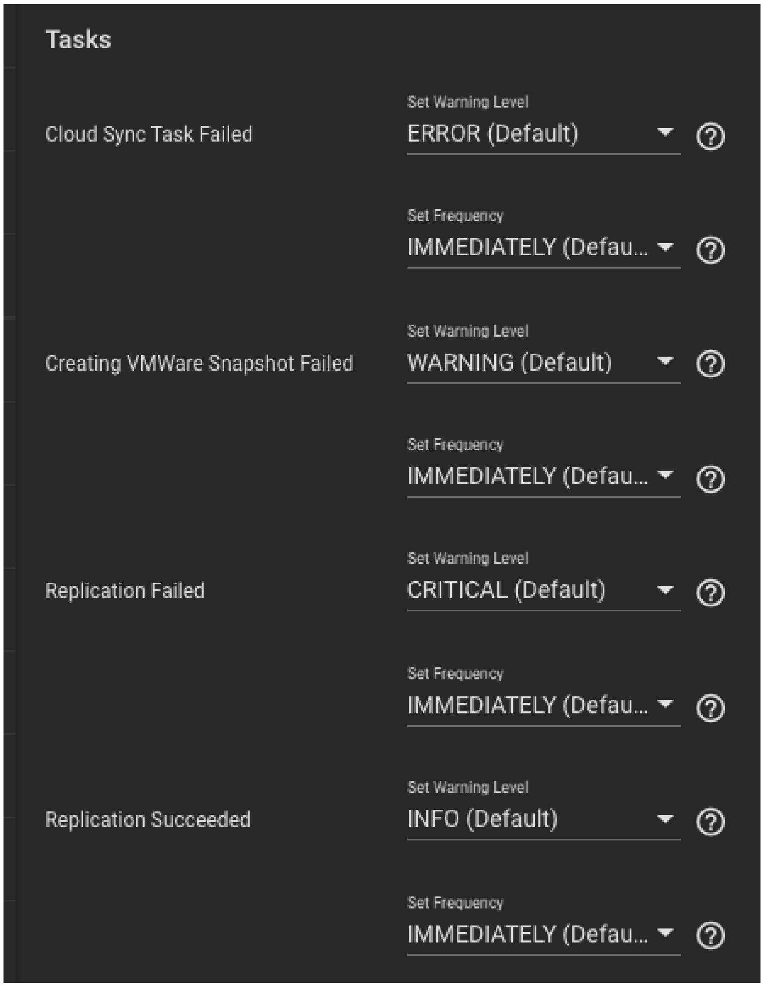
☑ Run Automatically

☐ Schedule

See **Replication Advanced Options** for descriptions of the available fields.

Replication Task Alert Priorities

To customize the importance and frequency of a Replication task alert (success or failure), go to **System > Alert Settings** and scroll down to the *Tasks* area. Set the *Warning Level* and how often the alert notification is sent.



Tasks

Cloud Sync Task Failed

Set Warning Level: ERROR (Default)

Set Frequency: IMMEDIATELY (Defau...

Creating VMWare Snapshot Failed

Set Warning Level: WARNING (Default)

Set Frequency: IMMEDIATELY (Defau...

Replication Failed

Set Warning Level: CRITICAL (Default)

Set Frequency: IMMEDIATELY (Defau...

Replication Succeeded

Set Warning Level: INFO (Default)

Set Frequency: IMMEDIATELY (Defau...

See **Alert Settings** for more information about this UI screen.

FAQ

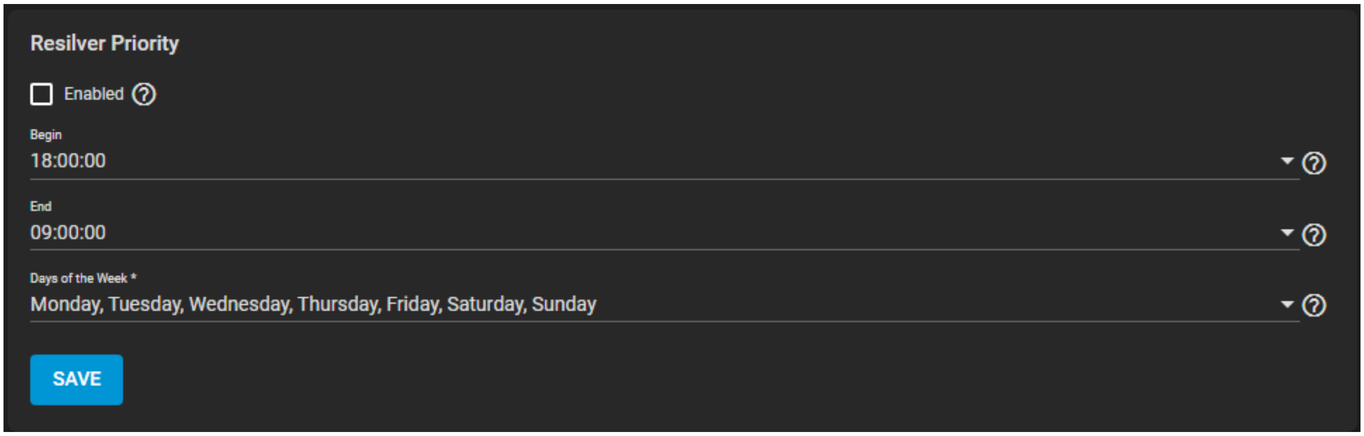
Question: If the internet connection goes down for a period of time, will the replication restart where it left off - including any intermediate snapshots? **Answer**: Yes.

Question: If a site changes a lot of data at one time and the internet bandwidth is not enough to finish sending the snapshot before the next one begins, will the replication jobs run one after the other and not stomp on each other? **Answer**: Yes.

4.7 - Resilver Priority

Resilvering is a process that copies data to a replacement disk and is best completed as quickly as possible. Increasing the priority of resilvers helps them finish faster. The **Resilver Priority** menu allows you to schedule when a resilver can become a higher priority for the system. This means scheduling resilvers when the additional I/O or CPU use does not affect normal usage.

Go to **Tasks > Resilver Priority** to configure the priority to a time that is most effective for your environment.



Resilver Priority

□ Enabled

Begin: 18:00:00

End: 09:00:00

Days of the Week *: Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday

Resilver Priority

Name	Description
Enabled	Set to run resilver tasks between the configured times.
Begin	Choose the hour and minute when a resilver process can run at a higher priority.
End	Choose the hour and minute after which a resilver process must return to running at a lower priority. A resilver process running after this time will likely take much longer to complete due to running at a lower priority compared to other disk and CPU activities, such as replications, SMB transfers, NFS transfers, Rsync transfers, S.M.A.R.T. tests, pool scrubs, user activity, etc.
Days of the Week	Select the days to run resilver tasks.

A resilver process running during the time-frame defined between “Begin Time” and “End Time” will likely work faster, as it is not being throttled to run at a lower priority. Keep in mind that it is advised to avoid putting the system under any intensive activity or heavy loads (replications, SMB transfers, NFS transfers, Rsync transfers, S.M.A.R.T. tests, pool scrubs, etc) during a resilver process.

4.8 - Scrub Tasks

A “scrub” is when ZFS scans the data on a pool. Scrubs identify data integrity problems, detect silent data corruptions caused by transient hardware issues, and provide early disk failure alerts.

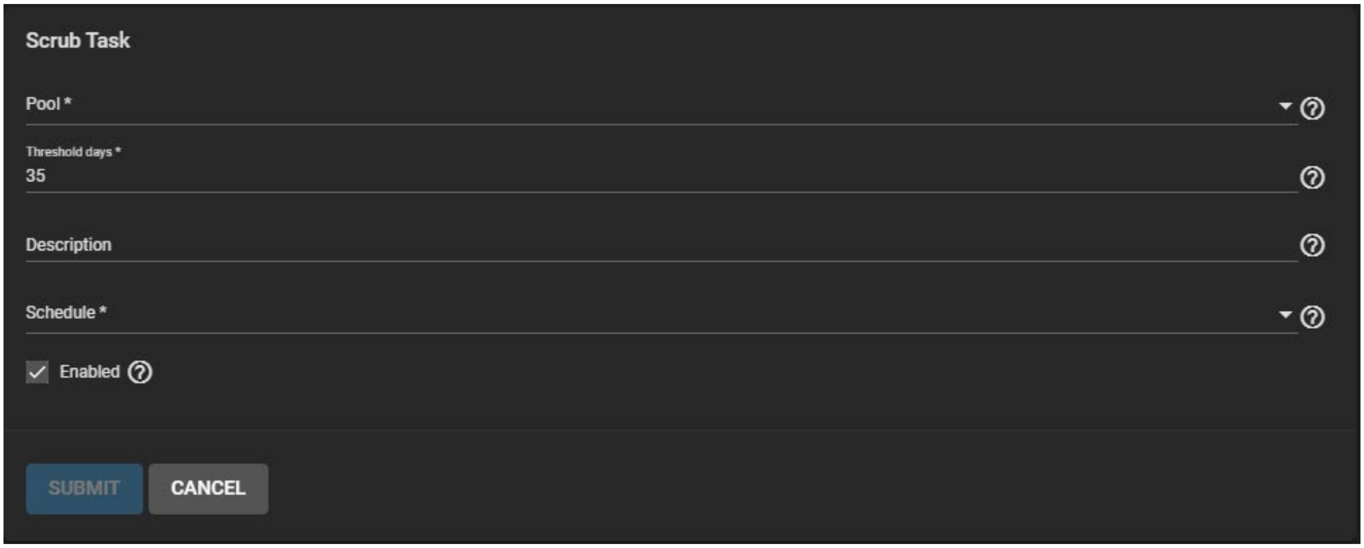
Default Scrub Tasks

By default, TrueNAS creates a scrub task when you create a new pool. The default schedule for a scrub is to run every Sunday at 12:00 AM. To edit the default scrub, go to **Tasks > Scrub Tasks**, click □, and *EDIT*.

Creating New Scrub Tasks

A data pool must exist before creating a scrub task.

To create a scrub task for a pool, go to **Tasks > Scrub Tasks** and click *ADD*.



Scrub Task

Pool *

Threshold days *
35

Description

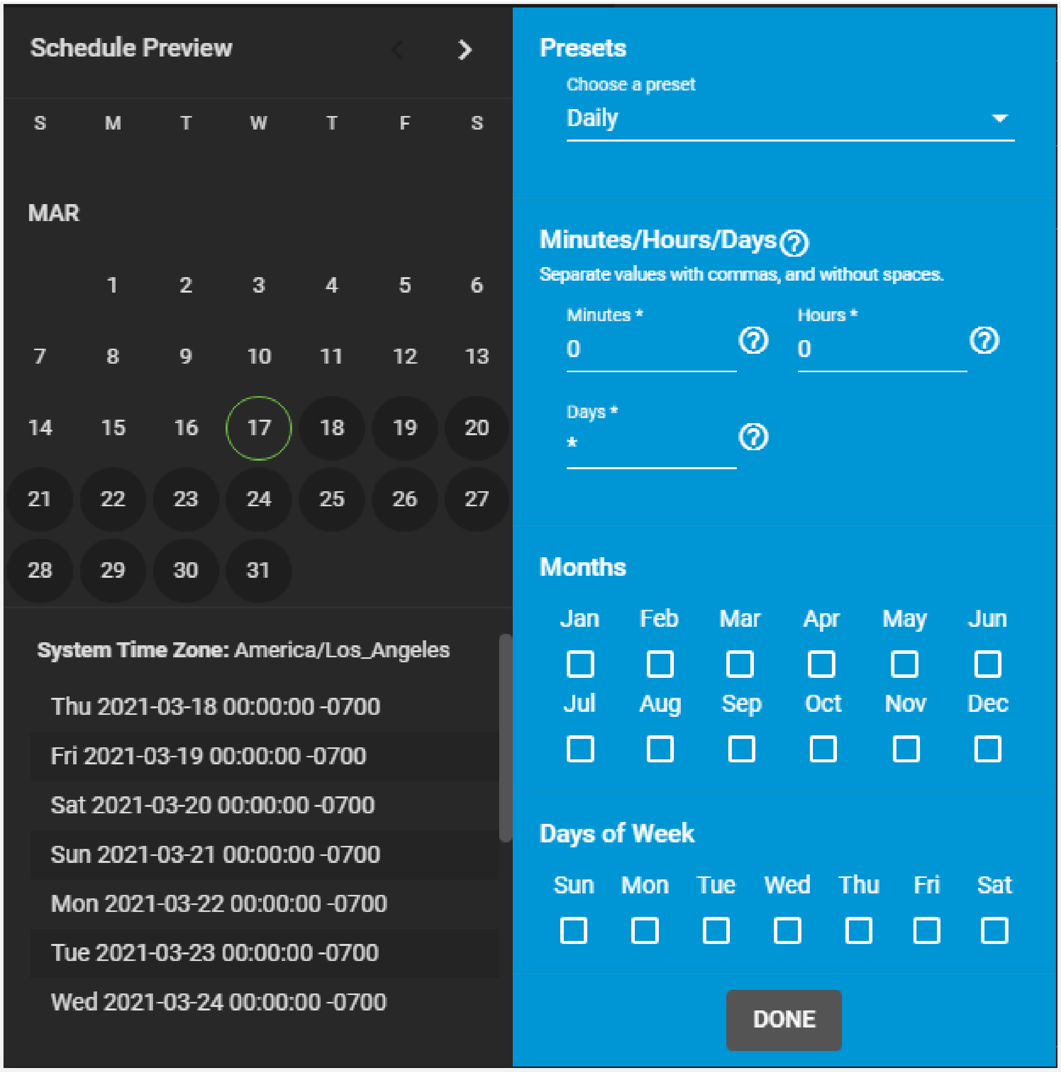
Schedule *

☑ Enabled

Scrub Task

Name	Description
Pool	Choose a pool to scrub.
Threshold days	Controls the task schedule by setting how many days must pass before a completed scrub can run again. If you schedule a scrub to run daily and set *Threshold days* to 7, the scrub attempts to run daily. If the scrub succeeds, it will check but won’t run again until seven days pass. Using a multiple of seven ensures the scrub runs on the same weekday.
Description	Describe the scrub task.
Schedule	How often to run the scrub task. Choose one of the presets or *Custom* to use the **Advanced Scheduler**.
Enabled	Unset to disable the scheduled scrub without deleting it.

Advanced Scheduler expand □



System Time Zone: America/Los_Angeles

Thu 2021-03-18 00:00:00 -0700
Fri 2021-03-19 00:00:00 -0700
Sat 2021-03-20 00:00:00 -0700
Sun 2021-03-21 00:00:00 -0700
Mon 2021-03-22 00:00:00 -0700
Tue 2021-03-23 00:00:00 -0700
Wed 2021-03-24 00:00:00 -0700

Presets

Choose a preset: Daily

Minutes/Hours/Days

Separate values with commas, and without spaces.

Minutes *: 0

Hours *: 0

Days *: *

Months

Jan □ Feb □ Mar □ Apr □ May □ Jun □
Jul □ Aug □ Sep □ Oct □ Nov □ Dec □

Days of Week

Sun □ Mon □ Tue □ Wed □ Thu □ Fri □ Sat □

Choosing a **Presets** option populates the rest of the fields. To customize a schedule, enter crontab values for the `Minutes/Hours/Days`.

These fields accept standard cron values. The simplest option is to enter a single number in the field. The task runs when the time value matches that number. For example, entering *10* means that the job runs when the time is ten minutes past the hour.

An asterisk (`*`) means match all values.

Specific time ranges are set by entering hyphenated number values. For example, entering *30-35* in the **Minutes** field sets the task to run at minutes 30, 31, 32, 33, 34, and 35.

You can also enter lists of values. Enter individual values separated by a comma (`,`). For example, entering *1,14* in the **Hours** field means the task runs at 1:00 AM (0100) and 2:00 PM (1400).

A slash (`/`) designates a step value. For example, while entering `*` in **Days** means the task runs every day of the month, `*/2` means the task runs every other day.

Combining all the above examples together creates a schedule running a task each minute from 1:30-1:35 AM and 2:30-2:35 PM every other day.

There is an option to select which **Months** the task runs. Leaving each month unset is the same as selecting every month.

The **Days of Week** schedules the task to run on specific days. This is in addition to any listed days. For example, entering *1* in **Days** and setting *Wed* for **Days of Week** creates a schedule that starts a task on the first day of the month *and* every Wednesday of the month.

The **Schedule Preview** displays when the current settings mean the task runs.

Examples of CRON syntax

Syntax	Meaning	Examples
*	Every item.	* (minutes) = every minute of the hour. * (days) = every day.
*/N	Every N th item.	*/15 (minutes) = every 15th minute of the hour (every quarter hour). */3 (days) = every 3rd day. */3 (months) = every 3rd month.
Comma and hyphen/dash	Each stated item (comma) Each item in a range (hyphen/dash).	1,31 (minutes) = on the 1st and 31st minute of the hour. 1-3,31 (minutes) = on the 1st to 3rd minutes inclusive, and the 31st minute, of the hour. mon-fri (days) = every Monday to Friday inclusive (every weekday). mar,jun,sep,dec (months) = every March, June, September, December.

Days can be specified as days of month, or days of week.

With these options, you can create flexible schedules similar to these examples:

Desired schedule	Values to enter
3 times a day (at midnight, 08:00 and 16:00)	months=*; days=*; hours=0/8 or 0,8,16; minutes=0 (Meaning: every day of every month, when hours=0/8/16 and minutes=0)
Every Monday, Wednesday and Friday, at 8.30 pm	months=*; days=mon,wed,fri; hours=20; minutes=30
1st and 15th day of the month, during October to June, at 00:01 am	months=oct-dec,jan-jun; days=1,15; hours=0; minutes=1
Every 15 minutes during the working week, which is 8am - 7pm (08:00 - 19:00) Monday to Friday	Note that this requires two tasks to achieve: (1) months=*; days=mon-fri; hours=8-18; minutes=*/15 (2) months=*; days=mon-fri; hours=19; minutes=0 We need the second scheduled item, to execute at 19:00, otherwise we would stop at 18:45. Another workaround would be to stop at 18:45 or 19:45 rather than 19:00.

4.9 - Cloud Sync Tasks

TrueNAS can send, receive, or synchronize data with a Cloud Storage provider. Cloud Sync tasks allow for single time transfers or recurring transfers on a schedule, and are an effective method to back up data to a remote location.

> Using the Cloud means that data can go to a third party commercial vendor not directly affiliated with iXsystems. Please investigate and fully understand that vendor's pricing policies and services before creating any Cloud Sync task. iXsystems is not responsible for any charges incurred from the use of third party vendors with the Cloud Sync feature.

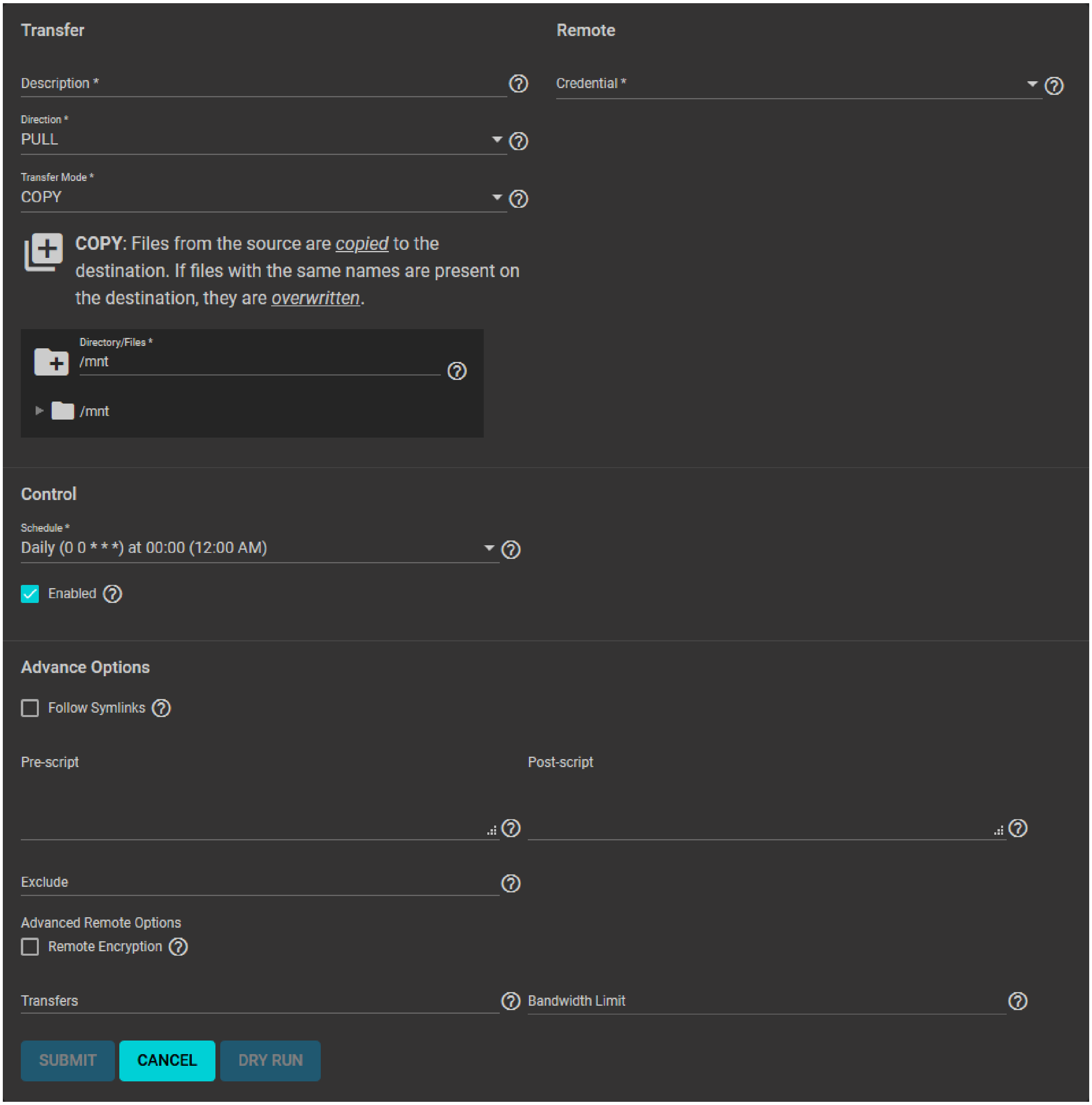
TrueNAS supports major providers like Amazon S3, Google Cloud, and Microsoft Azure, along with a variety of other vendors. To see the full list of supported vendors, go to **System > Cloud Credentials > Add** and open the *Provider* dropdown.

Requirements

- All system Storage must be configured and ready to receive or send data.
- A Cloud Storage provider account and a cloud storage location must be available, like an Amazon S3 bucket.
- Cloud Storage account credentials must be saved to **System > Cloud Credentials** before creating the sync task. See Cloud Credentials for specific instructions.

Creating a Cloud Sync Task

Go to **Tasks > Cloud Sync Tasks** and click *Add*.



Transfer

Description *

Direction *
PULL

Transfer Mode *
COPY

COPY: Files from the source are *copied* to the destination. If files with the same names are present on the destination, they are *overwritten*.

Directory/Files *
/mnt

/mnt

Remote

Credential *

Control

Schedule *
Daily (0 0 * * *) at 00:00 (12:00 AM)

☑ Enabled

Advance Options

☐ Follow Symlinks

Pre-script

Post-script

Exclude

Advanced Remote Options
☐ Remote Encryption

Transfers

Bandwidth Limit

Give the task a memorable *Description* and select an existing cloud *Credential*. TrueNAS connects to the chosen Cloud Storage Provider and shows the available storage locations. Decide if data is transferring to (*PUSH*) or from (*PULL*) the Cloud Storage location (**Remote**). Choose a *Transfer Mode*:

⊙ Sync

Sync keeps all the files identical between the two storage locations. If the sync encounters an error, files are not deleted in the destination. This includes a common error when the Dropbox copyright detector flags a file as copyrighted.

Note that syncing to a Backblaze B2 bucket does not delete files from the bucket, even when those files have been deleted locally. Instead, files are tagged with a version number or moved to a hidden state. To automatically delete old or unwanted files from the bucket, adjust the Backblaze B2 Lifecycle Rules.

Files stored in Amazon S3 Glacier or S3 Glacier Deep Archive cannot be deleted by a sync. These files must first be restored by another means, like the Amazon S3 console.

○ **Copy**

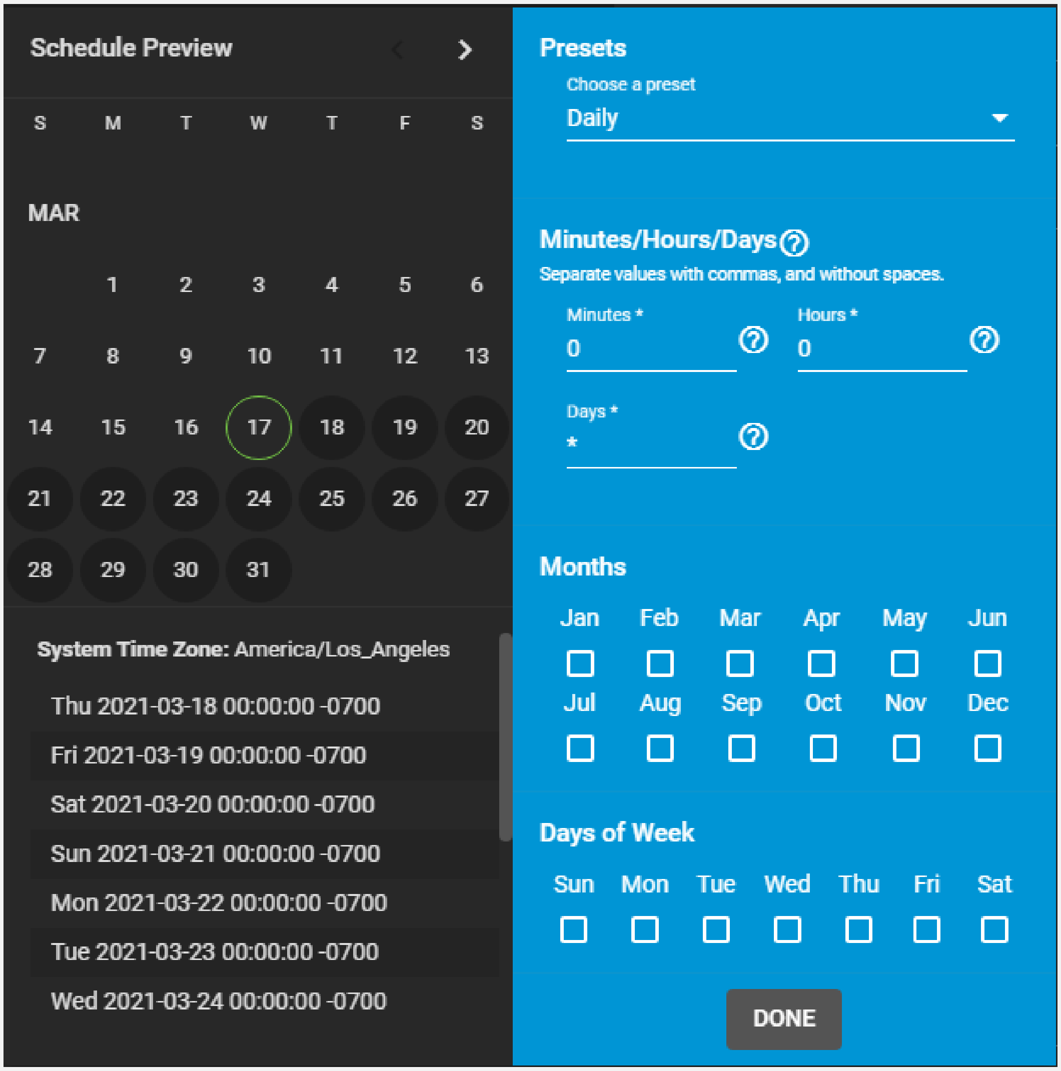
Copy duplicates each source file into the destination, *overwriting* any files in the destination that have the same name as the source. Copying is the least potentially destructive option.

○ **Move**

Move transfers the files from the source to the destination and *deletes* the original source files. Files with the same names on the destination are overwritten.

Next, **Control** when the task runs by defining a *Schedule*. When a specific *Schedule* is required, choose *Custom* and use the **Advanced Scheduler**.

Advanced Scheduler expand □



Schedule Preview

S	M	T	W	T	F	S
MAR						
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

System Time Zone: America/Los_Angeles

```
Thu 2021-03-18 00:00:00 -0700
Fri 2021-03-19 00:00:00 -0700
Sat 2021-03-20 00:00:00 -0700
Sun 2021-03-21 00:00:00 -0700
Mon 2021-03-22 00:00:00 -0700
Tue 2021-03-23 00:00:00 -0700
Wed 2021-03-24 00:00:00 -0700
```

Presets

Choose a preset: Daily

Minutes/Hours/Days

Separate values with commas, and without spaces.

Minutes *: 0

Hours *: 0

Days *: *

Months

Jan □ Feb □ Mar □ Apr □ May □ Jun □

Jul □ Aug □ Sep □ Oct □ Nov □ Dec □

Days of Week

Sun □ Mon □ Tue □ Wed □ Thu □ Fri □ Sat □

Choosing a **Presets** option populates the rest of the fields. To customize a schedule, enter crontab values for the `Minutes/Hours/Days`.

These fields accept standard cron values. The simplest option is to enter a single number in the field. The task runs when the time value matches that number. For example, entering *10* means that the job runs when the time is ten minutes past the hour.

An asterisk (`*`) means match all values.

Specific time ranges are set by entering hyphenated number values. For example, entering *30-35* in the **Minutes** field sets the task to run at minutes 30, 31, 32, 33, 34, and 35.

You can also enter lists of values. Enter individual values separated by a comma (`,`). For example, entering *1,14* in the **Hours** field means the task runs at 1:00 AM (0100) and 2:00 PM (1400).

A slash (`/`) designates a step value. For example, while entering `*` in **Days** means the task runs every day of the month, `*/2` means the task runs every other day.

Combining all the above examples together creates a schedule running a task each minute from 1:30-1:35 AM and 2:30-2:35 PM every other day.

There is an option to select which **Months** the task runs. Leaving each month unset is the same as selecting every month.

The **Days of Week** schedules the task to run on specific days. This is in addition to any listed days. For example, entering *1* in **Days** and setting *Wed* for **Days of Week** creates a schedule that starts a task on the first day of the month *and* every Wednesday of the month.

The **Schedule Preview** displays when the current settings mean the task runs.

Examples of CRON syntax

Syntax	Meaning	Examples
*	Every item.	* (minutes) = every minute of the hour. * (days) = every day.
*/N	Every N th item.	*/15 (minutes) = every 15th minute of the hour (every quarter hour). */3 (days) = every 3rd day. */3 (months) = every 3rd month.
Comma and hyphen/dash	Each stated item (comma) Each item in a range (hyphen/dash).	1,31 (minutes) = on the 1st and 31st minute of the hour. 1-3,31 (minutes) = on the 1st to 3rd minutes inclusive, and the 31st minute, of the hour. mon-fri (days) = every Monday to Friday inclusive (every weekday). mar,jun,sep,dec (months) = every March, June, September, December.

Days can be specified as days of month, or days of week.

With these options, you can create flexible schedules similar to these examples:

Desired schedule	Values to enter
3 times a day (at midnight, 08:00 and 16:00)	months=*; days=*; hours=0/8 or 0,8,16; minutes=0 (Meaning: every day of every month, when hours=0/8/16 and minutes=0)
Every Monday, Wednesday and Friday, at 8.30 pm	months=*; days=mon,wed,fri; hours=20; minutes=30
1st and 15th day of the month, during October to June, at 00:01 am	months=oct-dec,jan-jun; days=1,15; hours=0; minutes=1
Every 15 minutes during the working week, which is 8am - 7pm (08:00 - 19:00) Monday to Friday	Note that this requires two tasks to achieve: (1) months=*; days=mon-fri; hours=8-18; minutes=*/15 (2) months=*; days=mon-fri; hours=19; minutes=0 We need the second scheduled item, to execute at 19:00, otherwise we would stop at 18:45. Another workaround would be to stop at 18:45 or 19:45 rather than 19:00.

Unsetting *Enable* makes the configuration available without allowing the *Schedule* to run the task. To manually activate a saved task, go to **Tasks > Cloud Sync Tasks**, click □ to expand a task, and click *RUN NOW*.

The remaining options allow tuning the task to your specific requirements.

Specific Options expand □

Transfer

Name	Description
Description	Enter a description of the Cloud Sync Task.
Direction	PUSH sends data to cloud storage. PULL receives data from cloud storage. Changing the direction resets the Transfer Mode to COPY.
Transfer Mode	SYNC: Files on the destination are changed to match those on the source. If a file does not exist on the source, it is also deleted from the destination. COPY: Files from the source are copied to the destination. If files with the same names are present on the destination, they are overwritten. MOVE: After files are copied from the source to the destination, they are deleted from the source. Files with the same names on the destination are overwritten.
Directory/Files	Select the directories or files to be sent to the cloud for Push syncs, or the destination to be written for Pull syncs. Be cautious about the destination of Pull jobs to avoid overwriting existing files.

Remote

Name	Description
Credential	Select the cloud storage provider credentials from the list of available Cloud Credentials.

Control

Name	Description
Schedule	Select a schedule preset or choose Custom to open the advanced scheduler.
Enabled	Enable this Cloud Sync Task. Unset to disable this Cloud Sync Task without deleting it.

Advanced Options

Name	Description
Follow Symlinks	Follow symlinks and copy the items to which they link.
Pre-Script	Script to execute before running sync.
Post-Script	Script to execute after running sync.
Exclude	List of files and directories to exclude from sync. Separate entries by pressing `Enter`. Examples of proper syntax used to exclude files/directories are: • `photos` will exclude a file named “photos” • `/photos` will exclude a file named “photos” from root directory (but not subdirectories) • `photos/` will exclude a directory named “photos” • `/photos/` will exclude a directory named “photos” from root directory (but not subdirectories). See [rclone filtering](#) for more details about the `--exclude` option.

Advanced Remote Options

Name	Description
	PUSH: Encrypt files before transfer and store the encrypted files on the remote system. Files are

Remote Encryption	encrypted using the Encryption Password and Encryption Salt values. *PULL*: Decrypt files that are being stored on the remote system before the transfer. Transferring the encrypted files requires entering the same Encryption Password and Encryption Salt that was used to encrypt the files. Additional details about the encryption algorithm and key derivation are available in the rclone crypt File formats documentation.
Transfers	Number of simultaneous file transfers. Enter a number based on the available bandwidth and destination system performance. See rclone –transfers .
Bandwidth limit	A single bandwidth limit or bandwidth limit schedule in rclone format. Separate entries by pressing Enter. Example: `08:00,512 12:00,10MB 13:00,512 18:00,30MB 23:00,off`. Units can be specified with the beginning letter: b, k (default), M, or G. See rclone –bwlimit .

Scripting and Environment Variables

Advanced users can write scripts that run immediately *before* or *after* the Cloud Sync task. The **Post-script** field is only run when the Cloud Sync task successfully completes. You can pass a variety of task environment variables into the **Pre-** and **Post-** script fields:

- CLOUD_SYNC_ID
- CLOUD_SYNC_DESCRIPTION
- CLOUD_SYNC_DIRECTION
- CLOUD_SYNC_TRANSFER_MODE
- CLOUD_SYNC_ENCRYPTION
- CLOUD_SYNC_FILENAME_ENCRYPTION
- CLOUD_SYNC_ENCRYPTION_PASSWORD
- CLOUD_SYNC_ENCRYPTION_SALT
- CLOUD_SYNC_SNAPSHOT

There also are provider-specific variables like CLOUD_SYNC_CLIENT_ID or CLOUD_SYNC_TOKEN or CLOUD_SYNC_CHUNK_SIZE

Remote storage settings:

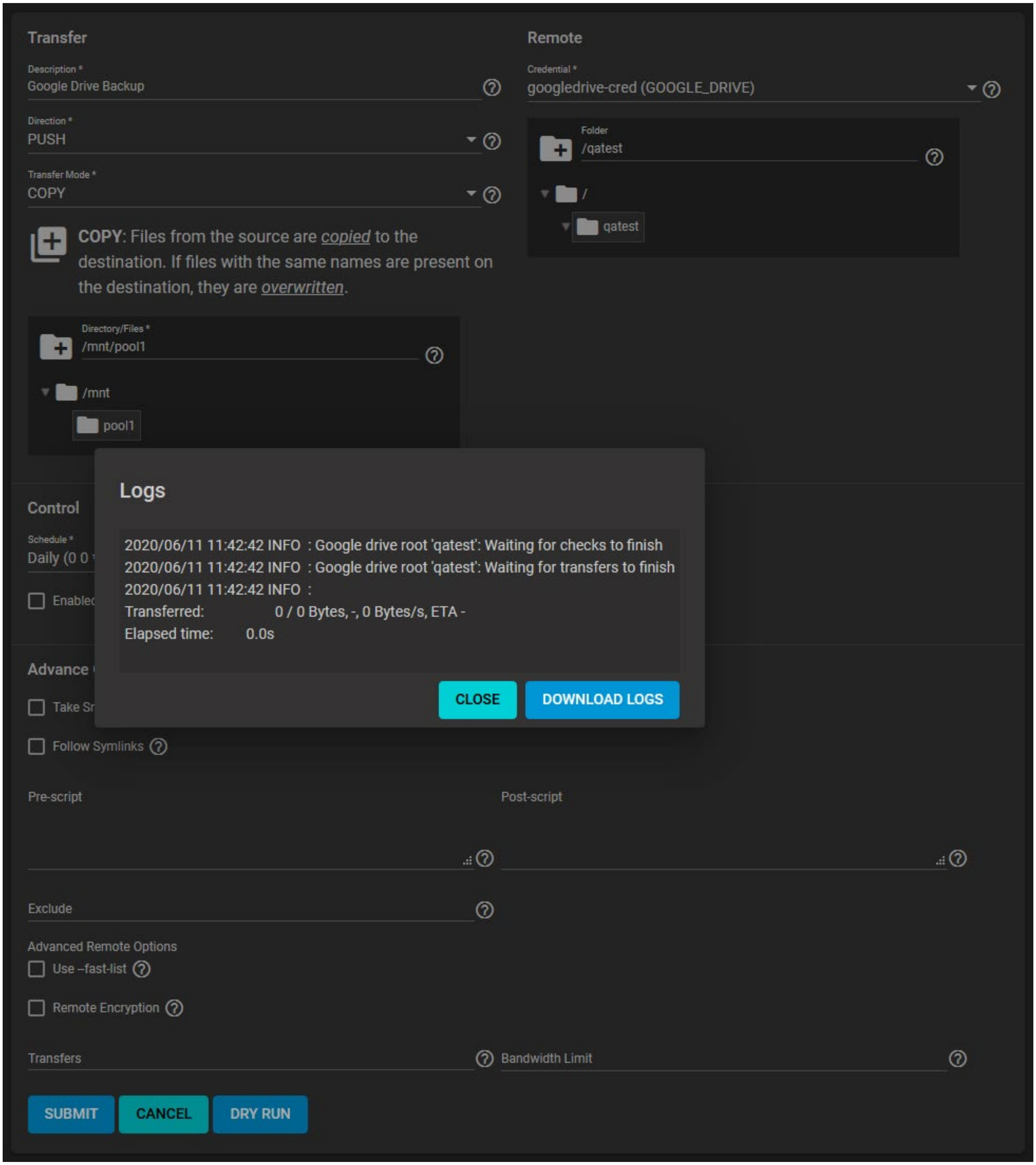
- CLOUD_SYNC_BUCKET
- CLOUD_SYNC_FOLDER

Local storage settings:

- CLOUD_SYNC_PATH

Testing Settings

Test the settings before saving by clicking *DRY RUN*. TrueNAS connects to the Cloud Storage Provider and simulates a file transfer. No data is actually sent or received. A dialog shows the test status and allows downloading the task logs.



Transfer

Description * Google Drive Backup

Direction * PUSH

Transfer Mode * COPY

COPY: Files from the source are *copied* to the destination. If files with the same names are present on the destination, they are *overwritten*.

Directory/Files * /mnt/pool1

Remote

Credential * googledrive-cred (GOOGLE_DRIVE)

Folder /qatest

Control

Schedule * Daily (0 0

□ Enablec

Advance

□ Take Sr

□ Follow Symlinks

Pre-script

Post-script

Exclude

Advanced Remote Options

□ Use --fast-list

□ Remote Encryption

Transfers

Bandwidth Limit

Logs

```
2020/06/11 11:42:42 INFO  : Google drive root 'qatest': Waiting for checks to finish
2020/06/11 11:42:42 INFO  : Google drive root 'qatest': Waiting for transfers to finish
2020/06/11 11:42:42 INFO  :
Transferred:            0 / 0 Bytes, -, 0 Bytes/s, ETA -
Elapsed time:       0.0s
```

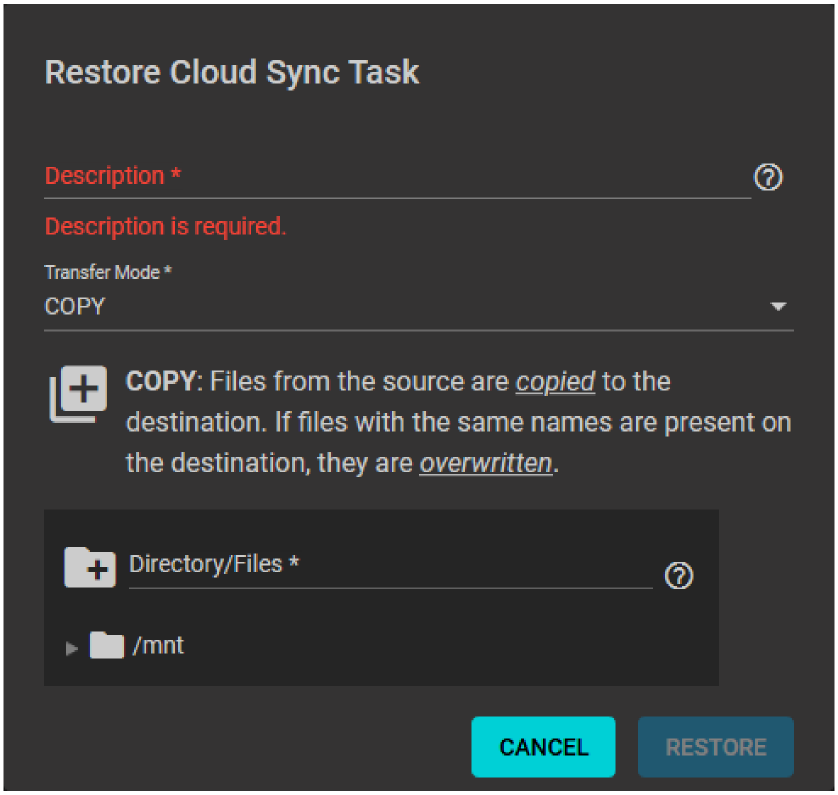
Cloud Sync Behavior

Saved tasks are activated according to their schedule or by clicking **RUN NOW**. An in-progress cloud sync must finish before another can begin. Stopping an in-progress task cancels the file transfer and requires starting the file transfer over.

To view logs about a running or the most recent run of a task, click the task status.

Cloud Sync Restore

To quickly create a new Cloud Sync that uses the same options but reverses the data transfer, expand (□) an existing Cloud Sync and click *RESTORE*.



Restore Cloud Sync Task

Description *

Description is required.

Transfer Mode *
COPY

COPY: Files from the source are *copied* to the destination. If files with the same names are present on the destination, they are *overwritten*.

Directory/Files *

/mnt

Enter a new *Description* for this reversed task and define the path to a storage location for the transferred data.

The restored cloud sync is saved as another entry in **Tasks > Cloud Sync Tasks**.

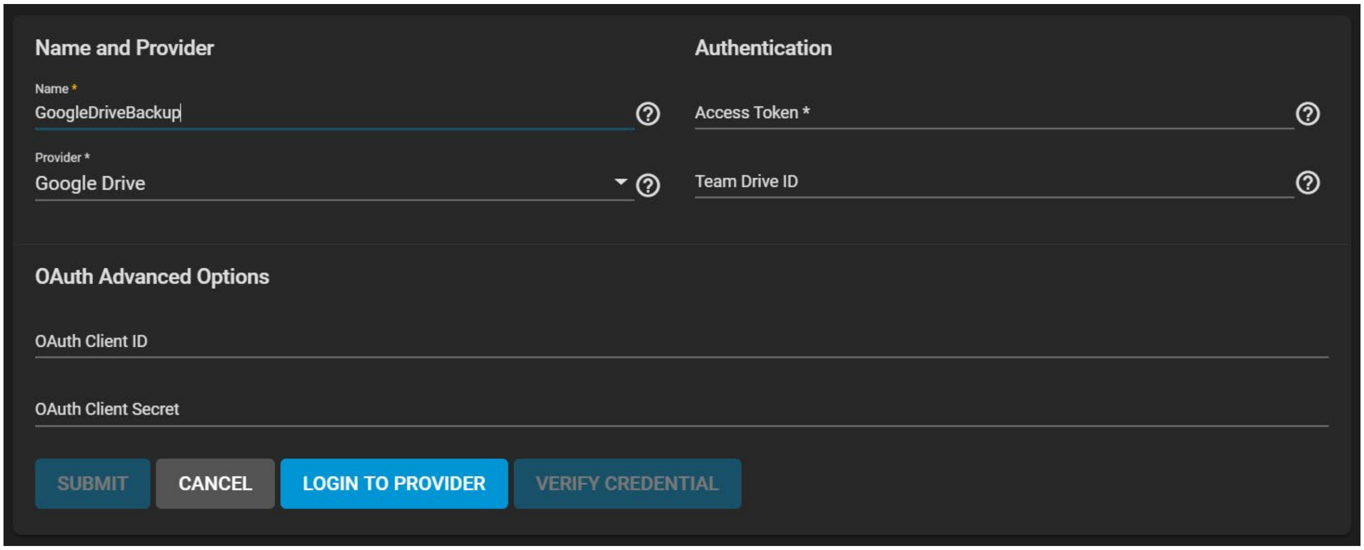
In case the restore destination dataset is the same as the original source dataset, the restored files might have their ownership altered to *root*. If the original files were not created by *root* and a different owner is required, you can recursively reset ACL Permissions of the restored dataset through the GUI or by running chown from the CLI.

4.10 - How To Back Up Google Drive to TrueNAS CORE

Google Drive and G Suite are widely used to create and share documents, spreadsheets, and presentations with team members. While cloud-based tools have inherent backups and replications included by the cloud provider, certain users may require additional backup or archive capabilities. For example, companies using G Suite for important work may need to keep records for years, potentially beyond the scope of the G Suite subscription. TrueNAS can easily back up Google Drive using its built-in cloud sync.

Setting up Google Drive credentials

Go to **System > Cloud Credentials** and click *ADD*. Name the Credential and select *Google Drive* as the Provider. Click *LOGIN TO PROVIDER* and log in with the appropriate Google user account.



Name and Provider

Name * GoogleDriveBackup

Provider * Google Drive

Authentication

Access Token *

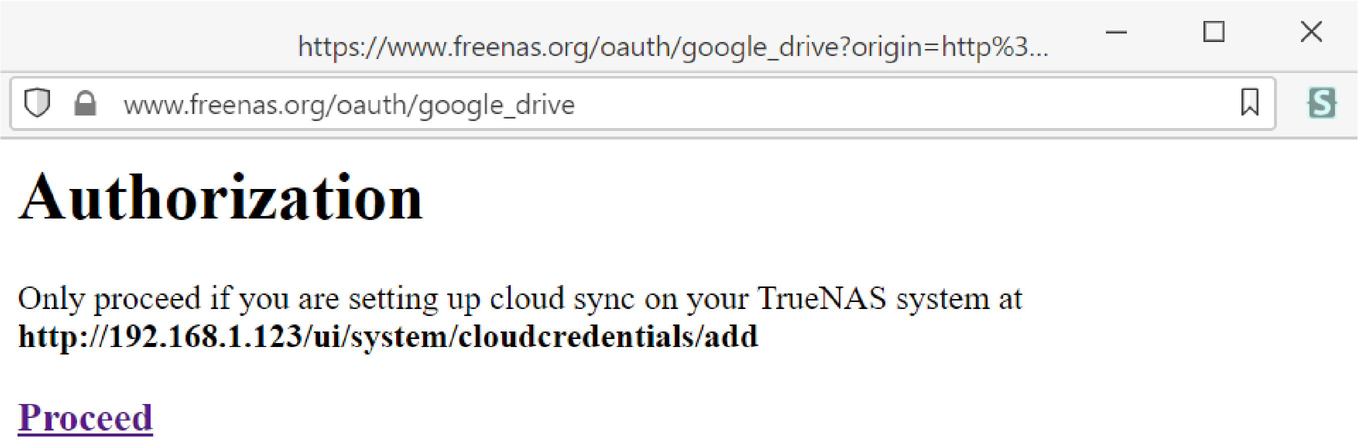
Team Drive ID

OAuth Advanced Options

OAuth Client ID

OAuth Client Secret

Google will request permission to access all the Google Drive files for the FreeNAS device.



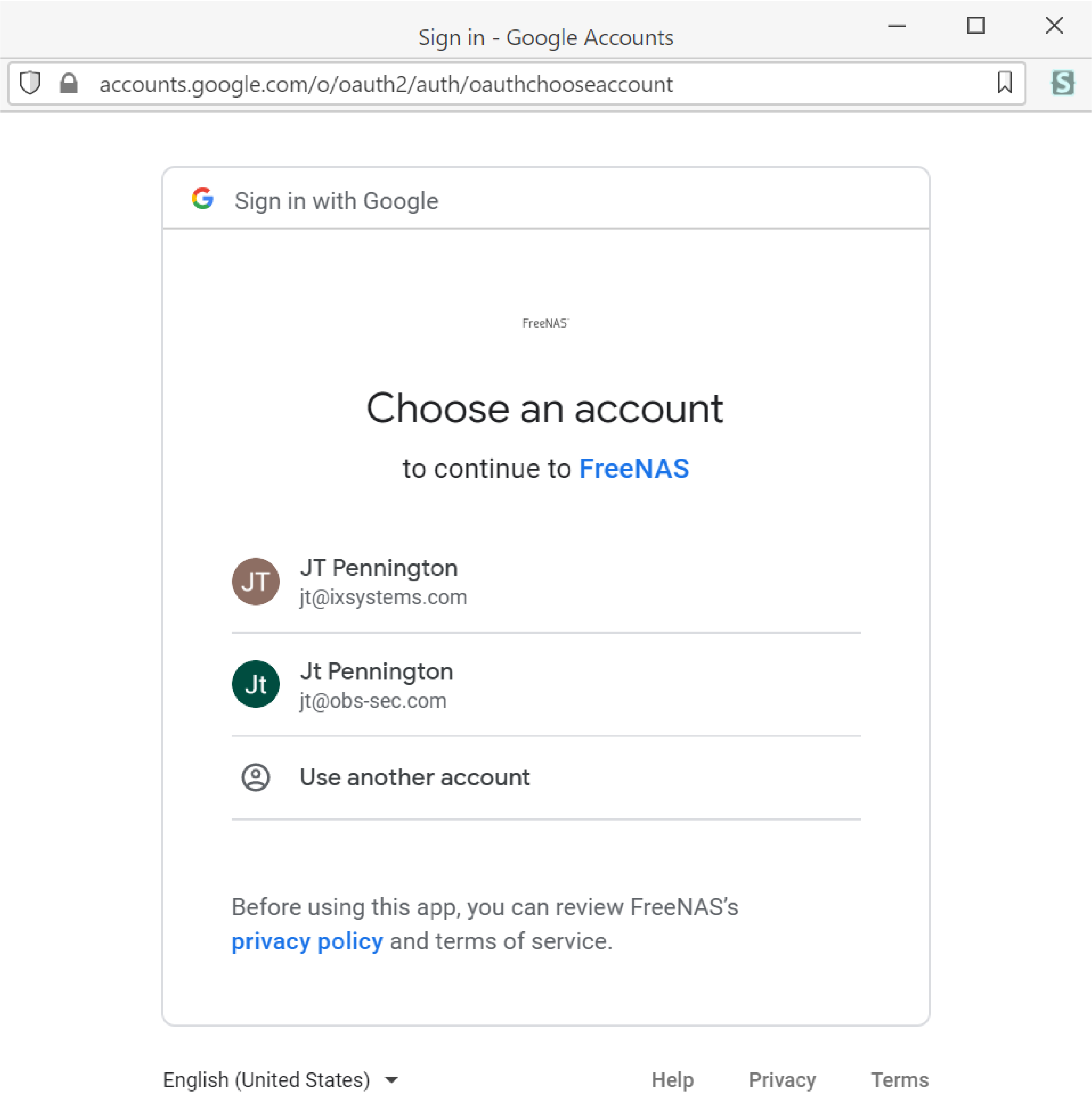
https://www.freenas.org/oauth/google_drive?origin=http%3...

www.freenas.org/oauth/google_drive

Authorization

Only proceed if you are setting up cloud sync on your TrueNAS system at **http://192.168.1.123/ui/system/cloudcredentials/add**

Proceed



Sign in - Google Accounts

accounts.google.com/o/oauth2/auth/oauthchooseaccount

Sign in with Google

FreeNAS

Choose an account

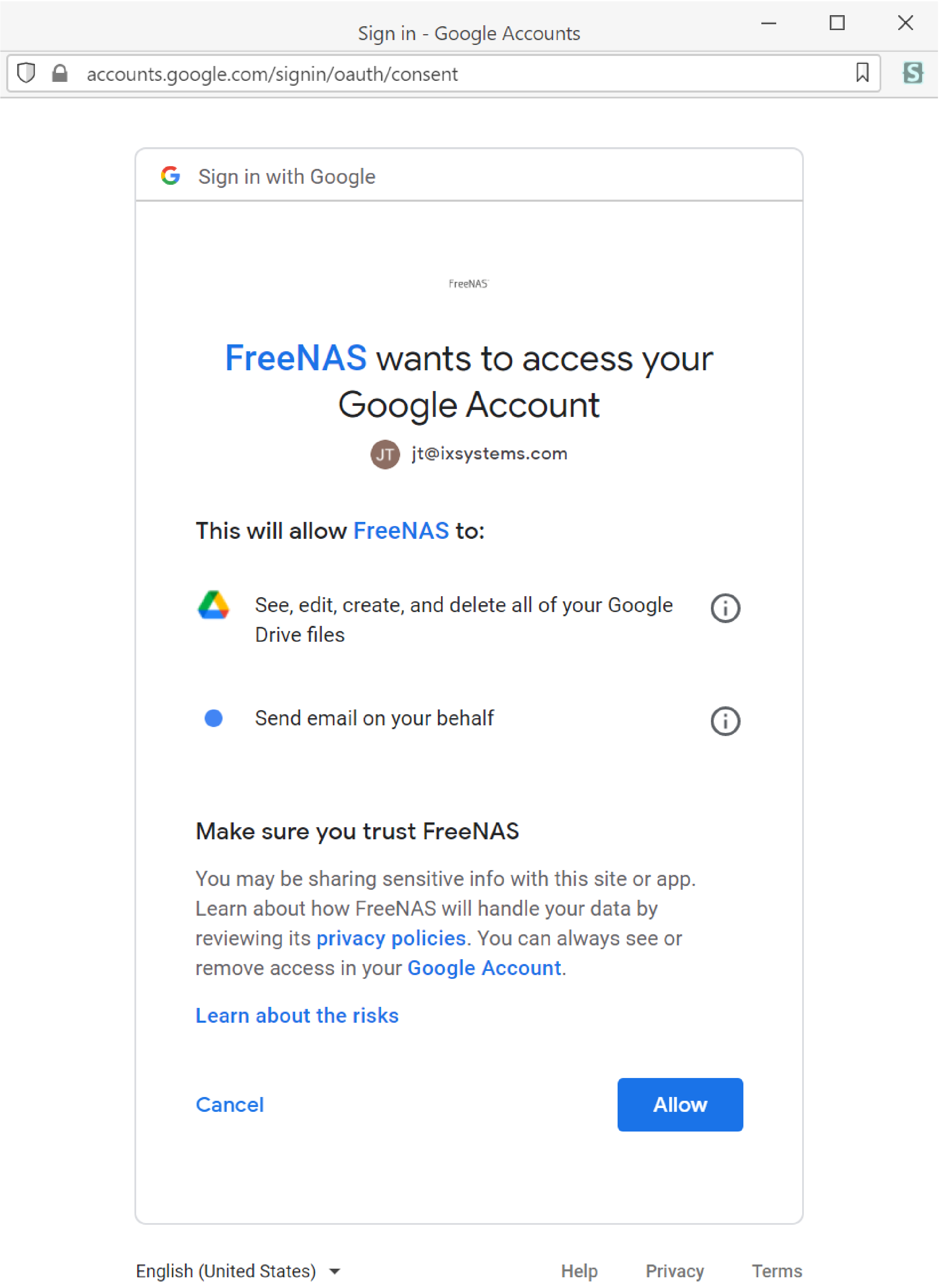
to continue to FreeNAS

JT Pennington
jt@ixsystems.com

Jt Pennington
jt@obs-sec.com

Use another account

Before using this app, you can review FreeNAS's privacy policy and terms of service.


Sign in - Google Accounts
accounts.google.com/signin/oauth/consent
Sign in with Google
FreeNAS

FreeNAS wants to access your Google Account

JT jt@ixsystems.com

This will allow FreeNAS to:

See, edit, create, and delete all of your Google Drive files

Send email on your behalf

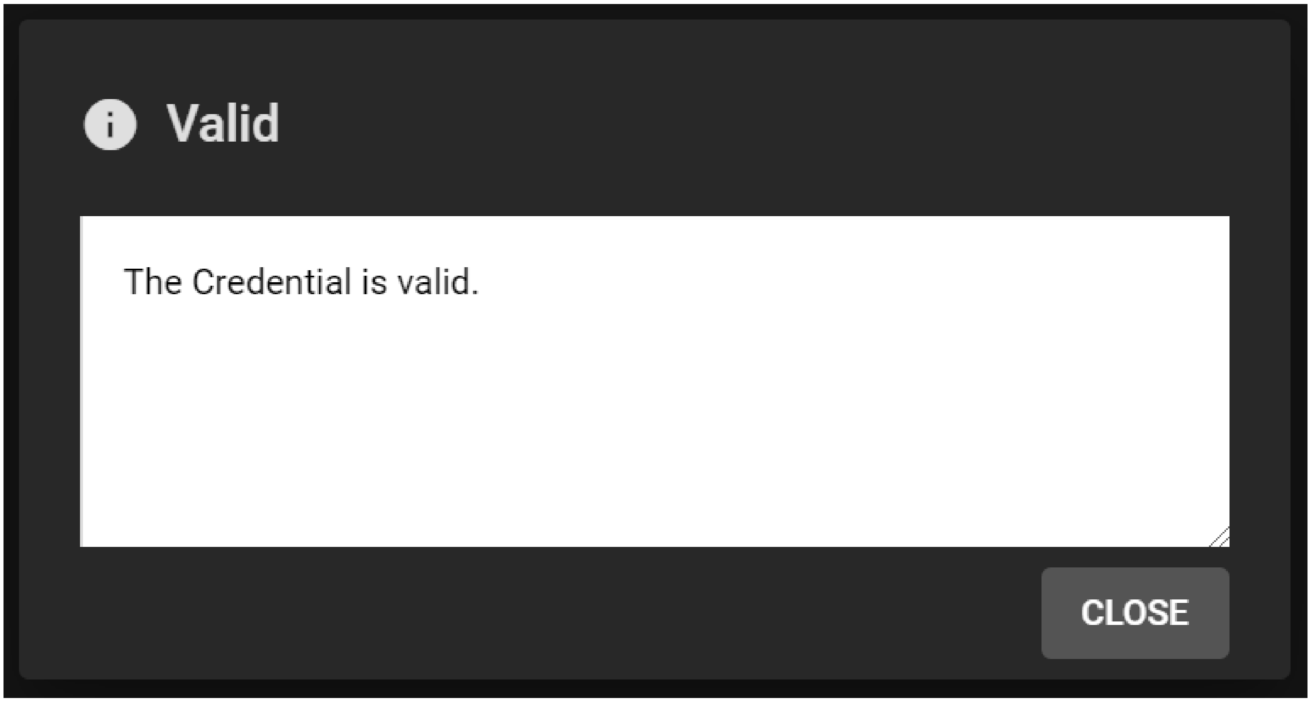
Make sure you trust FreeNAS

You may be sharing sensitive info with this site or app. Learn about how FreeNAS will handle your data by reviewing its privacy policies. You can always see or remove access in your Google Account.

Learn about the risks

Allow access and the appropriate access key will generate in the FreeNAS access token. You may assign a Team ID if necessary.

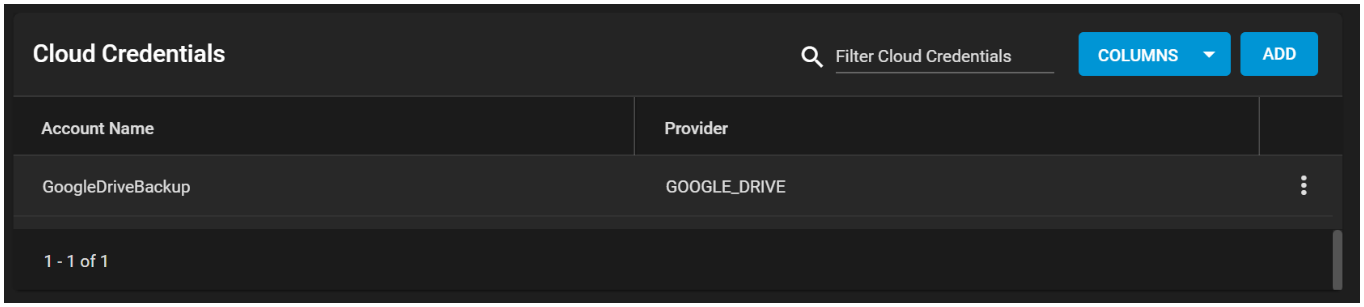
Click *VERIFY CREDENTIAL* and wait for it to verify.



Valid

The Credential is valid.

Once successful, click *SUBMIT*. The new cloud credentials will be visible in the web interface.



Cloud Credentials

Account Name	Provider
GoogleDriveBackup	GOOGLE_DRIVE

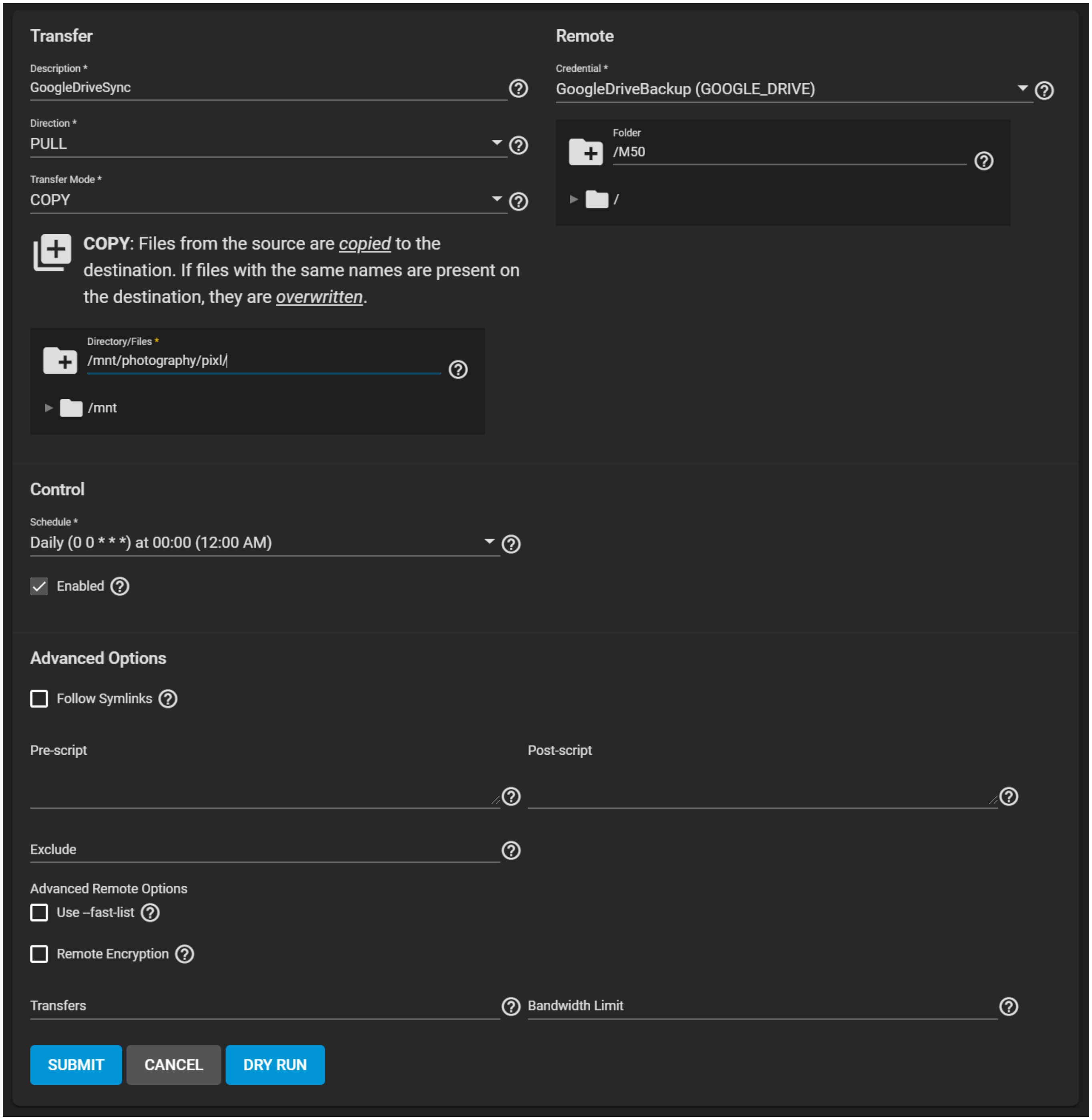
1 - 1 of 1

Set the cloud sync task

Go to **Tasks > Cloud Sync Tasks** and set the backup time frame, frequency, and folders – both the cloud-based folder and TrueNAS dataset. Set whether the synchronization should sync all changes, copy new files, or move files. Files are removed from the cloud source or TrueNAS source depending on if the task is set to push or pull. Add a description for the task and select the cloud credentials. Choose the appropriate cloud folder target and TrueNAS storage location.

Select the file transfer mode:

- **Sync**: Keep files newly created or deleted the same.
- **Copy**: Copy new files to the appropriate target (i.e., TrueNAS pulls files from Google Drive or pushes files to Google Drive).
- **Move**: Copy files to the target and then delete them from the source. Using Move, users can set a folder in Google Drive for archival, and move older documents to that folder from their Drive account. Those files would then automatically get backed up to their TrueNAS storage.



Transfer

Description * GoogleDriveSync

Direction * PULL

Transfer Mode * COPY

COPY: Files from the source are *copied* to the destination. If files with the same names are present on the destination, they are *overwritten*.

Directory/Files * /mnt/photography/pixl/

▸ /mnt

Remote

Credential * GoogleDriveBackup (GOOGLE_DRIVE)

Folder /M50

▸ /

Control

Schedule * Daily (0 0 * * *) at 00:00 (12:00 AM)

☑ Enabled

Advanced Options

□ Follow Symlinks

Pre-script

Post-script

Exclude

Advanced Remote Options

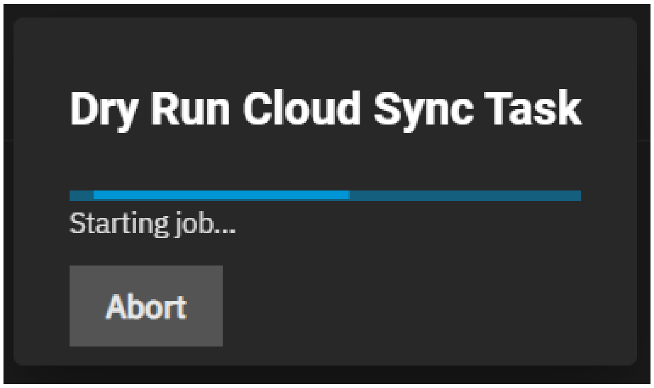
□ Use –fast-list

□ Remote Encryption

Transfers

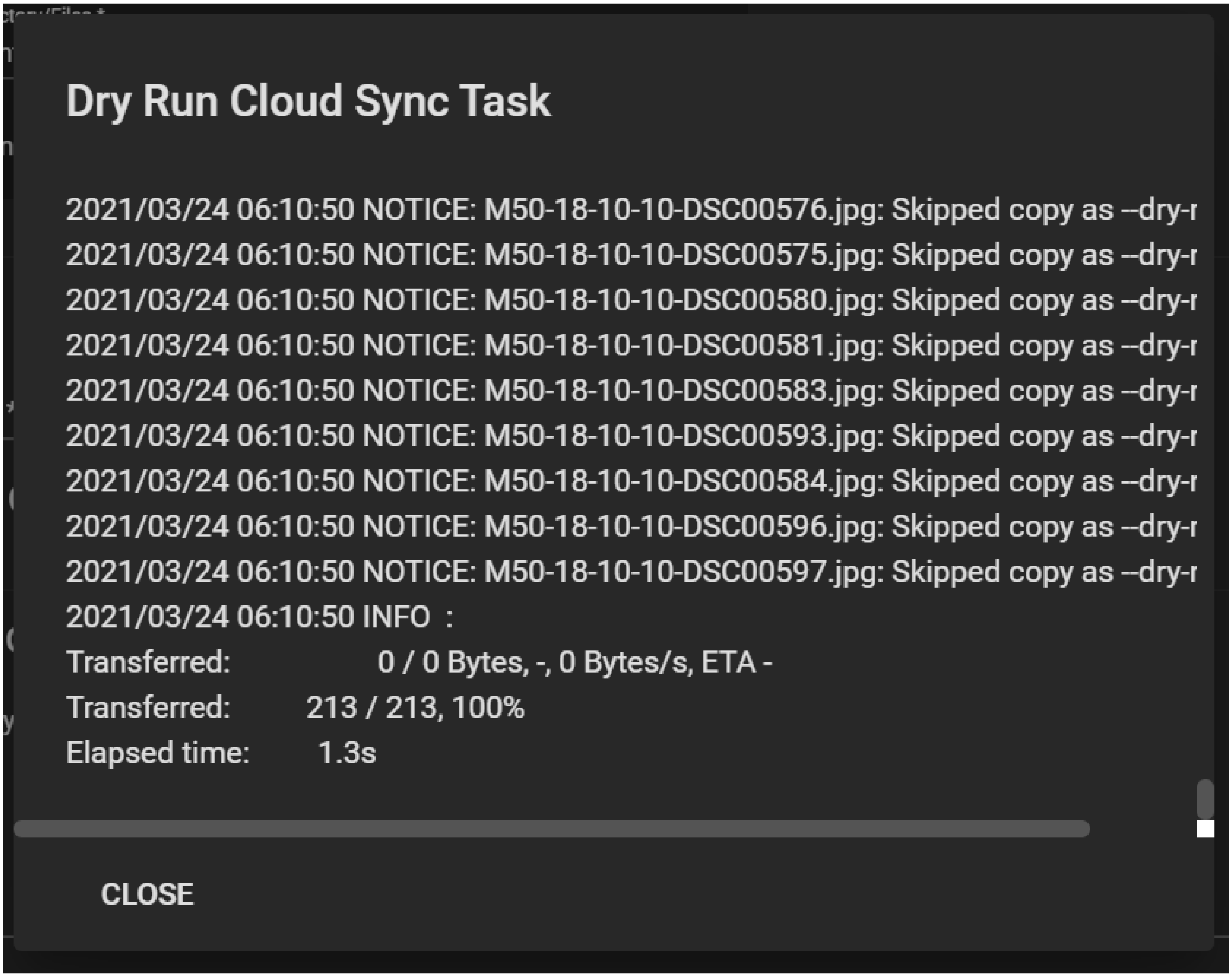
Bandwidth Limit

Once you create the task, attempt a Dry Run.



Dry Run Cloud Sync Task

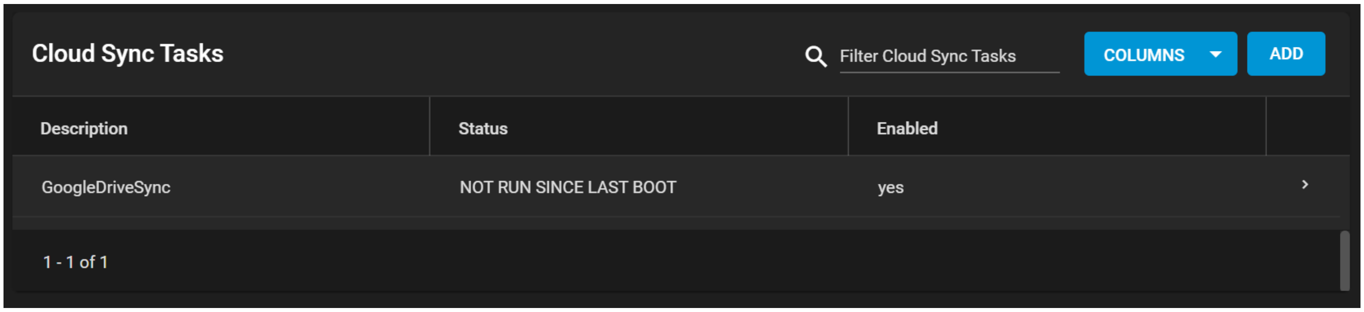
Starting job...



Dry Run Cloud Sync Task

```
2021/03/24 06:10:50 NOTICE: M50-18-10-10-DSC00576.jpg: Skipped copy as --dry-r
2021/03/24 06:10:50 NOTICE: M50-18-10-10-DSC00575.jpg: Skipped copy as --dry-r
2021/03/24 06:10:50 NOTICE: M50-18-10-10-DSC00580.jpg: Skipped copy as --dry-r
2021/03/24 06:10:50 NOTICE: M50-18-10-10-DSC00581.jpg: Skipped copy as --dry-r
2021/03/24 06:10:50 NOTICE: M50-18-10-10-DSC00583.jpg: Skipped copy as --dry-r
2021/03/24 06:10:50 NOTICE: M50-18-10-10-DSC00593.jpg: Skipped copy as --dry-r
2021/03/24 06:10:50 NOTICE: M50-18-10-10-DSC00584.jpg: Skipped copy as --dry-r
2021/03/24 06:10:50 NOTICE: M50-18-10-10-DSC00596.jpg: Skipped copy as --dry-r
2021/03/24 06:10:50 NOTICE: M50-18-10-10-DSC00597.jpg: Skipped copy as --dry-r
2021/03/24 06:10:50 INFO  :
Transferred:             0 / 0 Bytes, -, 0 Bytes/s, ETA -
Transferred:          213 / 213, 100%
Elapsed time:          1.3s
```

If the Dry Run succeeds, click *SAVE* to save the task.

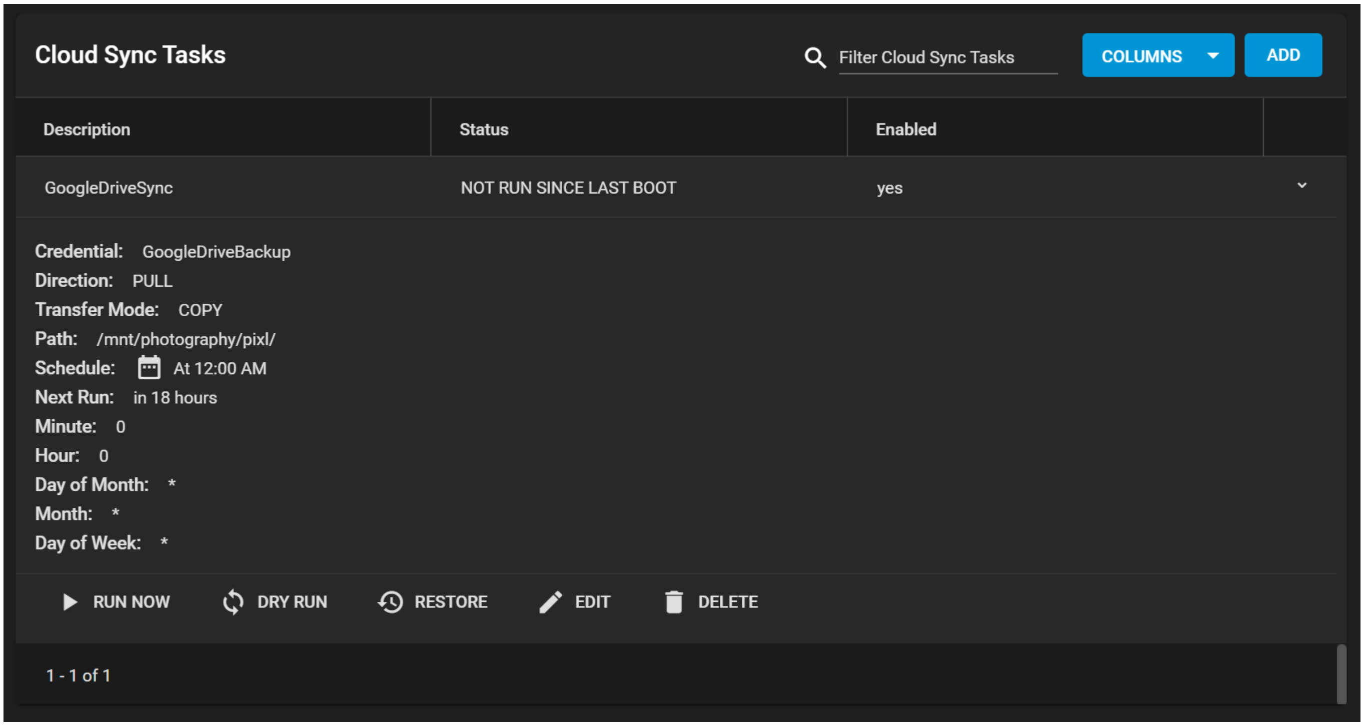


Cloud Sync Tasks

Description	Status	Enabled
GoogleDriveSync	NOT RUN SINCE LAST BOOT	yes

1 - 1 of 1

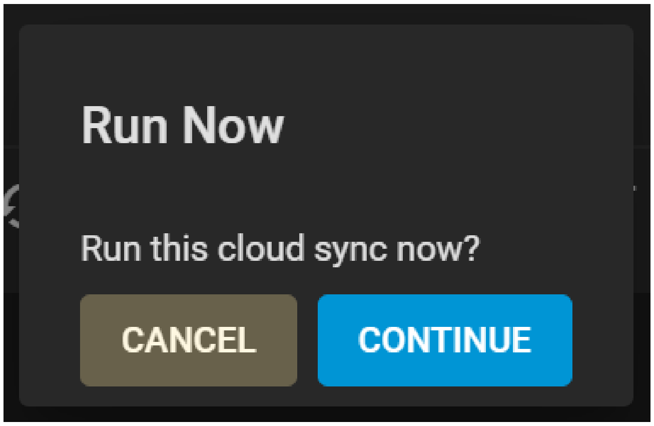
Expand the section down to see the options for the task.



Description	Status	Enabled
GoogleDriveSync	NOT RUN SINCE LAST BOOT	yes

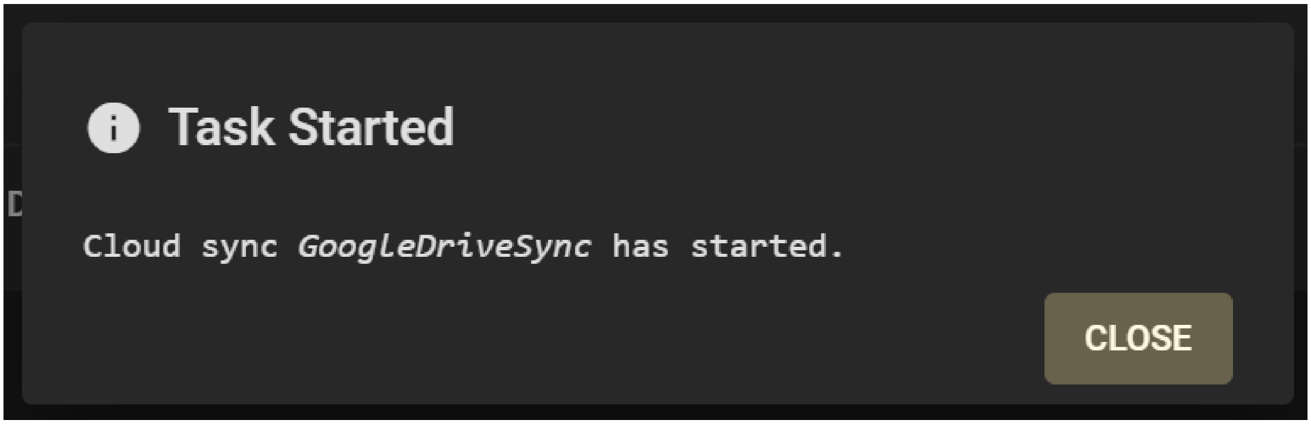
Credential: GoogleDriveBackup
Direction: PULL
Transfer Mode: COPY
Path: /mnt/photography/pixl/
Schedule: At 12:00 AM
Next Run: in 18 hours
Minute: 0
Hour: 0
Day of Month: *
Month: *
Day of Week: *

Clicking *RUN NOW* will prompt the task to start immediately.



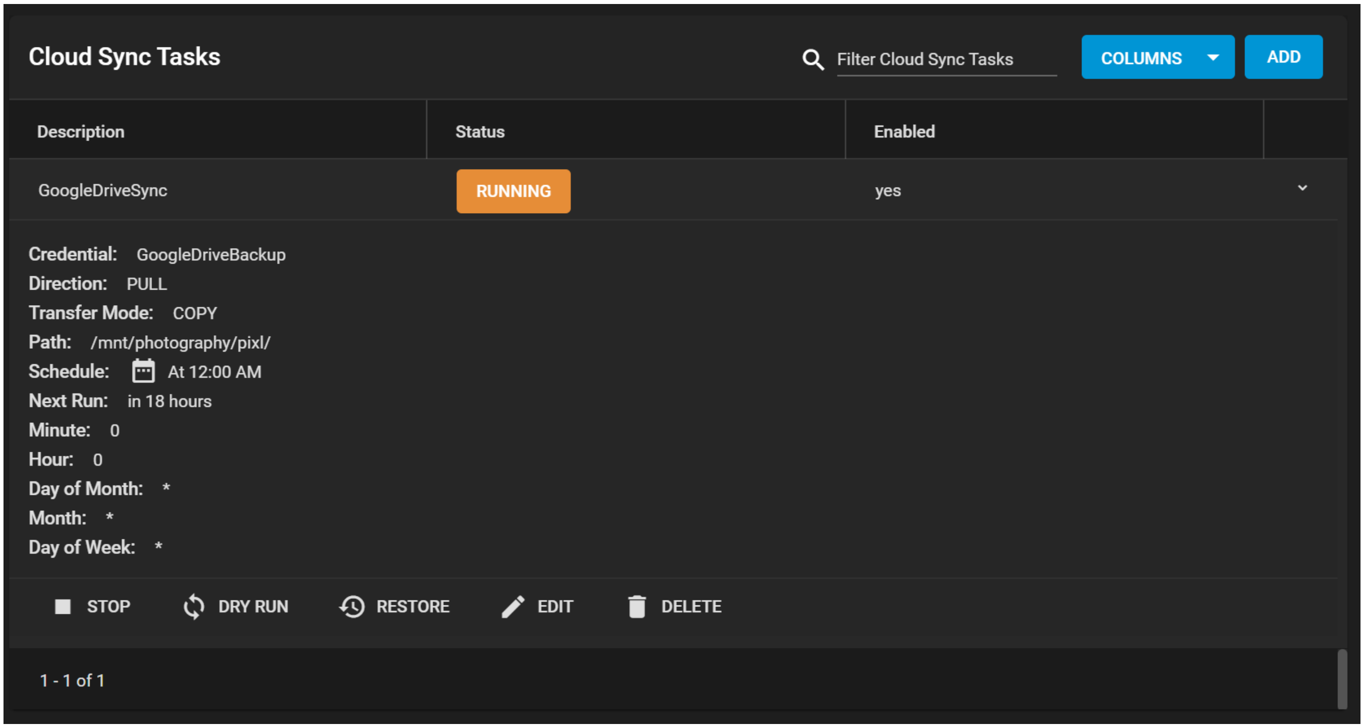
Run Now

Run this cloud sync now?



Task Started

Cloud sync *GoogleDriveSync* has started.



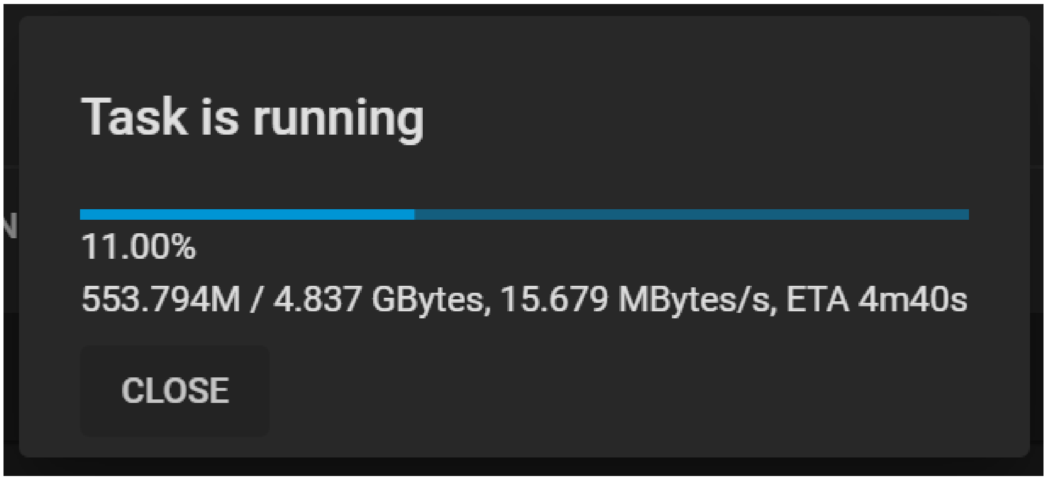
Cloud Sync Tasks

Description	Status	Enabled
GoogleDriveSync	RUNNING	yes

Credential: GoogleDriveBackup
Direction: PULL
Transfer Mode: COPY
Path: /mnt/photography/pixl/
Schedule: At 12:00 AM
Next Run: in 18 hours
Minute: 0
Hour: 0
Day of Month: *
Month: *
Day of Week: *

1 - 1 of 1

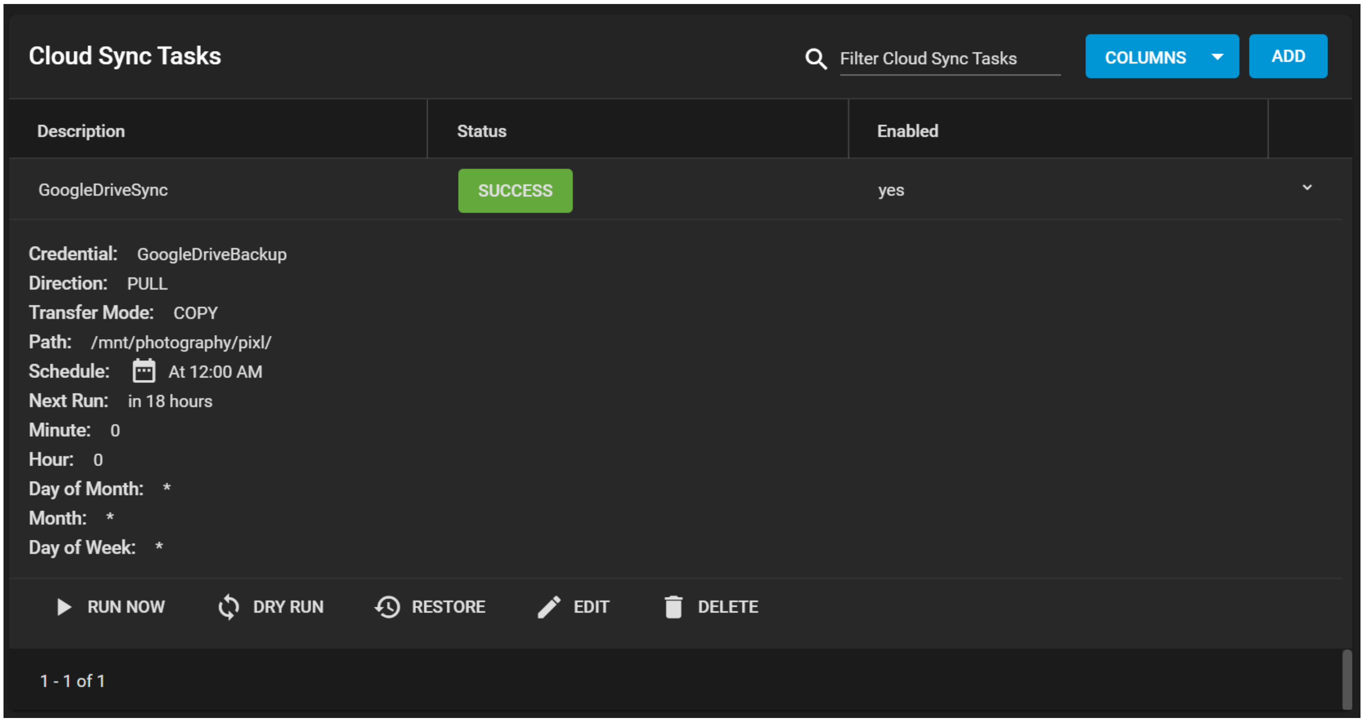
The web interface will show the status as *RUNNING* and *SUCCESS* upon completion. Details can be accessed via the *Task Manager* icon in the upper right-hand corner. While the task is running, clicking on the *RUNNING* button will reveal a popup log.



Task is running

11.00%
553.794M / 4.837 GBytes, 15.679 MBytes/s, ETA 4m40s

Once the sync reports a *SUCCESS* status, you can verify it by opening the folder on another computer if it is a share, through SSH access, or by checking the destination directory through the TrueNAS CLI.

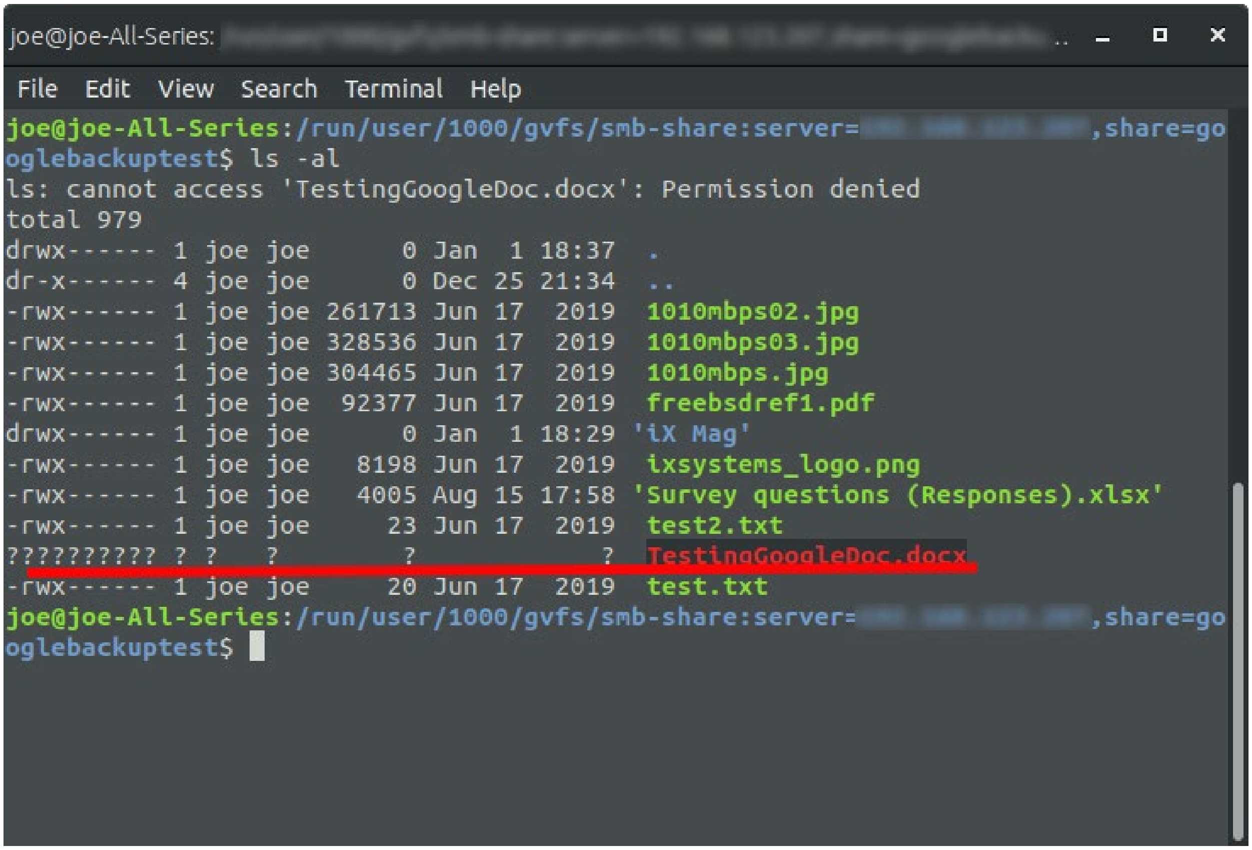


Description	Status	Enabled
GoogleDriveSync	SUCCESS	yes

Credential: GoogleDriveBackup
Direction: PULL
Transfer Mode: COPY
Path: /mnt/photography/pixl/
Schedule: At 12:00 AM
Next Run: in 18 hours
Minute: 0
Hour: 0
Day of Month: *
Month: *
Day of Week: *

Working with Google created content

One caveat is that Google Docs and other files created with Google tools have their own proprietary set of permissions and their read/write characteristics unknown to the system over a standard file share. Files are unreadable as a result.

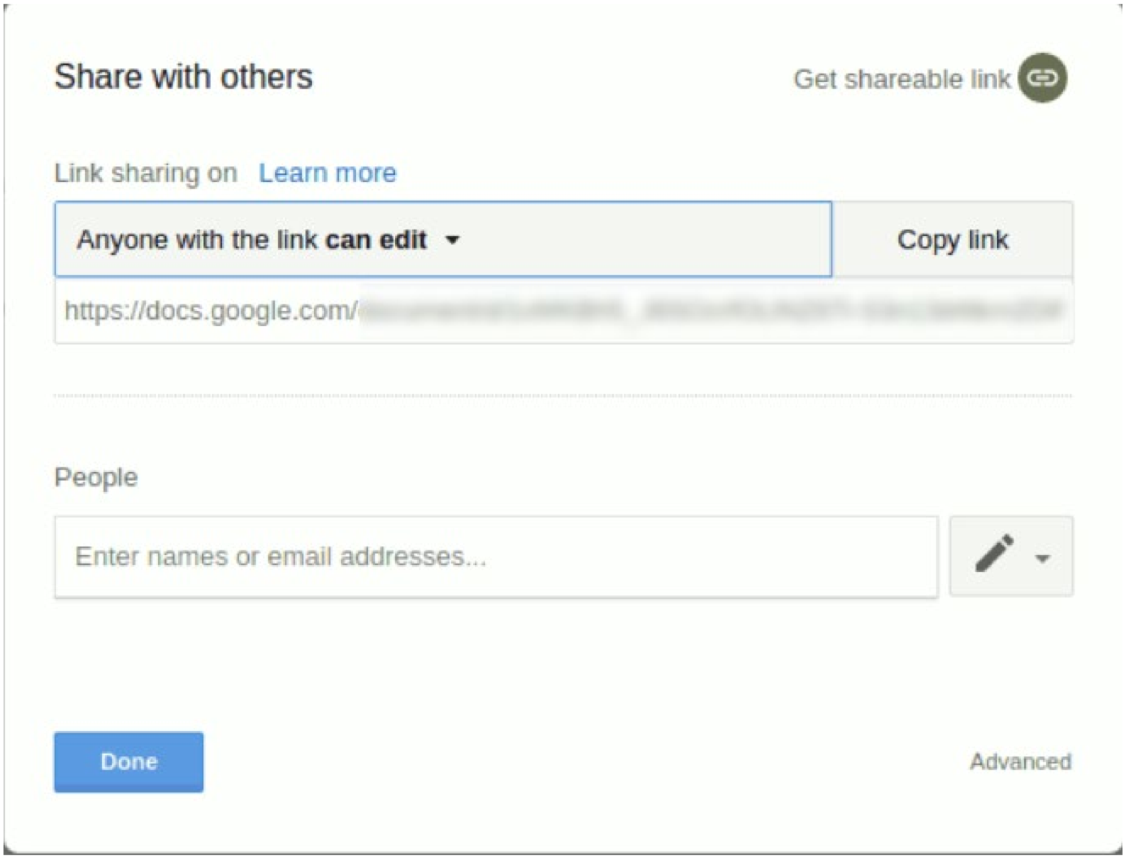


joe@joe-All-Series: [redacted] ..
File Edit View Search Terminal Help

```
joe@joe-All-Series:/run/user/1000/gvfs/smb-share:server=[redacted],share=go
oglebackuptest$ ls -al
ls: cannot access 'TestingGoogleDoc.docx': Permission denied
total 979
drwx------ 1 joe joe      0 Jan  1 18:37  .
dr-x------ 4 joe joe      0 Dec 25 21:34  ..
-rwx------ 1 joe joe 261713 Jun 17  2019  1010mbps02.jpg
-rwx------ 1 joe joe 328536 Jun 17  2019  1010mbps03.jpg
-rwx------ 1 joe joe 304465 Jun 17  2019  1010mbps.jpg
-rwx------ 1 joe joe  92377 Jun 17  2019  freebsdref1.pdf
drwx------ 1 joe joe      0 Jan  1 18:29 'iX Mag'
-rwx------ 1 joe joe   8198 Jun 17  2019  ixsystems_logo.png
-rwx------ 1 joe joe   4005 Aug 15 17:58 'Survey questions (Responses).xlsx'
-rwx------ 1 joe joe     23 Jun 17  2019  test2.txt
?????????? ? ?   ?        ?            ?  TestingGoogleDoc.docx
-rwx------ 1 joe joe     20 Jun 17  2019  test.txt
joe@joe-All-Series:/run/user/1000/gvfs/smb-share:server=[redacted],share=go
oglebackuptest$ 
```

To allow Google created files to become readable, allow link sharing to access the files before the backup. Doing so ensures that other users can open the files with read access, make changes, and then save as another file if further edits are needed. Note that this is only necessary if the file was created using Google Docs, Google Sheets, or Google

Slides; other files should not require modification of their share settings.



Link sharing on

Anyone with the link **can edit**

https://docs.google.com/[redacted]

TrueNAS is perfect for storing content, including cloud-based content, for the long-term. Not only is it simple to sync and backup from the cloud, but users can rest assured that their data is safe, with snapshots, copy-on-write, and built-in replication functionality.

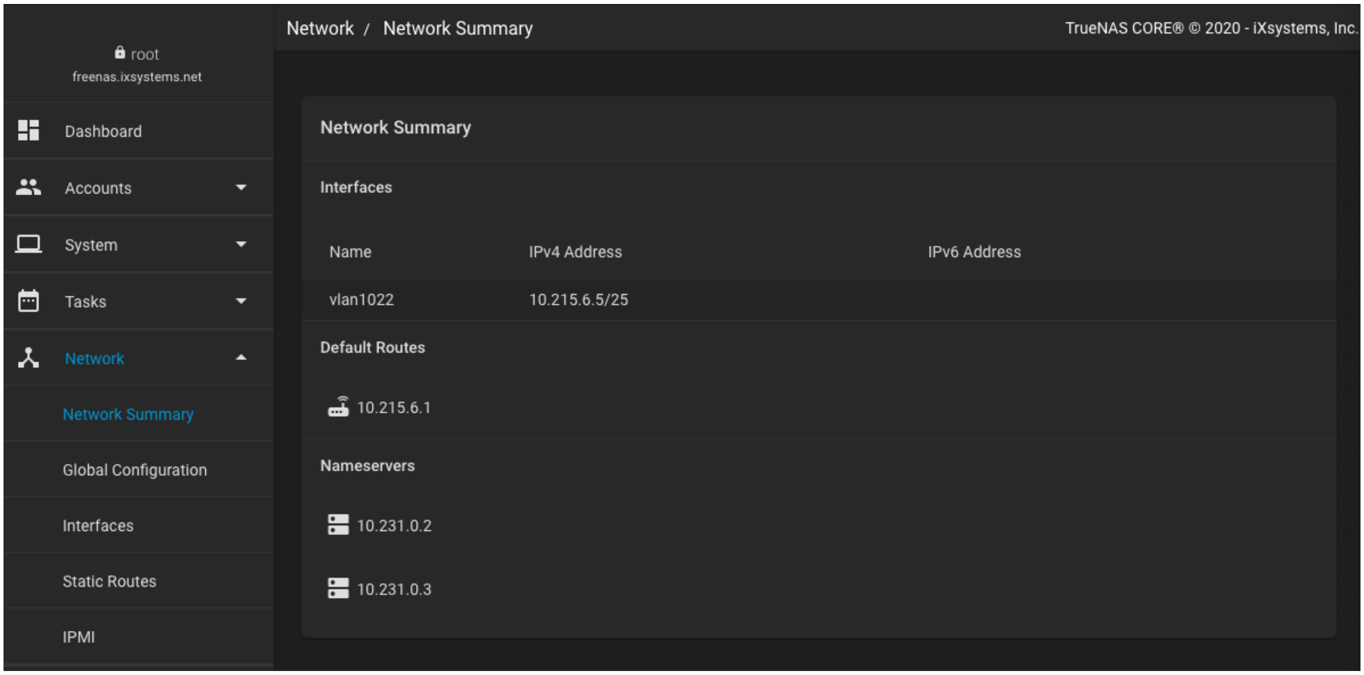
5 - Network

5.1 - Network Summary

It is recommended to set up your system connections before setting up data sharing. This allows integrating TrueNAS into your specific security and network environment before attempting to store or share critical data.

Network Summary

The Network Summary gives a concise overview of the current network setup. Information about the currently active **Interfaces**, **Default Routes**, and **Nameservers** is provided. These areas are not editable.



Network Summary

Interfaces

Name	IPv4 Address	IPv6 Address
vlan1022	10.215.6.5/25	

Default Routes

10.215.6.1

Nameservers

10.231.0.2

10.231.0.3

- **Interfaces** shows any configured physical, LAGG, Bridge, and VLAN interfaces. All detected physical interfaces are listed, even when unconfigured. The IPv4 or IPv6 address displays when a Static IP is saved for an interface.
- **Default Routes** lists all saved TrueNAS Default Routes. Go to **Network > Global Configuration** to configure Default Routes.
- **Nameservers** lists any configured DNS name servers that TrueNAS uses. To change this list, go to **Network > Global Configuration**. The TrueNAS **Hostname and Domain**, **Default Gateway**, and other options are available in **Network > Global Configuration**.

Additional Network Configuration Screens

Define any Static Routes in **Network > Static Routes**.

Out of Band Management is managed from **Network > IPMI**. This option is visible only when TrueNAS detects the appropriate physical hardware.

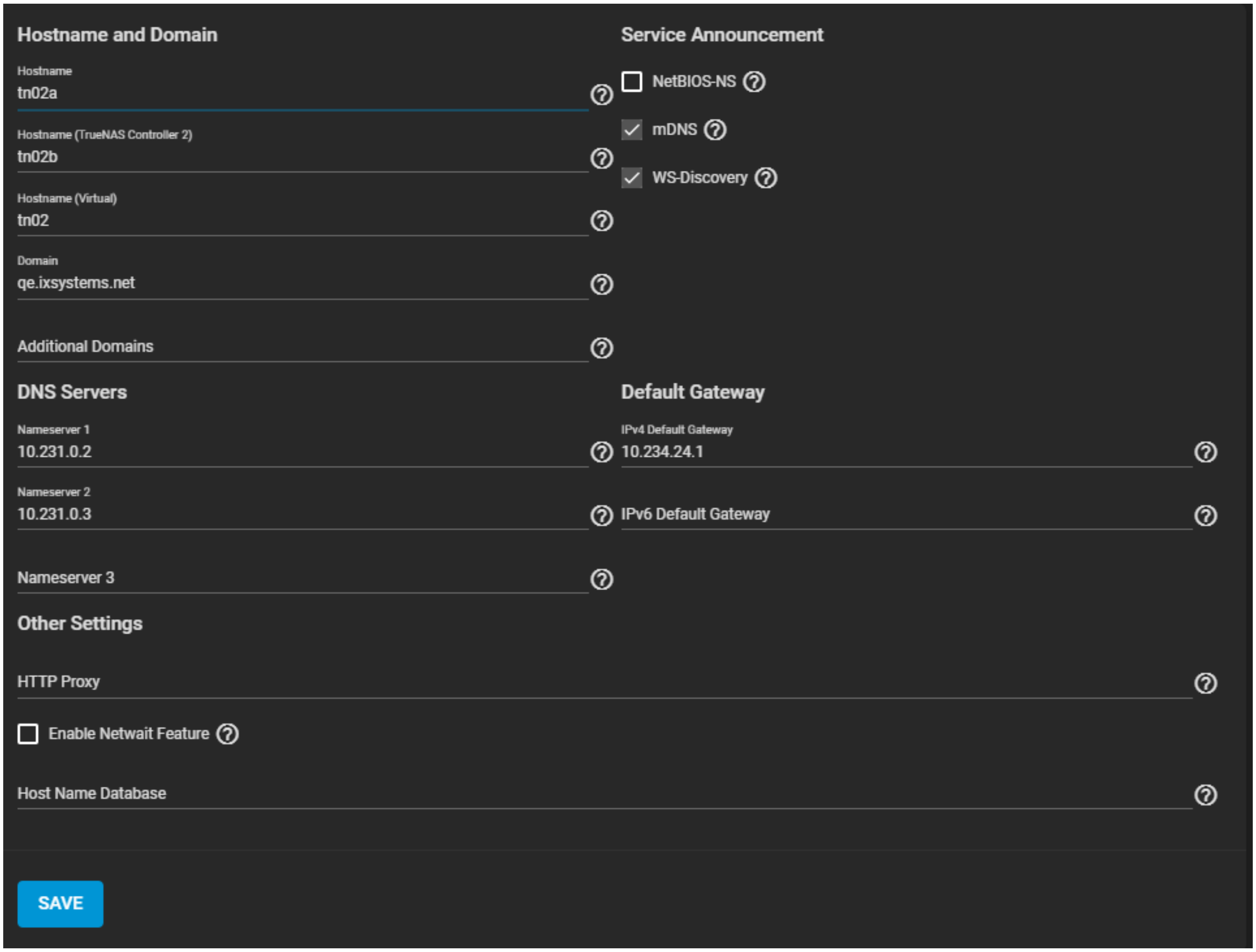
5.2 - Global Configuration

Network > Global Configuration has all the general TrueNAS networking settings that *are not* specific to any interface.

Disruptive Change

Making changes to the network interface the web interface uses can result in losing connection to TrueNAS! Fixing any misconfigured network settings might require command line knowledge or physical access to the TrueNAS system.

Global Configuration Settings



Hostname and Domain

Hostname: tn02a

Hostname (TrueNAS Controller 2): tn02b

Hostname (Virtual): tn02

Domain: qe.ixsystems.net

Additional Domains

Service Announcement

☐ NetBIOS-NS

☑ mDNS

☑ WS-Discovery

DNS Servers

Nameserver 1: 10.231.0.2

Nameserver 2: 10.231.0.3

Nameserver 3

Default Gateway

IPv4 Default Gateway: 10.234.24.1

IPv6 Default Gateway

Other Settings

HTTP Proxy

☐ Enable Netwait Feature

Host Name Database

Options are organized into several categories.

Can these options be configured elsewhere? expand □
Many of these Interface, DNS, and Gateway options are also configured in the Console Setup Menu. Be sure to check both locations when troubleshooting network connectivity issues.

Hostname and Domain

Many of these fields have default values, but can be changed to meet requirements of the local network. The *Hostname* and *Domain* display in the **Dashboard > System Information** card. Some options only display when the appropriate hardware is present.

Setting	Value	Description
Hostname	string	Host name of first TrueNAS controller. Upper and lower case alphanumeric, ., and - characters are allowed.
Hostname (TrueNAS Controller 2)	string	Host name of second TrueNAS controller (for HA only). Upper and lower case alphanumeric, ., and - characters are allowed.
Hostname (Virtual)	string	Virtual host name. When using a virtualhost, this is also used as the Kerberos principal name. Enter the fully qualified hostname plus the domain name. Upper and lower case alphanumeric, ., and - characters are allowed.
Domain	string	System domain name.
Additional Domains	string	Additional domains to search. Separate entries by pressing `Enter`. Adding search domains can cause slow DNS lookups

Service Announcement

Setting	Value	Description
NetBIOS-NS	checkbox	Legacy NetBIOS name server. Advertises the SMB service NetBIOS Name. Can be required for legacy SMB1 clients to discover the server. When advertised, the server appears in Network Neighborhood.
mDNS	checkbox	Multicast DNS. Uses the system *Hostname* to advertise enabled and running services. For example, this controls if the server appears under **Network** on MacOS clients.
WS-Discovery	checkbox	Uses the SMB Service *NetBIOS Name* to advertise the server to WS-Discovery clients. This causes the computer to appear in the **Network Neighborhood** of modern Windows OSes.

DNS Servers

Setting	Value	Description
Nameserver 1	IP address	Primary DNS server.
Nameserver 2	IP address	Secondary DNS server.
Nameserver 3	IP address	Tertiary DNS server.

Default Gateway

Setting	Value	Description
IPv4 Default Gateway	IP address	Typically not set. If set, used instead of the default gateway provided by DHCP
IPv6 Default Gateway	IP address	Typically not set.

Other Settings

Setting	Value	Description
HTTP Proxy	string	Enter the proxy information for the network in the format *http://my.proxy.server:3128* or *http://user:password@my.proxy.server:3128*.
Enable Netwait Feature	checkbox	Setting this prevents network services from starting until the interface can ping the addresses listed in the **Netwait IP list**.
Netwait IP List	string	Only appears when *Enable Netwait Feature* is set. Enter a list of IP addresses to ping. Separate entries by pressing Enter. Each address is tried until one is successful or the list is exhausted. Leave empty to use the default gateway.
Host Name Database	string	Used to add one entry per line which will be appended to /etc/hosts . Separate entries by pressing Enter. Use the format *IP_address space hostname* where multiple hostnames can be used if separated by a space. Hosts defined here are still accessible by name even when DNS is not available. See hosts for additional information.

5.3 - Interfaces

The TrueNAS CORE **Interfaces** section displays interface names and IP addresses, as well as their types and link states.

Adding, Editing, and Deleting Interfaces

To add a new network interface, click **ADD**.

To edit or delete an interface, click the more_vert in that interface's row, then click edit **EDIT** or delete **DELETE**.

You can click edit **EDIT** on a phycial interface to set a static IP address for the TrueNAS UI

You can also edit your TrueNAS sytem's physical NICs by clicking delete **RESET CONFIGURATION**.

Be careful when configuring the network interface that controls the TrueNAS® web interface or you may lose web connectivity.

Creating LAGG, Bridge, and VLAN Interfaces

Why should I use different interface types? expand □

LAGG (Link Aggregation)

You should use LAGG if you want to optimize multi-user performance, balance network traffic, or have network failover protection.

For example, Failover LAGG prevents a network outage by dynamically reassigning traffic to another interface when one physical link (a cable or NIC) fails.

Network Bridge

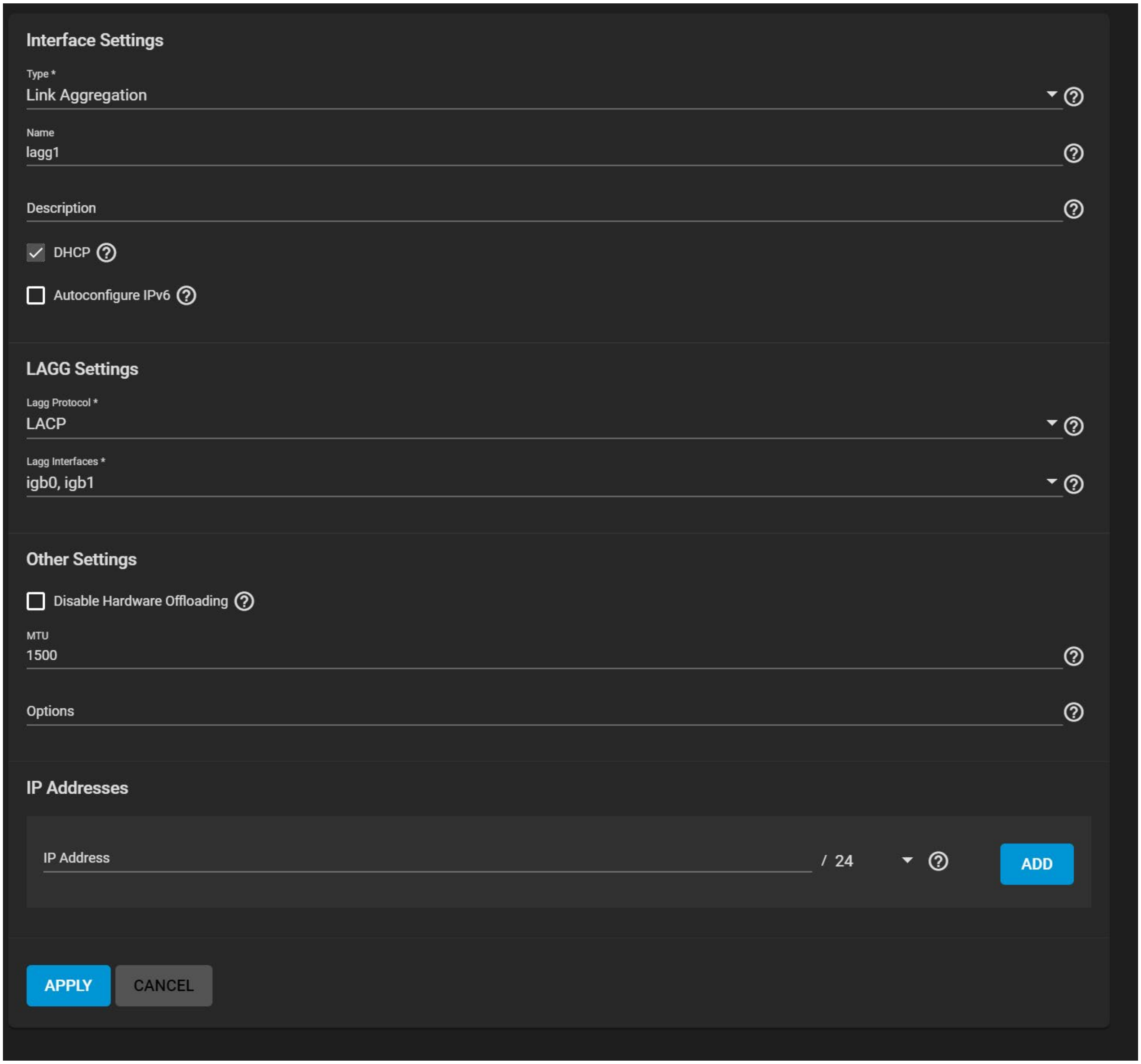
You should use a Bridge if you want to enable communication between two networks and provide a way for them to work as a single network.

For example, bridges can serve IPs to multiple VMs on one interface, which allows your VMs to be on the same network as the host.

⊙ LAGG

A Link Aggregation (LAGG) is a general method of combining (aggregating) multiple network connections in parallel or a series to provide additional bandwidth or redundancy for critical networking situations. TrueNAS uses lagg(4) to manage LAGGs.

To set up a LAGG interface, go to **Network > Interface > Add**.



Interface Settings

Type * Link Aggregation

Name lagg1

Description

☑ DHCP

☐ Autoconfigure IPv6

LAGG Settings

Lagg Protocol * LACP

Lagg Interfaces * igb0, igb1

Other Settings

☐ Disable Hardware Offloading

MTU 1500

Options

IP Addresses

IP Address / 24

Set the *Type* to *Link Aggregation*.

Enter a name for the interface. The name must use the format *laggX*, where *X* is a number representing a non-parent interface. It is also recommended to add any notes or reminders about this particular LAGG in the *Description*.

Under **LAGG Settings**, set the *Lagg Protocol* to configure the interface ports to match your networking needs:

LACP expand □
LACP is the most commonly used LAGG protocol and is one part of [IEEE specification 802.3ad]. In LACP mode, negotiation is performed with the network switch to form a group of ports that are all active at the same time. The network switch must support LACP for this option to function.

Failover expand □
Failover causes traffic to be sent through the primary interface of the group. If the primary interface fails, traffic diverts to the next available interface in the LAGG.

Load Balance expand □
Load Balance accepts inbound traffic on any port of the LAGG group and then balances the outgoing traffic on the

active ports in the LAGG group. It is a static setup that does not monitor the link state nor does it negotiate with the switch.

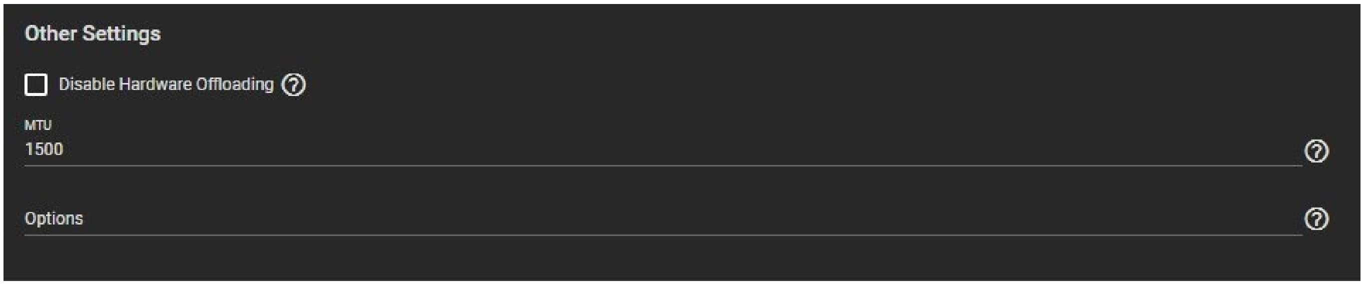
RoundRobin expand □
Round robin accepts inbound traffic on any port of the LAGG group and sends outbound traffic using a round robin scheduling algorithm. Traffic is sent out in sequence using each LAGG interface in turn.

None expand □
This mode disables traffic on the LAGG interface without disabling the LAGG interface.

Now define the *Lagg Interfaces* and review the remaining interface options.

Other Settings

Every kind of network interface has common settings:


Other Settings

□ Disable Hardware Offloading

MTU
1500

Options

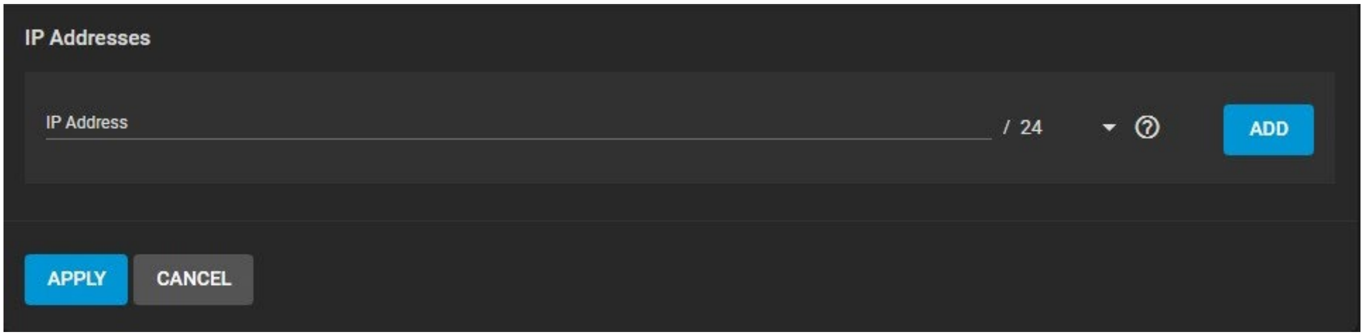
Disabling *Hardware Offloading* is discouraged as it can reduce network performance. However, disabling this option might be needed when the interface is managing Jails , Plugins , or Virtual Machines .

The Maximum Transmission Unit (MTU) is the largest protocol data unit that can be communicated. What the largest workable MTU size can be will change according to your available network interfaces and other physical hardware. *1500* and *9000* are standard Ethernet MTU sizes and the recommendation is to use the default *1500*. The permissible range of MTU values is *1492-9216*. Leaving this field blank sets the default value of *1500*.

If additional tuning is needed, you can enter additional ifconfig settings in the *Options*

IP Addresses

Additional aliases for the interface can also be defined:


IP Addresses

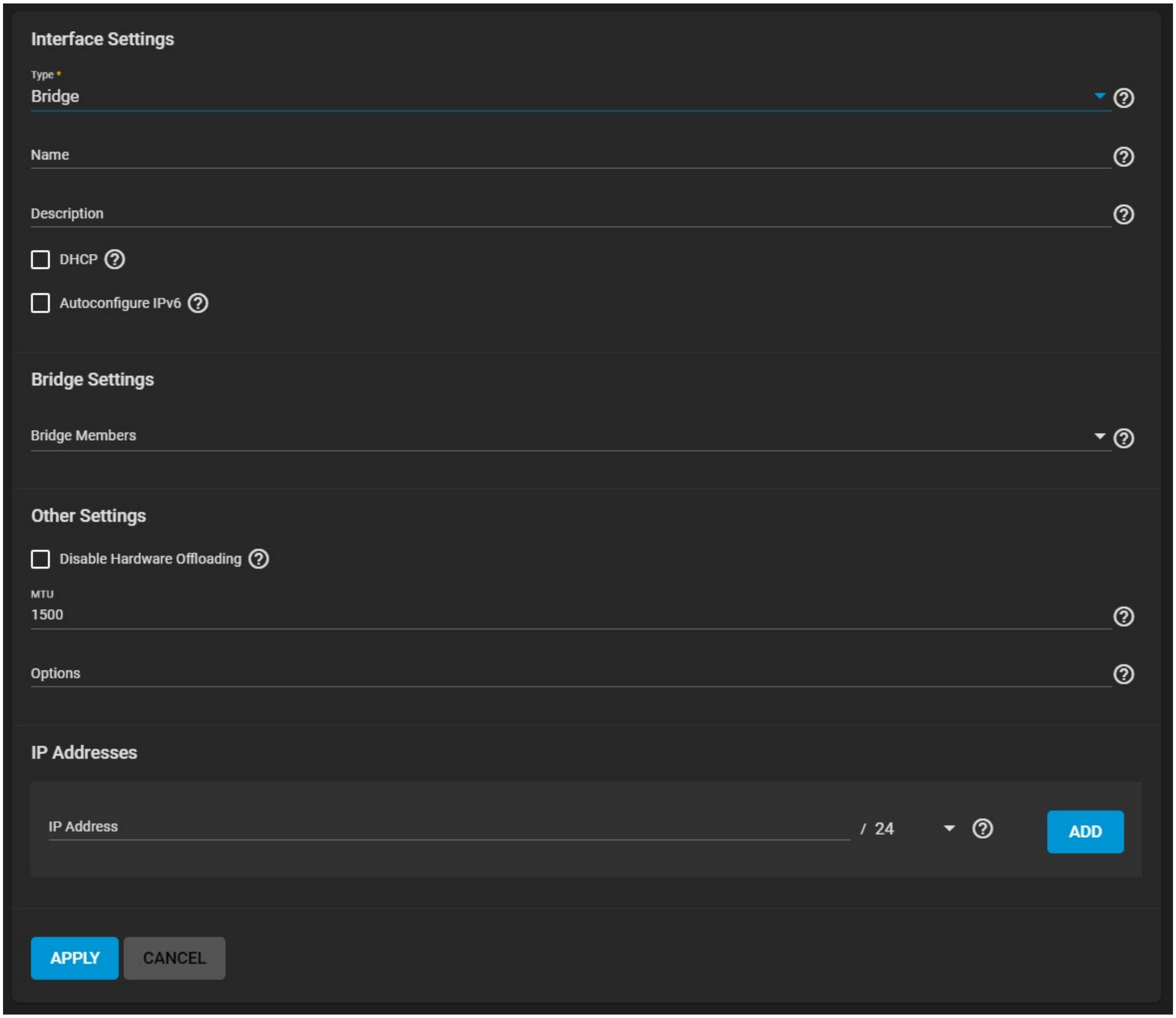
IP Address / 24

Either IPv4 or IPv6 addresses and subnets from *1-32* can be defined. Clicking *Add* will provide another field for defining an IP address.

○ **Bridge**

A Bridge generally refers to various methods of combining (aggregating) multiple network connections into a single aggregate network. TrueNAS uses bridge(4) to manage Bridges.

To set up a bridge interface, go to **Network > Interface > Add**.



Interface Settings

Type *
Bridge

Name

Description

□ DHCP

□ Autoconfigure IPv6

Bridge Settings

Bridge Members

Other Settings

□ Disable Hardware Offloading

MTU
1500

Options

IP Addresses

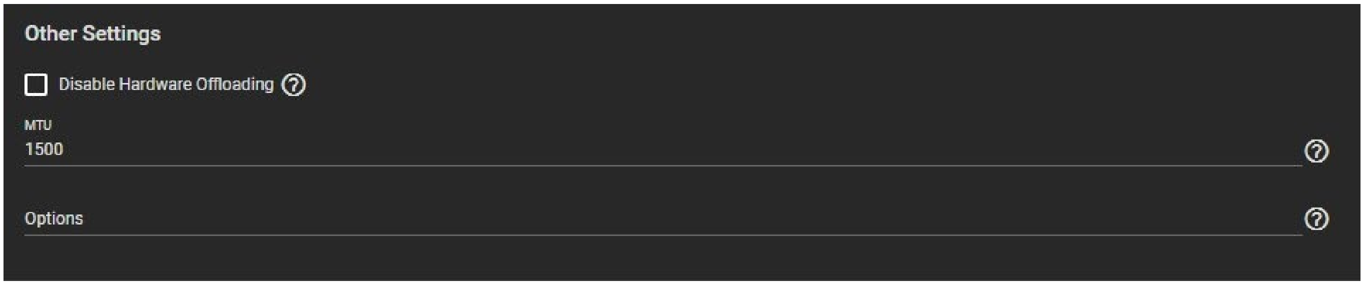
IP Address / 24

Set the *Type* to *Bridge* and enter a name for the interface. The name must use the format *bridgeX*, where *X* is a number representing a non-parent interface. It is also recommended to add any notes or reminders about this particular bridge in the *Description*.

Under **Bridge Settings**, select which interfaces will be *Bridge Members* and then configure the remaining interface options to match your networking needs.

Other Settings

Every kind of network interface has common settings:



Other Settings

☐ Disable Hardware Offloading

MTU

1500

Options

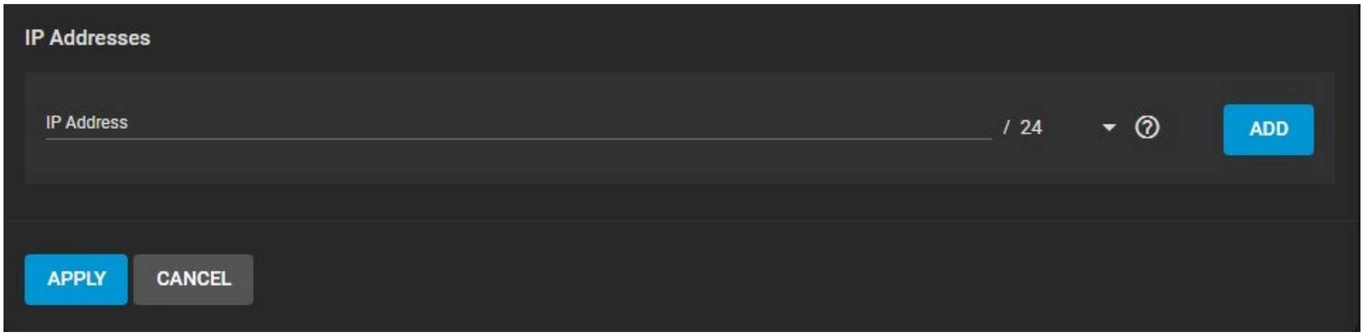
Disabling *Hardware Offloading* is discouraged as it can reduce network performance. However, disabling this option might be needed when the interface is managing Jails , Plugins , or Virtual Machines .

The Maximum Transmission Unit (MTU) is the largest protocol data unit that can be communicated. What the largest workable MTU size can be will change according to your available network interfaces and other physical hardware. *1500* and *9000* are standard Ethernet MTU sizes and the recommendation is to use the default *1500*. The permissible range of MTU values is *1492-9216*. Leaving this field blank sets the default value of *1500*.

If additional tuning is needed, you can enter additional ifconfig settings in the *Options*

IP Addresses

Additional aliases for the interface can also be defined:



IP Addresses

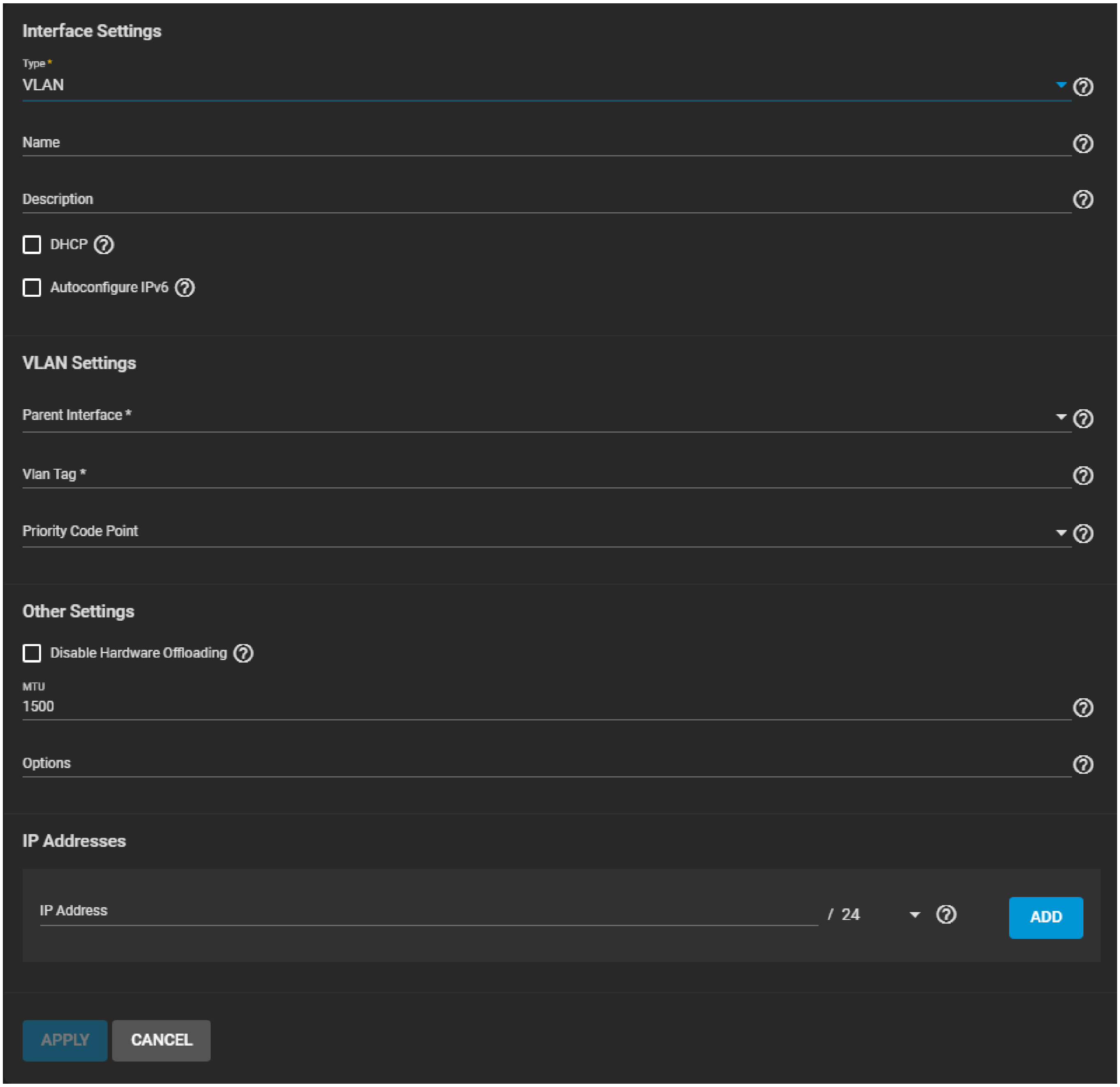
IP Address / 24

Either IPv4 or IPv6 addresses and subnets from *1-32* can be defined. Clicking *Add* will provide another field for defining an IP address.

○ VLAN

A virtual LAN (VLAN) is a domain that is partitioned and isolated in a computer network at the data link layer (OSI layer 2). More information on VLANs can be found here . TrueNAS uses vlan(4) to manage VLANS.

To set up a VLAN interface, go to **Network > Interface > Add**.



Interface Settings

Type *
VLAN

Name

Description

□ DHCP

□ Autoconfigure IPv6

VLAN Settings

Parent Interface *

Vlan Tag *

Priority Code Point

Other Settings

□ Disable Hardware Offloading

MTU
1500

Options

IP Addresses

IP Address / 24

Set the *Type* to *VLAN* and enter a *Name* for the interface. The name must use the format *vlanX*, where *X* is a number representing a non-parent interface. It is also recommended to add any notes or reminders about this particular VLAN in the *Description*.

Enabling *DHCP* or *Autoconfigure IPv6* requires understanding how this new interface will function inside your particular network environment. By default, TrueNAS allows only one network interface to have *DHCP* enabled.

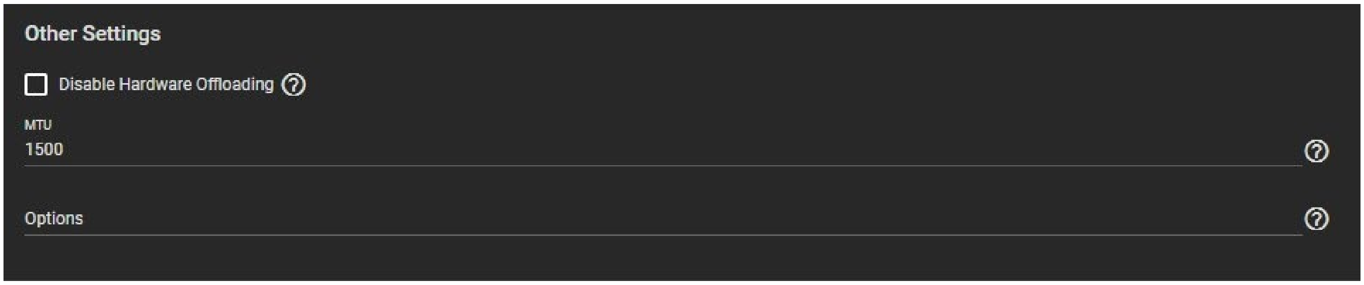
The remaining **VLAN Settings** must be configured for the interface to function properly:

- *Parent Interface* : Select the VLAN Parent Interface. This is usually an Ethernet card connected to a switch port that has already been configured for the VLAN.
- *Vlan Tag* : Enter a numeric tag for this interface. This is usually preconfigured in the switched network.
- *Priority Code Point* : Define the VLAN Class of Service . The available *802.1p* class of service ranges from *Best effort (default)* to *Network control (highest)*.

With the VLAN-specific options set, there are a few additional interfaces options to review.

Other Settings

Every kind of network interface has common settings:



Other Settings

□ Disable Hardware Offloading

MTU
1500

Options

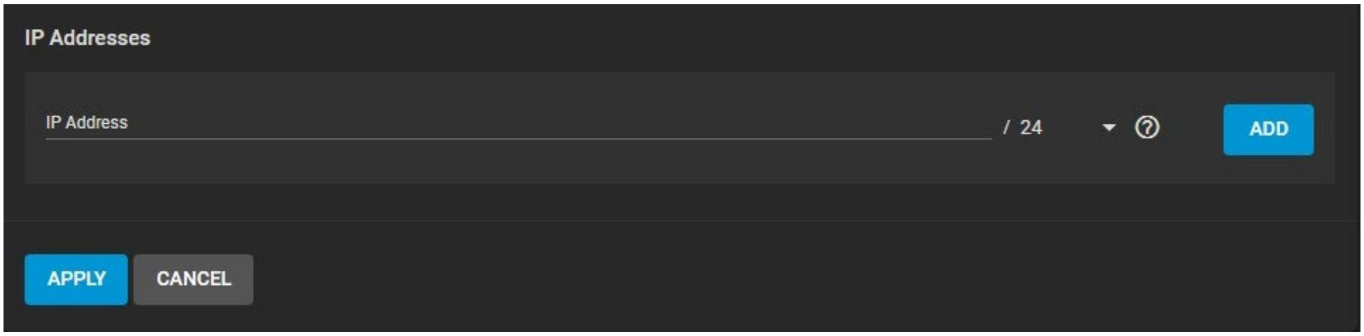
Disabling *Hardware Offloading* is discouraged as it can reduce network performance. However, disabling this option might be needed when the interface is managing Jails , Plugins , or Virtual Machines .

The Maximum Transmission Unit (MTU) is the largest protocol data unit that can be communicated. What the largest workable MTU size can be will change according to your available network interfaces and other physical hardware. *1500* and *9000* are standard Ethernet MTU sizes and the recommendation is to use the default *1500*. The permissible range of MTU values is *1492-9216*. Leaving this field blank sets the default value of *1500*.

If additional tuning is needed, you can enter additional ifconfig settings in the *Options*

IP Addresses

Additional aliases for the interface can also be defined:



IP Addresses

IP Address / 24

Either IPv4 or IPv6 addresses and subnets from *1-32* can be defined. Clicking *Add* will provide another field for defining an IP address.

5.3.1 - Setting a Static IP Address for the TrueNAS UI

Disruptive Change

Making changes to the network interface the web interface uses can result in losing connection to the TrueNAS system! Fixing any misconfigured network settings might require command line knowledge or physical access to the TrueNAS system.

Process Summary expand □

- Web UI
  - **Network > Interfaces** > *Add* or *Edit*
    - Type address into *IP Address* and select a subnet mask.
    - *Add* or *Delete* additional addresses as needed.
  - Test saved changes before permanently applying them.
    - Dialog asks to temporarily apply changes.
    - After applying the changes, you have an adjustable amount of time to verify the new settings work before permanently saving over the previous configuration.
  - **Network > Network Summary** summarizes addressing information of every configured interface.
- Console menu
  - Physical Interfaces: select *Configure Network Interfaces* (options are similar for other interface types)
    - Delete interface? `n`
    - Remove interface settings? `n`
    - Configure IPv4? `y`
      - Enter IP address and subnet mask
    - Configure IPv6 `y`
      - Enter IP address
    - Configure failover? `n`
  - Saving changes interrupts the web interface and could require a system reboot.

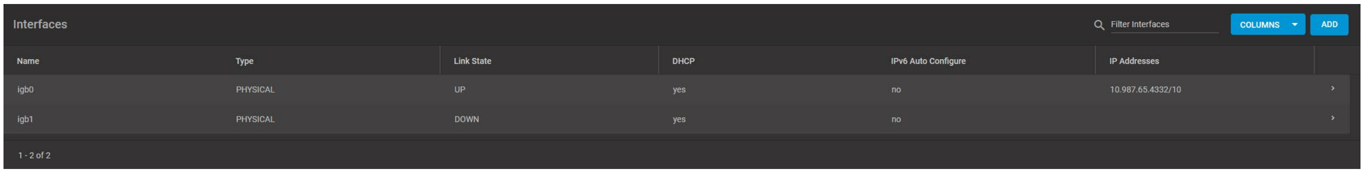
Setting Static IP Addresses

TrueNAS can configure physical network interfaces with static IP addresses in either the web interface or the system console menu.

> Using the web interface for this process is recommended. There are additional safety features to prevent saving misconfigured interface settings.

Adding Static IP Addresses Using the Web Interface

Log in to the web interface and go to **Network > Interfaces**. This contains creation and configuration options for physical and virtual network interfaces.

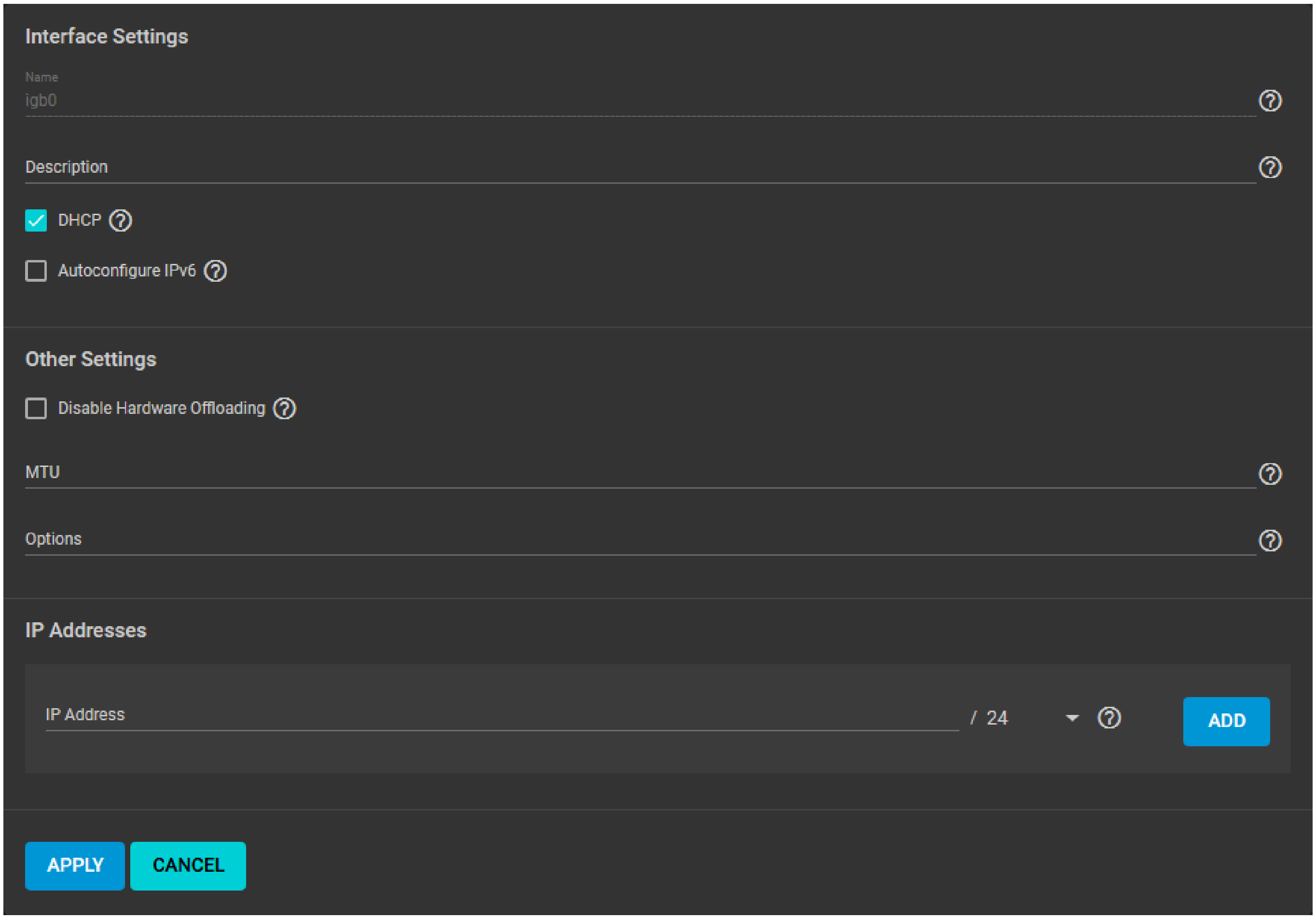


Name	Type	Link State	DHCP	IPv6 Auto Configure	IP Addresses
igb0	PHYSICAL	UP	yes	no	10.987.65.4332/10
igb1	PHYSICAL	DOWN	yes	no	

1 - 2 of 2

You can configure static IP addresses while creating or editing an interface.

High Availability must be disabled on TrueNAS Enterprise systems before an active interface can be edited.



Interface Settings

Name: igb0

Description

☑ DHCP

□ Autoconfigure IPv6

Other Settings

□ Disable Hardware Offloading

MTU

Options

IP Addresses

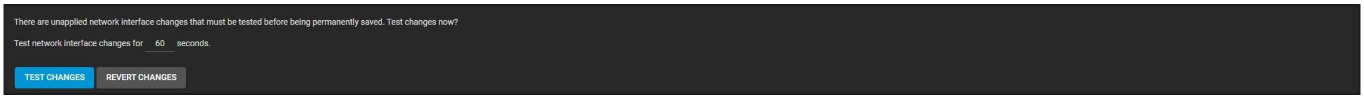
IP Address / 24

Type the desired address in the *IP Address* field and select a subnet mask.

Multiple interfaces cannot be members of the same subnet. See Multiple network interfaces on a single subnet for more information. Check the subnet mask if an error is shown when setting the IP addresses on multiple interfaces.

Use the buttons to *Add* and *Delete* more IP addresses as needed.

To avoid permanently saving invalid or unusable settings, network changes are applied temporarily. Saving any interface changes adds a dialog to the **Network > Interfaces** list to apply these changes.

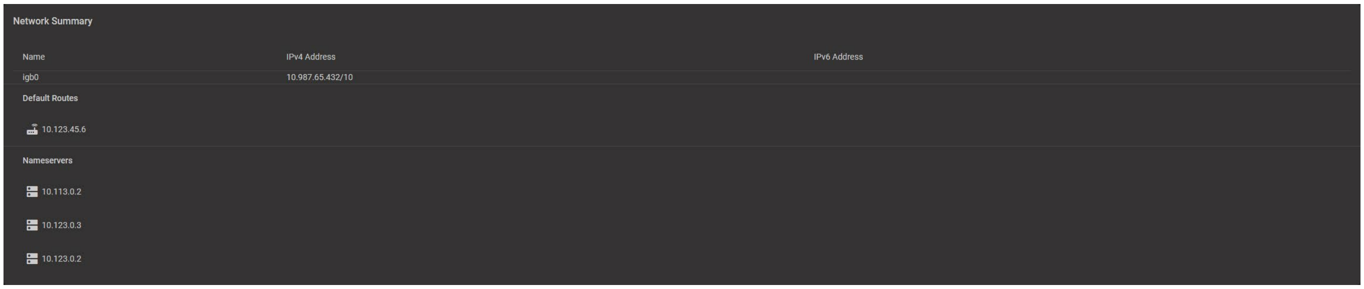


There are unapplied network interface changes that must be tested before being permanently saved. Test changes now?

Test network interface changes for 60 seconds.

You can adjust how long to test the network changes before they are reverted back to the previous settings. If the test is successful, another dialog allows making the network changes permanent.

To quickly view system networking settings, go to **Network > Network Summary**.



Network Summary

Name	IPv4 Address	IPv6 Address
igb0	10.987.65.432/10	

Default Routes

10.123.45.6

Nameservers

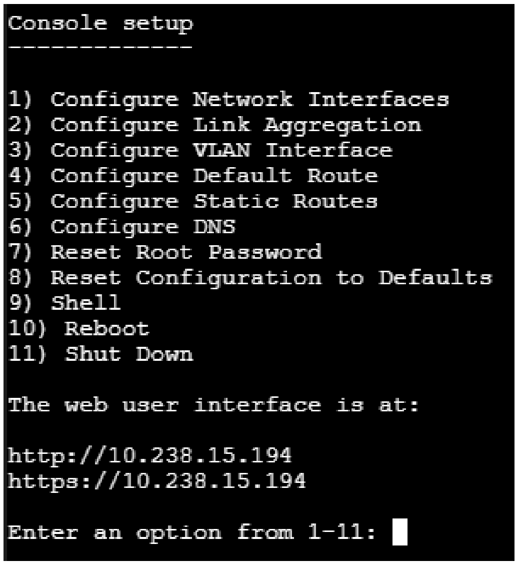
10.113.0.2

10.123.0.3

10.123.0.2

Using the System Console Menu to Assign Static IP Addresses to a Physical Interface

A monitor and keyboard attached to the system is needed to use the console, or, if the system hardware allows it, you can connect with IPMI. The console menu is shown when the system is fully booted.



```
Console setup
-------------

1) Configure Network Interfaces
2) Configure Link Aggregation
3) Configure VLAN Interface
4) Configure Default Route
5) Configure Static Routes
6) Configure DNS
7) Reset Root Password
8) Reset Configuration to Defaults
9) Shell
10) Reboot
11) Shut Down

The web user interface is at:

http://10.238.15.194
https://10.238.15.194

Enter an option from 1-11:
```

Use the *Configure Network Interfaces* option to add static IP addresses to a physical interface. Other interface types have a similar process to add static IP addresses. Interfaces that were already configured for DHCP will have that option disabled. There are a number of prompts to answer before a static address can be added. This example shows adding static IPv4 addresses to interface *igb0*:

```
Enter an option from 1-11: 1
1) igb0
2) igb1
Select an interface (q to quit): 1
Delete interface? (y/n) n
Remove the current settings of this interface? (This causes a momentary disconne
ction of the network.) (y/n) n
Configure IPv4? (y/n) y
Interface name:
Several input formats are supported
Example 1 CIDR Notation:
    192.168.1.1/24
Example 2 IP and Netmask separate:
    IP: 192.168.1.1
    Netmask: 255.255.255.0, /24 or 24
IPv4 Address:10.238.15.194/22
Saving interface configuration: Ok
Configure IPv6? (y/n) n
Configure failover settings? (y/n) n
Restarting network: ok
Restarting routing: ok
```

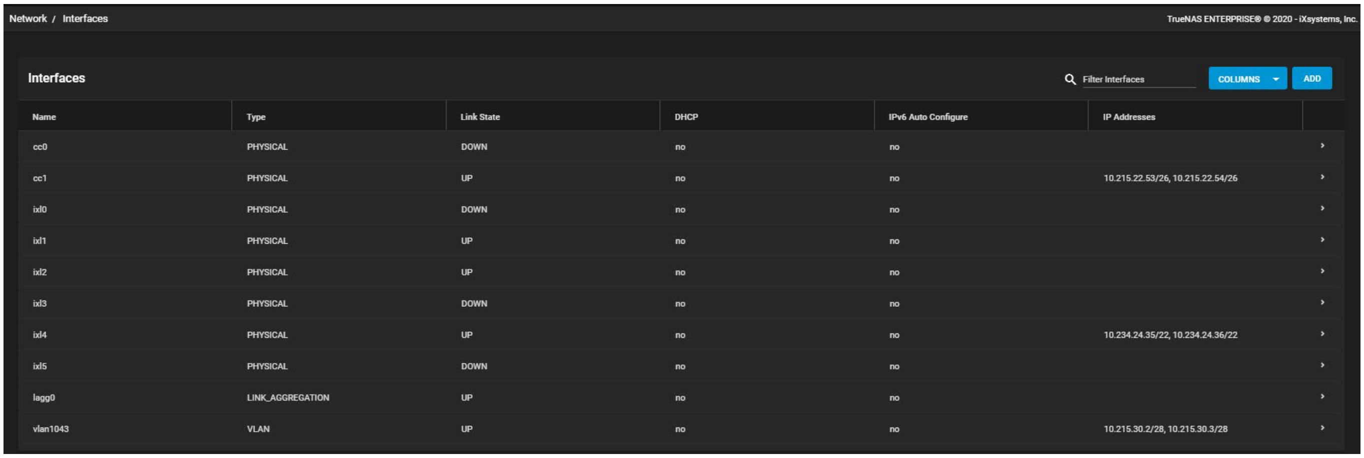
Saving interface configuration changes will disrupt the web interface while system networking restarts. When the interface being changed is also the interface that provides the web interface, a system reboot could be required for the new settings to take effect and the web interface to become available again.

5.3.2 - Editing a Physical Interface

Interface Editing

> Be careful when configuring the network interface that controls the TrueNAS® web interface or you may lose web connectivity.

Network > Interfaces lists all the physical Network Interface Controllers (NICs) connected to your TrueNAS® system.



Network / Interfaces

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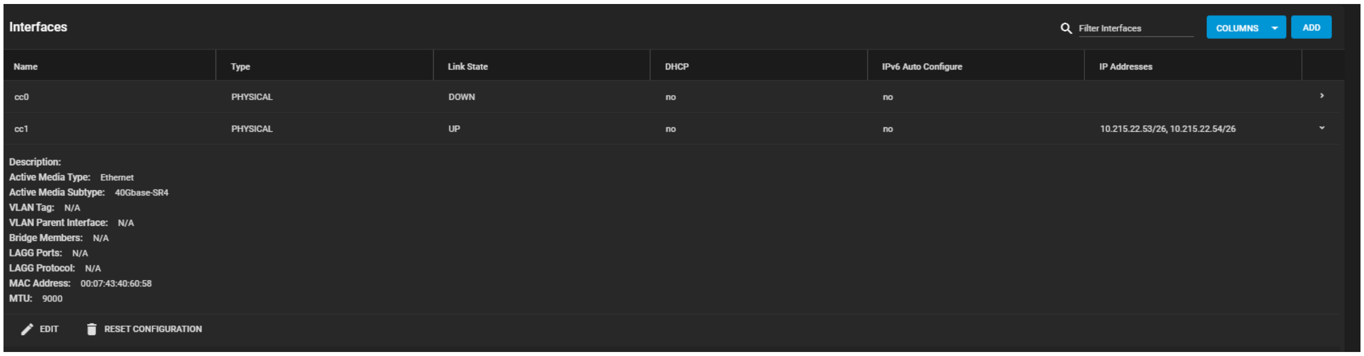
Interfaces

Name	Type	Link State	DHCP	IPv6 Auto Configure	IP Addresses
cc0	PHYSICAL	DOWN	no	no	
cc1	PHYSICAL	UP	no	no	10.215.22.53/26, 10.215.22.54/26
ixl0	PHYSICAL	DOWN	no	no	
ixl1	PHYSICAL	UP	no	no	
ixl2	PHYSICAL	UP	no	no	
ixl3	PHYSICAL	DOWN	no	no	
ixl4	PHYSICAL	UP	no	no	10.234.24.35/22, 10.234.24.36/22
ixl5	PHYSICAL	DOWN	no	no	
lagg0	LINK_AGGREGATION	UP	no	no	
vlan1043	VLAN	UP	no	no	10.215.30.2/28, 10.215.30.3/28

To edit an interface, click **>** next to it to expand the view and provide a general description about the chosen interface, then click *EDIT*.

> If you are a TrueNAS Enterprise customer, remember that you cannot edit an interface if High Availability (HA) is enabled.
> Go to **System > Failover** and check the *Disable Failover* box, then click *SAVE*.



Interfaces

Name	Type	Link State	DHCP	IPv6 Auto Configure	IP Addresses
cc0	PHYSICAL	DOWN	no	no	
cc1	PHYSICAL	UP	no	no	10.215.22.53/26, 10.215.22.54/26

Description:
Active Media Type: Ethernet
Active Media Subtype: 40Gbase-SR4
VLAN Tag: N/A
VLAN Parent Interface: N/A
Bridge Members: N/A
LAGG Ports: N/A
LAGG Protocol: N/A
MAC Address: 00:07:43:40:60:58
MTU: 9000

> An interface’s editing options are dependent on the *Type* of interface that you are modifying.

Interface Settings

Setting	Value	Description
Description	string	Notes or explanatory text about this interface.
DHCP	checkbox	Enable DHCP to auto-assign an IPv4 address to this interface. Leave unset to create a static IPv4 or IPv6 configuration. Only one interface can be configured for DHCP.
Autoconfigure IPv6	checkbox	Automatically configure the IPv6 address with rtsol. Only one interface can be configured this way.

Other Settings

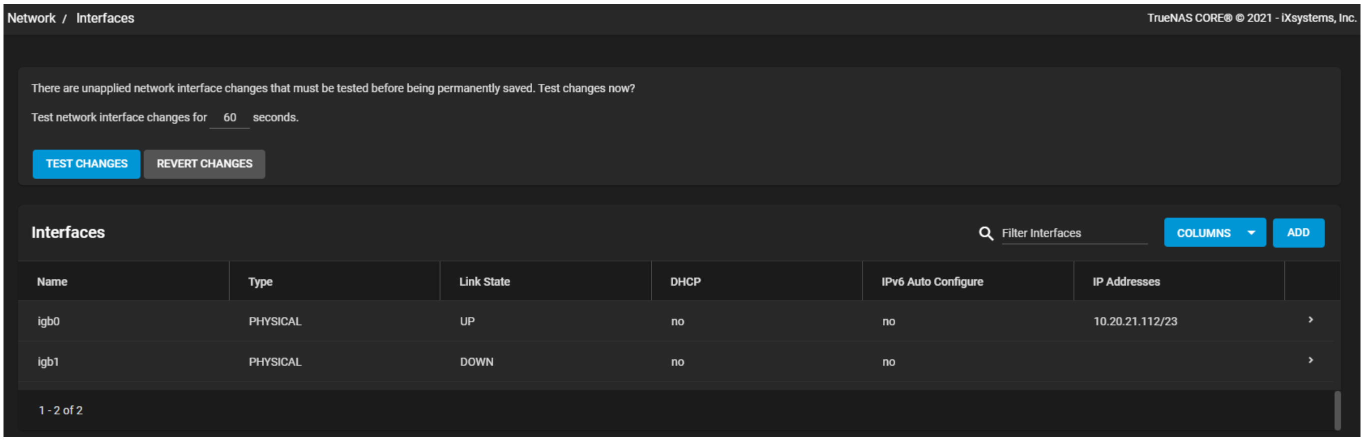
Setting	Value	Description
Disable Hardware Offloading	checkbox	Turn off hardware offloading for network traffic processing. WARNING: disabling hardware offloading can reduce network performance and is only recommended when the interface is managing jails, plugins, or virtual machines (VMs).
MTU	string	Maximum Transmission Unit, the largest protocol data unit that can be communicated. The largest workable MTU size varies with network interfaces and equipment. 1500 and 9000 are standard Ethernet MTU sizes. Leaving blank restores the field to the default value of 1500.
Options	string	Additional parameters from ifconfig. Separate multiple parameters with a space. For example: mtu 9000 increases the MTU for interfaces which support jumbo frames.

IP Addresses

Setting	Value	Description
IP Address	integer and drop-down menu	Static IPv4 or IPv6 address and subnet mask. Example: 10.0.0.3 and /24. Click *ADD* to add another IP address. Clicking *DELETE* removes that IP Address.

Saving Changes

After you're done editing, click *SAVE*. You have the option to *TEST CHANGES* or *REVERT CHANGES*. The default time for testing any changes is 60 seconds, but you can change it to your desired setting.



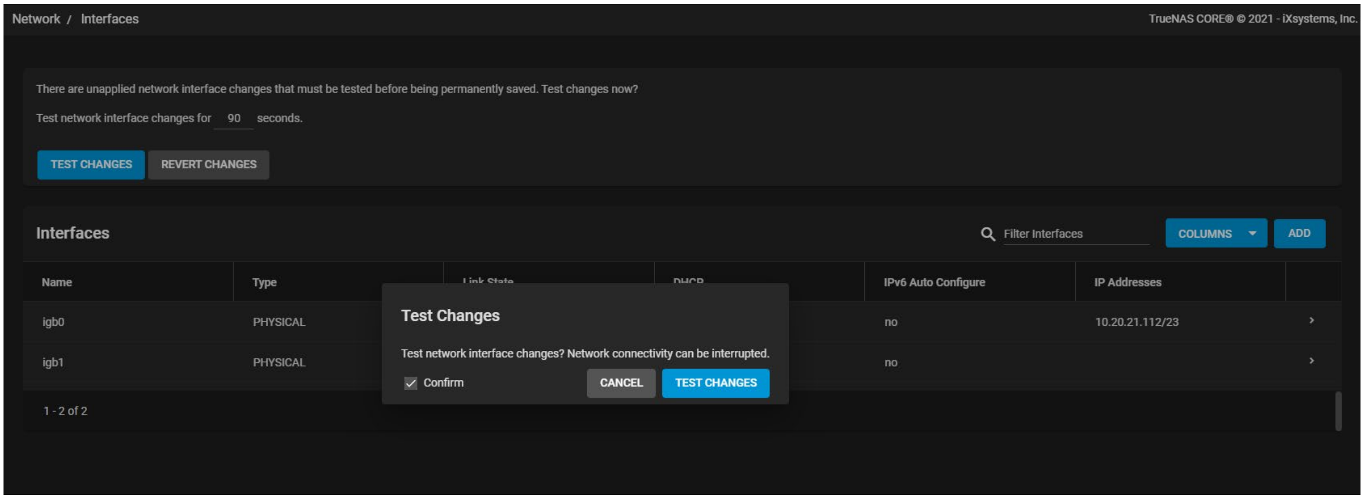
There are unapplied network interface changes that must be tested before being permanently saved. Test changes now?

Test network interface changes for 60 seconds.

Name	Type	Link State	DHCP	IPv6 Auto Configure	IP Addresses
igb0	PHYSICAL	UP	no	no	10.20.21.112/23
igb1	PHYSICAL	DOWN	no	no	

1 - 2 of 2

After clicking *TEST CHANGES*, confirm your choice and click *TEST CHANGES* again.



Network / Interfaces

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There are unapplied network interface changes that must be tested before being permanently saved. Test changes now?

Test network interface changes for 90 seconds.

TEST CHANGES REVERT CHANGES

Interfaces

Filter Interfaces COLUMNS ADD

Name	Type	Link State	DHCP	IPv6 Auto Configure	IP Addresses
igb0	PHYSICAL			no	10.20.21.112/23
igb1	PHYSICAL			no	

1 - 2 of 2

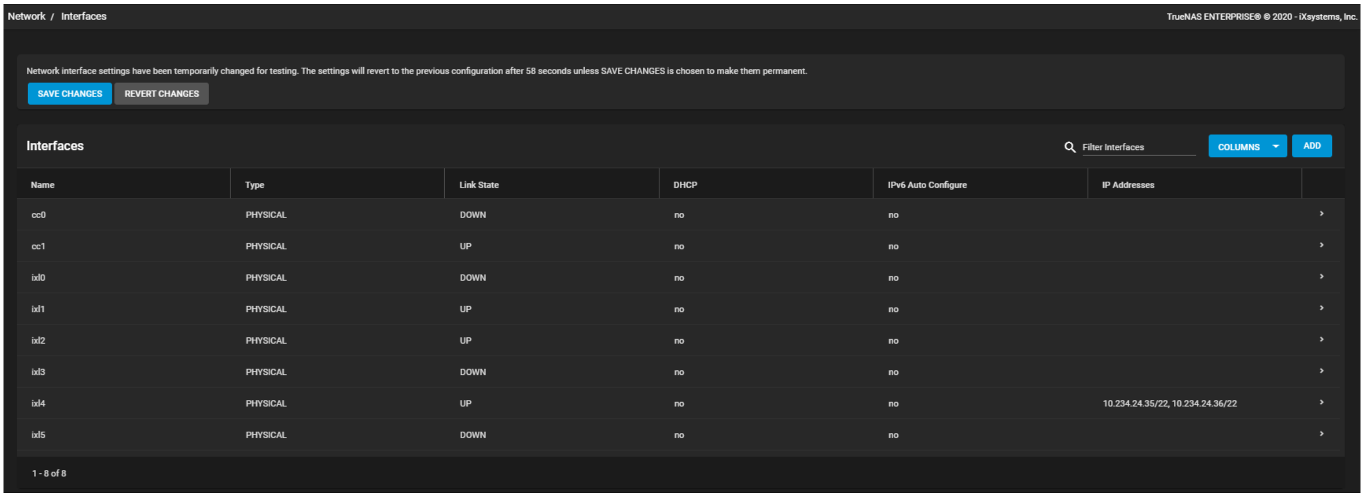
Test Changes

Test network interface changes? Network connectivity can be interrupted.

☑ Confirm

CANCEL TEST CHANGES

Users can either *SAVE CHANGES* or *REVERT CHANGES*. A user will have the time they specified to make their choice. If you select *SAVE CHANGES*, a dialog box will ask you to *CANCEL* or *SAVE* network interface changes. Click *SAVE*.



Network / Interfaces

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Network interface settings have been temporarily changed for testing. The settings will revert to the previous configuration after 58 seconds unless SAVE CHANGES is chosen to make them permanent.

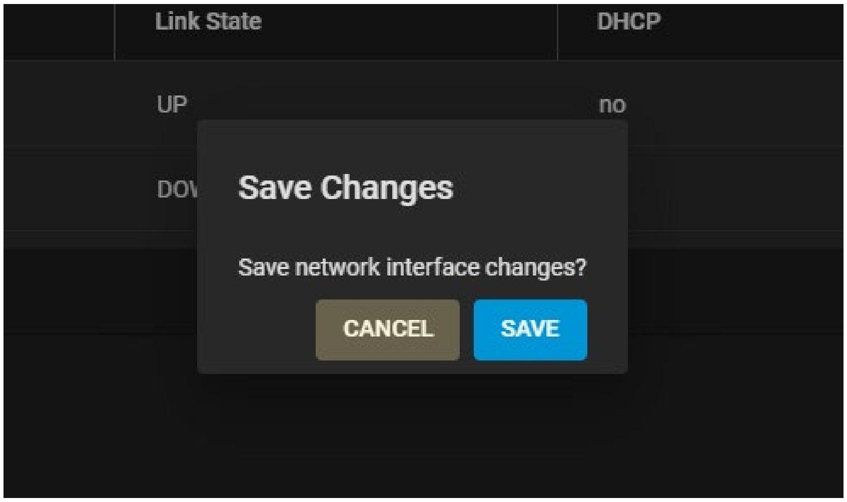
SAVE CHANGES REVERT CHANGES

Interfaces

Filter Interfaces COLUMNS ADD

Name	Type	Link State	DHCP	IPv6 Auto Configure	IP Addresses
cc0	PHYSICAL	DOWN	no	no	
cc1	PHYSICAL	UP	no	no	
ixl0	PHYSICAL	DOWN	no	no	
ixl1	PHYSICAL	UP	no	no	
ixl2	PHYSICAL	UP	no	no	
ixl3	PHYSICAL	DOWN	no	no	
ixl4	PHYSICAL	UP	no	no	10.234.24.35/22, 10.234.24.36/22
ixl5	PHYSICAL	DOWN	no	no	

1 - 8 of 8



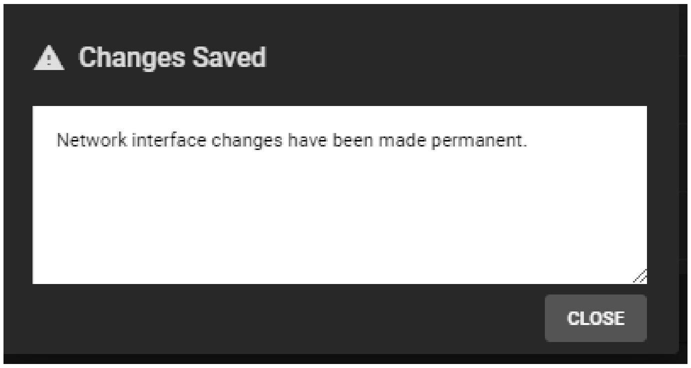
Link State	DHCP
UP	no
DOV	

Save Changes

Save network interface changes?

CANCEL SAVE

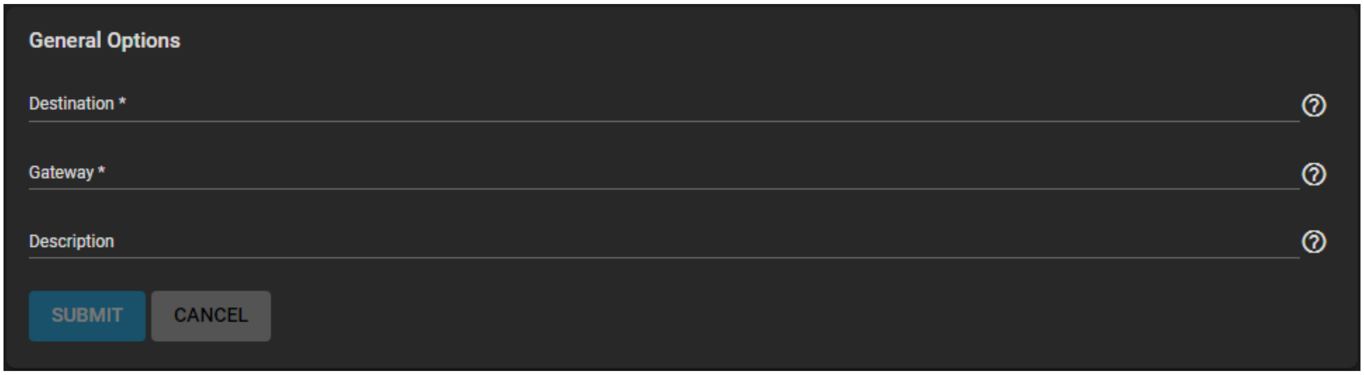
The system will display a dialog box to show that Network interface changes have been made permanent.



Network interface changes have been made permanent.

5.4 - Static Routes

By default, no static routes are defined on a default TrueNAS system. If a static route is required to reach portions of the network, add the route by going to **Network > Static Routes** and clicking *ADD*.



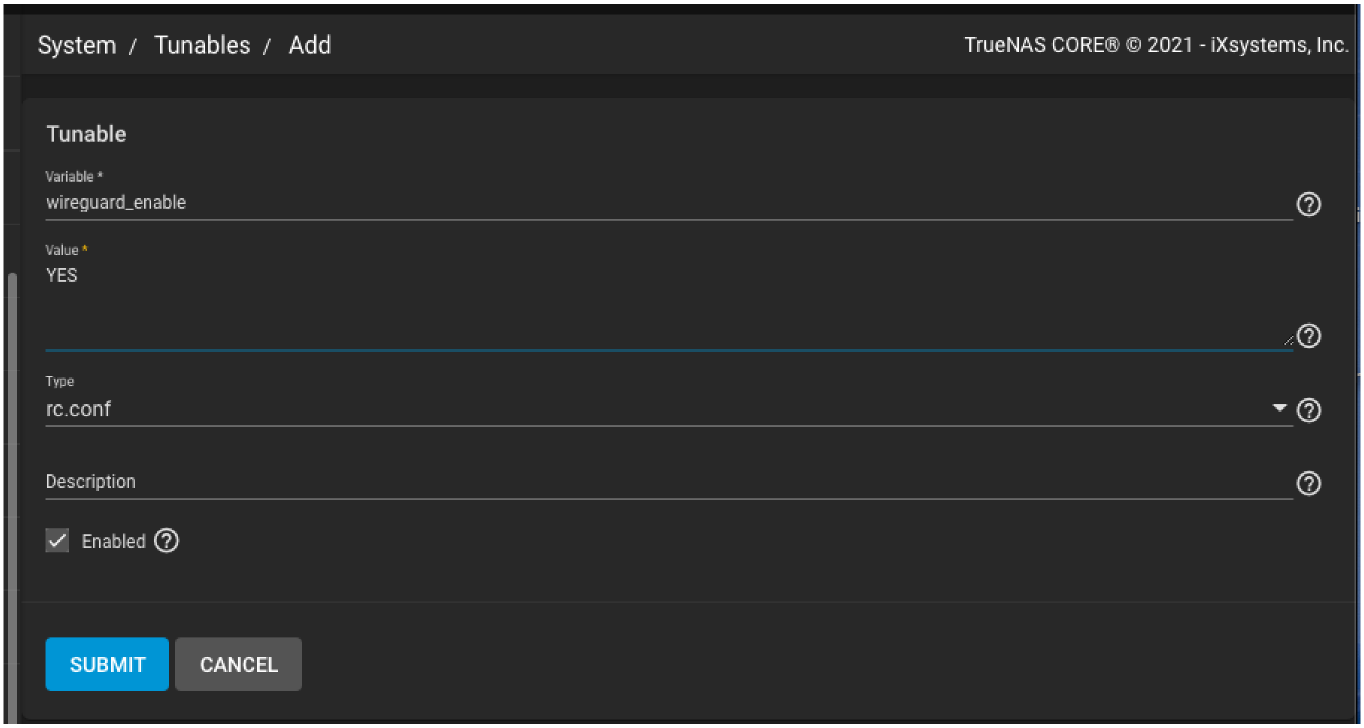
Setting	Value	Description
Destination	integer	Use the format *A.B.C.D/E* where *E* is the CIDR mask.
Gateway	integer	Enter the IP address of the gateway.
Description	string	Notes or identifiers describing the route.

5.5 - Enabling WireGuard

WireGuard is a popular option in the VPN marketplace due to its speed, simplicity, and modern cryptography standards. Starting with FreeNAS version 11.3-RC1 and continuing through TrueNAS 12.0, it is possible to connect your NAS directly to a WireGuard network with a few easy steps.

Start by creating some custom tunables to enable the service and give it a default interface. Log in to the TrueNAS web interface and go to **System > Tunables > Add**. Use these settings to enable the service:

- *Variable* = `wireguard_enable`
- *Value* = `YES`
- *Type* = `rc.conf`



Variable * wireguard_enable

Value * YES

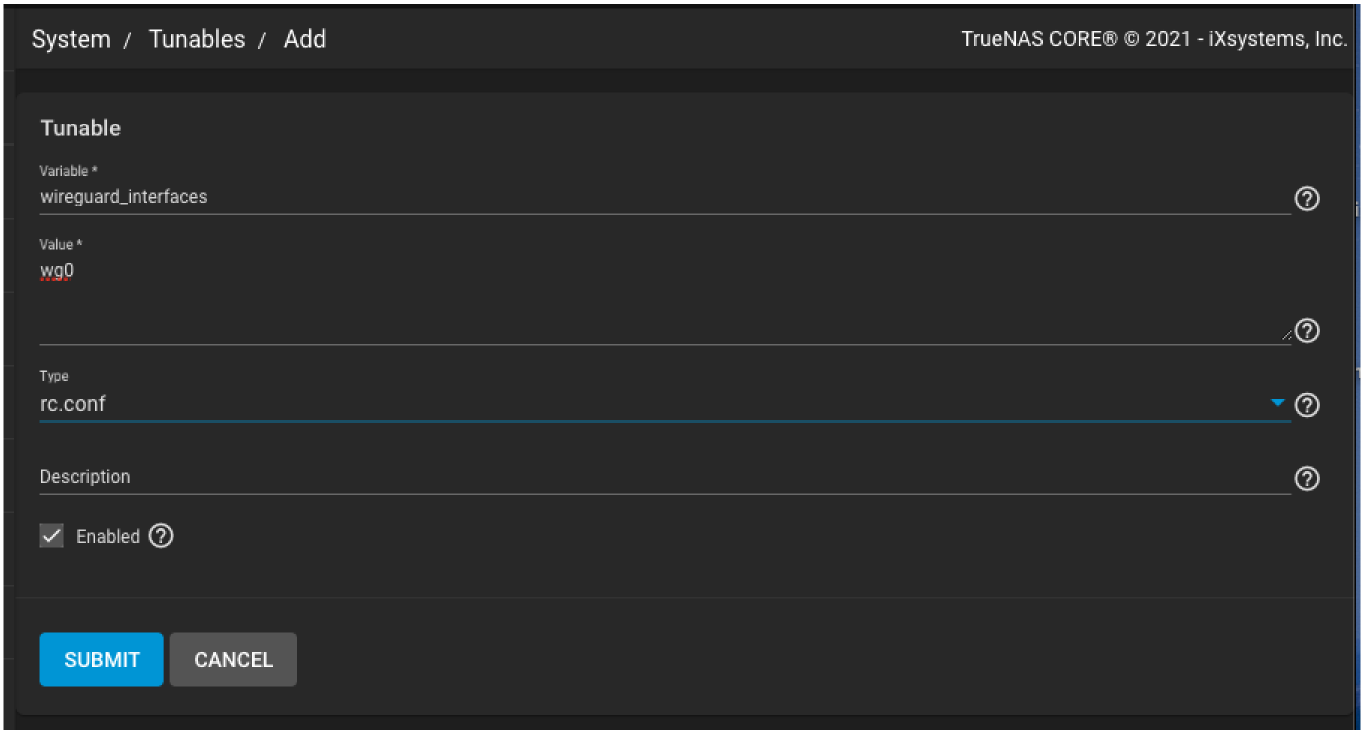
Type rc.conf

Description

☑ Enabled

Next, create another tunable to define the networking interface:

- *Variable* = `wireguard_interfaces`
- *Value* = `wg0`
- *Type* = `rc.conf`



Tunable

Variable * wireguard_interfaces

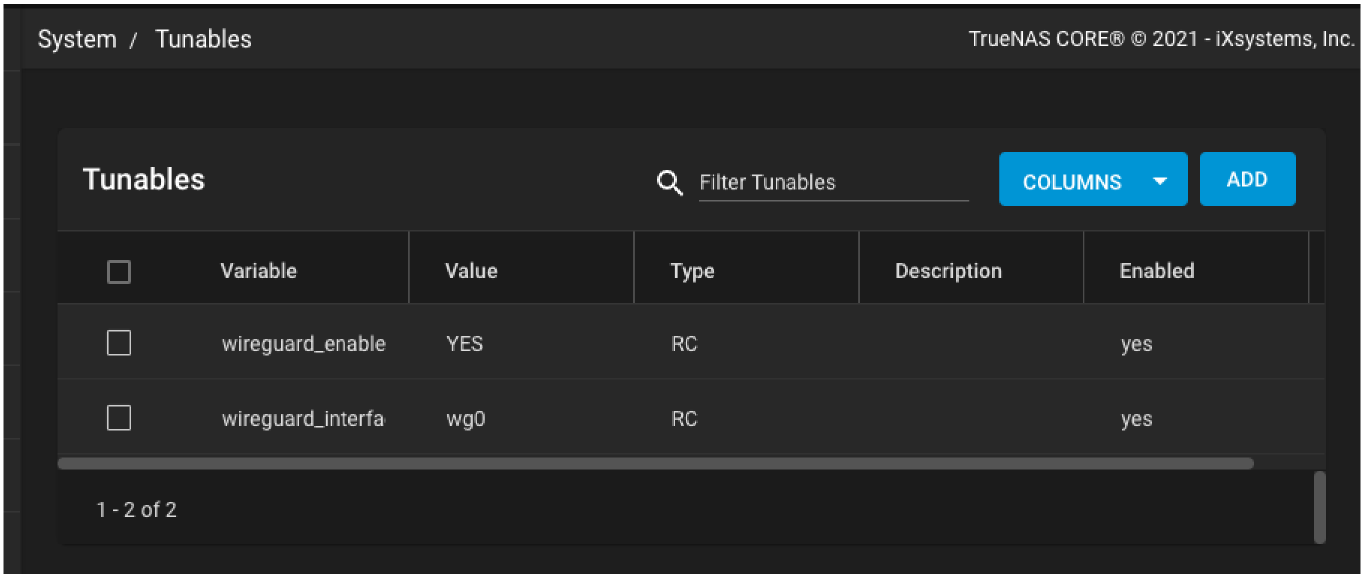
Value * wg0

Type rc.conf

Description

☑ Enabled

When finished, you will have these two variables set and enabled:



□	Variable	Value	Type	Description	Enabled
□	wireguard_enable	YES	RC		yes
□	wireguard_interfa	wg0	RC		yes

1 - 2 of 2

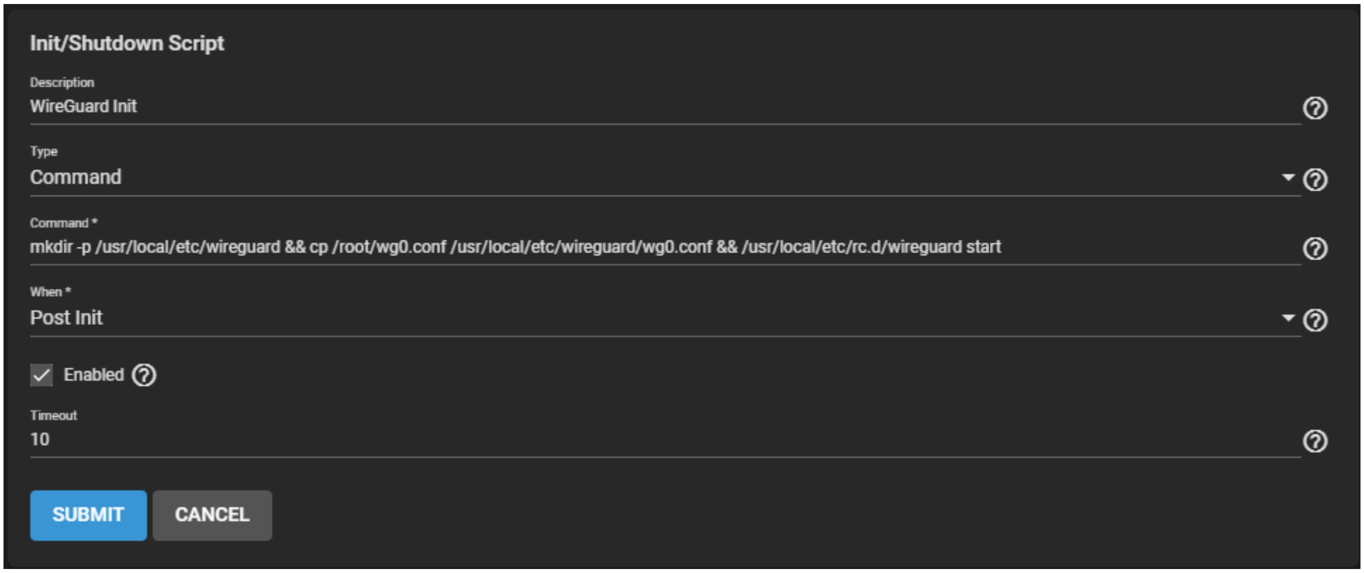
Next, we need a post-init script that places the WireGuard config in the correct location at startup. Go to **Tasks > Init/Shutdown Scripts** and click *Add*. Configure the script to load the WireGuard `.conf` file each time the system boots:

- *Type* = `Command`
- *Command* = `mkdir -p /usr/local/etc/wireguard && cp /root/wg0.conf /usr/local/etc/wireguard/wg0.conf && /usr/local/etc/rc.d/wireguard start`
- *When* = `Post Init`

You can configure the `/root/wg0.conf` file and apply a WireGuard configuration to attach to whatever WireGuard network you define. It can be a single point-to-point to anything running WireGuard or even use full routing. Example use cases are:

- Access data on a NAS from your Remote Laptop
- Linking NAS to NAS for replication
- Attaching a managed NAS to a remote network

- Access to your NAS from your smartphone



Init/Shutdown Script

Description
WireGuard Init

Type
Command

Command *
mkdir -p /usr/local/etc/wireguard && cp /root/wg0.conf /usr/local/etc/wireguard/wg0.conf && /usr/local/etc/rc.d/wireguard start

When *
Post Init

☑ Enabled

Timeout
10

Now create the `/root/wg0.conf` that contains the specific WireGuard configuration to apply at boot. This file settings are dependent on your specific networking environment and requirements, which is beyond the scope of this article. There are quickstart guides and tutorials available online as well as the built-in `wg-quick` manpage.

Once you have a valid `/root/wg0.conf`, rebooting the system brings up the WireGuard interface and you'll see a `wg0` device in the output of `ifconfig`.

```
# ifconfig wg0
wg0: flags=8051<UP,POINTOPOINT,RUNNING,MULTICAST> metric 0 mtu 1420
        options=80000<LINKSTATE>
        inet 192.168.X.X --> 192.168.X.X netmask 0xffffff00
        nd6 options=101<PERFORMNUD,NO_DAD>
        groups: tun
        Opened by PID 1734
```

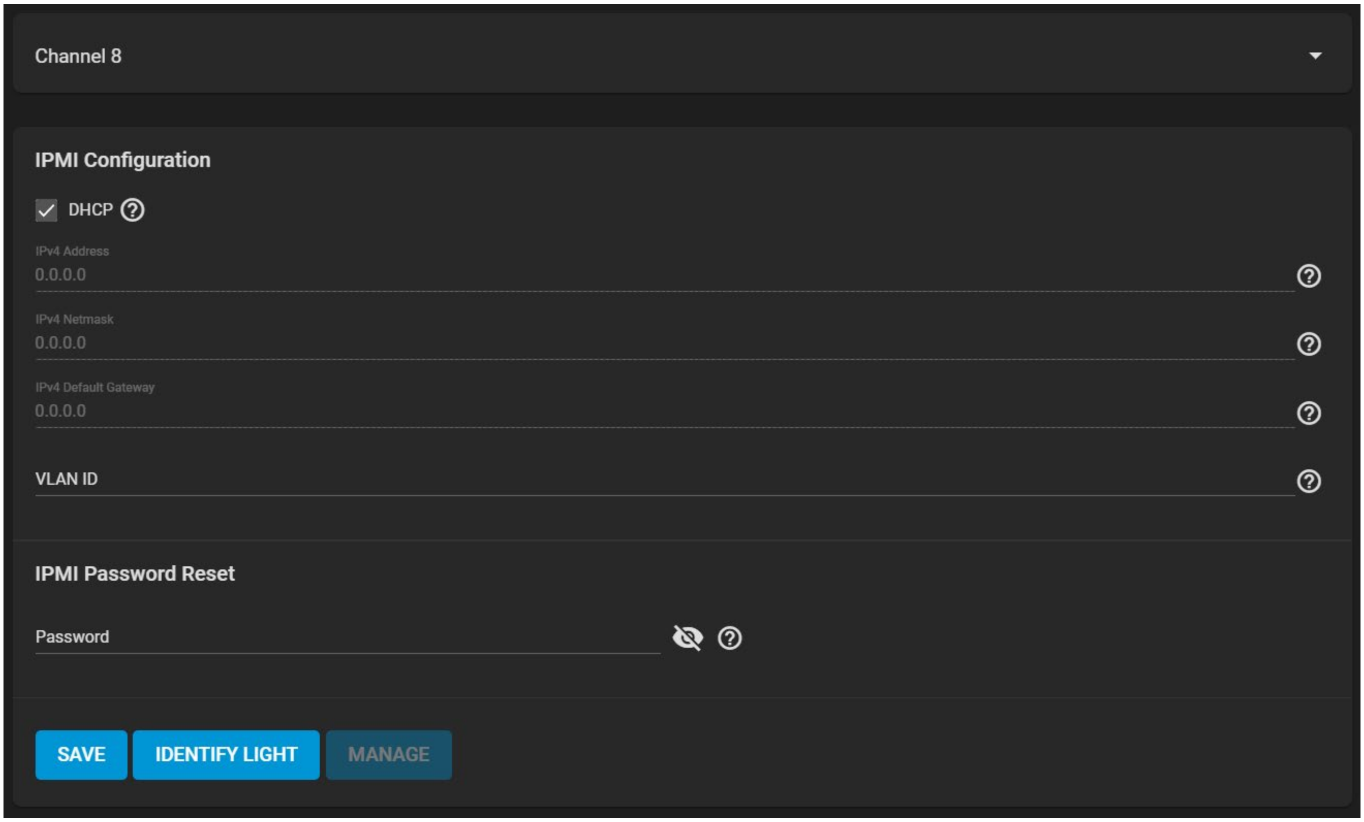
Congratulations, you have successfully linked your TrueNAS system to a secure WireGuard tunnel!

5.6 - IPMI

IPMI requires compatible hardware! Refer to your hardware documentation to determine if this option will appear in the TrueNAS web interface.

Many TrueNAS Storage Arrays provide a built-in out-of-band management port which can be used to provide side-band management should the system become unavailable through the web interface. This allows for a few vital functions, such as checking the log, accessing the BIOS setup, and powering on the system without requiring physical access to the system. It can also be used to allow another person remote access to the system to assist with a configuration or troubleshooting issue.

Some IPMI implementations require updates to work with newer versions of Java. See PSA: Java 8 Update 131 breaks ASRock's IPMI Virtual console for more information.



Channel 8

IPMI Configuration

☑ DHCP

IPv4 Address
0.0.0.0

IPv4 Netmask
0.0.0.0

IPv4 Default Gateway
0.0.0.0

VLAN ID

IPMI Password Reset

Password

IPMI is configured from **Network > IPMI**. The IPMI configuration screen provides a shortcut to the most basic IPMI configuration.

IPMI Configuration

These options are available:

Setting	Value	Description
TrueNAS Controller	drop-down menu	Select a TrueNAS controller. All IPMI changes are applied to that TrueNAS controller.
Channel	drop-down menu	Select the communications channel to use. Available channel numbers vary by hardware.

Password	string	Enter the password used to connect to the IPMI interface from a web browser. The maximum length accepted in the UI is 20 characters, but different hardware might require shorter passwords.
DHCP	checkbox	If left unset, IPv4 Address, IPv4 Netmask, and Ipv4 Default Gateway must be set.
IPv4 Address	string	IP address used to connect to the IPMI web interface.
IPv4 Netmask	drop-down menu	Subnet mask associated with the IP address.
IPv4 Default Gateway	string	Default gateway associated with the IP address.
VLAN ID	string	Enter the VLAN identifier if the IPMI out-of-band management interface is not on the same VLAN as management networking.
IDENTIFY LIGHT	button	Show a dialog to activate an IPMI identify light on the compatible connected hardware.

IPMI Options

After saving the configuration, the IPMI interface is accessed using a web browser and the IP address specified in **Network > IPMI**. The management interface prompts for login credentials. Refer to your IPMI device documentation to learn the default administrator account credentials.

After logging in to the management interface, the default administrative user name can be changed and additional IPMI users created. The appearance of the IPMI utility and the functions that are available vary by hardware.

6 - Storage

6.1 - Pools

6.1.1 - Pool Creation

TrueNAS uses ZFS data storage “pools” to efficiently store and protect data.

What's a pool? expand □

Storage pools are attached drives organized into virtual devices (vdevs). ZFS and TrueNAS periodically reviews and “heals” whenever a bad block is discovered in a pool. Drives are arranged inside vdevs to provide varying amounts of redundancy and performance. This allows for high performance pools, pools that maximize data lifetime, and all situations in between

Review Storage Needs

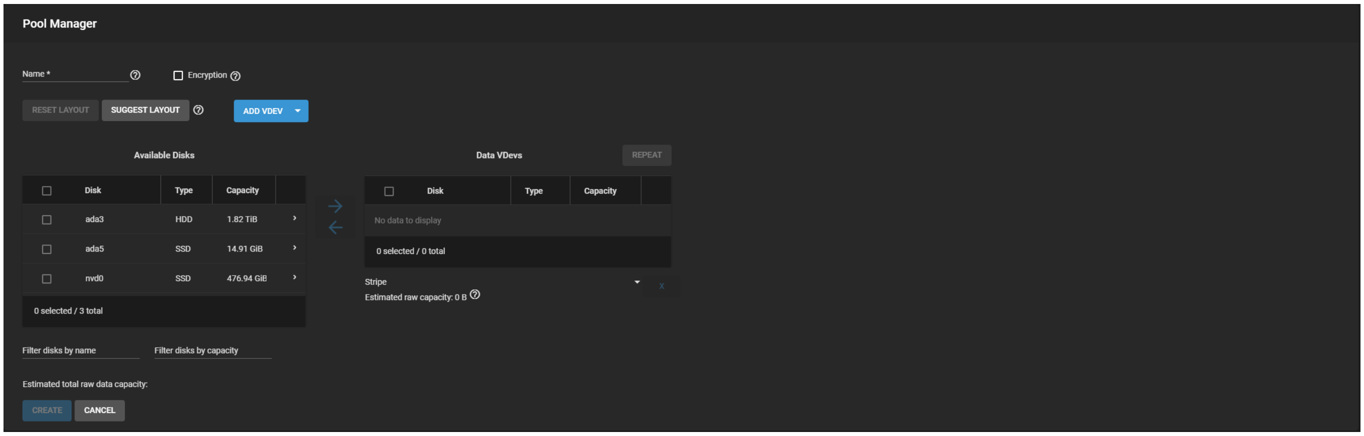
It is strongly recommended to review the available system resources and plan the storage use case before creating a storage pool.

- When storing critical information, more drives allocated to the pool increases redundancy.
- Maximizing total available storage at the expense of redundancy or performance means allocating large volume disks and configuring the pool for minimal redundancy.
- Maximizing pool performance means installing and allocating high-speed SSD drives to the pool.

Determining your specific storage requirements is a critical step before creating a pool.

Creating a Pool

To create a new pool, go to **Storage > Pools** and click *ADD*. Select *Create new pool* and click *CREATE POOL* to open the **Pool Manager**.



□	Disk	Type	Capacity
□	ada3	HDD	1.82 TiB
□	ada5	SSD	14.91 GiB
□	nvd0	SSD	476.94 GiB

0 selected / 3 total

□	Disk	Type	Capacity

No data to display

0 selected / 0 total

Stripe

Estimated raw capacity: 0 B

Estimated total raw data capacity:

To begin, enter a pool *Name*.

Encryption? □

expand

Encryption algorithms are available as an option for maximizing data security. This also complicates how data is retrieved and risks permanent data loss! Refer to the Encryption article for more details and decide if encryption is necessary for your use case before setting any *Encryption* options.

Next, configure the virtual devices (vdevs) that make up the pool.

Suggested Layout

Clicking *SUGGEST LAYOUT* allows TrueNAS to review all available disks and populate the primary *Data* vdev with identically sized drives in a balanced configuration between storage capacity and data redundancy. To clear the suggestion, click *RESET LAYOUT*.

To manually configure the pool, add vdevs according to your use case. Set the **Disk** boxes and click the □ to move the disks into a vdev.

Vdev Types

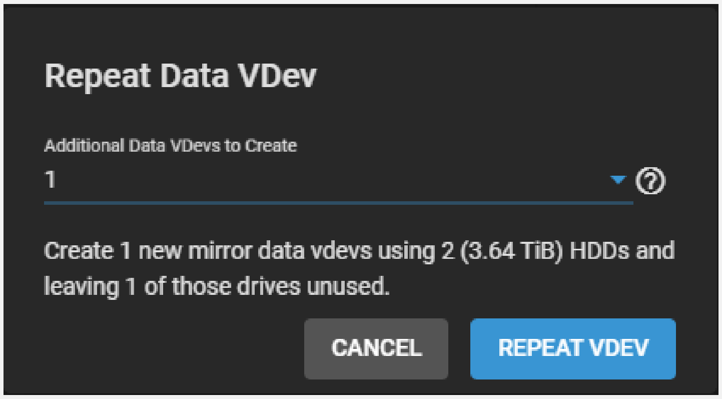
Pools have many different kinds of vdevs available. These store data or enable unique features for the pool:

⊙ **Data**

Standard vdev for primary storage operations. Each storage pool requires at least one *Data* vdev. *Data* vdev configuration typically affects how the other kinds of vdevs are configured.

Duplicating a Data vdev expand □

A **Data VDev** with disks is duplicated by clicking *REPEAT*. When more disks are available and equal in size, the *REPEAT* button creates another vdev with an identical configuration called a “mirror” of vdevs.



Repeat Data VDev

Additional Data VDevs to Create

1

Create 1 new mirror data vdevs using 2 (3.64 TiB) HDDs and leaving 1 of those drives unused.

When even more same-size disks are available, multiple copies of the original vdev can be created.

Don’t have multiple data vdevs with different numbers of disks in each vdev. This complicates and limits the pool capabilities.

○ **Cache**
ZFS L2ARC read-cache used with fast devices to accelerate read operations. This can be added or removed after creating the pool.

○ **Log**
ZFS LOG device that improves synchronous write speeds. This can be added or removed after creating the pool.

○ **Hot Spare**

Drives reserved for inserting into *Data* vdevs when an active drive fails. Hot spares are temporarily used as replacements for failed drives to prevent larger pool and data loss scenarios.

When a failed drive is replaced with a new drive, the hot spare reverts to an inactive state and is available again as a hot spare.

When the failed drive is only detached from the pool, the temporary hot spare is promoted to a full *Data* vdev member and is no longer available as a hot spare.

○ **Metadata**
Special Allocation class used to create Fusion Pools for increased metadata and small block I/O performance.
○ **Dedup**
Stores ZFS de-duplication. Requires allocating X GiB for every X TiB of general storage. Example: 1 GiB of *Dedup* vdev capacity for every 1 TiB of *Data* vdev availability.

To add a different vdev type during pool creation, click *ADD VDEV* and select the type. Select disks from `Available Disks` and use the □ (right arrow) next to the new **VDev** to add it to that section.

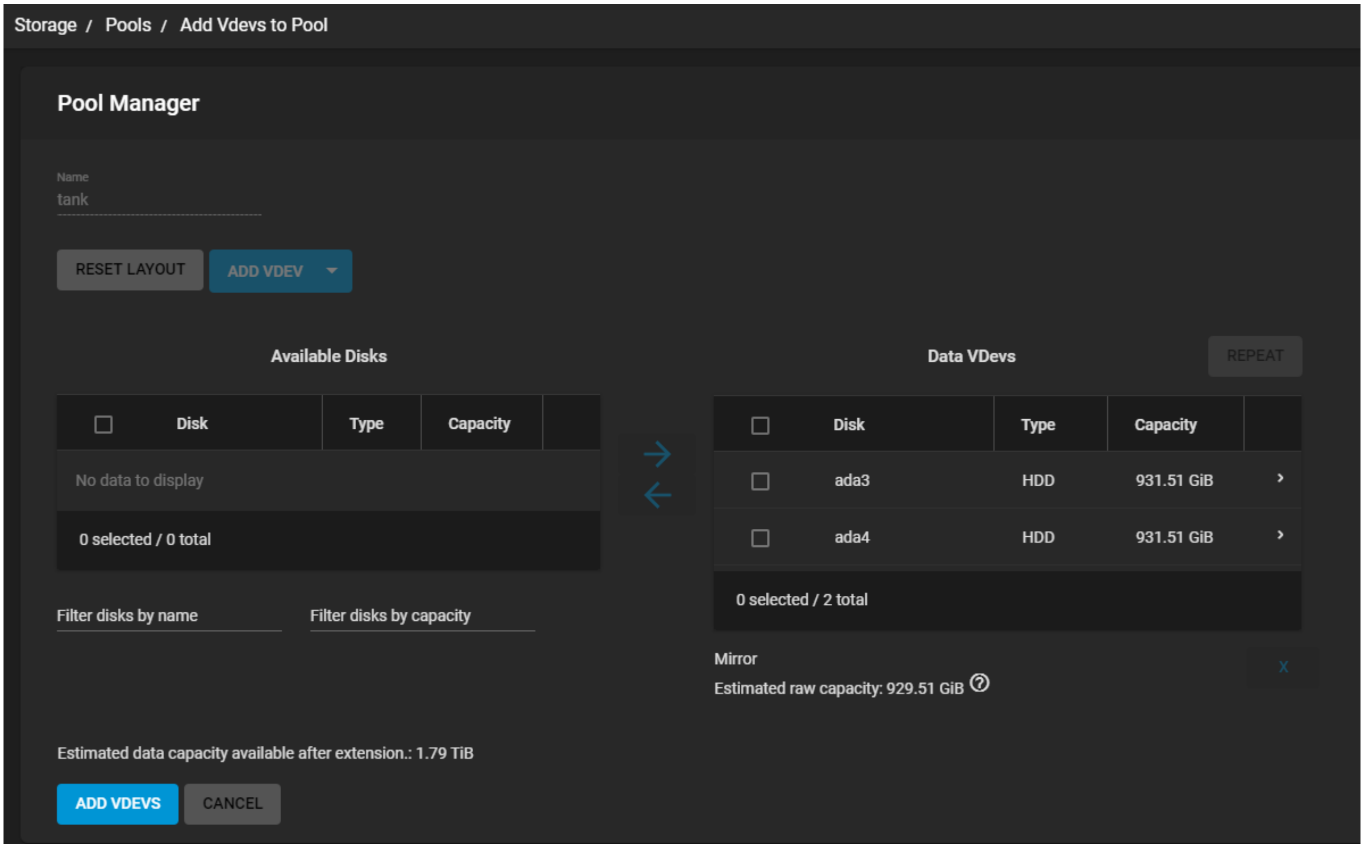
Vdev Layout

Disks added to a vdev arrange in different layouts, according to the specific pool use case.

Can I create vdevs with different layouts in one pool? expand □
Adding multiple vdevs with different layouts to a pool is not supported. Create a new pool when a different vdev layout is required. For example, *pool1* has a data vdev in a *mirror* layout, so create *pool2* for any *raid-z* vdevs.

◉ **Stripe**
Each disk is used to store data. Requires at least one disk and has no data redundancy. Never use a *Stripe* to store critical data! A single disk failure results in losing all data in the vdev.
○ **Mirror**
Data is identical in each disk. Requires at least two disks, has the most redundancy, and the least capacity.
○ **RAIDZ1**
Uses one disk for parity while all other disks store data. Requires at least three disks.
○ **RAIDZ2**
Uses two disks for parity while all other disks store data. Requires at least four disks.
○ **RAIDZ3**
Uses three disks for parity while all other disks store data. Requires at least five disks.

The **Pool Manager** suggests a vdev layout from the number of disks added to the vdev. For example, if two disks are added, TrueNAS automatically configures the vdev as a *Mirror*, where the total available storage is the size of one added disk while the other disk provides redundancy.



Pool Manager

Name
tank

Available Disks

□ Disk	Type	Capacity
No data to display		

0 selected / 0 total

Filter disks by name

Filter disks by capacity

Data VDevs

□	Disk	Type	Capacity
□	ada3	HDD	931.51 GiB
□	ada4	HDD	931.51 GiB

0 selected / 2 total

Mirror

Estimated raw capacity: 929.51 GiB

Estimated data capacity available after extension.: 1.79 TiB

To change the vdev layout, open the *Data VDevs* list and select the desired layout.

6.1.2 - Pool Import

This procedure only applies to disks with a ZFS storage pool. To import disks with different file systems, see Import Disk .

ZFS pool importing works for pools that were exported or disconnected from the current system, created on another system, and pools to reconnect after reinstalling or upgrading the TrueNAS system. To import a pool, go to **Storage > Pools > ADD**.

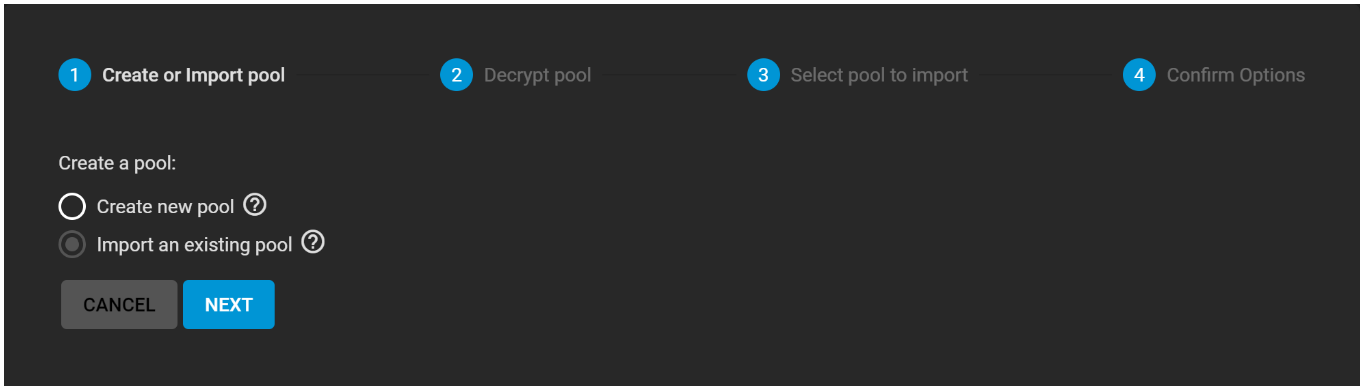
Do I need to do anything different with disks installed on a different system? expand □
When physically installing ZFS pool disks from another system, use the `zpool export poolname` command in the command line or a web interface equivalent to export the pool on that system. Shut that system down and move the drives to the TrueNAS system. Shutting down the original system prevents an *"in use by another machine"* error during the TrueNAS import.

There are two kinds of pool imports, standard ZFS pool imports and ZFS pools with legacy GELI encryption .

⊙ **Standard ZFS Pool**

Standard ZFS Pools

Select *Import Existing Pool* and click *NEXT*.

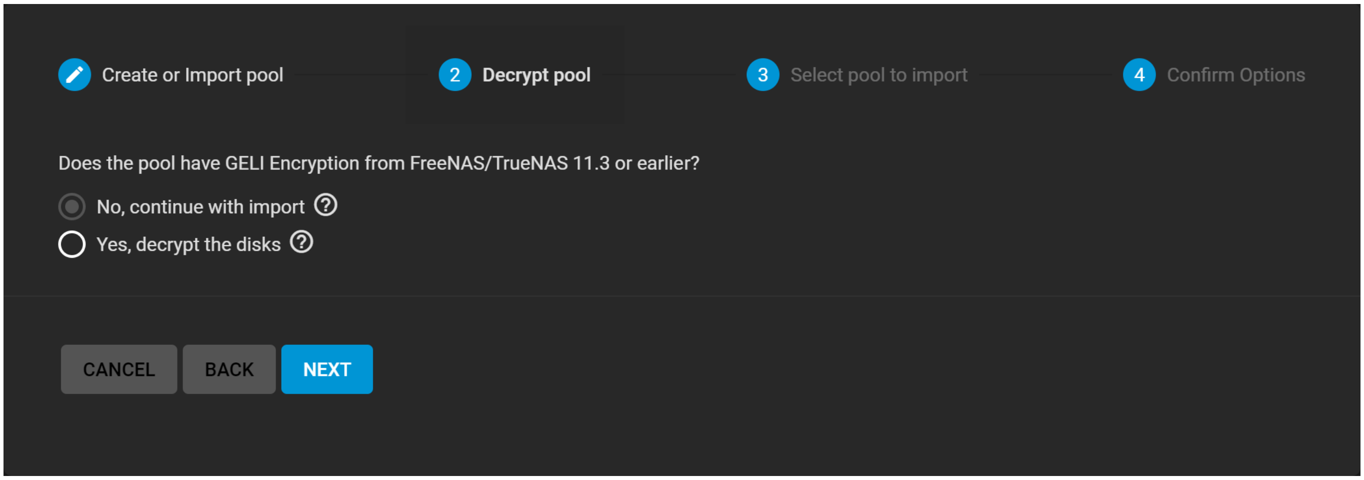


Create a pool:

○ Create new pool ?

● Import an existing pool ?

The wizard asks if the pool has legacy GELI encryption.



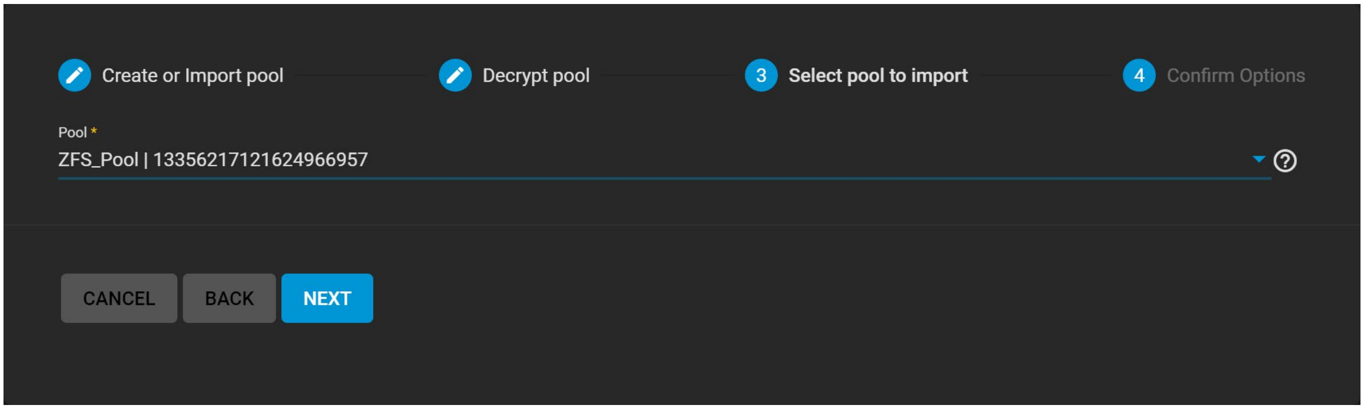
Does the pool have GELI Encryption from FreeNAS/TrueNAS 11.3 or earlier?

● No, continue with import ?

○ Yes, decrypt the disks ?

Select *No, continue with import* and click *NEXT*.

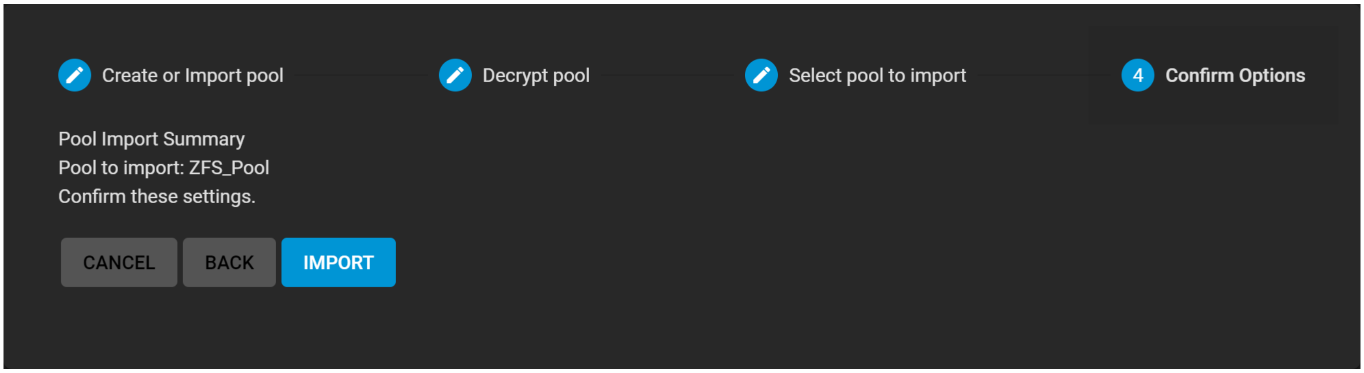
TrueNAS detects any pools that are present but unconnected.



Pool *
ZFS_Pool | 13356217121624966957

Choose the ZFS pool to import and click *NEXT*.

Review the Pool Import Summary and click *IMPORT*.



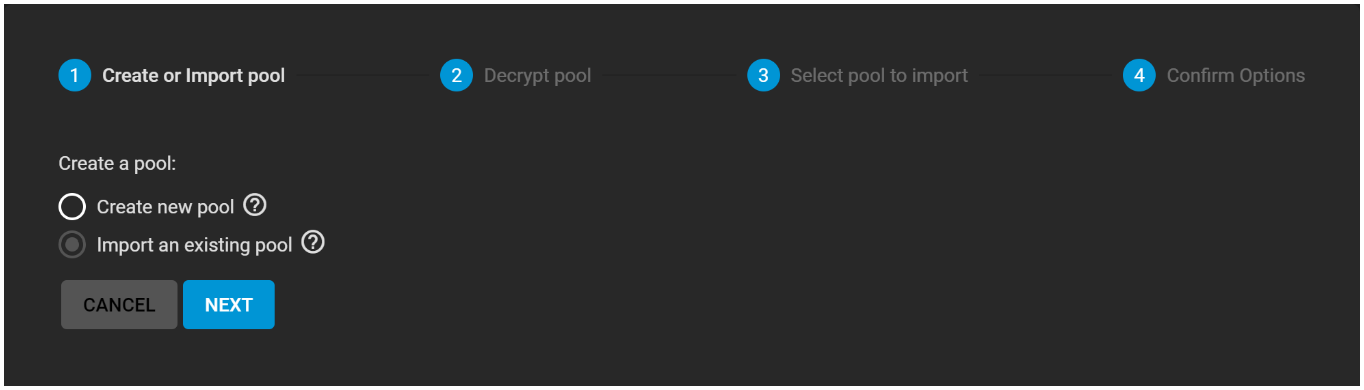
Pool Import Summary
Pool to import: ZFS_Pool
Confirm these settings.

○ ZFS Pool with GELI

Encrypted GELI Pools

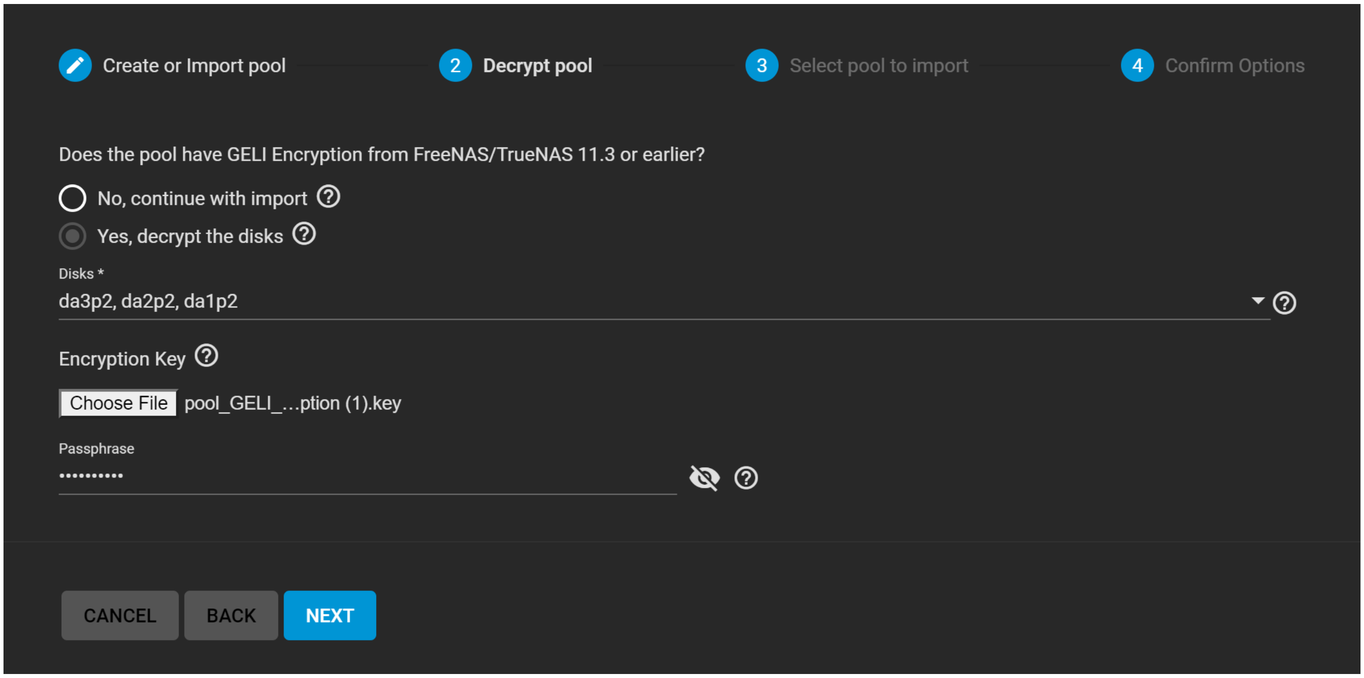
Importing a GELI-encrypted pool requires using the encryption key file and passphrase to decrypt the pool *before* importing. When a pool cannot be decrypted, it cannot be re-imported after a failed upgrade or lost configuration, and the **data is irretrievable**. Always have a copy of the pool GELI key file and passphrase available.

Select *Import Existing Pool* and click *NEXT*.



Create a pool:
○ Create new pool
● Import an existing pool

The wizard asks if the pool has legacy GELI encryption. Select *Yes, decrypt the disks* and review the decryption options.



Does the pool have GELI Encryption from FreeNAS/TrueNAS 11.3 or earlier?

○ No, continue with import

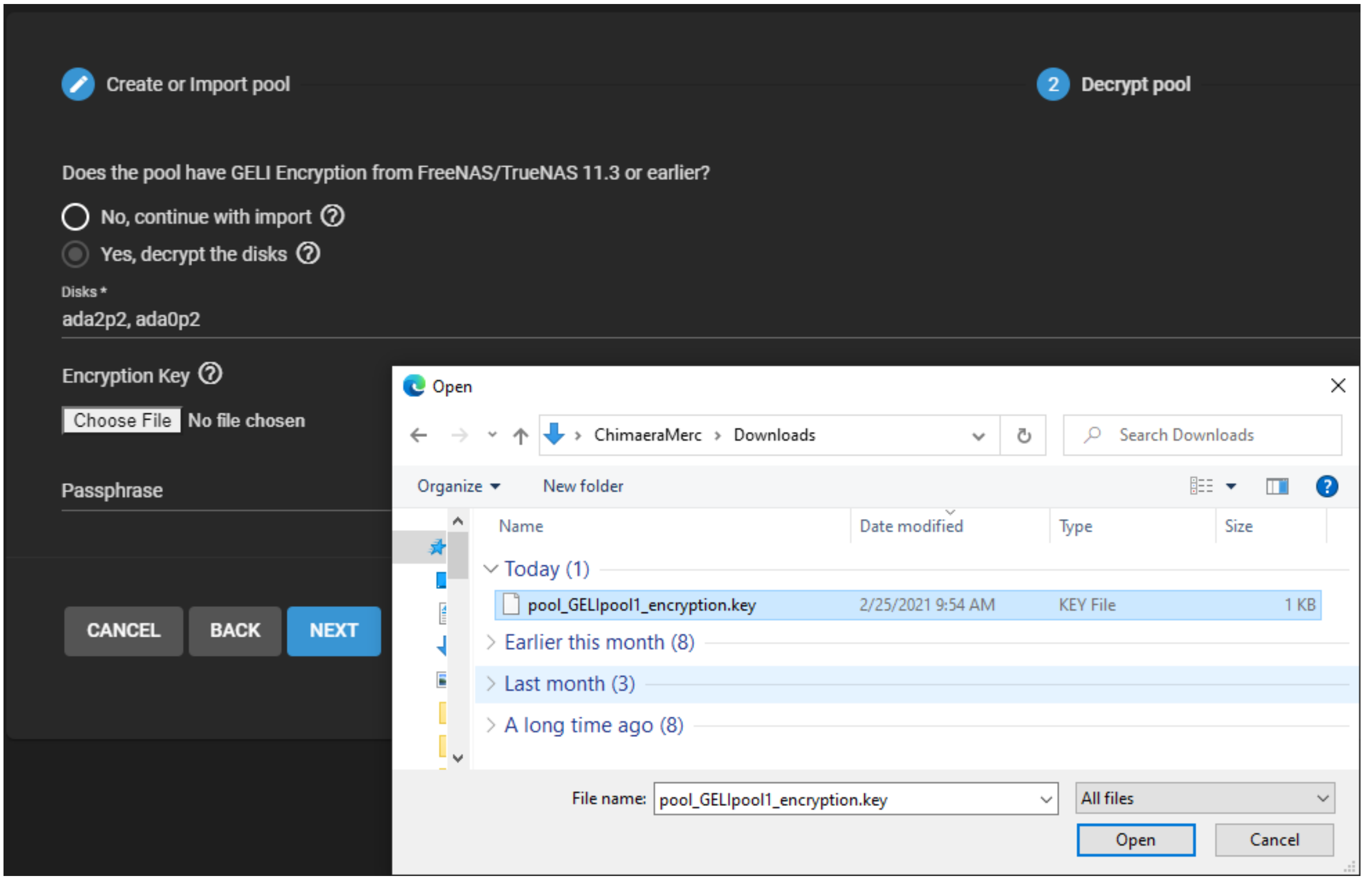
● Yes, decrypt the disks

Disks *
da3p2, da2p2, da1p2

Encryption Key
Choose File pool_GELI_...ption (1).key

Passphrase
••••••••••

Make sure the *Disks* selection shows the encrypted disks and partitions that are part of the incoming pool. Apply the GELI encryption key file by clicking *Choose File* and uploading the file from your local system.



Does the pool have GELI Encryption from FreeNAS/TrueNAS 11.3 or earlier?

○ No, continue with import

● Yes, decrypt the disks

Disks *
ada2p2, ada0p2

Encryption Key
Choose File No file chosen

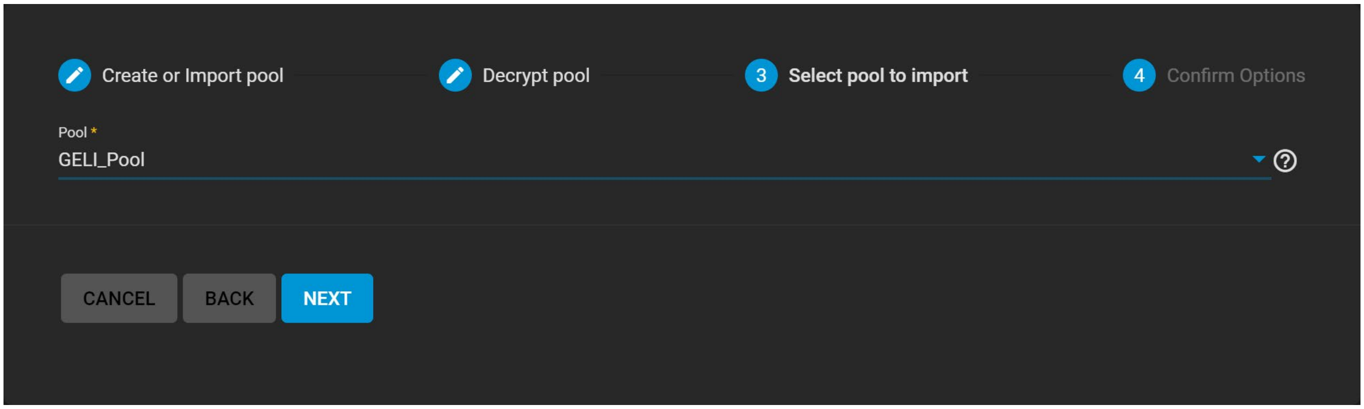
Passphrase

Name	Date modified	Type	Size
pool_GELIpool1_encryption.key	2/25/2021 9:54 AM	KEY File	1 KB

File name: pool_GELIpool1_encryption.key

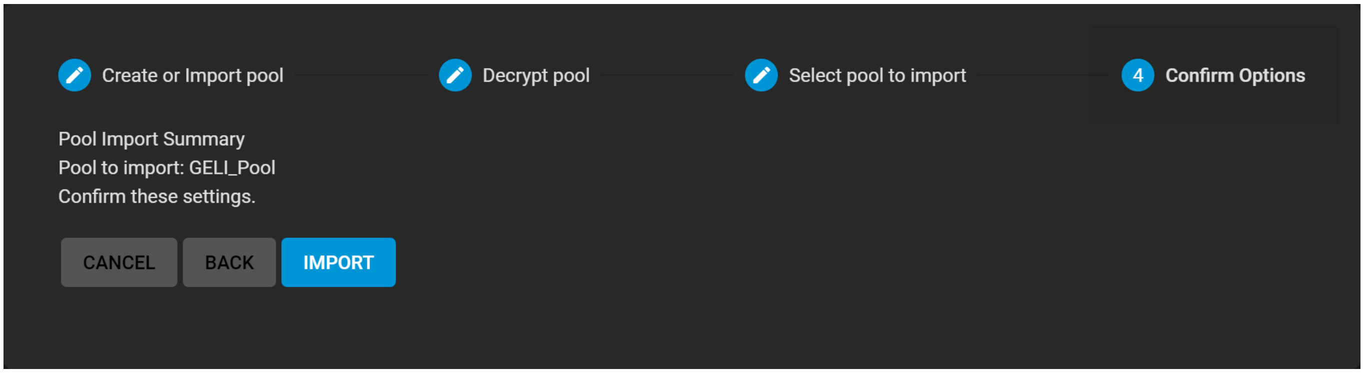
When a passphrase is also present, enter it in the *Passphrase* field. Click *Next* and wait for the disks to decrypt.

When the disks are decrypted, select the GELI pool to import.



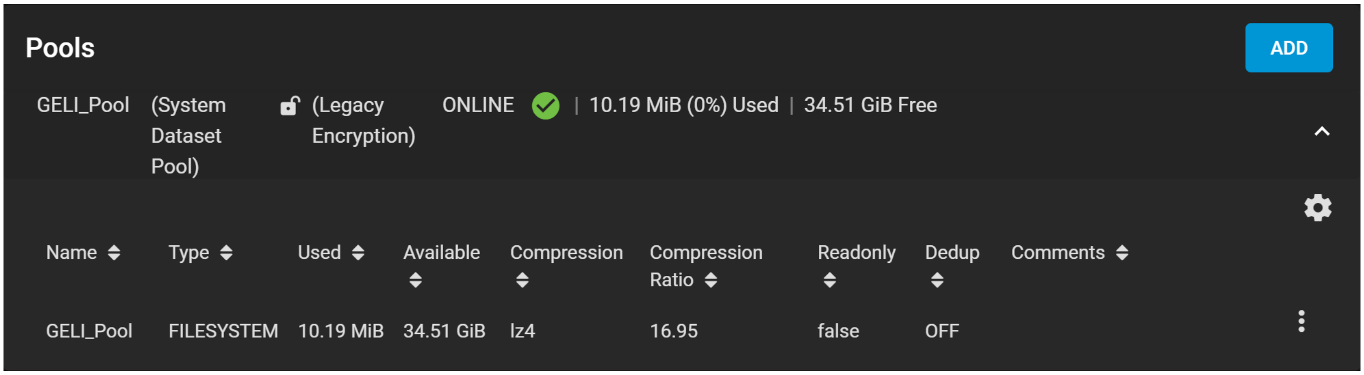
Pool *
GELI_Pool

Review the **Pool Import Summary** and click *IMPORT*.



Pool Import Summary
Pool to import: GELI_Pool
Confirm these settings.

GELI encrypted pools show in **Storage > Pools** as **(Legacy Encryption)**.



GELI_Pool (System Dataset Pool) (Legacy Encryption) ONLINE ✓ | 10.19 MiB (0%) Used | 34.51 GiB Free

Name	Type	Used	Available	Compression	Compression Ratio	Readonly	Dedup	Comments
GELI_Pool	FILESYSTEM	10.19 MiB	34.51 GiB	lz4	16.95	false	OFF	

Back Up the Pool Key

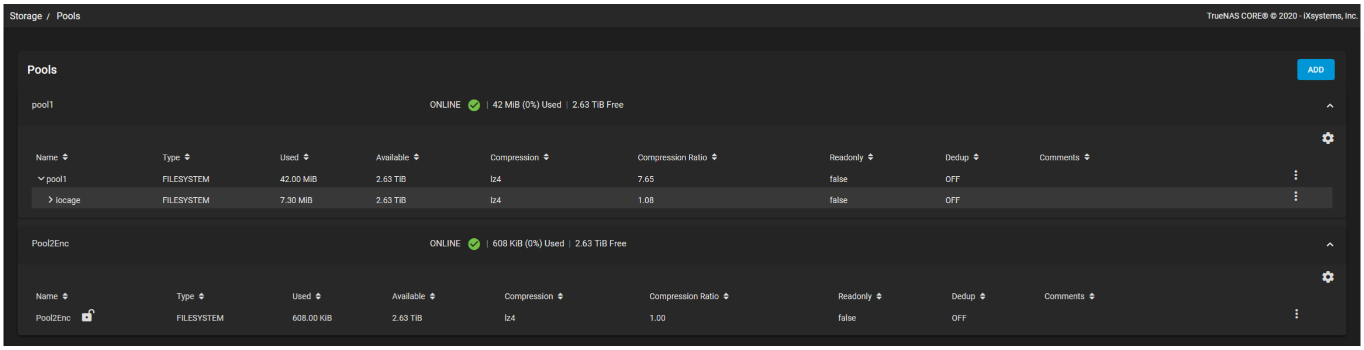
For security reasons, encrypted pool keys do not save to a configuration backup file. When TrueNAS is installed to a new device and restored with a saved configuration file, keys for encrypted disks are not present and the system does not request them.

To correct this, export the encrypted pool in **Storage > Pools** with settings > **Export/Disconnect**. **Do not** set *Destroy data on this pool?*. Now import the pool again. During the import, add the encryption keys as described previously.

6.1.3 - Managing Pools

> When a pool is created, a root dataset is also automatically created with the same name as the pool. The root dataset's permissions can't be changed.

After creating a data storage pool, there are a variety of options to change the initial configuration of that pool. Changing a pool can be disruptive, so make sure you are aware of existing resources on the system and consider backing up any stored data before changing the pool. To find an existing pool, log in to the web interface and go to **Storage > Pools**.



pool1 ONLINE ✓ | 42 MiB (0%) Used | 2.63 TiB Free

Name	Type	Used	Available	Compression	Compression Ratio	Readonly	Dedup	Comments
pool1	FILESYSTEM	42.00 MiB	2.63 TiB	lz4	7.65	false	OFF	
iocage	FILESYSTEM	7.30 MiB	2.63 TiB	lz4	1.08	false	OFF	

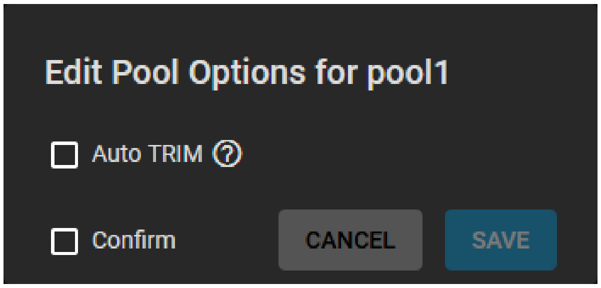
Pool2Enc ONLINE ✓ | 608 KiB (0%) Used | 2.63 TiB Free

Name	Type	Used	Available	Compression	Compression Ratio	Readonly	Dedup	Comments
Pool2Enc	FILESYSTEM	608.00 KiB	2.63 TiB	lz4	1.00	false	OFF	

The current status and storage usage of each pool is shown. To see more details about a pool, click the **v** symbol on the right side of the pool entry. Click the settings for all pool management options.

Pool Options

Contains any additional high-level settings for the pool.



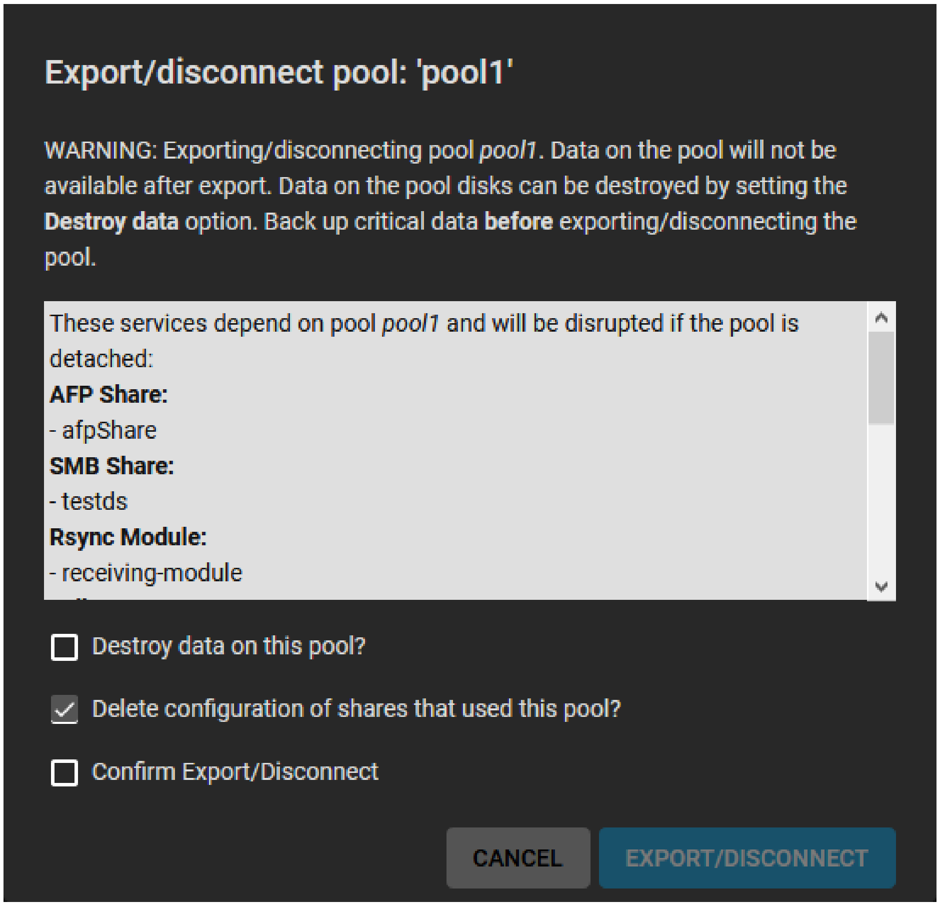
□ Auto TRIM

□ Confirm

Auto TRIM allows TrueNAS to periodically check the pool disks for storage blocks that can be reclaimed. This can have a performance impact on the pool, so the option is disabled by default. For more details about TRIM in ZFS, see the `autotrim` property description in zpool.8.

Export/Disconnect

Removes the pool from the system. Can be used to prepare drives for transfer to a new system and import the pool or completely delete the pool and any data stored on it. A dialog warns about the risks of disconnecting the pool and shows any system services that are affected by removing the pool.



Export/disconnect pool: 'pool1'

WARNING: Exporting/disconnecting pool *pool1*. Data on the pool will not be available after export. Data on the pool disks can be destroyed by setting the **Destroy data** option. Back up critical data **before** exporting/disconnecting the pool.

These services depend on pool *pool1* and will be disrupted if the pool is detached:
AFP Share:
- afpShare
SMB Share:
- testds
Rsync Module:
- receiving-module

□ Destroy data on this pool?

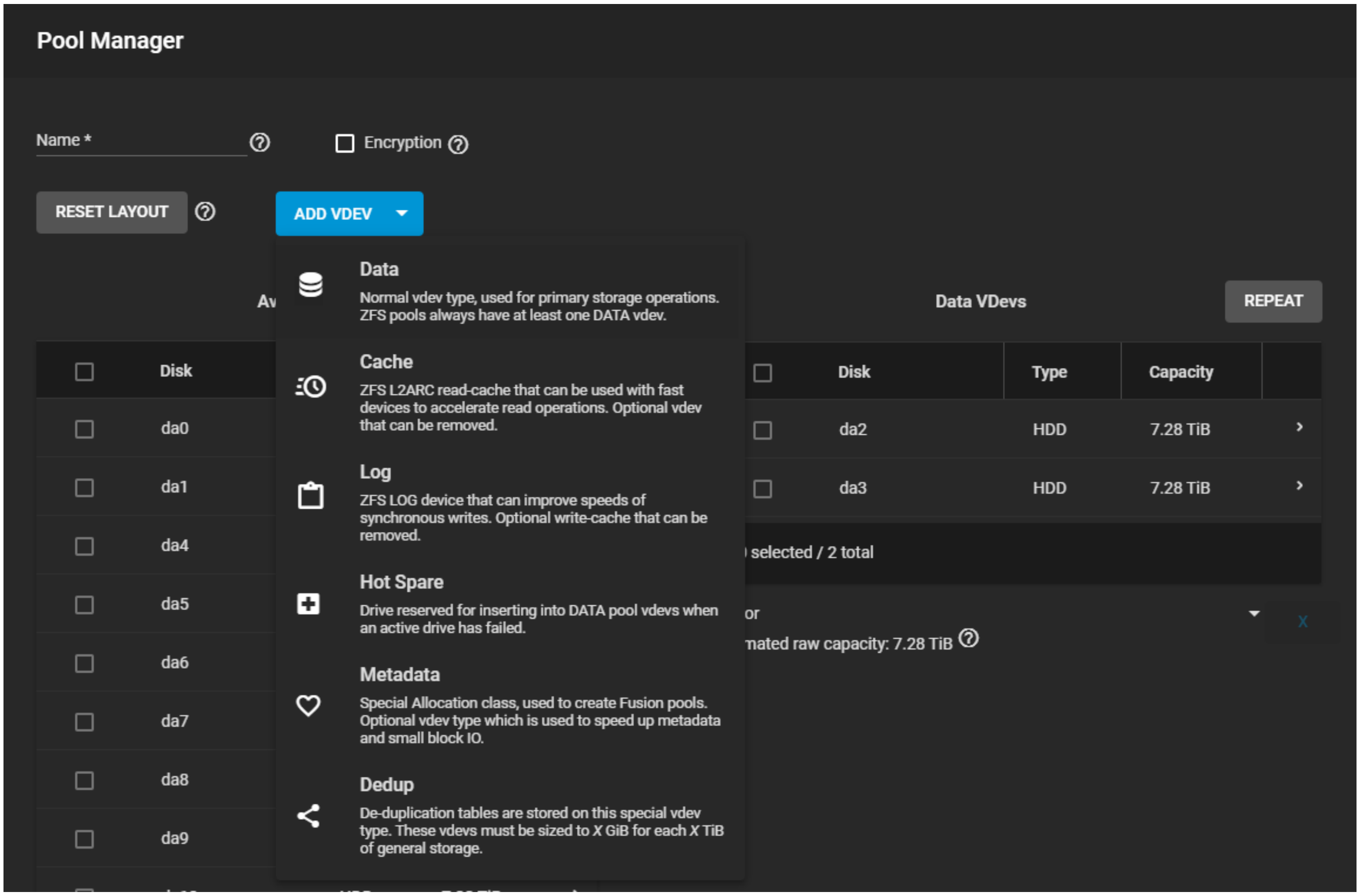
☑ Delete configuration of shares that used this pool?

□ Confirm Export/Disconnect

Because this is a destructive action, additional checkboxes must be set and the name of the pool manually entered when also deleting stored data. Existing shares to this data can also be removed when the pool is disconnected.

○ Add Vdevs

This opens the **Pool Manager** to add more vdevs to the pool.



Data
Normal vdev type, used for primary storage operations. ZFS pools always have at least one DATA vdev.

Cache
ZFS L2ARC read-cache that can be used with fast devices to accelerate read operations. Optional vdev that can be removed.

Log
ZFS LOG device that can improve speeds of synchronous writes. Optional write-cache that can be removed.

Hot Spare
Drive reserved for inserting into DATA pool vdevs when an active drive has failed.

Metadata
Special Allocation class, used to create Fusion pools. Optional vdev type which is used to speed up metadata and small block IO.

Dedup
De-duplication tables are stored on this special vdev type. These vdevs must be sized to *X* GiB for each *X* TiB of general storage.

□	Disk	Type	Capacity
□	da2	HDD	7.28 TiB
□	da3	HDD	7.28 TiB

selected / 2 total

or

nated raw capacity: 7.28 TiB

Changing the original encryption and data vdev configuration is not allowed.

A new data vdev is chosen by default. To add different kinds of vdevs to the pool, click *ADD VDEV* and choose the type from the drop down.

When adding disks to increase the capacity of a pool, ZFS supports the addition of virtual devices, or vdevs, to an existing ZFS pool. **After a vdev is created, more drives cannot be added to that vdev**, but a new vdev can be striped with another of the **same type** to increase the overall size of the pool. To extend a pool, the vdev being added must be the same type as existing vdevs.

Some vdev extending examples:

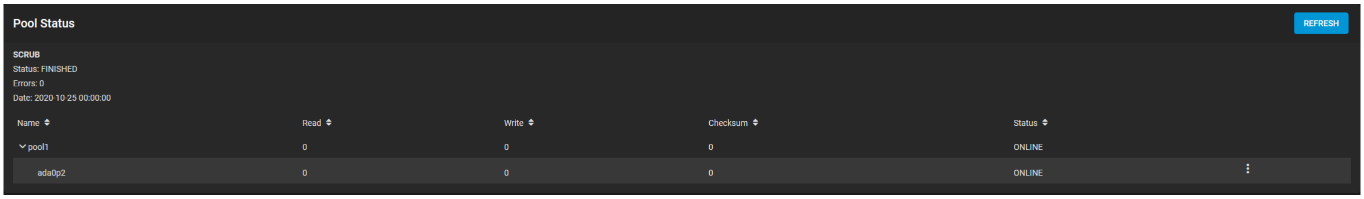
- to extend a ZFS mirror, add the same number of drives. The result is a striped mirror. For example, if ten new drives are available, a mirror of two drives could be created initially, then extended by adding another mirror of two drives, and repeating three more times until all ten drives have been added.
- to extend a three-drive RAIDZ1, add another three drives. The resulting pool is a stripe of two RAIDZ1 vdevs, similar to RAID 50 on a hardware controller.
- to extend a four-drive RAIDZ2, add another four drives. The result is a stripe of RAIDZ2 vdevs, similar to RAID 60 on a hardware controller.
- adding a disk as a *hot spare* to the pool.

○ Scrub Pool

Initiate a data integrity check of the pool. Any problems detected during the scrub are either automatically corrected or will generate an alert in the web interface. By default, every pool is automatically checked on a reoccurring scrub schedule.

○ Status

Opens the **Pool Status** screen to show the state of the last scrub and disks in the pool.



SCRUB
Status: FINISHED
Errors: 0
Date: 2020-10-25 00:00:00

Name	Read	Write	Checksum	Status
pool1	0	0	0	ONLINE
ada0p2	0	0	0	ONLINE

Additional options for [managing connected disks](#) are available in this screen.

○ Expand Pool

Increases the size of the pool to match all available disk space. This option is typically used when virtual disks are resized apart from TrueNAS.

○ Upgrade Pool

This option only appears when the pool can be upgraded to use new [ZFS feature flags](#). Before upgrading an existing pool, be aware of these caveats:

- Upgrading a pool is one-way, meaning that if you change your mind you cannot go back to an earlier ZFS version or downgrade to an earlier version of the software that does not support those ZFS features.
- Before performing any operation that can affect the data on a storage disk, always back up all data first and verify the integrity of the backup. While it is unlikely that the pool upgrade will affect the data, it is always better to be safe than sorry.
- Upgrading a ZFS pool is optional. Do not upgrade the pool if the possibility of reverting to an earlier version of TrueNAS or repurposing the disks in another operating system that supports ZFS is desired. It is not necessary to upgrade the pool unless the end user has a specific need for the newer ZFS Feature Flags. If a pool is upgraded to the latest feature flags, it will not be possible to import that pool into another operating system that does not yet support those feature flags.

The upgrade itself only takes a few seconds and is non-disruptive. It is not necessary to stop any sharing services to upgrade the pool. However, it is best to upgrade when the pool is not being heavily used. The upgrade process will suspend I/O for a short period, but is nearly instantaneous on a quiet pool.

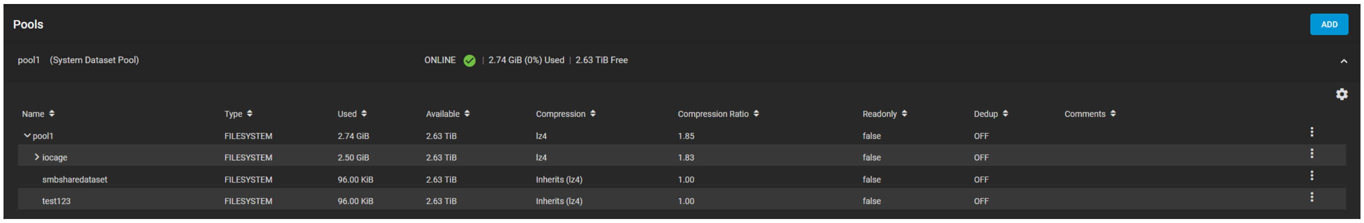
6.1.4 - Datasets

A TrueNAS dataset is a file system you create within a data storage pool. Datasets can contain files, directories (child datasets), and have individual permissions or flags. You can encrypt datasets using either the pool encryption created with the pool or with a separate dataset-level encryption configuration.

We recommend you organize your pool with datasets before configuring data sharing , as this allows for more fine-tuning of access permissions and using different sharing protocols.

Creating a Dataset

To create a dataset in the desired pool, go to **Storage > Pools**.

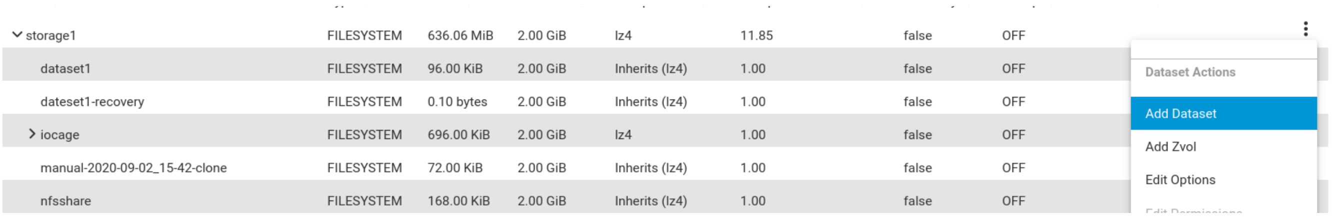


Pools

pool1 (System Dataset Pool) ONLINE | 2.74 GiB (0%) Used | 2.63 TiB Free

Name	Type	Used	Available	Compression	Compression Ratio	Readonly	Dedup	Comments
pool1	FILESYSTEM	2.74 GiB	2.63 TiB	lz4	1.85	false	OFF	
iocage	FILESYSTEM	2.50 GiB	2.63 TiB	lz4	1.83	false	OFF	
smbsharedataset	FILESYSTEM	96.00 KiB	2.63 TiB	Inherits (lz4)	1.00	false	OFF	
test123	FILESYSTEM	96.00 KiB	2.63 TiB	Inherits (lz4)	1.00	false	OFF	

Find the pool and top-level (root) dataset for that pool, then click □ and **Add Dataset**.

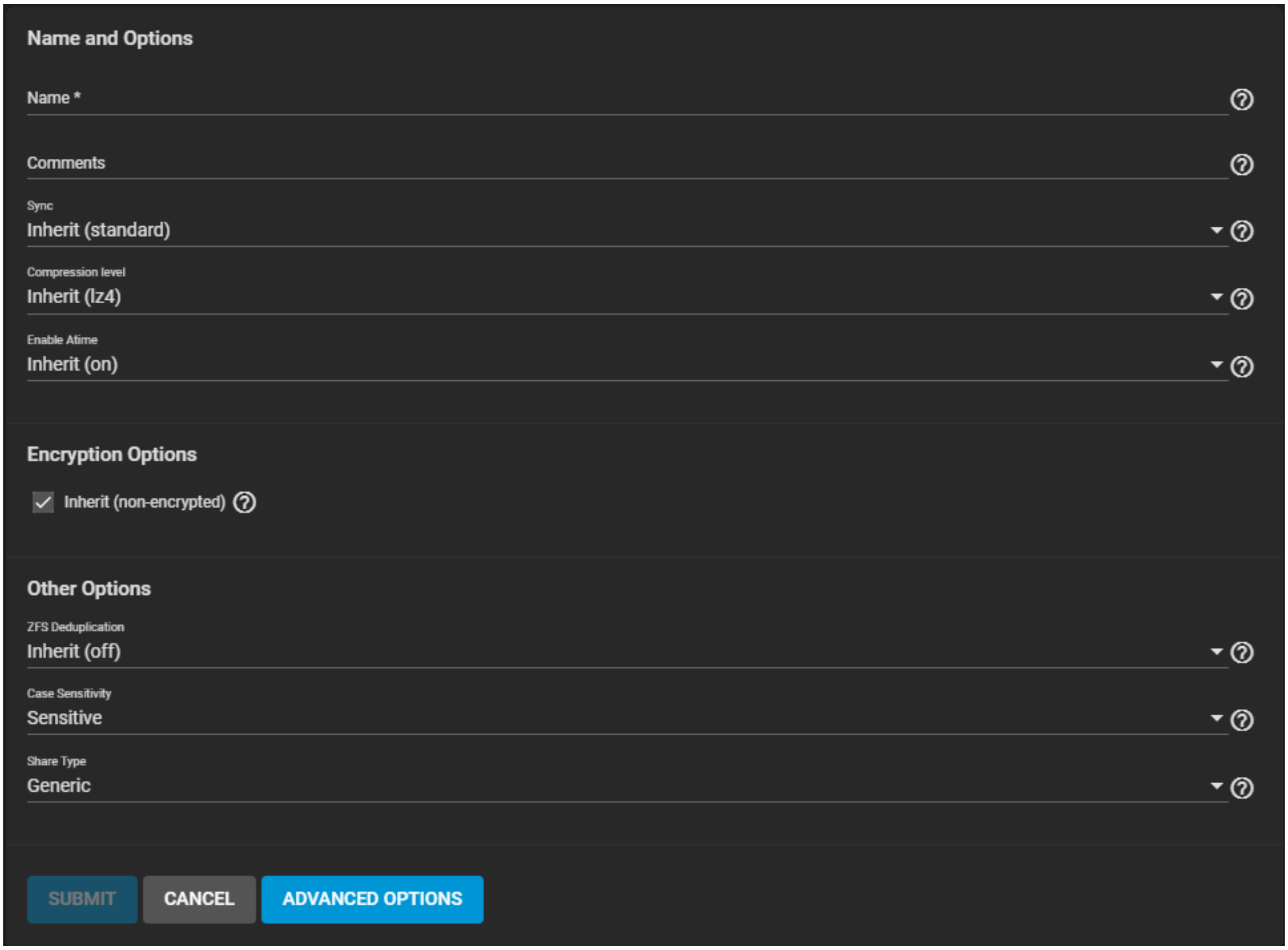


storage1	FILESYSTEM	636.06 MiB	2.00 GiB	lz4	11.85	false	OFF
dataset1	FILESYSTEM	96.00 KiB	2.00 GiB	Inherits (lz4)	1.00	false	OFF
dateset1-recovery	FILESYSTEM	0.10 bytes	2.00 GiB	Inherits (lz4)	1.00	false	OFF
iocage	FILESYSTEM	696.00 KiB	2.00 GiB	lz4	1.00	false	OFF
manual-2020-09-02_15-42-clone	FILESYSTEM	72.00 KiB	2.00 GiB	Inherits (lz4)	1.00	false	OFF
nfsshare	FILESYSTEM	168.00 KiB	2.00 GiB	Inherits (lz4)	1.00	false	OFF

To create a dataset with the default options, enter a name for the dataset and click **SUBMIT**.

If using a specific data sharing option, select the **Share Type** you need as you cannot change the share type after you click **SUBMIT**.

Dataset Options



Name and Options

Name *

Comments

Sync: Inherit (standard)

Compression level: Inherit (lz4)

Enable Atime: Inherit (on)

Encryption Options

☑ Inherit (non-encrypted)

Other Options

ZFS Deduplication: Inherit (off)

Case Sensitivity: Sensitive

Share Type: Generic

You must configure the **Name and Options** fields to create the dataset. Datasets typically inherit most settings from the root or parent dataset, but you must enter a name before clicking **SUBMIT**.

Setting	Value	Description
Name	string	Unique identifier for the dataset that you cannot change after the dataset is created.
Comments	string	Notes about the dataset.
Sync	drop-down list	**Standard** uses the sync settings that the client software requests. **Always** waits for data writes to complete, and **Disabled** never waits for writes to complete.
Compression level	drop-down list	Encode information in less space than the original data occupies. We recommend you choose a compression algorithm that balances disk performance with the amount of saved space: **lz4** is a general recommendation as it maximizes performance and dynamically identifies the best files to compress. **zstd** is the Zstandard compression algorithm that has several options for balancing speed and compression. **gzip** options are similar to zstd and range from **1** for least compression with best performance, through **9** for maximum compression with greatest performance impact. **zle** is a fast algorithm that only eliminates runs of zeroes. **lzjb** is a legacy algorithm that is not recommended for use.
Enable Atime	drop-down list	**on** updates the access time for files when they are read. **off** disables creating log traffic when reading files to maximize performance.

By default, datasets inherit the **Encryption Options** from the root or parent dataset. To configure the dataset with different encryption settings, unset **Inherit** and select the new **Encryption Options**. For detailed descriptions of the encryption options, see the Encryption article .

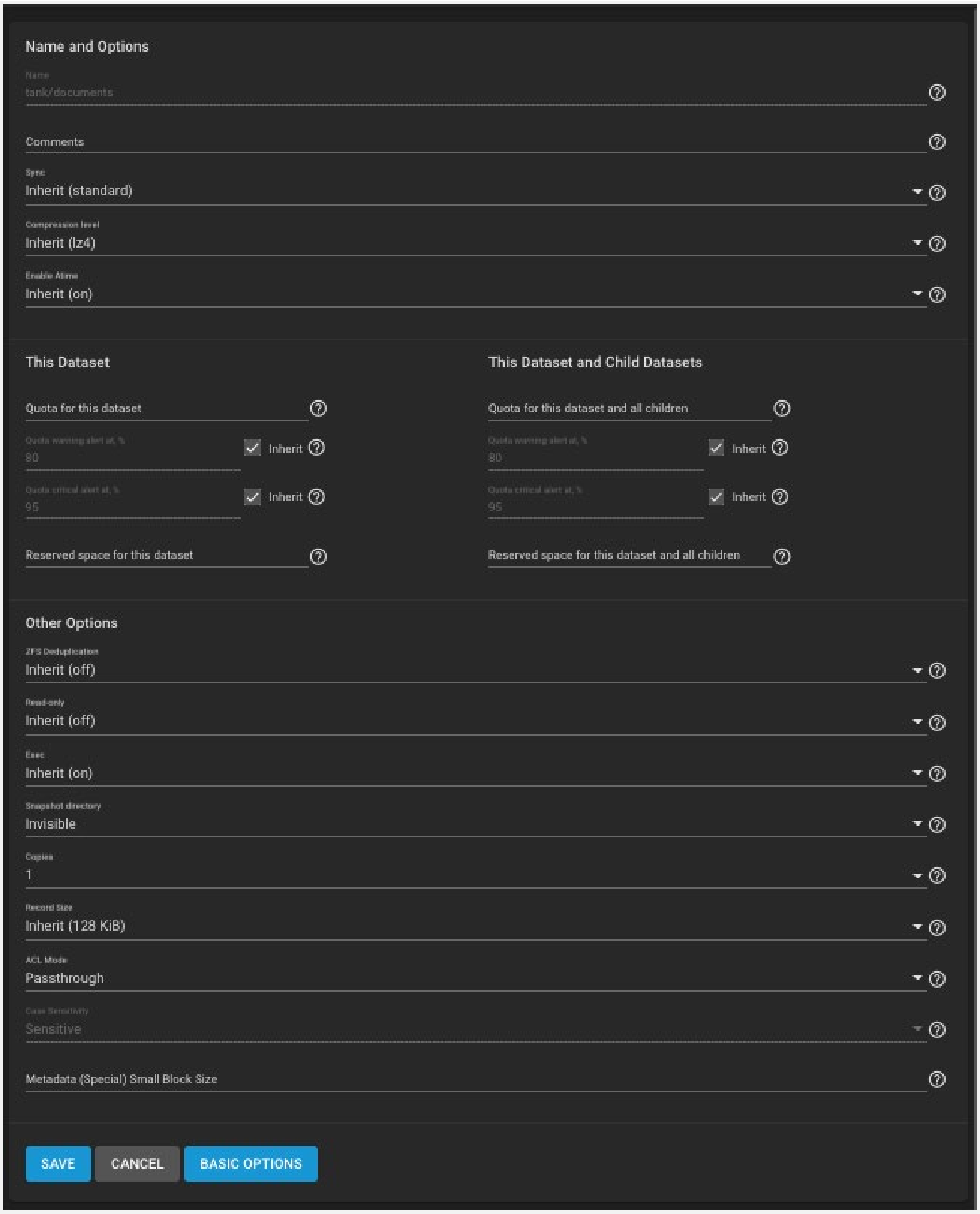
The **Other Options** help tune the dataset for particular data sharing protocols:

Setting	Value	Description
ZFS Deduplication	drop-down list	Transparently reuse a single copy of duplicated data to save space. Deduplication can improve storage capacity, but is RAM intensive. Compressing data is a general recommendation before using deduplication. Deduplicating data is a one-way process. *Deduplicated data cannot be un-deduplicated!*
Case Sensitivity	drop-down list	**Sensitive** assumes filenames are case sensitive. **Insensitive** assumes filenames are not case sensitive. **Mixed** understands both types of filenames. You cannot change this setting after the dataset is created.
Share Type	drop-down list	Define the type of data sharing the dataset uses to optimize the dataset for that sharing protocol. You cannot change this setting after the dataset is created. If creating an AFP share use **Generic**. For SMB shares select **SMB**

Advanced Dataset Options

Advanced Options expand □

Clicking **ADVANCED OPTIONS** adds dataset quota management tools and a few additional fields to the **Other Options**:



Name and Options

Name
tank/documents

Comments

Sync
Inherit (standard)

Compression level
Inherit (lz4)

Enable Atime
Inherit (on)

This Dataset

Quota for this dataset

Quota warning alert at, %
80 ☑ Inherit

Quota critical alert at, %
95 ☑ Inherit

Reserved space for this dataset

This Dataset and Child Datasets

Quota for this dataset and all children

Quota warning alert at, %
80 ☑ Inherit

Quota critical alert at, %
95 ☑ Inherit

Reserved space for this dataset and all children

Other Options

ZFS Deduplication
Inherit (off)

Read-only
Inherit (off)

Exec
Inherit (on)

Snapshot directory
Invisible

Copies
1

Record Size
Inherit (128 KiB)

ACL Mode
Passthrough

Case Sensitivity
Sensitive

Metadata (Special) Small Block Size

Setting a quota defines the maximum allowed space for the dataset. You can also reserve a defined amount of pool space for the dataset to help prevent situations where automatically generated data like system logs consume all space on the dataset. You can configure quotas for either the new dataset or to include all child datasets in the quota.

Setting	Value	Description
Quota for this datset	integer	Define the maximum allowed space for the dataset. **0** disables quotas.
Quota warning alert at, %	integer	Generate a warning level alert when consumed space reaches the defined percentage. By default, the dataset inherits this value from the parent dataset. Unset **Inherit** to change the value.
Quota critical alert at, %	integer	Generate a critical level alert when consumed space reaches the defined percentage. By default, the dataset inherits this value from the parent dataset. Unset **Inherit** to change the value.

Reserved space for this dataset	integer	Reserve additional space for datasets that contain logs which could eventually take up all the available free space. **0** is unlimited.

More fields are added to the **Other Options** setting. By default, many of these options inherit their values from the parent dataset.

Setting	Value	Description
Read-only	drop-down list	**On** prevents modifying the dataset. **Off** allows users accessing the dataset to modify its contents.
Exec	drop down	**On** allows processes to execute from within this dataset. **Off** prevents processes from executing in the dataset. The recommended setting is **On**.
Snapshot directory	drop-down list	Controls visibility of the *.zfs* directory on the dataset. Choose between **Visible** or **Invisible**.
Copies	drop-down list	Duplicates ZFS user data stored on this dataset. Choose between **1**, **2**, or **3** redundant data copies. This can improve data protection and retention, but is not a substitute for storage pools with disk redundancy.
Record Size	drop-down list	Logical block size in the dataset. Matching the fixed size of data, as in a database, could result in better performance.
ACL Mode	drop-down list	Determine how chmod behaves when adjusting file ACLs. See the zfs `aclmode` property. **Passthrough** only updates ACL entries that are related to the file or directory mode. **Restricted** does not allow chmod to make changes to files or directories with a non-trivial ACL. An ACL is trivial if it can be fully expressed as a file mode without losing any access rules. Setting the ACL Mode to **Restricted** is typical to optimize a dataset for SMB sharing, but can require further optimizations. For example, configuring an rsync task with this dataset could require adding `--no-perms` in the task **Auxiliary Parameters** field.
Metadata (Special) Small Block Size	integer	Threshold block size for including small file blocks into the special allocation class (fusion pools). Blocks smaller than or equal to this value are assigned to the special allocation class while greater blocks are assigned to the regular class. Valid values are zero or a power of two from 512B up to 1M. The default size **0** means no small file blocks are allocated in the special class. Before setting this property, you must add a special class vdev to the pool.

Managing Datasets

After creating a dataset additional management options are available by going to **Storage > Pools** and clicking □ for a dataset:

- **Add Dataset**: create a new dataset that is a child of this dataset. You can continue layering datasets in this manner.
- **Add Zvol**: create a new ZFS block device as a child of this dataset.
- **Edit Options**: opens the dataset options to make adjustments to the dataset configuration. You cannot change the dataset **Name**, **Case Sensitivity**, and **Share Type** after you click **SUBMIT**.
- **Edit Permissions**: opens the editor to set access permissions for this dataset. Depending on the dataset creation options, this can be a simple permissions editor or the full ACL editor. For more information about editing permissions, read the permissions article. This option is not available for the root dataset.
- **User Quotas**: shows options to set data or object quotas for user accounts cached on the system or user accounts connected to this system.
- **Group Quotas**: shows options to set data or object quotas for user groups cached on the system or user groups connected to this system.
- **Delete Dataset**: removes the dataset, all stored data, and any snapshots of the dataset from TrueNAS.

Deleting datasets can result in unrecoverable data loss! Be sure you move any critical data off the dataset or that it is obsolete before deleting a dataset.

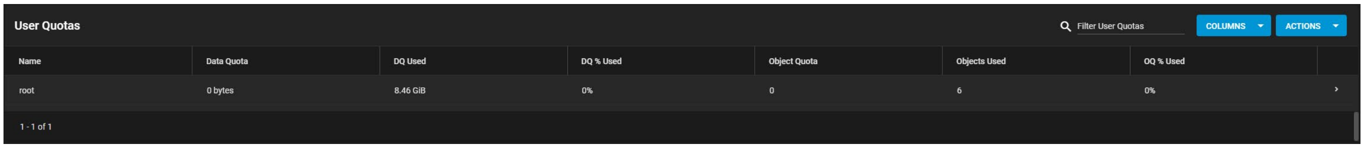
- **Create Snapshot**: take a single [ZFS snapshot](#) of the dataset to provide additional data protection and mobility. Created snapshots are listed in **Storage > Snapshots**.

Quotas

TrueNAS allows setting data or object quotas for user accounts and groups cached on or connected to the system.

⊙ User

To view and edit user quotas, go to **Storage > Pools** and click □ to open the **Dataset Actions** menu and then click **User Quotas**.



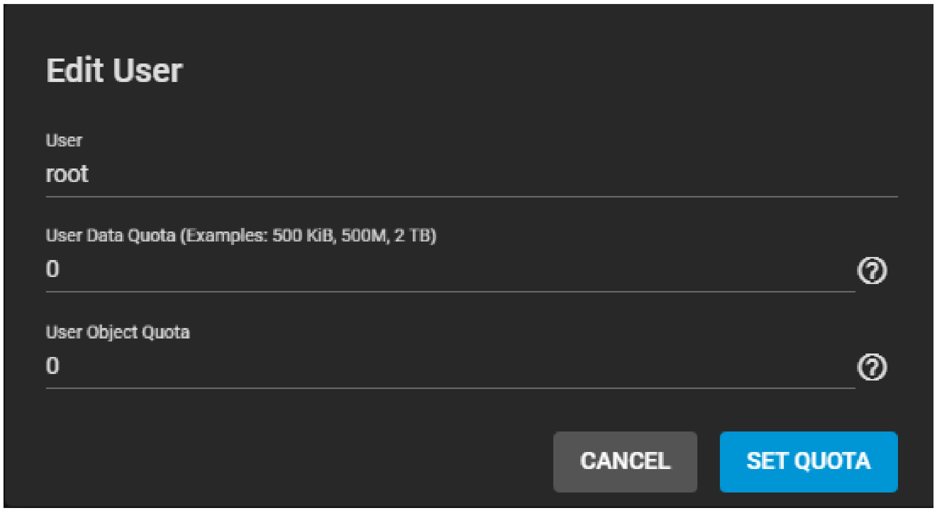
User Quotas

Name	Data Quota	DQ Used	DQ % Used	Object Quota	Objects Used	OQ % Used
root	0 bytes	8.46 GiB	0%	0	6	0%

1 - 1 of 1

The **User Quotas** page displays the names and quota data of any user accounts cached on or connected to the system.

To edit individual user quotas, go to the user row and click the □ and then click edit.



Edit User

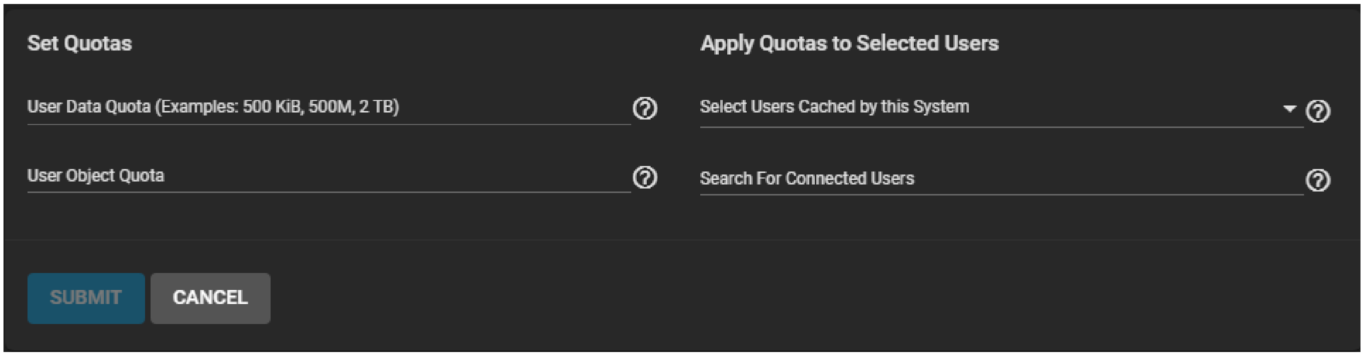
User
root

User Data Quota (Examples: 500 KiB, 500M, 2 TB)
0

User Object Quota
0

Use the **Edit User** window to edit the **User Data Quota**, which is the amount of disk space that each selected users can use, and the **User Object Quota**, which is the number of objects that each selected user can own.

To edit user quotas in bulk, click **Actions** and hen select **Set Quotas (Bulk)**.



Set Quotas

User Data Quota (Examples: 500 KiB, 500M, 2 TB)

User Object Quota

Apply Quotas to Selected Users

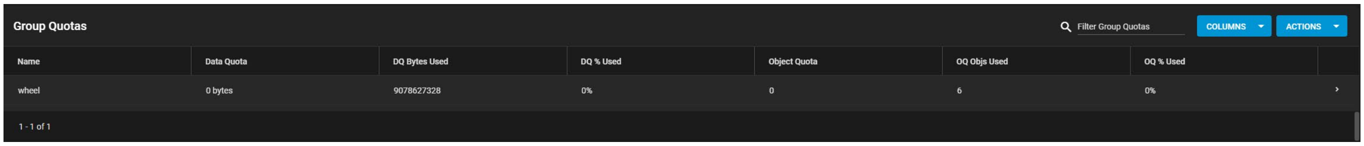
Select Users Cached by this System

Search For Connected Users

Use the **Set Quotas** window to edit user data and object quotas after selecting any cached or connected users.

○ Group

Go to **Storage > Pools** and click □ to open the **Dataset Actions** menu. Click **Group Quotas**.



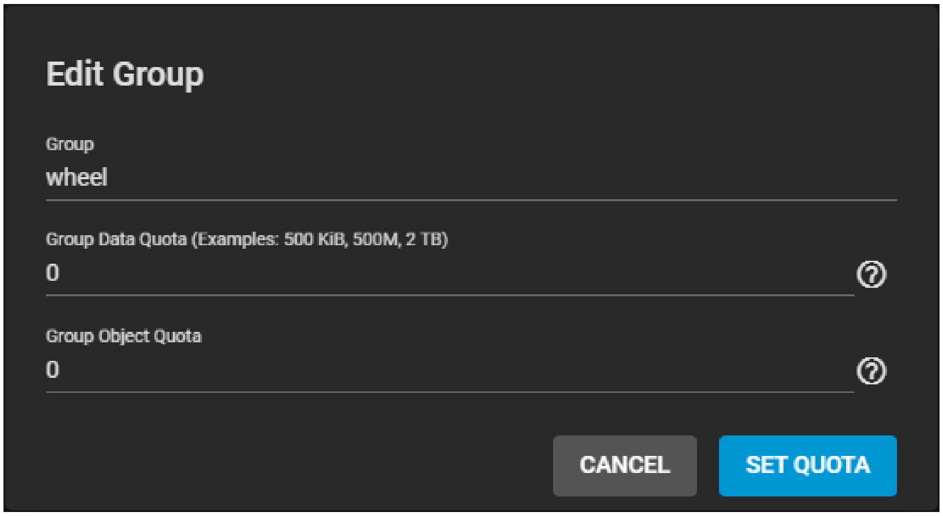
Group Quotas

Name	Data Quota	DQ Bytes Used	DQ % Used	Object Quota	OQ Objs Used	OQ % Used	
wheel	0 bytes	9078627328	0%	0	6	0%	›

1 - 1 of 1

The **Group Quotas** page displays the names and quota data of any groups cached on or connected to the system.

To edit individual group quotas, go to the group's row and click the **>** and then click edit.



Edit Group

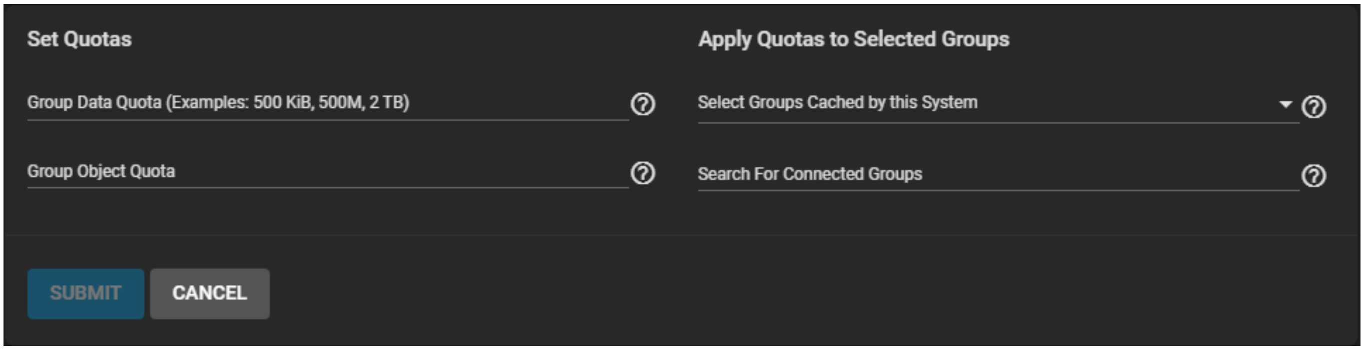
Group: wheel

Group Data Quota (Examples: 500 KiB, 500M, 2 TB): 0

Group Object Quota: 0

Use the **Edit Group** window to edit the **Group Data Quota** and **Group Object Quota**.

To edit group quotas in bulk, click **Actions** and select **Set Quotas (Bulk)**.



Set Quotas
Group Data Quota (Examples: 500 KiB, 500M, 2 TB)
Group Object Quota
Apply Quotas to Selected Groups
Select Groups Cached by this System
Search For Connected Groups
SUBMIT
CANCEL

The same options for single groups display, along with choosing groups for these new quota rules.

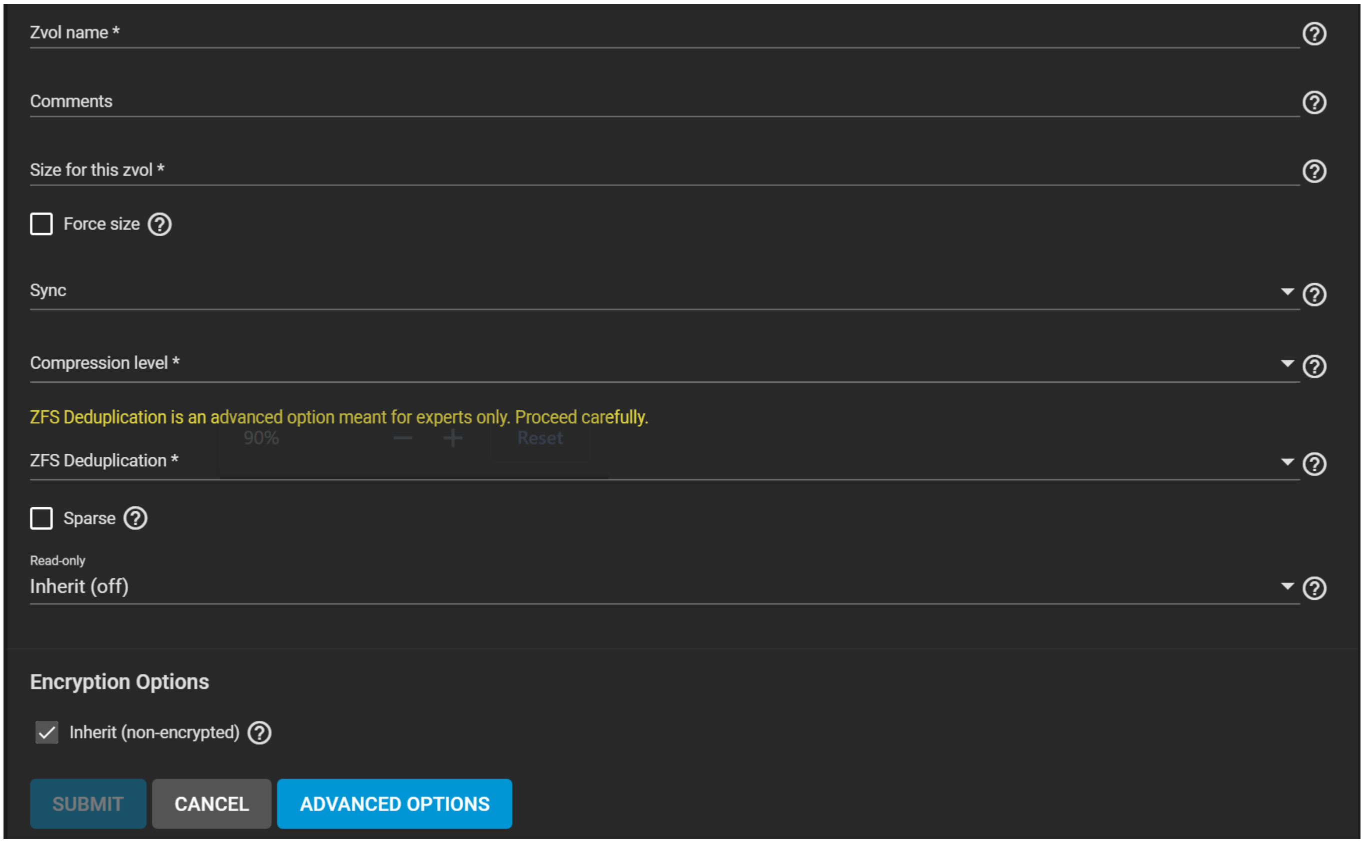
6.1.5 - Zvols

- Options
- Managing Zvols

A ZFS Volume (Zvol) is a dataset that represents a block device. These are needed when configuring an iSCSI Share.

To create a zvol in a pool, go to **Storage > Pools** then click □ and *Add Zvol*.

Options



Zvol name *

Comments

Size for this zvol *

□ Force size

Sync

Compression level *

ZFS Deduplication is an advanced option meant for experts only. Proceed carefully.

ZFS Deduplication *

□ Sparse

Read-only
Inherit (off)

Encryption Options

☑ Inherit (non-encrypted)

To quickly create a Zvol with the default options, enter a name for the Zvol, a size, and click *SAVE*.

Setting	Value	Description
Zvol name	string	Enter a short name for the zvol. Using a zvol name longer than 63-characters can prevent accessing zvols as devices. For example, a zvol with a 70-character filename or path cannot be used as an iSCSI extent. This setting is mandatory.
Comments	string	Enter any notes about this zvol.
Size for this zvol	integer	Specify size and value. Units like `t`, `TiB`, and `G` can be used. The size of the zvol can be increased later, but cannot be reduced. If the size is more than 80% of the available capacity, the creation will fail with an “out of space” error unless `Force size` is also enabled.
Force size	checkbox	By default, the system will not create a zvol if that operation will bring the pool to over 80% capacity. **While NOT recommended**, enabling this option will force the creation of the zvol.
		Sets the data write synchronization. *Inherit* inherits the sync settings from the

Sync	drop-down menu	parent dataset, *Standard* uses the sync settings that have been requested by the client software, *Always* waits for data writes to complete, and *Disabled* never waits for writes to complete.
Compression level	drop-down menu	Compress data to save space. Refer to Compression for a description of the available algorithms.
ZFS Deduplication	drop-down menu	Do not change this setting unless instructed to do so by your iXsystems support engineer.
Sparse	checkbox	Used to provide thin provisioning. Use with caution as writes will fail when the pool is low on space.
Read-only	drop-down menu	Set to prevent the zvol from being modified.
Inherit (Encryption Options)	checkbox	Enabling causes the zvol to use the encryption properties of the root dataset.

Advanced Options expand □

Setting	Value	Description
Block size	drop-down menu	The default is *Inherit*, other options include, *4KiB*, *8KiB*, *16KiB*, *32KiB*, *64KiB*, *128KiB*

Optimal Zvol Block Sizes expand □

TrueNAS automatically recommends a space-efficient *block size* for new zvols. This table shows the minimum volume *block size* values that are recommended. To manually change this value, use the *Block size* dropdown menu.

Configuration	Number of Drives	Optimal Block Size
Mirror	N/A	16k
Raidz-1	3	16k
Raidz-1	4/5	32k
Raidz-1	6/7/8/9	64k
Raidz-1	10+	128k
Raidz-2	4	16k
Raidz-2	5/6	32k
Raidz-2	7/8/9/10	64k
Raidz-2	11+	128k
Raidz-3	5	16k
Raidz-3	6/7	32k
Raidz-3	8/9/10/11	64k
Raidz-3	12+	128k

Additional tuning can be required for optimal performance, depending on the workload. iXsystems Engineers are available to assist Enterprise customers with tuning their TrueNAS hardware. The workload tuning chapter of the OpenZFS handbook is also a good resource.

Managing Zvols

To see options for an existing zvol, click more_vert next to the desired zvol in **Storage** > **Pools**:

- *Delete zvol* removes the zvol from TrueNAS.

  > Deleting zvols can result in unrecoverable data loss! Be sure that any critical data is moved off the zvol or is otherwise obsolete.

  Deleting a zvol also deletes all snapshots of that zvol.
- *Edit Zvol* opens the zvol creation form for changing the previously saved settings. Similar to datasets, a zvol name cannot be changed.
- *Create Snapshot* takes a single current point in time image of the zvol and saves it to **Storage > Snapshots**. A snapshot *Name* is suggested and an extra option to make the snapshot *Recursive* is available.

When the selected zvol is cloned from an existing snapshot, *Promote Dataset* is available. When a clone is promoted, the original volume becomes a clone of the clone, making it possible to delete the volume that the clone was created from. Otherwise, a clone cannot be deleted while the original volume exists.

When the zvol is created with encryption enabled, additional **Encryption Actions** are shown.

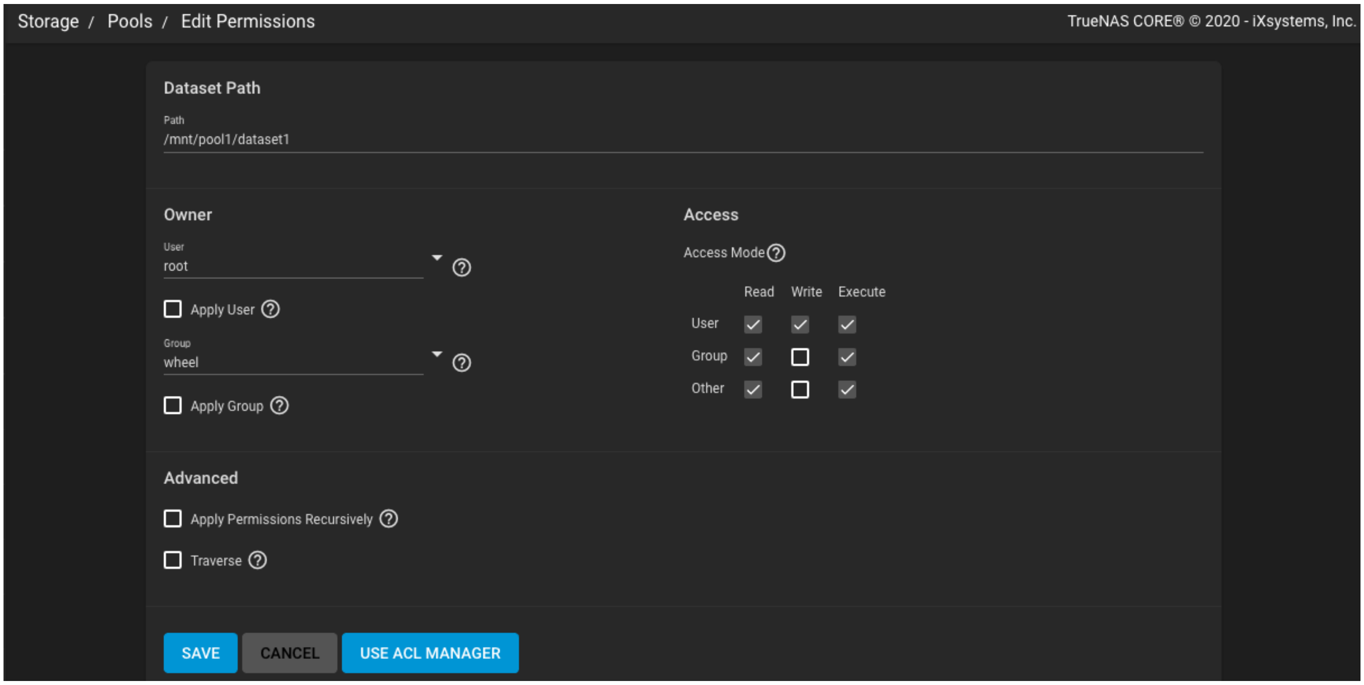
6.1.6 - Permissions

Permissions control the actions users can perform on dataset contents. TrueNAS allows using both a simple permissions manager and editing a full Access Control List (ACL) for defining dataset permissions.

To change dataset permissions, go to **Storage > Pools >** more_vert **>** *Edit Permissions* for a dataset.

Basic Permissions Editor

The **Permissions Editor** option allows basic adjustments to a datasets ACL.



Storage / Pools / Edit Permissions
TrueNAS CORE® © 2020 - iXsystems, Inc.

Dataset Path

Path
/mnt/pool1/dataset1

Owner

User
root

☐ Apply User

Group
wheel

☐ Apply Group

Access

Access Mode

	Read	Write	Execute
User	☑	☑	☑
Group	☑	☐	☑
Other	☑	☐	☑

Advanced

☐ Apply Permissions Recursively

☐ Traverse

SAVE
CANCEL
USE ACL MANAGER

Options

Dataset Path shows the full pathway to this dataset. This is set when the dataset is created and cannot be changed.

The **Owner** section controls which TrueNAS *User* and *Group* has full control of this dataset.

Name	Description
User	User that controls the dataset. Users created manually or imported from a directory service appear in the drop-down menu.
Apply User	Confirms changes to *User*. To prevent errors, changes to the *User* are submitted only when this box is set.
Group	Group that controls the dataset. Groups created manually or imported from a directory service

	appear in the drop-down menu.
Apply Group	Confirms changes to *Group*. To prevent errors, changes to the *Group* are submitted only when this box is set.

Access Mode defines the basic *Read*, *Write*, and *Execute* permissions for the *User*, *Group*, and *Other* accounts that might access this dataset.

Advanced has several tuning options:

Name	Description
Apply Permissions Recursively	Apply permissions recursively to all directories and files within the current dataset.
Traverse	Apply permissions recursively to all child datasets of the current dataset.

To switch from the basic editor to the advanced ACL editor, click *USE ACL MANAGER*.

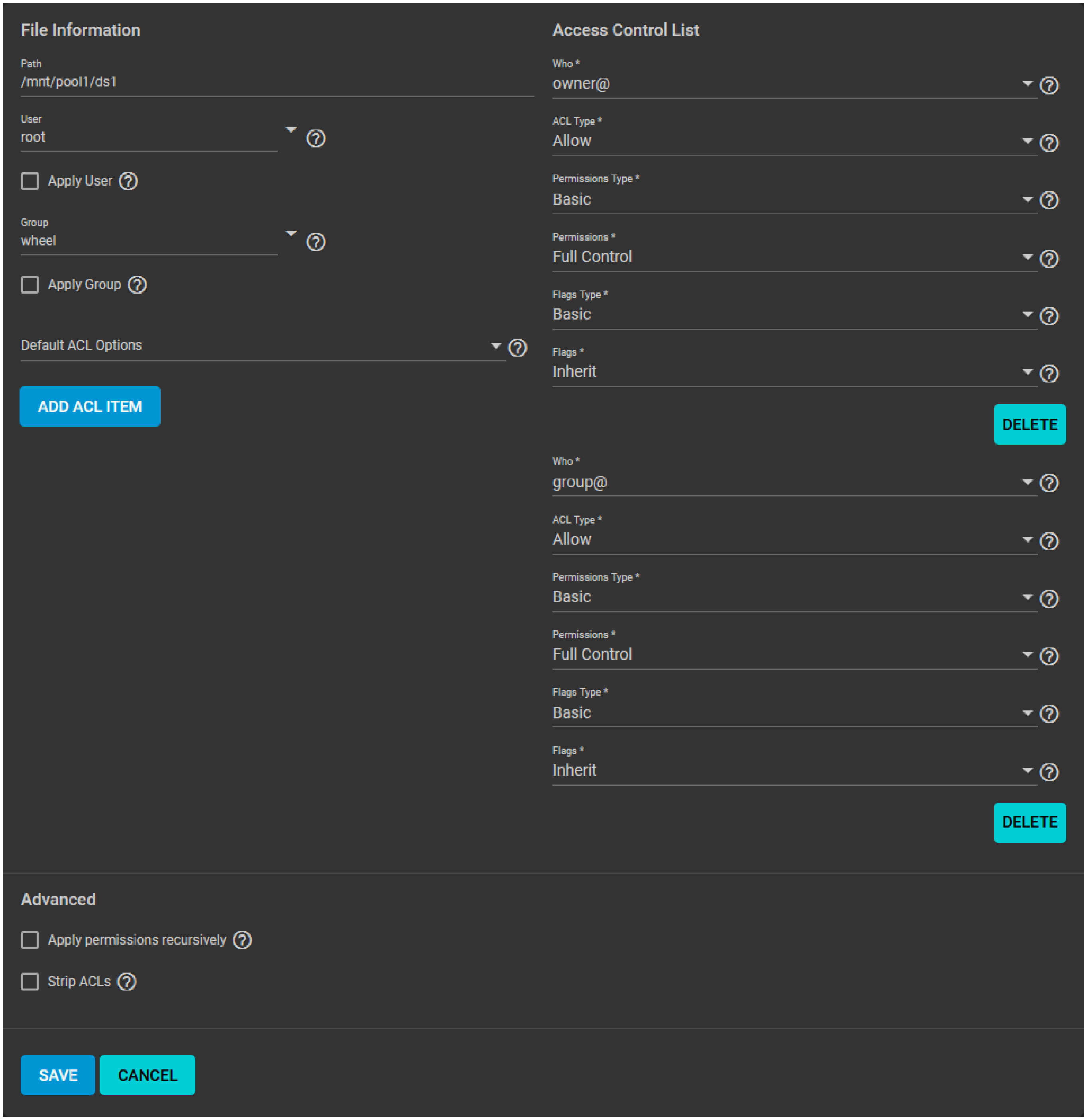
Access Control Lists

An Access Control List (ACL) is a set of account permissions associated with a dataset and applied to directories or files within that dataset. ACLs are typically used to manage user interactions with shared datasets and are created when a dataset is added to a pool.

When creating a dataset, you can choose how the ACL can be modified by selecting an *ACL Mode*:

- *Passthrough* only updates ACL entries (ACEs) that are related to the file or directory mode.
- *Restricted* does not allow `chmod` to make changes to files or directories with a non-trivial ACL. An ACL is trivial if it can be fully expressed as a file mode without losing any access rules. Setting the ACL Mode to Restricted is typically used to optimize a dataset for SMB sharing, but can require further optimizations. For example, configuring an rsync task with this dataset could require adding `--no-perms` as an extra option for the task.

To view an ACL, go to **Storage > Pools >** more_vert **>** *Edit Permissions* for a nested dataset within a pool.



File Information

Path
/mnt/pool1/ds1

User
root

☐ Apply User

Group
wheel

☐ Apply Group

Default ACL Options

ADD ACL ITEM

Access Control List

Who *
owner@

ACL Type *
Allow

Permissions Type *
Basic

Permissions *
Full Control

Flags Type *
Basic

Flags *
Inherit

DELETE

Who *
group@

ACL Type *
Allow

Permissions Type *
Basic

Permissions *
Full Control

Flags Type *
Basic

Flags *
Inherit

DELETE

Advanced

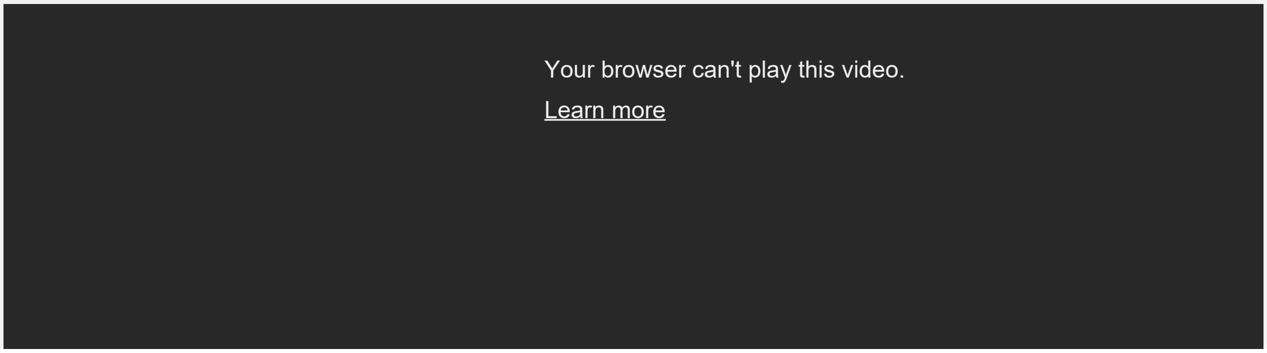
☐ Apply permissions recursively

☐ Strip ACLs

SAVE CANCEL

Tutorial Video expand ☐

The video at https://www.youtube.com/watch?v=p3wn0b_aXNw&t=3s shows editing ACLs for FreeNAS 11.3. However, the same process applies for TrueNAS 12.0 and later:



ACL Inheritance

The ACL for a new file or directory is typically inherited from the parent directory and is preserved when it is moved or renamed within the same dataset. An exception is when there are no *File Inherit* or *Directory Inherit* flags in the parent ACL *owner@*, *group@*, or *everyone@* entries. These non-inheriting entries are added to the ACL of the newly created file or directory based on the Samba create and directory masks or the umask value.

Editing an ACL

Click *ACL Manager* to adjust file ownership or account permissions to the dataset. The first time viewing the ACL Manager a dialog suggests using basic presets. The ACL can be edited at any time after choosing to either apply a preset or create a custom ACL.

Choose **Select a preset ACL** and choose a preset. The preset options are *OPEN*, *RESTRICTED*, or *HOME*.

Choose **Create a custom ACL** to create a new list of customized permissions.

File Information

The selected *User* controls the dataset and always has permission to modify the ACL and other attributes. The selected *Group* also controls the dataset, but can have permissions changed by adding or modifying a `group@` ACE. Any user accounts or groups imported from a directory service can be selected as the primary *User* or *Group*.

Access Control List (ACEs)

To add a new item to the ACL, define *Who* the Access Control Entry (ACE) applies to, and configure permissions and inheritance flags for the ACE.

ACL Details from Shell expand □

To view an ACL information from the console, go to **System Settings > Shell** and enter command:

```
getfacl /mnt/path/to/dataset
```

Permissions

Permissions are divided between Basic and Advanced options. The basic options are commonly used groups of the advanced options.

Basic Permissions

- *Read* (`r-x---a-R-c---`): view file or directory contents, attributes, named attributes, and ACL. Includes the *Traverse* permission.
- *Modify* (`rwxpDdaARWc--s`): adjust file or directory contents, attributes, and named attributes. Create

new files or subdirectories. Includes the *Traverse* permission. Changing the ACL contents or owner is not allowed.
- *Traverse* (`--x---a-R-c---`): Execute a file or move through a directory. Directory contents are restricted from view unless the *Read* permission is also applied. To traverse and view files in a directory, but not be able to open individual files, set the *Traverse* and *Read* permissions, then add the advanced *Directory Inherit* flag.
- *Full Control* (`rwxpDdaARWcCos`): Apply all permissions.

Advanced Permissions

- *Read Data* (`r`): View file contents or list directory contents.
- *Write Data* (`w`): Create new files or modify any part of a file.
- *Append Data* (`p`): Add new data to the end of a file.
- *Read Named Attributes* (`R`): view the named attributes directory.
- *Write Named Attributes* (`W`): create a named attribute directory. Must be paired with the Read Named Attributes permission.
- *Execute* (`x`): Execute a file, move through, or search a directory.
- *Delete Children* (`D`): delete files or subdirectories from inside a directory.
- *Read Attributes* (`a`): view file or directory non-ACL attributes.
- *Write Attributes* (`A`): change file or directory non-ACL attributes.
- *Delete* (`d`): remove the file or directory.
- *Read ACL* (`c`): view the ACL.
- *Write ACL* (`C`): change the ACL and the ACL mode.
- *Write Owner* (`o`): change the user and group owners of the file or directory.
- *Synchronize* (`s`): synchronous file read/write with the server. This permission does not apply to FreeBSD clients.

Inheritance Flags

Basic inheritance flags only enable or disable ACE inheritance. Advanced flags offer finer control for applying an ACE to new files or directories.

Basic Flags

- *Inherit* (`fd-----`): enable ACE inheritance.
- *No Inherit* (`-------`): disable ACE inheritance.

Advanced Flags

- *File Inherit* (`f`): The ACE is inherited with subdirectories and files. It applies to new files.
- *Directory Inherit* (`d`): new subdirectories inherit the full ACE.
- *No Propagate Inherit* (`n`): The ACE can only be inherited once.
- *Inherit Only* (`i`): Remove the ACE from permission checks but allow it to be inherited by new files or subdirectories. Inherit Only is removed from these new objects.
- *Inherited* (`I`): set when the ACE has been inherited from another dataset.

6.1.7 - Storage Encryption

TrueNAS supports different encryption options for critical data.

> Users are responsible for backing up and securing encryption keys and passphrases! Losing the ability to decrypt data is similar to a catastrophic data loss.

Data-at-rest encryption is available with:

- Self Encrypting Drives (SEDs) using OPAL or FIPS 140.2 (Both AES 256)
- Encryption of specific datasets (AES-256-GCM in TrueNAS 12.0)

The local TrueNAS system manages keys for data-at-rest. The user is responsible for storing and securing their keys. TrueNAS 12.0 and newer includes the Key Management Interface Protocol (KMIP).

Encryption Drawbacks and Considerations expand □

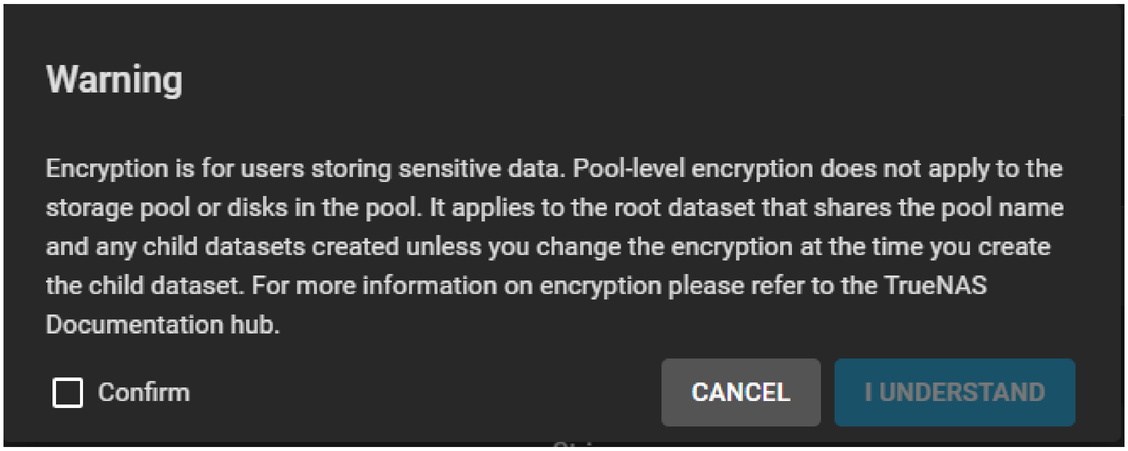
Always consider the following drawbacks/considerations when encrypting data:

- Losing encryption keys and passwords means losing your data.
- Unrelated encrypted datasets do not support deduplication.
- Using GELI or ZFS encryption with deduplication is not recommended because of the sizable performance impact.
- Using many encryption and deduplication features at once requires caution since all compete for the same CPU cycles.

Encrypting a Storage Pool

> Encryption is for users storing sensitive data. Pool-level encryption does *NOT* apply to the storage pool or the disks in the pool. It only applies to the root dataset that shares the same name as the pool. Child datasets, or zvols, inherit encryption from the parent dataset unless you overwrite encryption when creating the child datasets or zvols.

Encrypting the root dataset of a new storage pool further increases data security. Create a new pool and check the **Encryption** checkbox on the **Pool Manager** screen. TrueNAS encryption warning dialog box displays.



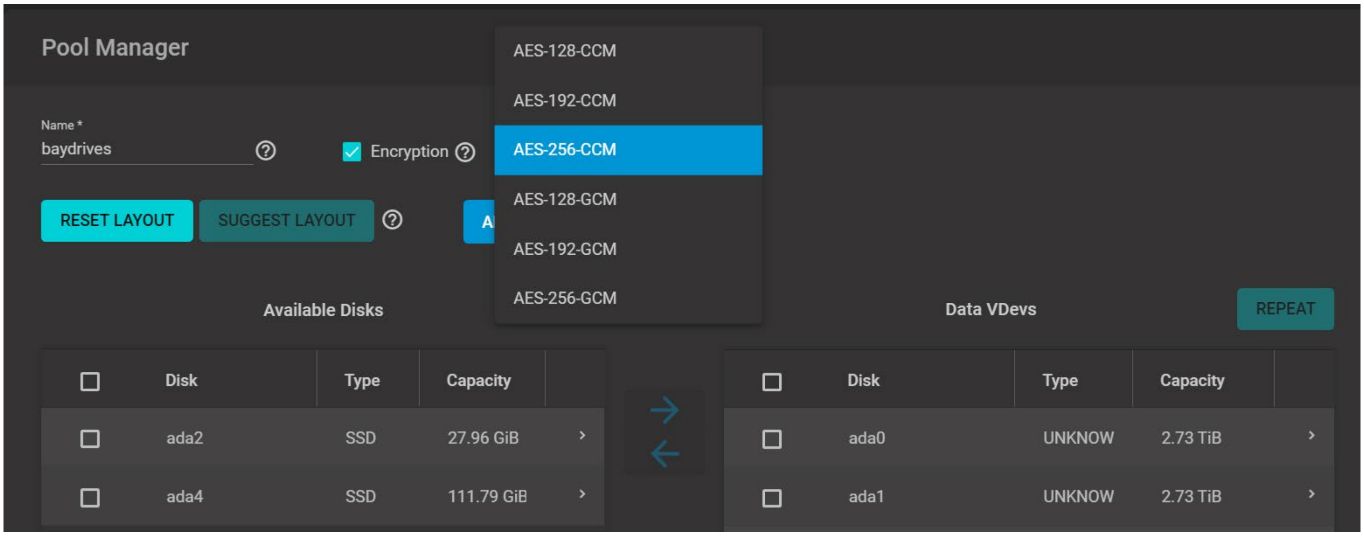
Warning

Encryption is for users storing sensitive data. Pool-level encryption does not apply to the storage pool or disks in the pool. It applies to the root dataset that shares the pool name and any child datasets created unless you change the encryption at the time you create the child dataset. For more information on encryption please refer to the TrueNAS Documentation hub.

□ Confirm

Read the warning, click the **Confirm** checkbox, and click **I UNDERSTAND**.

We recommend using the default encryption cipher, but other ciphers are available.



Pool Manager

Name * baydrives

☑ Encryption

Available Disks

□	Disk	Type	Capacity
□	ada2	SSD	27.96 GiB
□	ada4	SSD	111.79 GiB

Data VDevs

□	Disk	Type	Capacity
□	ada0	UNKNOW	2.73 TiB
□	ada1	UNKNOW	2.73 TiB

What are these options? expand □
TrueNAS supports AES Galois Counter Mode (GCM) and Counter with CBC-MAC (CCM) algorithms for encryption. These algorithms provide authenticated encryption with block ciphers.

Encrypting a New Dataset

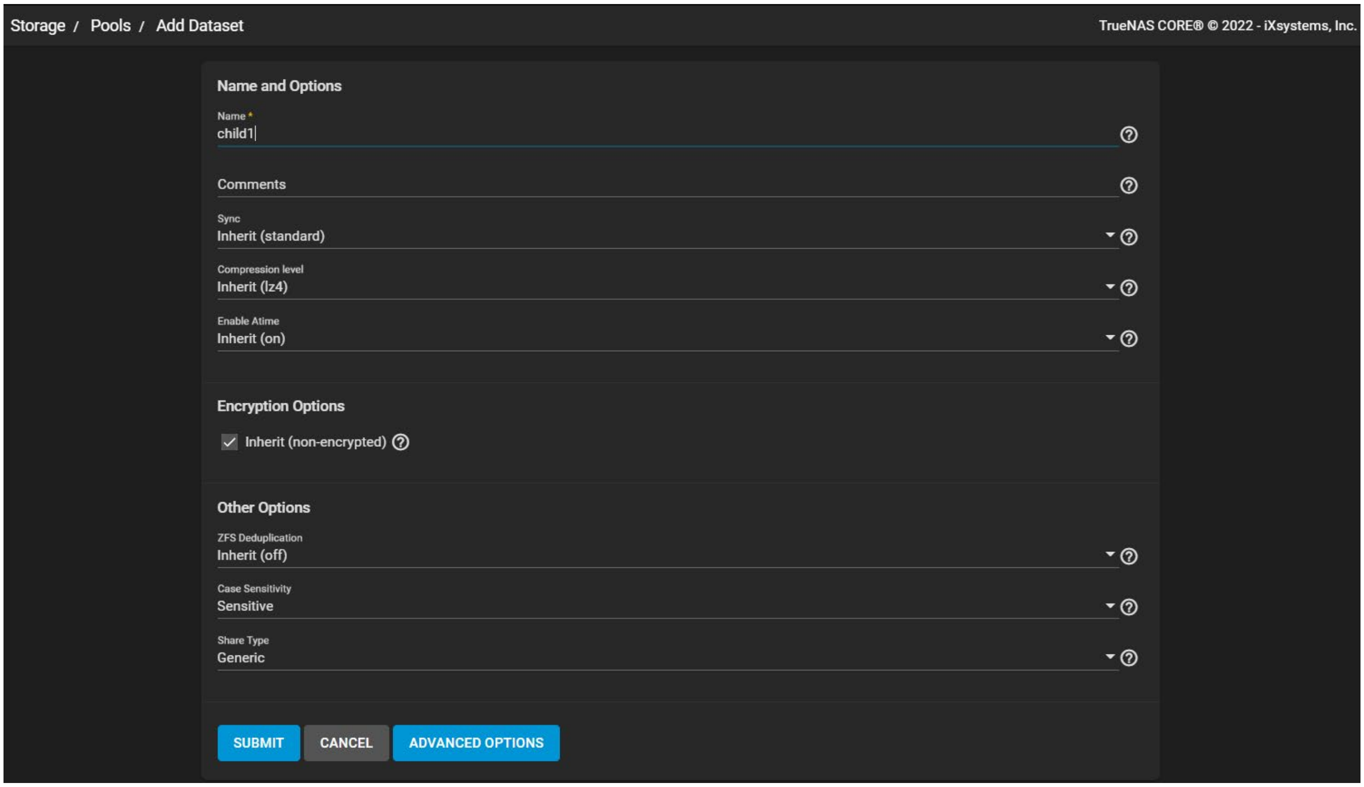
You can create new datasets within an existing storage pool as either encrypted or non-encrpted. A mix of encrypted and non-encrypted datasets can exist in a single storage pool.

To encrypt a dataset, create a new dataset and after typing a name scroll down to the **Encryption Options** section. The **Add Dataset** configuration screen encryption fields change based on the **Encryption Type**.

⊙ Inherit Checkbox

Because child datasets inherit settings from the parent dataset, the **Add Dataset** configuration screen displays with the inherit checkbox already check-marked. This means the inherit checkbox text for the child configuration screen changes based on the parent encryption setting.

Inherit (encrypted) displays for an encrypted parent dataset.


Storage / Pools / Add Dataset
TrueNAS CORE® © 2022 - iXsystems, Inc.

Name and Options

Name *: child1

Comments

Sync: Inherit (standard)

Compression level: Inherit (lz4)

Enable Atime: Inherit (on)

Encryption Options

☑ Inherit (non-encrypted)

Other Options

ZFS Deduplication: Inherit (off)

Case Sensitivity: Sensitive

Share Type: Generic

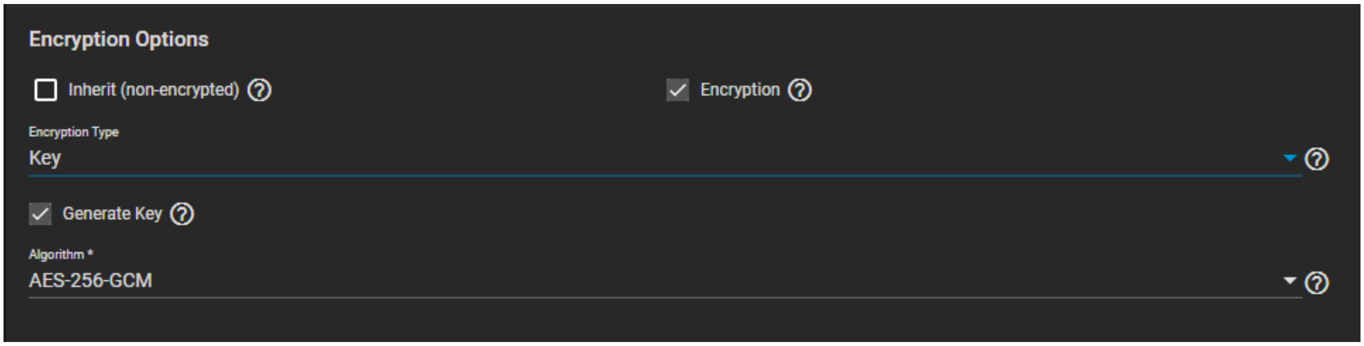
SUBMIT
CANCEL
ADVANCED OPTIONS

Inherit (non-encrypted) displays for a parent dataset not encrypted.

You can change the inherited encrypted/non-encrypted state by unchecking the inherit box. This displays the **Encryption** checkbox already check-marked.

○ Encryption Checkbox

Click the **Inherit (encrypted)** or **Inherited (non-encrypted)** checkbox with the checkmark to turn off inherited encryption settings. The **Encryption** checkbox displays already check-marked. You can now change this dataset’s encryption settings.


Encryption Options

☐ Inherit (non-encrypted)

☑ Encryption

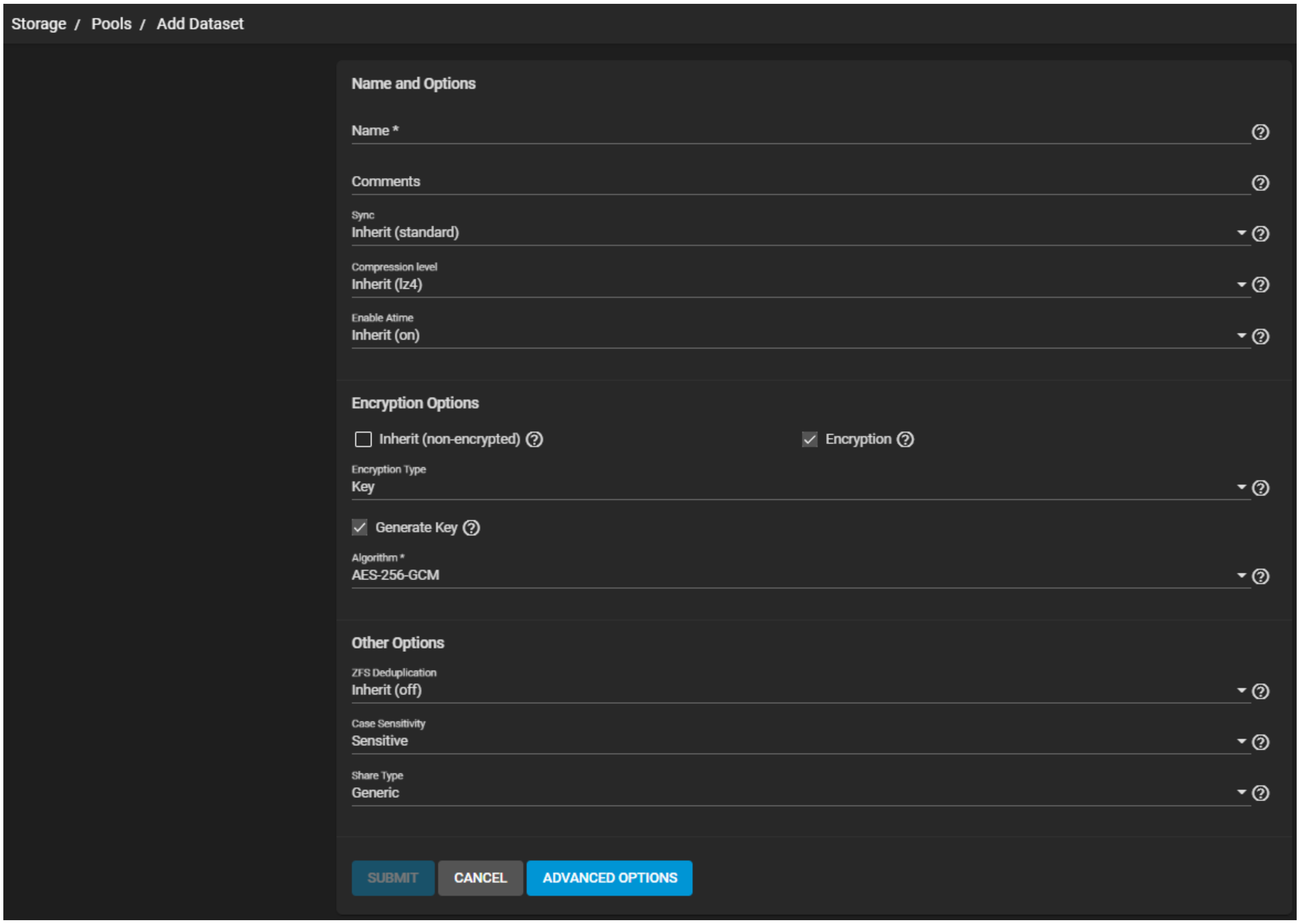
Encryption Type: Key

☑ Generate Key

Algorithm *: AES-256-GCM

> If you uncheck the **Encryption** checkbox on the **Add Dataset** configuration screen, the encryption fields no longer display and the new child dataset is not encrypted.

Encryption Options fields change based on the **Encryption Type** selected. There are two options, **Key** or **Passphrase**. The default setting is **Key**.



Name and Options

Name *

Comments

Sync: Inherit (standard)

Compression level: Inherit (lz4)

Enable Atime: Inherit (on)

Encryption Options

□ Inherit (non-encrypted) ☑ Encryption

Encryption Type: Key

☑ Generate Key

Algorithm *: AES-256-GCM

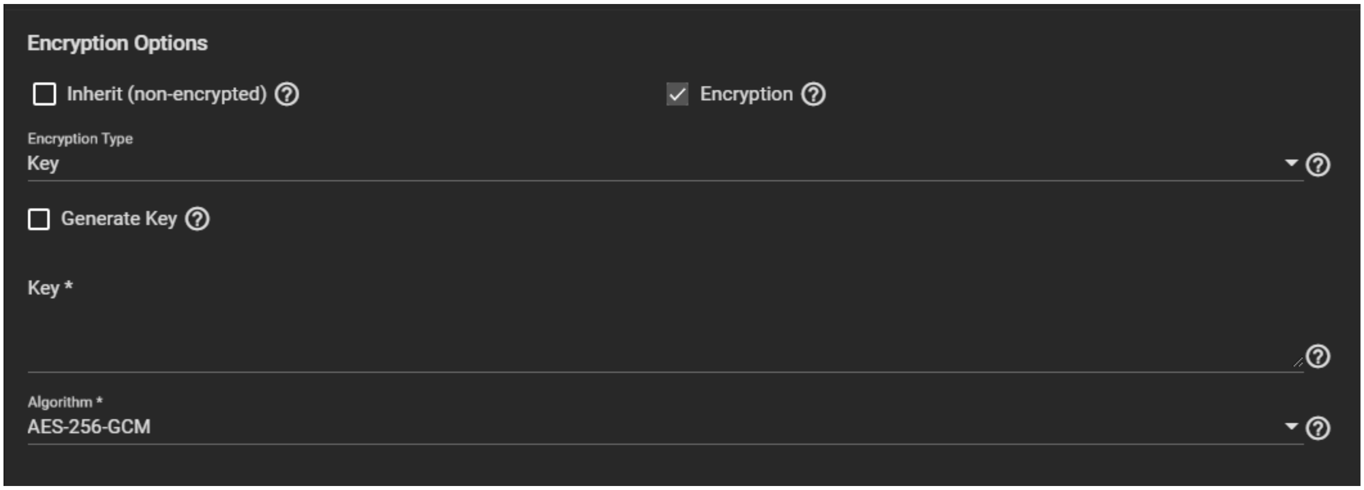
Other Options

ZFS Deduplication: Inherit (off)

Case Sensitivity: Sensitive

Share Type: Generic

The **Generate Key** checkbox defaults to check-marked. If you uncheck it, the **Key*** text field displays below it. Type the encryption key you want to use into this field.



Encryption Options

□ Inherit (non-encrypted) ☑ Encryption

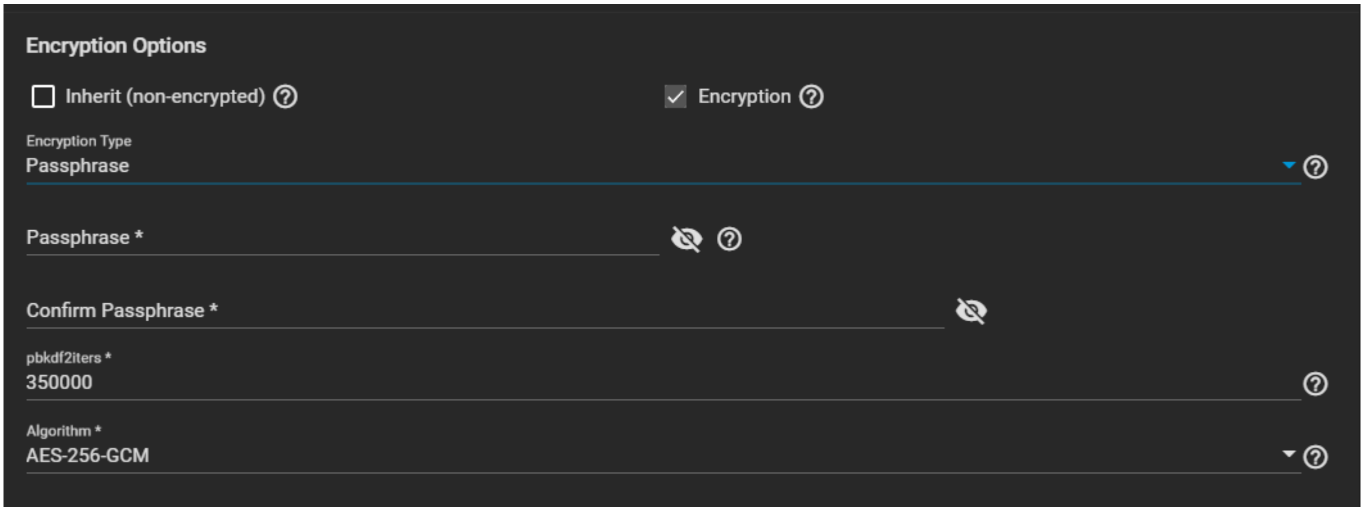
Encryption Type: Key

□ Generate Key

Key *

Algorithm *: AES-256-GCM

If you change the **Encryption Type** to **Passphrase** new **Encryption Options** fields display.



Encryption Options

☐ Inherit (non-encrypted) ⓘ ☑ Encryption ⓘ

Encryption Type: Passphrase

Passphrase *

Confirm Passphrase *

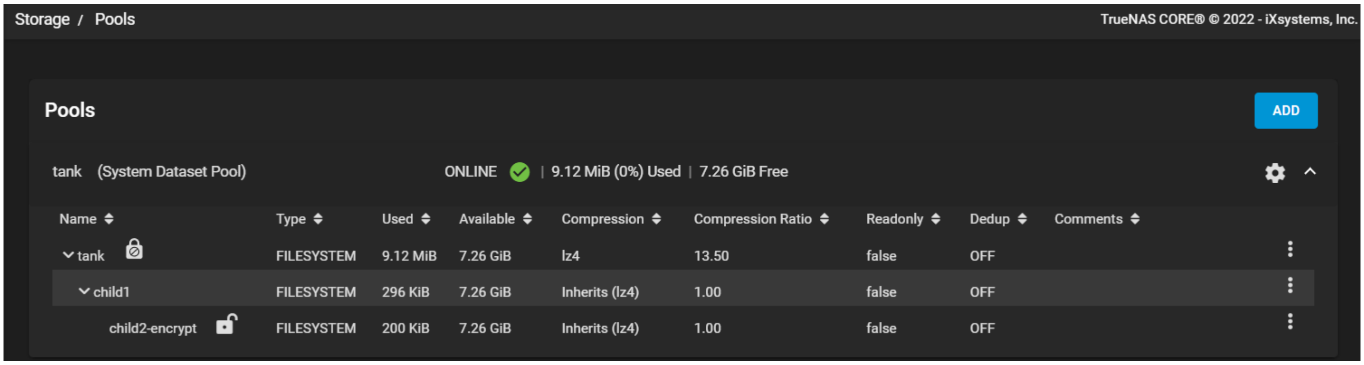
pbkdf2iters *: 350000

Algorithm *: AES-256-GCM

If using the passphrase option choose a complex phrase not easy to guess.

> Keep both encryption keys and/or passphrases safeguarded in a secure and protected place. Losing encryption keys or passphrases can result in permanent data loss!

After configuring the new dataset encryption settings and any other settings, click **SAVE**. The new dataset displays on the **Storage > Pools** screen below its parent dataset. If you encrypt a dataset, an unlocked icon displays to the right of its name and a locked icon displays to the right of the root dataset name. It remains unlocked until you lock it.



Storage / Pools — TrueNAS CORE® © 2022 - iXsystems, Inc.

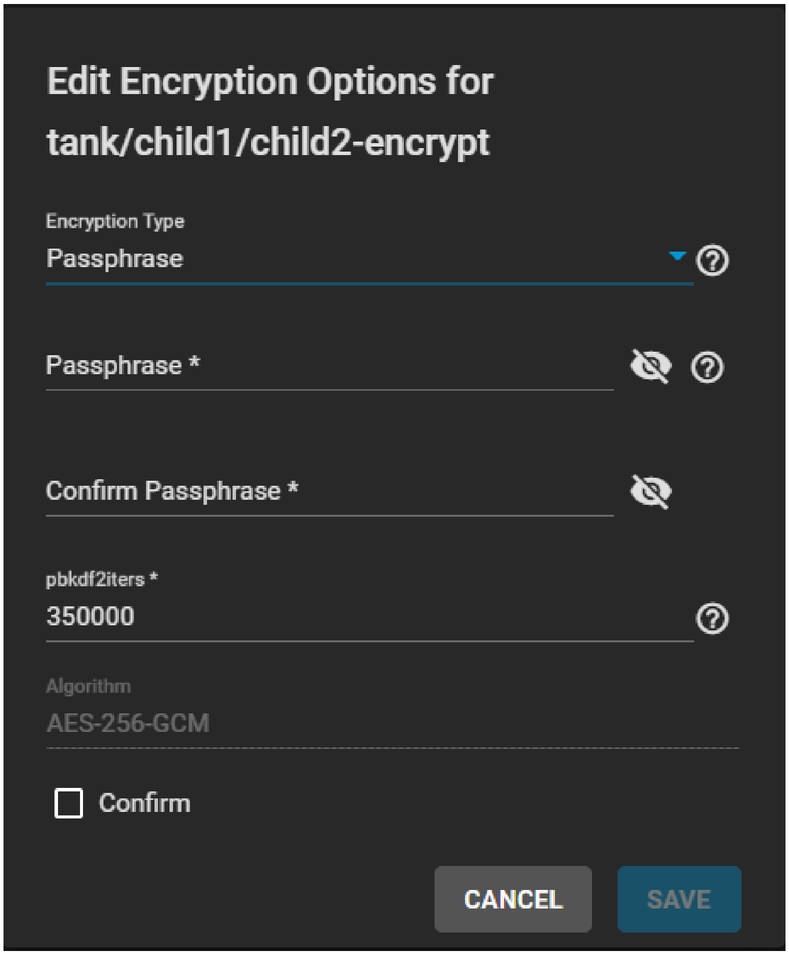
Pools — ADD

tank (System Dataset Pool) ONLINE ✓ | 9.12 MiB (0%) Used | 7.26 GiB Free

Name	Type	Used	Available	Compression	Compression Ratio	Readonly	Dedup	Comments
tank 🔒	FILESYSTEM	9.12 MiB	7.26 GiB	lz4	13.50	false	OFF	
child1	FILESYSTEM	296 KiB	7.26 GiB	Inherits (lz4)	1.00	false	OFF	
child2-encrypt 🔓	FILESYSTEM	200 KiB	7.26 GiB	Inherits (lz4)	1.00	false	OFF	

Changing Dataset Encryption

Click on **Encryption Options** on the **Dataset Action** menu to change dataset encryption settings. This option only displays on the menu for datasets with encryption configured. The **Edit Encryption Options** configuration window displays and window name includes the dataset full path name. In the example used it includes the root dataset *tank*, the child dataset without encryption *child1*, and finally the selected child-of-the-child dataset with encryption *child2-encrypt* (i.e., *tank/child1/child2-encrypt*).



Edit Encryption Options for tank/child1/child2-encrypt

Encryption Type: Passphrase

Passphrase *

Confirm Passphrase *

pbkdf2iters *: 350000

Algorithm: AES-256-GCM

□ Confirm

Click the **Confirm** checkbox to check-mark it and then click **SAVE** after making any changes.

Save any change to the encryption key or passphrase, update your saved passcodes and keys file, and back it up.

Locking and Unlocking Datasets

TrueNAS displays a dataset status with icons:

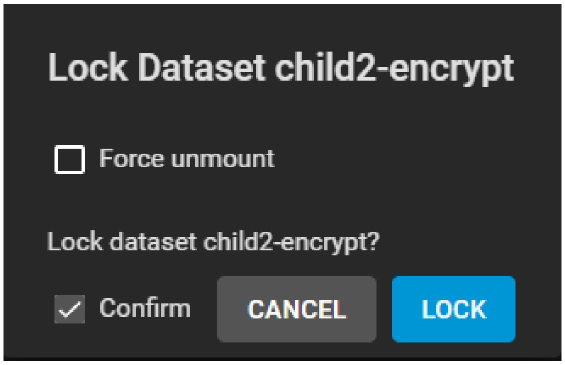
- Dataset unlocked icon:
- Dataset locked icon: lock

The locked icon displayed beside the root dataset after adding a dataset with encryption and also beside a dataset where the pool encryption properties don't match the root dataset is: 🔒

You can only lock and unlock an encrypted dataset when it is secured with a passphrase instead of a key file. Before locking a dataset, verify that it is not currently in use.

Locking a Dataset

Click the dataset's more_vert icon to display the **Dataset Actions** menu and then click on **Lock**. The **Lock Dataset** dialog box displays and includes the dataset full path name.


Lock Dataset child2-encrypt

□ Force unmount

Lock dataset child2-encrypt?

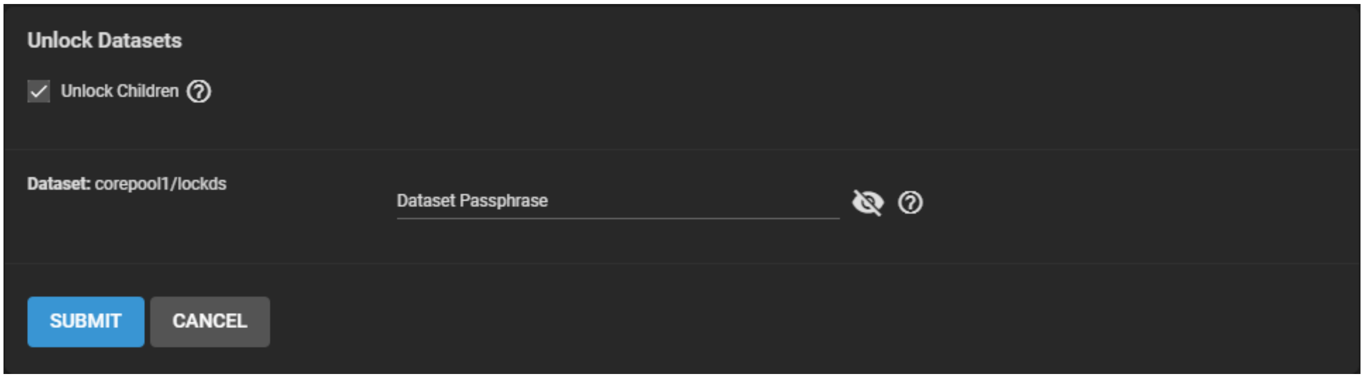
☑ Confirm

Use the **Force unmount** option only if you are certain no one is currently accessing the dataset. Click the **Confirm** checkbox to check-mark it and click **LOCK**, and then click **LOCK**. A confirmation window diplays indicating the dataset is locked and the unlock icon changes to a locked icon.

You *cannot* use locked datasets.

Unlocking a Dataset

To unlock a dataset, click on the more_vert icon to display the **Dataset Actions** menu and then click on **Unlock**.


Unlock Datasets

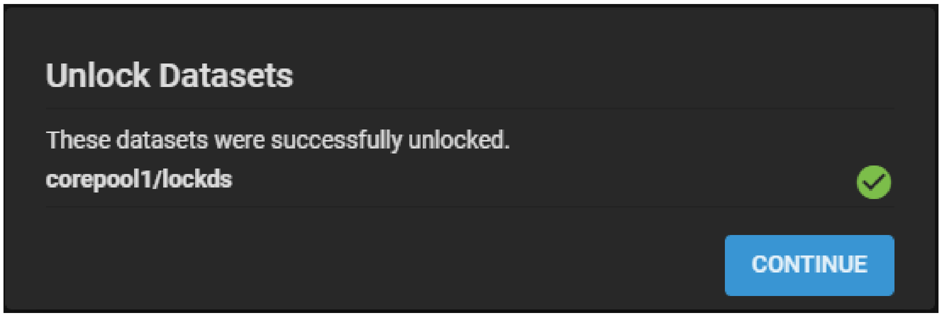
☑ Unlock Children

Dataset: corepool1/lockds

Dataset Passphrase

Type the passphrase and click **SUBMIT**. To unlock child datasets, set the **Unlock Children** checkbox. Child datasets that inherited the parent dataset’s encryption settings unlock when the parent unlocks. Users can unlock child datasets with different passphrases as the parent simultaneously by entering their passphrases.

Two confirmation windows display. Click **CONTINUE** to confirm you want to unlock the datasets or **CANCEL** to exit and keep the datasets locked. A second confirmation window displays confirming the datasets are unlocked. Click **CONTINUE** to close the second confirmation window.

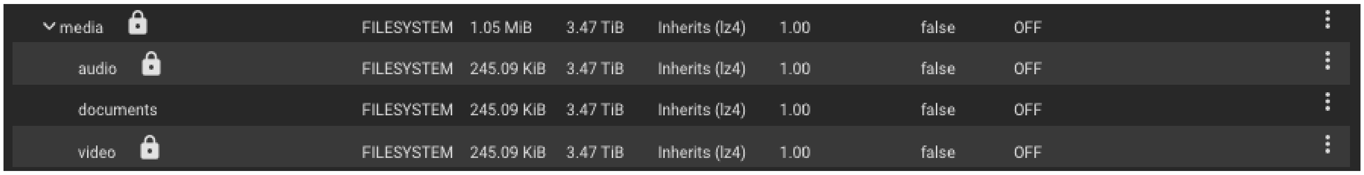

Unlock Datasets

These datasets were successfully unlocked.

corepool1/lockds ✓

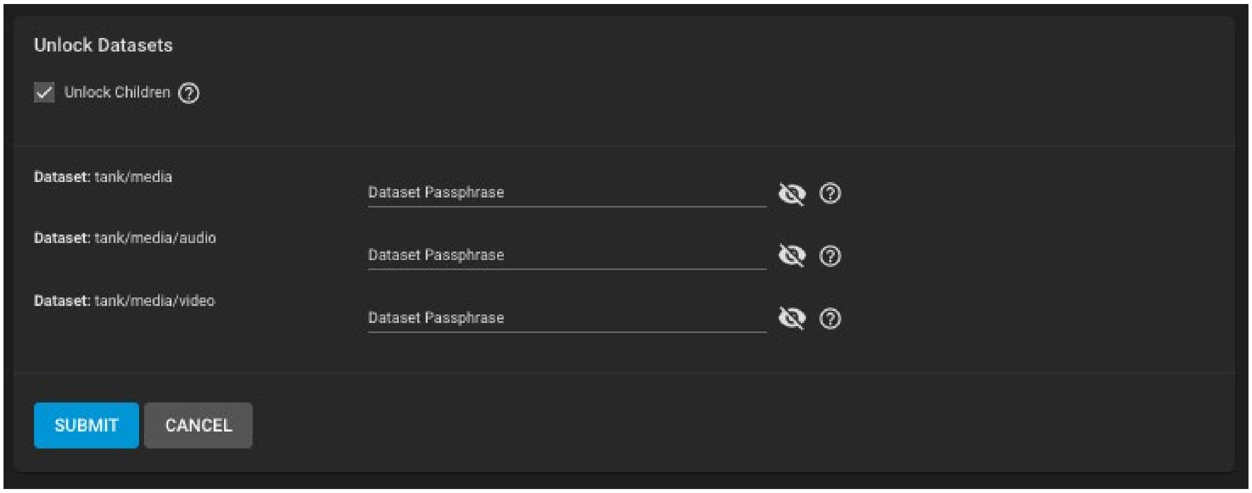
TrueNAS displays the dataset with the unlocked icon.

Unlocking Mutliple Datasets Example:



media	FILESYSTEM	1.05 MiB	3.47 TiB	Inherits (lz4)	1.00	false	OFF
audio	FILESYSTEM	245.09 KiB	3.47 TiB	Inherits (lz4)	1.00	false	OFF
documents	FILESYSTEM	245.09 KiB	3.47 TiB	Inherits (lz4)	1.00	false	OFF
video	FILESYSTEM	245.09 KiB	3.47 TiB	Inherits (lz4)	1.00	false	OFF

The parent dataset is **media**. It has three child datasets. The **documents** child dataset inherits the parent encryption settings and its password. The other two child datasets (**audio** and **video**) have their own passphrases. After locking the parent dataset all child datasets lock too.



Unlock Datasets

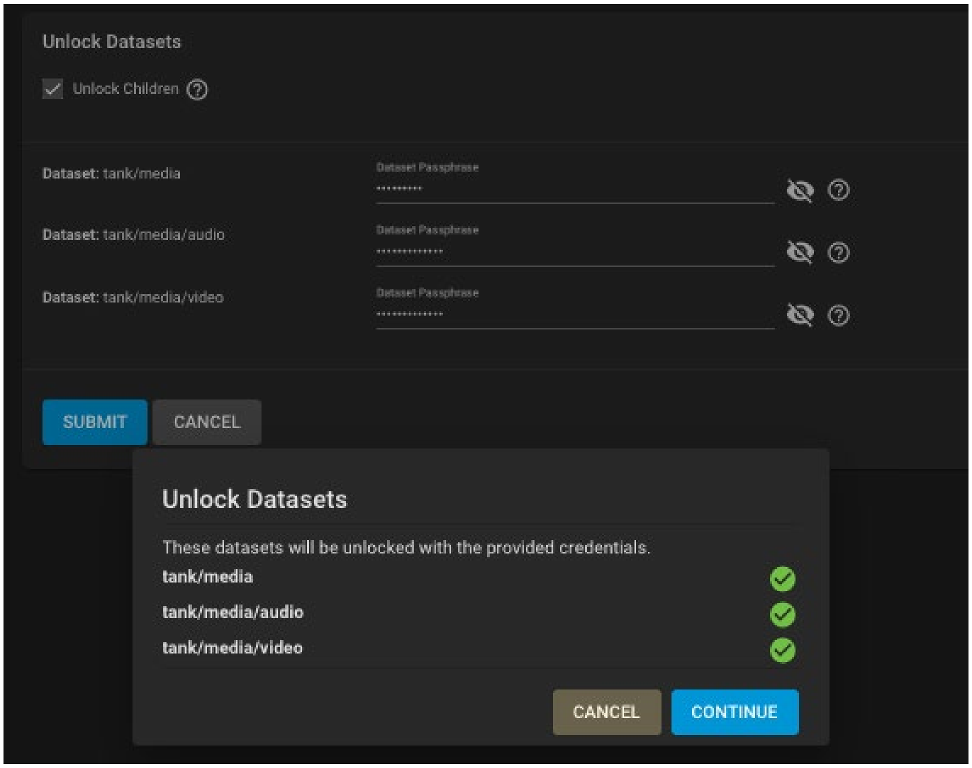
☑ Unlock Children

Dataset: tank/media — Dataset Passphrase

Dataset: tank/media/audio — Dataset Passphrase

Dataset: tank/media/video — Dataset Passphrase

Open the more_vert for the parent dataset and click **Unlock**. To unlock all the datasets, click on the **Unlock Children** checkbox to check-mark it and type the passphrase for each dataset to unlock them.



Unlock Datasets

☑ Unlock Children

Dataset: tank/media — Dataset Passphrase: **********

Dataset: tank/media/audio — Dataset Passphrase: **************

Dataset: tank/media/video — Dataset Passphrase: **************

Unlock Datasets

These datasets will be unlocked with the provided credentials.

tank/media ✓

tank/media/audio ✓

tank/media/video ✓

Click the **CONTINUE** button on both confirmation windows to successfully unlock the datasets. The datasets display the unlocked icon.

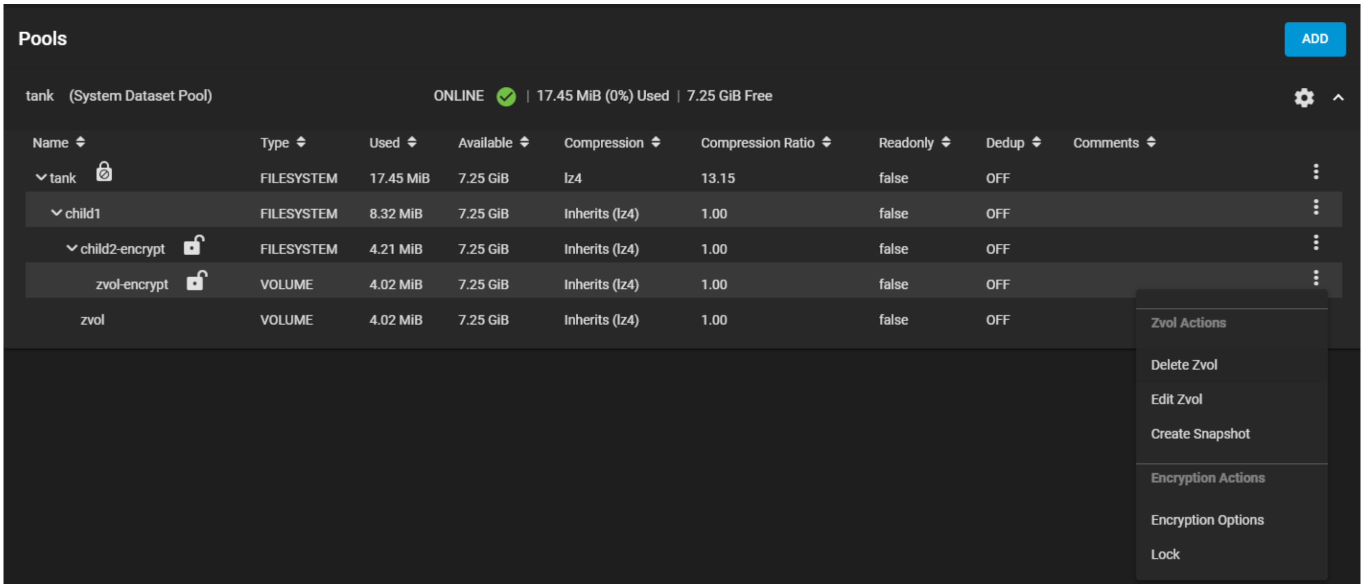
Encrypting a Zvol

Encryption is for securing sensitive data.

You can only encrypt a zvol if you create the zvol from a dataset with encryption.

Users are responsible for backing up and securing encryption keys and passphrases! Losing the ability to decrypt data is similar to a catastrophic data loss.

Zvols, like datasets, inherit encryption settings from the parent dataset. To encrypt a zvol, select a dataset configured with encryption and then create a new zvol. Next, click the more_vert icon to display the **Zvol Actions** menu.

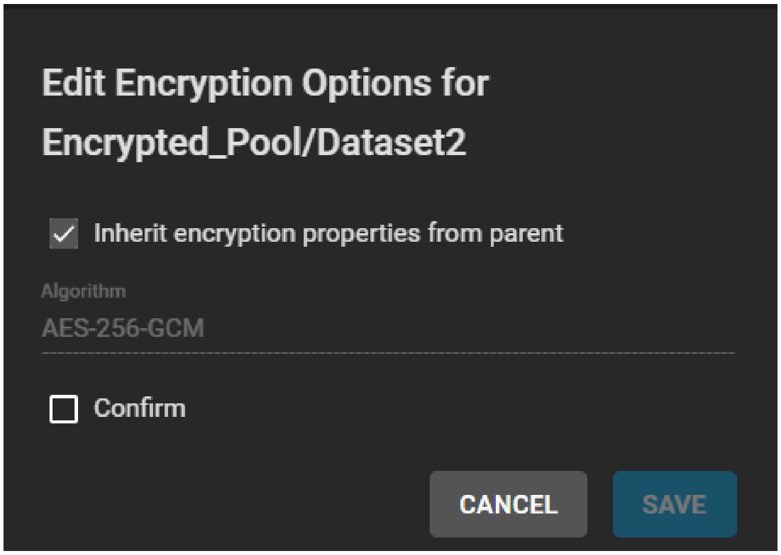


tank (System Dataset Pool) ONLINE | 17.45 MiB (0%) Used | 7.25 GiB Free

Name	Type	Used	Available	Compression	Compression Ratio	Readonly	Dedup	Comments
tank	FILESYSTEM	17.45 MiB	7.25 GiB	lz4	13.15	false	OFF	
child1	FILESYSTEM	8.32 MiB	7.25 GiB	Inherits (lz4)	1.00	false	OFF	
child2-encrypt	FILESYSTEM	4.21 MiB	7.25 GiB	Inherits (lz4)	1.00	false	OFF	
zvol-encrypt	VOLUME	4.02 MiB	7.25 GiB	Inherits (lz4)	1.00	false	OFF	
zvol	VOLUME	4.02 MiB	7.25 GiB	Inherits (lz4)	1.00	false	OFF	

If you do not see encryption options on the menu then you created the zvol from a dataset not configured with encryption. You can delete the zvol and start over.

Click **Encryption Options**. The **Edit Encryption Options** configuration window displays with the **Inherit encryption properties from parent** checkbox check-marked.



Edit Encryption Options for Encrypted_Pool/Dataset2

☑ Inherit encryption properties from parent

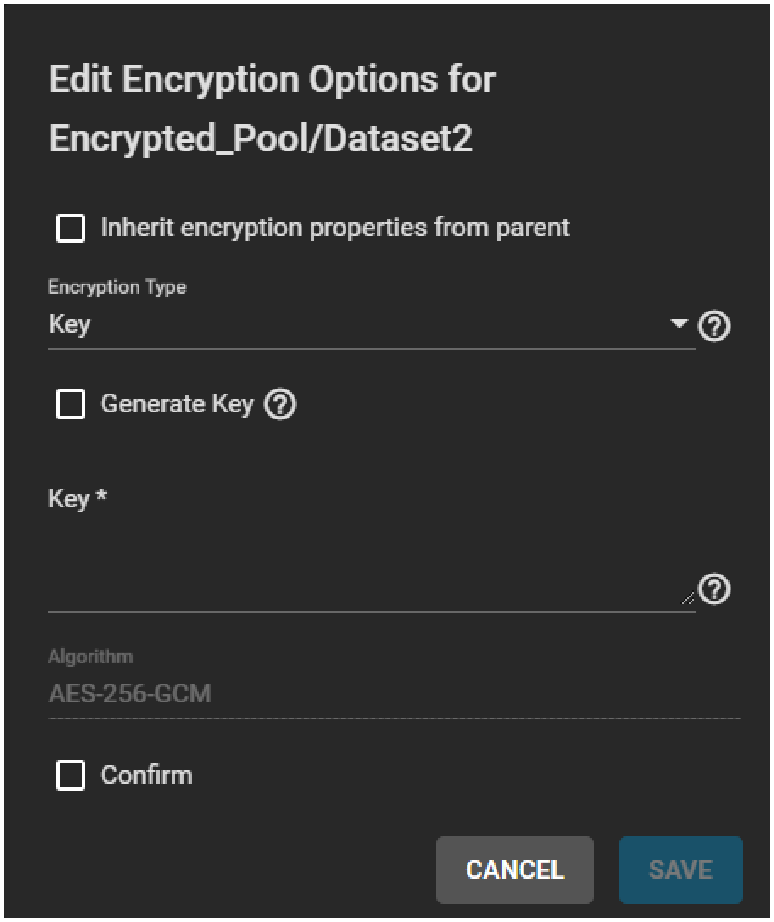
Algorithm
AES-256-GCM

□ Confirm

Like datasets, the window name includes the full path for the zvol. In this example, the root dataset *Encrypted_Pool*, the encrypted child dataset *Dataset2* (i.e., *Encrypted_Pool/Dataset2*).

If not making changes, click the **Confirm** checkbox to activate the **SAVE** button, and then click **SAVE**. The zvol is encrypted with settings inherited from its parent.

To change inherited encryption properties, click on the inherit checkbox to uncheck it. Additional configuration option fields display.



Edit Encryption Options for Encrypted_Pool/Dataset2

☐ Inherit encryption properties from parent

Encryption Type: Key

☐ Generate Key

Key *

Algorithm: AES-256-GCM

☐ Confirm

If **Encryption Type** is set to**Key**, type an encryption key into the **Key** field or check-mark the **Generate Key** checkbox. If set to **Passphrase**, type a passphrase at least eight characters long into both the **Passphrase** and **Confirm Passphrase** fields. After making any changes, click the **Confirm** checkbox to check-mark it and activate the **SAVE** button, and then click **SAVE**. The zvol is now encrypted with settings not inherited from its parent.

Save any change to the encryption key or passphrase, update your saved passcodes and keys file, and back up the file.

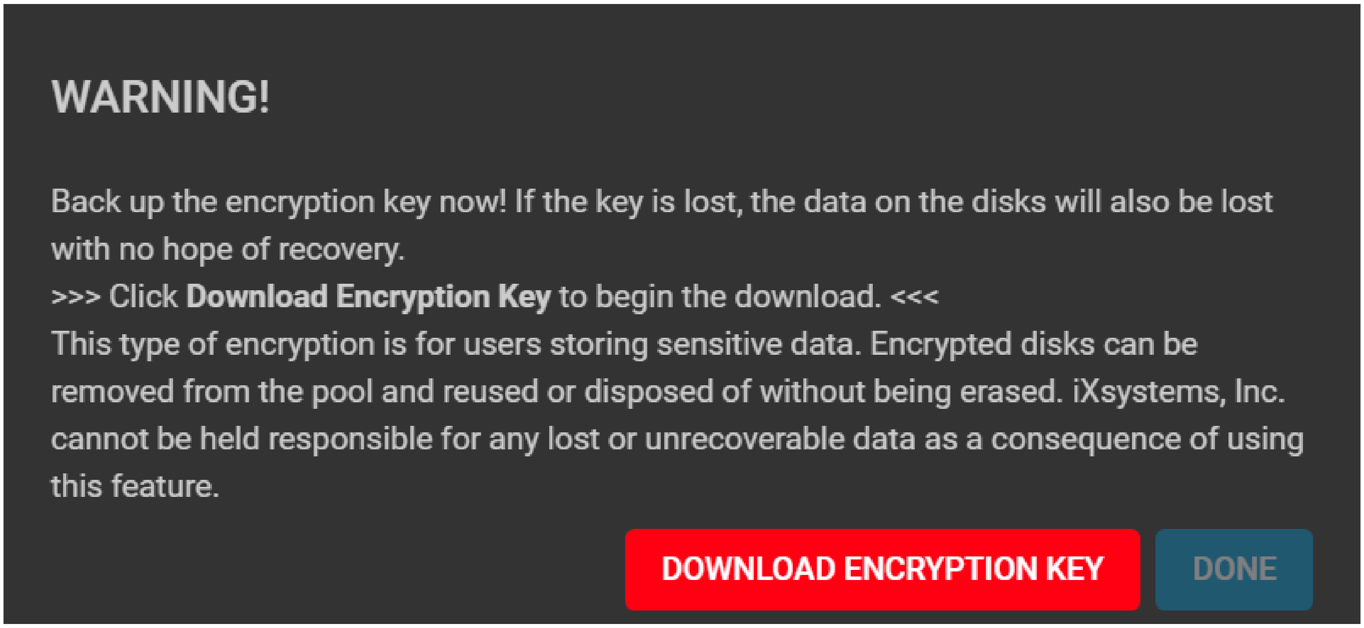
Managing Encryption Credentials

There are two ways to manage the encryption credentials: with key files or passphrases.

⊙ **Key Files**

Creating a new encrypted pool automatically generates a new key file and prompts you to download it.

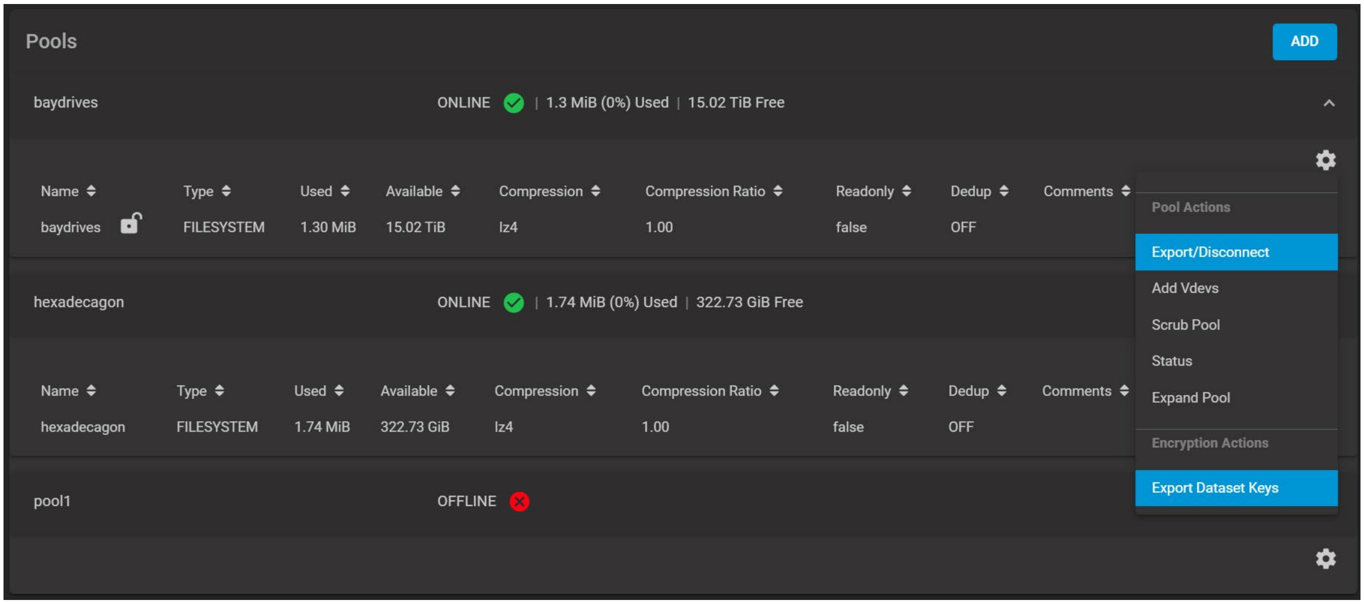
Always back up the key file to a safe and secure location.



WARNING!

Back up the encryption key now! If the key is lost, the data on the disks will also be lost with no hope of recovery.
>>> Click **Download Encryption Key** to begin the download. <<<
This type of encryption is for users storing sensitive data. Encrypted disks can be removed from the pool and reused or disposed of without being erased. iXsystems, Inc. cannot be held responsible for any lost or unrecoverable data as a consequence of using this feature.

To manually download a copy of the pool's inherited and non-inherited encrypted dataset key files, open the pool settings menu and click on **Export Dataset Keys**. Enter the root password and click the **CONTINUE** button.



Pools

baydrives ONLINE ✓ | 1.3 MiB (0%) Used | 15.02 TiB Free

Name	Type	Used	Available	Compression	Compression Ratio	Readonly	Dedup	Comments
baydrives	FILESYSTEM	1.30 MiB	15.02 TiB	lz4	1.00	false	OFF	

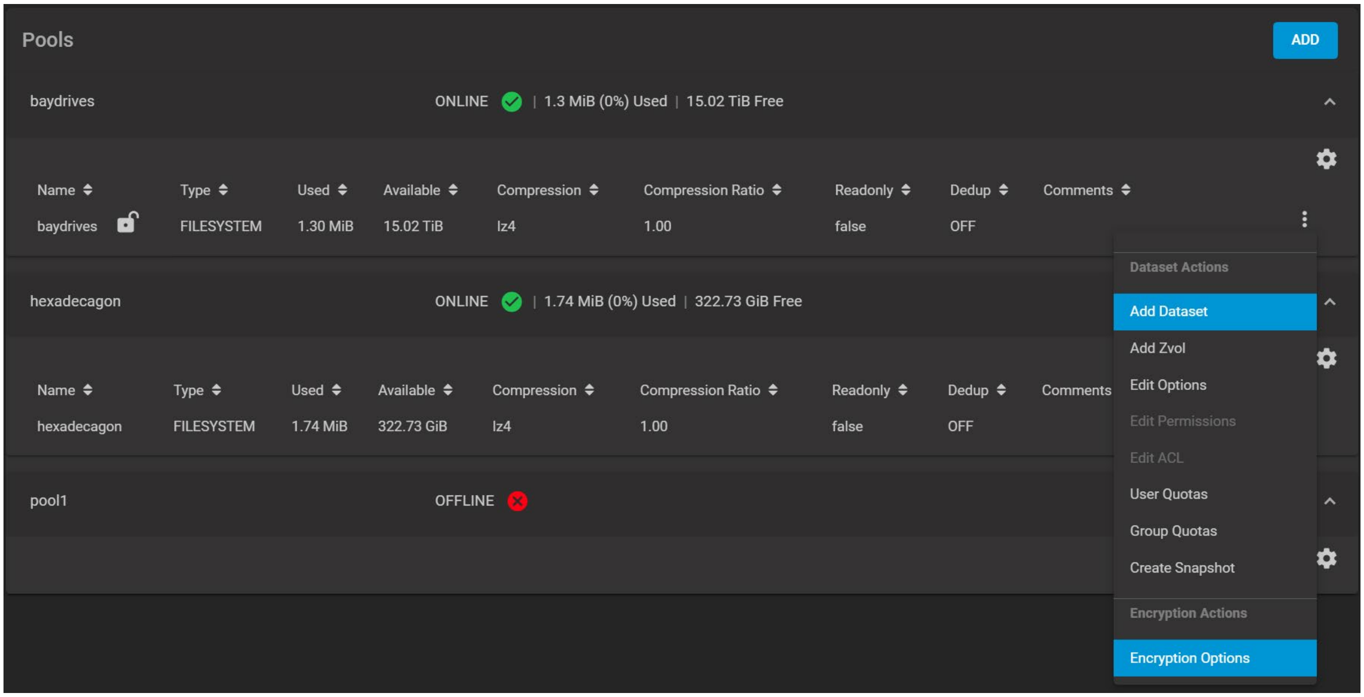
hexadecagon ONLINE ✓ | 1.74 MiB (0%) Used | 322.73 GiB Free

Name	Type	Used	Available	Compression	Compression Ratio	Readonly	Dedup	Comments
hexadecagon	FILESYSTEM	1.74 MiB	322.73 GiB	lz4	1.00	false	OFF	

pool1 OFFLINE ✕

To manually download a backup a single dataset's key file, click the dataset more_vert and click on **Export Key**. Next type the root password and click the **CONTINUE** button. Click the **DOWNLOAD KEY** button.

To change the key, click the dataset more_vert and **Encryption Options**.



baydrives ONLINE | 1.3 MiB (0%) Used | 15.02 TiB Free

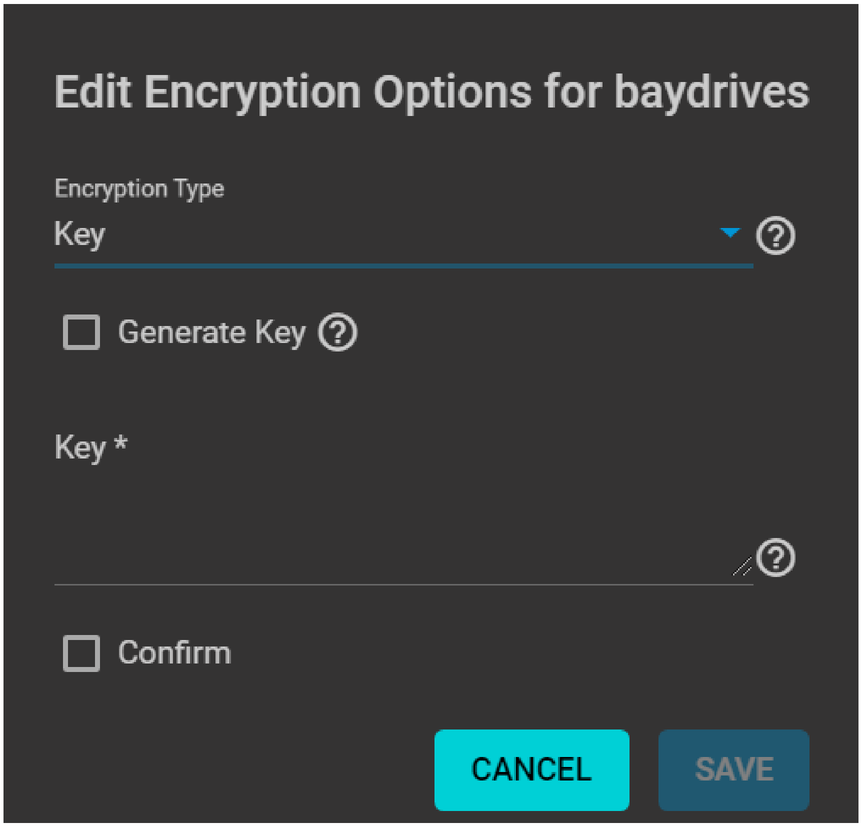
Name	Type	Used	Available	Compression	Compression Ratio	Readonly	Dedup	Comments
baydrives	FILESYSTEM	1.30 MiB	15.02 TiB	lz4	1.00	false	OFF	

hexadecagon ONLINE | 1.74 MiB (0%) Used | 322.73 GiB Free

Name	Type	Used	Available	Compression	Compression Ratio	Readonly	Dedup	Comments
hexadecagon	FILESYSTEM	1.74 MiB	322.73 GiB	lz4	1.00	false	OFF	

pool1 OFFLINE

Type your custom key or click **Generate Key**.



Edit Encryption Options for baydrives

Encryption Type: Key

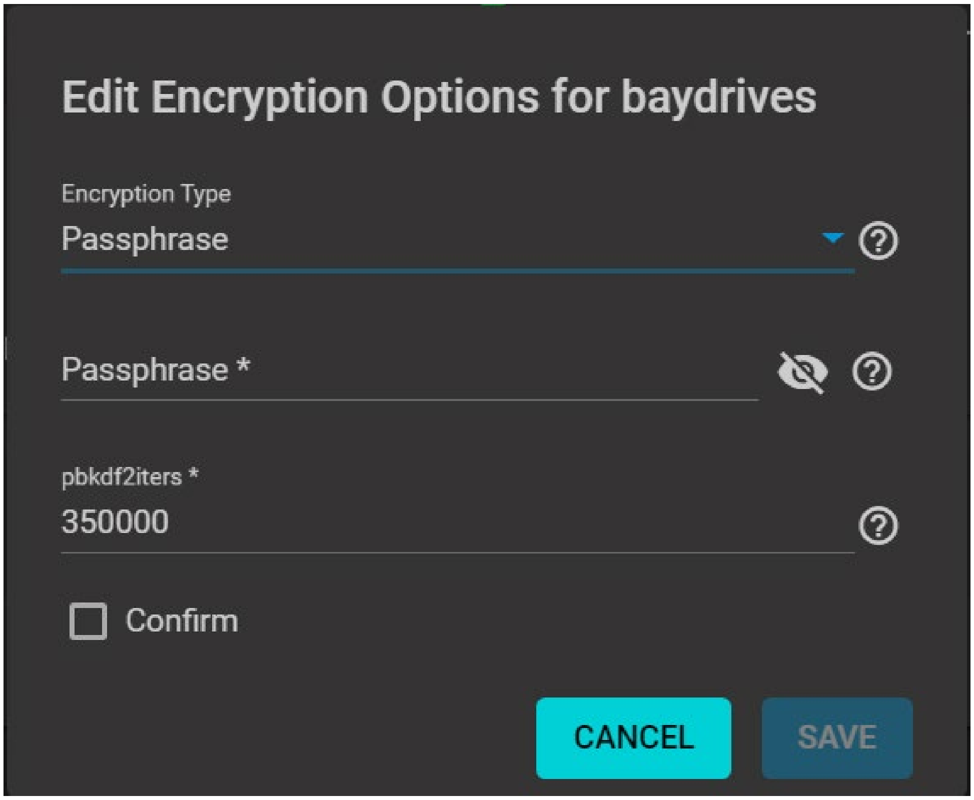
□ Generate Key

Key *

□ Confirm

○ **Passphrases**

To use a passphrase instead of a keyfile, click the dataset more_vert icon to display the **Dataset Actions** menu and then click **Encryption Options**. Change the **Encryption Type** from **Key** to **Passphrase**.



Edit Encryption Options for baydrives

Encryption Type: Passphrase

Passphrase *

pbkdf2iters *: 350000

□ Confirm

Set the rest of the options:

- **Passphrase**: A user-defined string at least eight characters long that is required to decrypt the dataset. Type it into the **Passphrase** and **Confirm Passphrase** fields.

> The passphrase is the only means to decrypt the information stored in this dataset.

Be sure to create a memorable passphrase or physically secure the passphrase.

- **pbkdf2iters**: The number of password-based key derivation function 2 (PBKDF2) iterations to use for reducing vulnerability to brute-force attacks. Users must enter a number greater than *100000*.

Unlocking a Replicated Encrypted Dataset or Zvol Without a Passphrase

TrueNAS Enterprise users can connect a Key Management Interoperability Protocol (KMIP) server to centralize keys when they are not using passphrases to unlock a dataset or zvol.

Users with TrueNAS CORE or Enterprise installations without KMIP should either replicate the dataset or zvol without properties to disable encryption at the remote end or construct a special json manifest to unlock each child dataset/zvol with a unique key.

● **Method 1: Construct JSON Manifest**

1. Replicate every encrypted dataset you want to replicate with properties.
2. Export key for every child dataset that has a unique key.
3. For each child dataset construct a proper json with poolname/datasetname of the destination system and key from the source system like this: `{"tank/share01": "57112db4be777d93fa7b76138a68b790d46d6858569bf9d13e32eb9fda72146b"}`
4. Save this file with the extension .json.
5. Unlock the dataset(s) on the remote system using properly constructed json files.

○ **Method 2: Replicate Encrypted Dataset/Zvol without Properties**

Uncheck properties when replicating so that the destination dataset isn't encrypted on the remote side and doesn't require a key to unlock.

1. Go to **Tasks > Replication Tasks** and click **ADD**.
2. Click **ADVANCED REPLICATION CREATION**.
3. Fill out the form as needed and make sure **Include Dataset Properties** is *NOT* checked.
4. Click **SUBMIT**.

NOTE: This does not affect TrueNAS Enterprise installs with KMIP.

Legacy GELI Encryption

TrueNAS no longer supports GELI encryption (deprecated).

Can I directly convert a GELI-encrypted pool to native ZFS encryption? expand □
No. You must migrate data out of the GELI pool and into a ZFS encrypted pool.

GELI Pool Migrations

You can *migrate* data from the GELI-encrypted pool to a new ZFS-encrypted pool.

Be sure to unlock the GELI-encrypted pool before attempting any data migrations. The new ZFS-encrypted pool must be at least the same size as the previous GELI-encrypted pool. Do not delete the GELI dataset until you have verified the data migration.

There are a few options to migrate data from a GELI-encrypted pool to a new ZFS-encrypted pool:

⊙ **Replication Wizard**

Using the Replication Wizard expand □

The TrueNAS web interface continues to detect and support GELI encrypted pools as *Legacy Encrypted* pools. As of TrueNAS version 12.0-U1, a decrypted GELI pool can migrate data to a new ZFS encrypted pool using the Replication Wizard.

Start the Replication Wizard by selecting **Tasks** -> **Replication Task** -> **ADD**

Source Location:

- Select **On this System**.
- Set the dataset to transfer.

Destination Location:

- Select **On a Different System**.

SSH Connection:

- Either create the ssh connection by clicking **Create New** or select the destination system's ssh connection.
- In **Destination**, select the dataset to replicate the files to.
- Set **Encryption**.
- Choose either **PASSPHRASE** or **HEX** for the **Encryption Key Format**.
- If you selected PASSPHRASE, type the passphrase. If you selected HEX, set **Generate Encryption Key**.
- Set **Store Encryption key in Sending TrueNAS database**.
- Click **Next**

Replication Schedule:

- Set **Run Once** in Replication Schedule.
- Unset **Make Destination Dataset Read-Only**.
- Click **START REPLICATION**

File Transfer

This method does not preserve file ACLs.

The web interface supports using **Tasks > Rsync Tasks** to transfer files out of the GELI pool. In the **Shell**, `rsync` and other file transfer mechanisms (`scp`, `cp`, `sftp`, `ftp`, `rdiff-backup`) are available for copying data between pools.

ZFS Send and Receive

These instructions are an example walkthrough. It is not an exact step-by-step guide for all situations. Research ZFS send/receive before attempting this. A simple example cannot cover every edge case.

Legend:

```
GELI Pool = pool_a
Origin Dataset = dataset_1
Latest Snapshot of GELI Pool = snapshot_name
ZFS Native Encrypted Pool = pool_b
Receieving Dataset = dataset_2
```

1. Create a new encrypted pool in **Storage > Pools**.
2. Open the **Shell**. Make a new snapshot of the GELI pool and dataset with the data to be migrated: `zfs snapshot -r pool_a/dataset_1@snapshot_name`.
3. Create a passphrase: `echo passphrase > /tmp/pass`.
4. Use ZFS send/receive to transfer the data between pools: `zfs send -Rv pool_a/dataset_1@snapshot_name | zfs recv -o encryption=on -o keyformat=passphrase -o keylocation=file:///tmp/pass pool_b/dataset_2`.
5. When the transfer is complete, go to **Storage > Pools** and lock the new dataset. After locking the dataset, immediately unlock it. TrueNAS prompts for the passphrase. After entering the passphrase and unlocking the pool, you can delete the `/tmp/pass` file used for the transfer.
6. If desired, you can convert the dataset to use a key file instead of a passphrase. To use a key file, click the dataset □ (Options) and click **Encryption Options**. Change the **Encryption Type** from **Passphrase** to **Key** and save.
7. Repeat this process for every dataset in the pool that you need to migrate.

Back up your key file immediately!

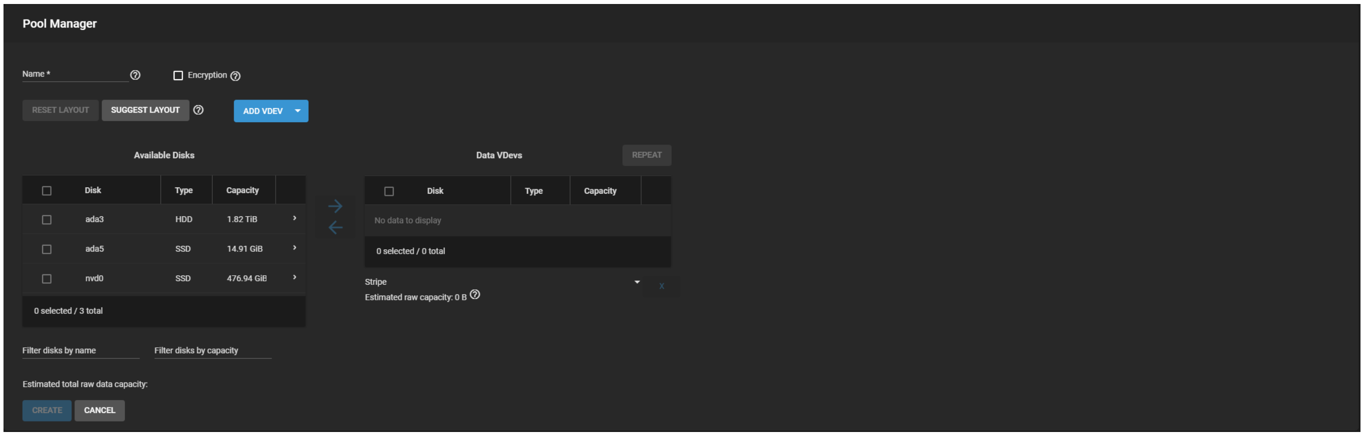
6.1.8 - Fusion Pools

Fusion Pools are also known as **ZFS Allocation Classes**, **ZFS Special vdevs**, and **Metadata vdevs**.

What's a special vdev? expand □
A special vdev can store meta data such as file locations and allocation tables. The allocations in the special class are dedicated to specific block types. By default, this includes all metadata, the indirect blocks of user data, and any deduplication tables. The class can also be provisioned to accept small file blocks. This is a great use case for high performance but smaller sized solid-state storage. Using a special vdev drastically speeds up random I/O and cuts the average spinning-disk I/Os needed to find and access a file by up to half.

Creating a Fusion Pool

Go to **Storage > Pools**, click *ADD*, and select *Create new pool*.



Pool Manager

Name *

□ Encryption

Available Disks

□	Disk	Type	Capacity
□	ada3	HDD	1.82 TiB
□	ada5	SSD	14.91 GiB
□	nvd0	SSD	476.94 GiB

0 selected / 3 total

Filter disks by name

Filter disks by capacity

Estimated total raw data capacity:

Data VDevs

□	Disk	Type	Capacity
No data to display			

0 selected / 0 total

Stripe

Estimated raw capacity: 0 B

A pool must always have one normal (non-dedup/special) vdev before other devices can be assigned to the special class. Configure the **Data VDevs**, then click *ADD VDEV* and select *Metadata*.

Add SSDs to the new **Metadata VDev** and select the same layout as the **Data VDevs**.

The metadata special vdev is critical for pool operation and data integrity, so you must protect it with hot spare(s).

UPS Recommendation expand □
When using SSDs with an internal cache, add Uninterruptible Power Supply (UPS) to the system to help minimize the risk from power loss.

Using special vdevs identical to the data vdevs (so they can use the same hot spares) is recommended, but for performance reasons you can make a different type of vdev (like a mirror of SSDs). In that case you must provide hot spare(s) for that drive type as well. Otherwise, if the special vdev fails and there is no redundancy, the pool becomes corrupted and prevents access to stored data.

Drives added to a metadata vdev cannot be removed from the pool.

When more than one metadata vdev is created, then allocations are load-balanced between all these devices. If the special class becomes full, then allocations spill back into the normal class.

After the fusion pool is created, the **Status** shows a **Special** section with the metadata SSDs.

See Managing Pools.

6.1.9 - SLOG Overprovisioning

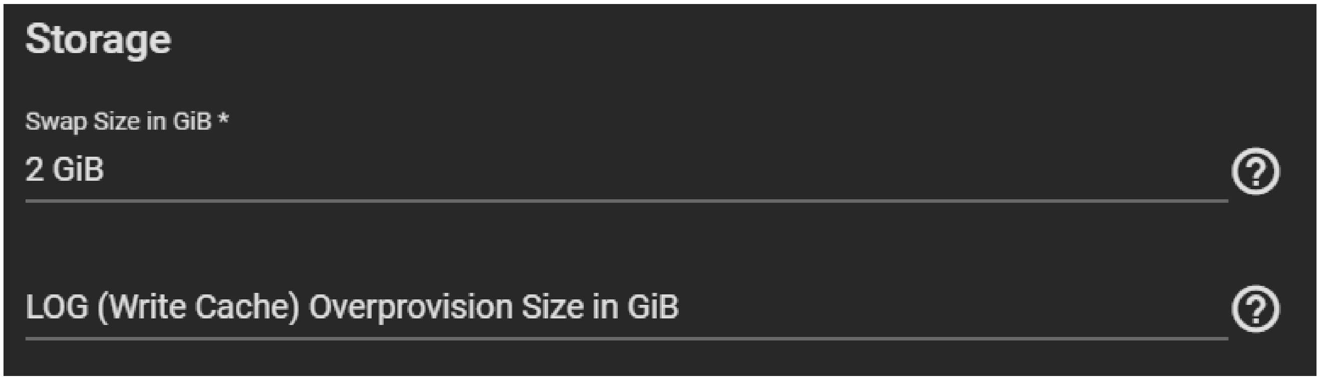
Overprovisioning SLOG SSDs is useful for different scenarios. The most useful benefit of overprovisioning is greatly extending SSD life. Overprovisioning an SSD distributes the total number of writes and erases across more flash blocks on the drive.

Seagate provdes a thoughtful investigation into overprovisioning SSDs: https://www.seagate.com/tech-insights/ssd-over-provisioning-benefits-master-ti/.

> Some SATA devices are limited to one resize per power cycle. Some BIOS can block resize during boot and require a live power cycle.

◉ **Web Interface**

To over provision a SLOG device, log in to TrueNAS and go to **System > Advanced**. Enter an overprovision value corresponding to the new size in GB.



Storage

Swap Size in GiB *

2 GiB

LOG (Write Cache) Overprovision Size in GiB

When this value is applied, the overprovision value is applied whenever a pool is created with a SLOG device. It is impossible to restore an overprovisioned SLOG device back to original capacity without running `disk_resize` after first destroying the pool it was part of and issuing a full power cycle.

> Only one overprovision/underprovision operation occurs per power cycle.

Erasing the overprovision setting and setting to *none* prevents future SLOG devices from being overprovisioned.

○ **Shell**

Use `disk_resize` in the Shell to overprovision.

The command to overprovision an SSD is `disk_resize {DEVICE} {SIZE}`, where *{DEVICE}* is the SSD device name and *{SIZE}* is the new provision size in GiB or TiB. Example: `disk_resize ada5 16GB`. When no size is specified, it reverts the provision back the full size of the device.

6.2 - Snapshots

Snapshots are one of the most powerful features of ZFS. A snapshot provides a read only point-in-time copy of a file system or volume. This copy does not consume extra space in the ZFS pool. The snapshot only records the differences between storage block references whenever the data is modified.

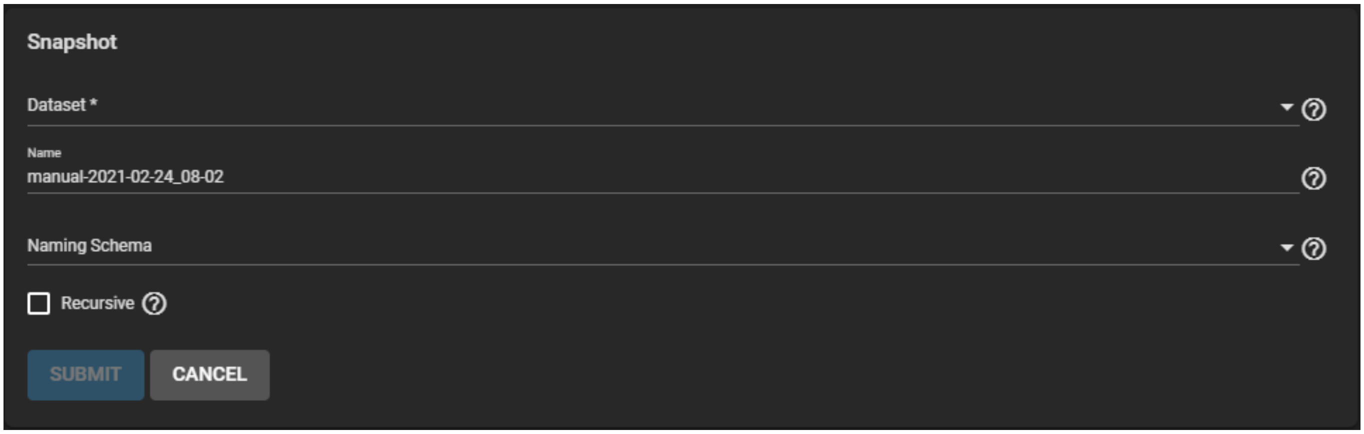
Why do I want to keep snapshots? expand □
Snapshots keep a history of files and provide a way to recover an older or even deleted files. For this reason, many administrators take regular snapshots, store them for some time, and copy them to a different system. This strategy allows an administrator to roll the system data back to a specific point in time. In the event of catastrophic system or disk failure, off-site snapshots can restore data up to the most recent snapshot.

Taking snapshots requires the system have all pools, datasets, and zvols already configured.

Creating a Single Snapshot

> Consider making a Periodic Snapshot Task to save time and create regular, fresh snapshots.

To quickly snapshot existing storage, go to **Storage > Snapshots** and click **ADD**.



Snapshot

Dataset *

Name
manual-2021-02-24_08-02

Naming Schema

□ Recursive

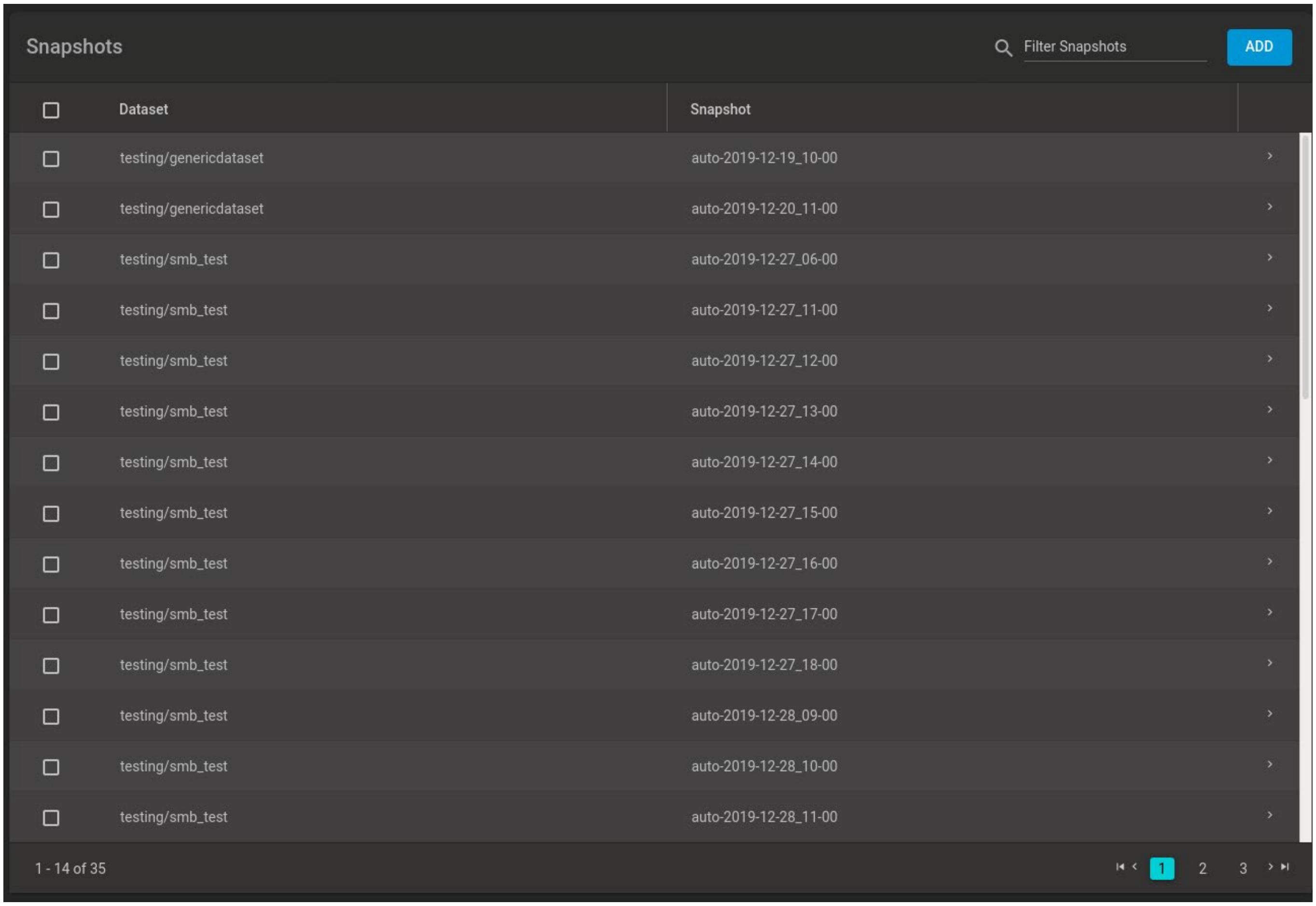
Use the **Dataset** drop-down list to select an existing ZFS pool, dataset, or zvol to snapshot.

The TrueNAS software displays a suggested name that you can override with any custom string. To include the snapshot in Replication Tasks choose a proper naming schema. The **Naming Schema** drop-down list populates with schemas already created from periodic snapshot tasks.

To include child datasets with the snapshot, set **Recursive**.

Managing Snapshots

Go to **Storage > Snapshots** to manage created snapshots.



□	Dataset	Snapshot
□	testing/genericdataset	auto-2019-12-19_10-00
□	testing/genericdataset	auto-2019-12-20_11-00
□	testing/smb_test	auto-2019-12-27_06-00
□	testing/smb_test	auto-2019-12-27_11-00
□	testing/smb_test	auto-2019-12-27_12-00
□	testing/smb_test	auto-2019-12-27_13-00
□	testing/smb_test	auto-2019-12-27_14-00
□	testing/smb_test	auto-2019-12-27_15-00
□	testing/smb_test	auto-2019-12-27_16-00
□	testing/smb_test	auto-2019-12-27_17-00
□	testing/smb_test	auto-2019-12-27_18-00
□	testing/smb_test	auto-2019-12-28_09-00
□	testing/smb_test	auto-2019-12-28_10-00
□	testing/smb_test	auto-2019-12-28_11-00

Each entry in the list includes the dataset and snapshot names. Click chevron_right to view options for a snapshot:

⊙ **DATE CREATED**
The exact time and date of the snapshot creation.
○ **USED**

The amount of space consumed by this dataset and all of its descendants. This value, checked against the dataset quota and reservation, shows the space used but does not include the dataset reservation. It takes into account the reservations of any descendant datasets. The amount of space that a dataset consumes from its parent, and the amount of space freed if this dataset is recursively deleted, is the greater of its space used and its reservation.

At creation, a snapshot shares space between the snapshot, file system, and even with previous snapshots. File system changes reduce the shared space and count toward a snapshot's used space. Deleting a snapshot often increases the space that is unique and used in other snapshots.

Another method to view the space used by an individual snapshot is to go to the **Shell** and enter `zfs list -t snapshot`.

The space used, available, or referenced does not account for pending changes. Pending changes generally update within a few seconds, but larger disk changes slow usage updates.

○ **REFERENCED**
The amount of data accessible by this dataset. This could be shared with other datasets in the pool. New snapshots or clones reference the same amount of space as the file system or snapshot it was created from, as the contents are identical.
○ **DELETE**

The **Delete** option destroys the snapshot. You must delete child clones before you can delete their parent snapshot. While creating a snapshot is instantaneous, deleting one is I/O intensive and can take a long time, especially when deduplication is enabled.

Why? expand □
ZFS has to review all allocated blocks before deletion to see if another process is using that block. If not used, the ZFS can free that block.

○ **CLONE TO NEW DATASET**

Creates a new snapshot *clone* (dataset) from the snapshot contents.

What is a clone? expand □
A **clone** is a writable copy of the snapshot. Because a clone is actually a mountable dataset, it appears in the **Pools** screen rather than the **Snapshots** screen. Creating a new snapshot adds **-clone** to the name by default.

A dialog prompts for the new dataset name. The suggested name derives from the snapshot name.

○ **ROLLBACK**

Revert the **Dataset** back to the point in time saved by the snapshot.

Rollback is a dangerous operation that causes any configured replication tasks to fail. Replications use the existing snapshot when doing an incremental backup, and rolling back can put the snapshots 'out of order'. To restore the data within a snapshot, the recommended steps are:

1. Clone the desired snapshot.
2. Share the clone with the share type or service running on the TrueNAS system.
3. Allow users to recover their needed data.
4. Delete the clone from **Storage > Pools**.

This approach does not destroy any on-disk data and has no impact on replication.

TrueNAS asks for confirmation before rolling back to the chosen snapshot state. Clicking **Yes** reverts all dataset files to the state they were in at the time of snapshot creation.

Bulk Operations

To delete multiple snapshots, select the left column box for each snapshot to include. Click the delete **Delete** button that displays.

To search through the snapshots list by name, type a matching criteria into the search **Filter Snapshots** text field. The list now displays only the snapshot names that match the filter text.

Browsing a Snapshot Collection

Browsing a snapshot collection is an advanced capability that requires ZFS and command-line experience.

All dataset snapshots are accessible as an ordinary hierarchical file system, accessed from a hidden .zfs located at the root of every dataset.

A snapshot and any files it contains are not accessible or searchable if the snapshot mount path is longer than *88* characters. The data within the snapshot is safe but to make the snapshot accessible again shorten the mount path.

A user with permission to access the hidden file can view and explore all snapshots for a dataset from the **Shell** or the **Sharing** screen using services like **SMB**, **NFS**, and **SFTP**.

In summary, the main required changes to settings are:

- In dataset properties, change the ZFS properties to enable snapshot visibility.
- In the Samba auxiliary settings, change the `veto files` command to not hide the .zfs, and add the setting `zfsacl:expose_snapdir=true`.

The effect is that any user who can access the dataset contents can view the list of snapshots by going to the dataset .zfs directory. Users can browse and search any files they have permission to access throughout the entire dataset snapshot collection.

When creating a snapshot, permissions or ACLs set on files within that snapshot mmight limit access to the files.

Snapshots are read-only, so users do not have permission to modify a snapshot or its files, even if they had write permissions when creating the snapshot.

The ZFS `zfs diff` command, which can run in the **Shell**, lists all changed files between any two snapshot versions within a dataset, or between any snapshot and the current data.

6.3 - VMware-Snapshots

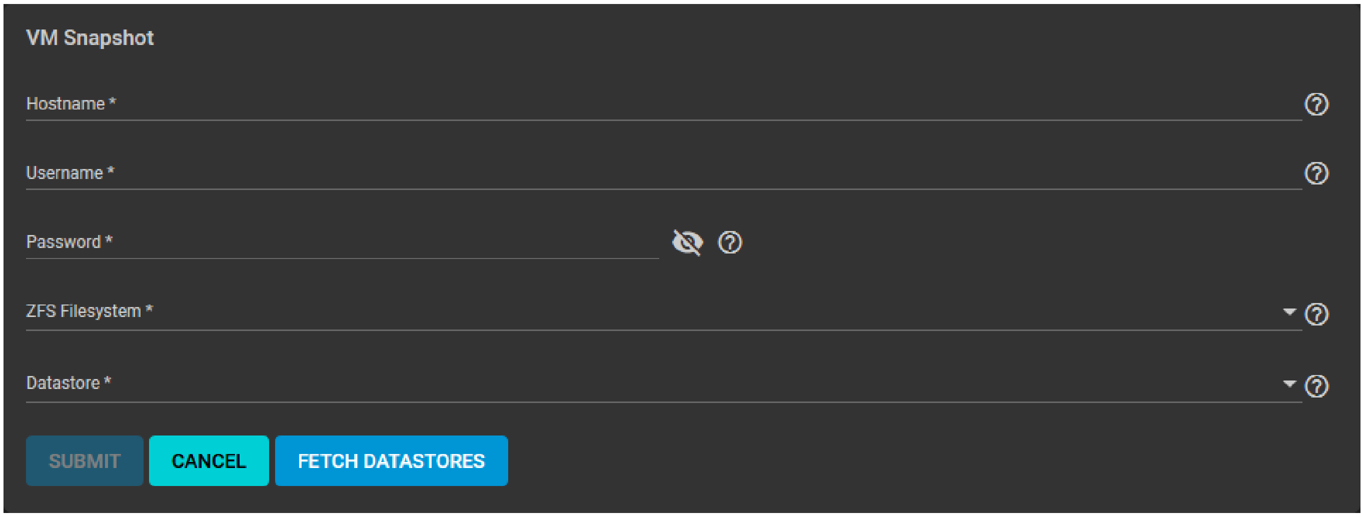
Storage > **VMware-Snapshots** coordinates ZFS snapshots when using TrueNAS as a VMware datastore. When a ZFS snapshot is created, TrueNAS automatically snapshots any running VMware virtual machines before taking a scheduled or manual ZFS snapshot of the dataset or zvol backing that VMware datastore.

Virtual machines **must be powered on** for TrueNAS snapshots to be copied to VMware. The temporary VMware snapshots are then deleted on the VMware side but still exist in the ZFS snapshot and are available as stable restore points. These coordinated snapshots go in the **Storage > Snapshots** list.

You need a paid-edition for VMware ESXi to use VMware-Snapshots. If you try to use them with ESXi free then you will see the following error message: **"Error: Can't create snapshot, current license or ESXi version prohibits execution of the requested operation."**. Indeed ESXi free has locked (read-only) API that prevents using TrueNAS VMware-Snapshots. The cheapest ESXi edition that is compatible with TrueNAS VMware-Snapshots is *VMware vSphere Essentials Kit*.

Create a VMware Snapshot

Go to **Storage > VMware Snapshots** and click *ADD*.



Setting	Value	Description
Hostname	string	Enter the IP address or hostname of the VMware host. When clustering, use the IP address or hostname of the vCenter server for the cluster.
Username	string	Enter a user account name created on the VMware host. The account must have permission to snapshot virtual machines.
Password	string	Enter the password associated with the *Username*.
ZFS Filesystem	browse button	Select a filesystem to snapshot.
Datastore	drop-down menu	After entering the *Hostname*, *Username*, and *Password*, click *FETCH DATASTORES* to populate the menu. Select the datastore to synchronize.

TrueNAS connects to the VMware host after clicking *FETCH DATASTORES*. The *ZFS Filesystem* and *Datastore* drop-down menus populate from the VMware host response. Choosing a datastore also selects any previously mapped dataset.

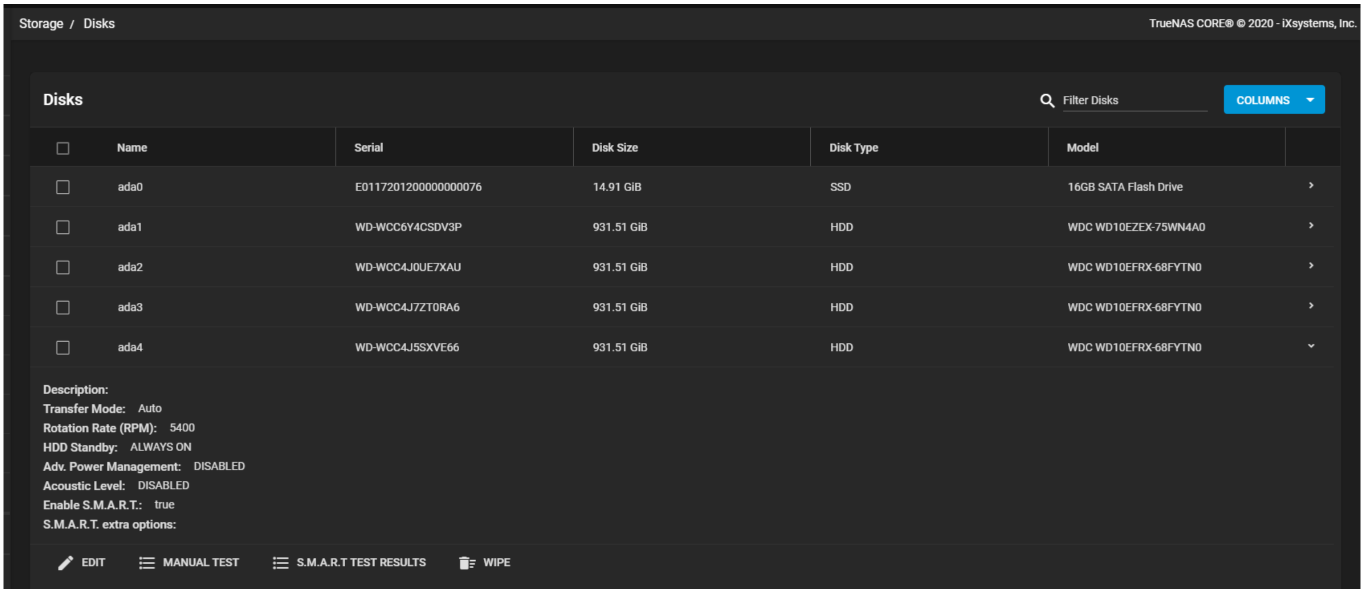
6.4 - Disks

6.4.1 - Wipe

The wipe function deletes obsolete data off an unused disk.

This is a destructive action and results in permanent data loss! Back up any critical data off the disk to be wiped.

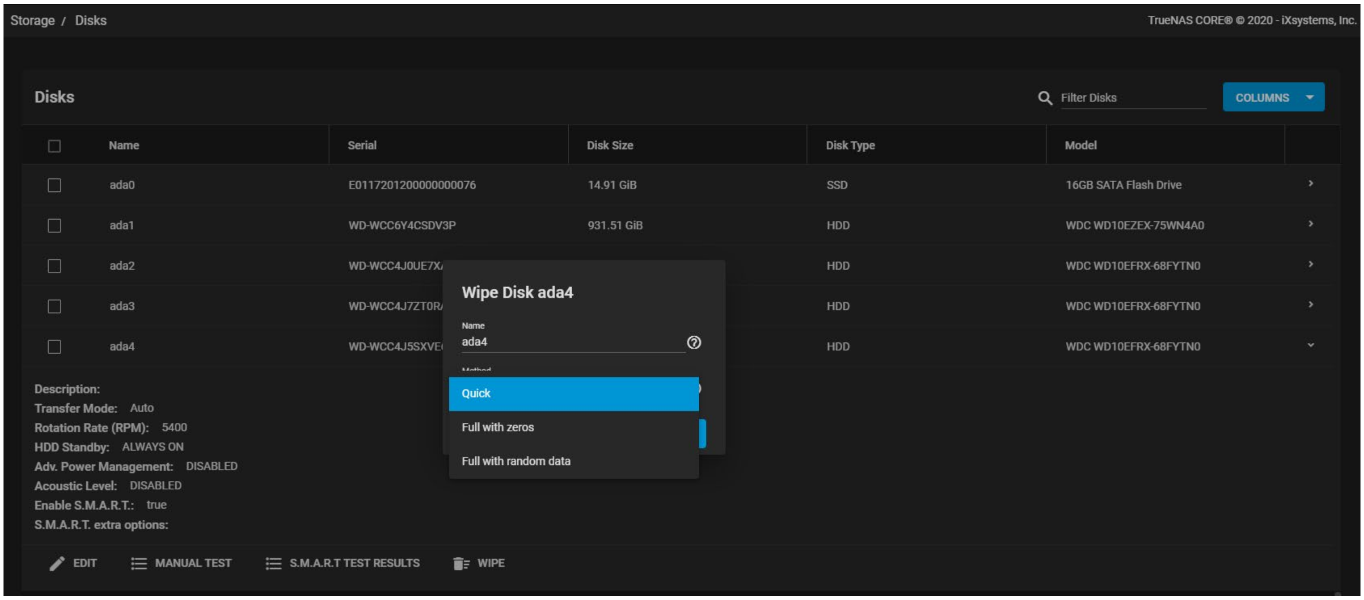
To wipe a disk, go to **Storage** > **Disks**. Click the chevron_right for a disk to see all the options.



□	Name	Serial	Disk Size	Disk Type	Model	
□	ada0	E0117201200000000076	14.91 GiB	SSD	16GB SATA Flash Drive	›
□	ada1	WD-WCC6Y4CSDV3P	931.51 GiB	HDD	WDC WD10EZEX-75WN4A0	›
□	ada2	WD-WCC4J0UE7XAU	931.51 GiB	HDD	WDC WD10EFRX-68FYTN0	›
□	ada3	WD-WCC4J7ZT0RA6	931.51 GiB	HDD	WDC WD10EFRX-68FYTN0	›
□	ada4	WD-WCC4J5SXVE66	931.51 GiB	HDD	WDC WD10EFRX-68FYTN0	˅

Description:
Transfer Mode: Auto
Rotation Rate (RPM): 5400
HDD Standby: ALWAYS ON
Adv. Power Management: DISABLED
Acoustic Level: DISABLED
Enable S.M.A.R.T.: true
S.M.A.R.T. extra options:

The *WIPE* option is only available when the disk is not in use. Click *WIPE* to open a dialog with additional options:



□	Name	Serial	Disk Size	Disk Type	Model	
□	ada0	E0117201200000000076	14.91 GiB	SSD	16GB SATA Flash Drive	›
□	ada1	WD-WCC6Y4CSDV3P	931.51 GiB	HDD	WDC WD10EZEX-75WN4A0	›
□	ada2	WD-WCC4J0UE7X/		HDD	WDC WD10EFRX-68FYTN0	›
□	ada3	WD-WCC4J7ZT0R/		HDD	WDC WD10EFRX-68FYTN0	›
□	ada4	WD-WCC4J5SXVE		HDD	WDC WD10EFRX-68FYTN0	˅

Description:
Transfer Mode: Auto
Rotation Rate (RPM): 5400
HDD Standby: ALWAYS ON
Adv. Power Management: DISABLED
Acoustic Level: DISABLED
Enable S.M.A.R.T.: true
S.M.A.R.T. extra options:

Wipe Disk ada4
Name: ada4
Method: Quick

The disk *Name* (da1, da2, ada4) helps confirm that you have selected the right disk to wipe

The *Method* dropdown shows the different available wipe options available:

⊙ Quick

Erases only the partitioning information on a disk, making it easy to reuse but without clearing other old data. Quick wipes take only a few seconds.

○ **Full with zeros**

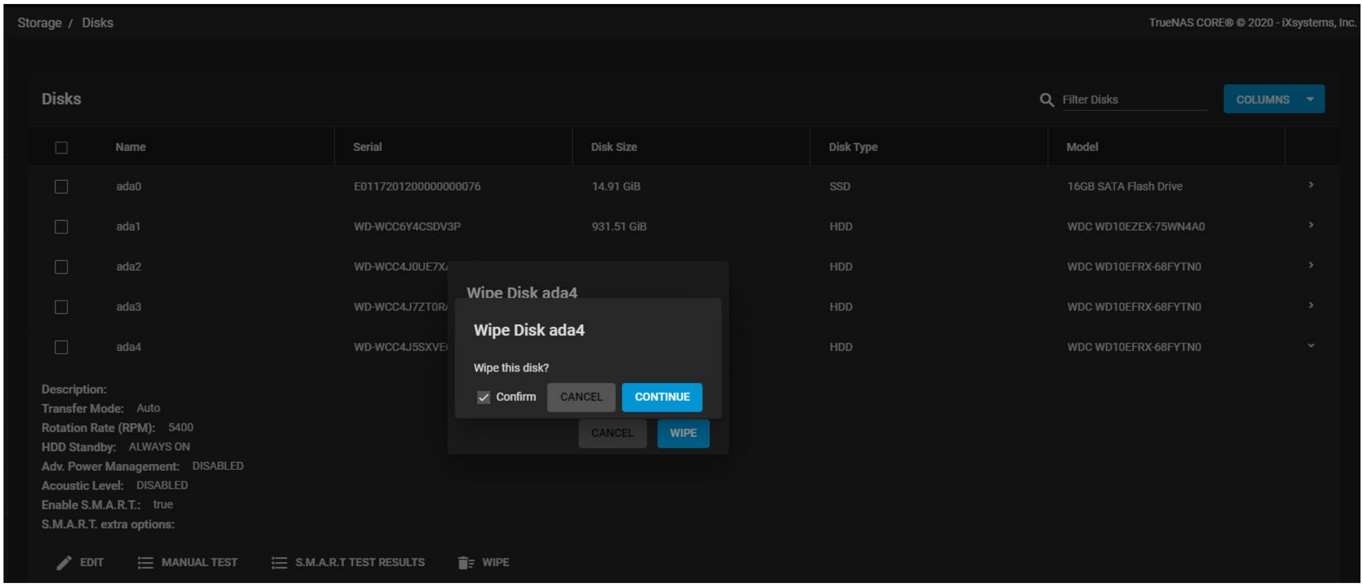
Overwrites the entire disk with zeros and can take several hours to complete.

○ **Full with random**

Overwrites the entire disk with random binary code and takes even longer than **Full with zeros** to complete.

Ensure all data is backed up and the disk is no longer in use. Triple check that the correct disk is selected for the wipe. Recovering data from a wiped disk is usually impossible.

After choosing the appropriate method, click *WIPE*. A dialog asks for confirmation of the action.



Storage / Disks

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Disks

Filter Disks

□	Name	Serial	Disk Size	Disk Type	Model
□	ada0	E0117201200000000076	14.91 GiB	SSD	16GB SATA Flash Drive
□	ada1	WD-WCC6Y4CSDV3P	931.51 GiB	HDD	WDC WD10EZEX-75WN4A0
□	ada2	WD-WCC4J0UE7X		HDD	WDC WD10EFRX-68FYTN0
□	ada3	WD-WCC4J7ZT0R		HDD	WDC WD10EFRX-68FYTN0
□	ada4	WD-WCC4J5SXVE		HDD	WDC WD10EFRX-68FYTN0

Description:
Transfer Mode: Auto
Rotation Rate (RPM): 5400
HDD Standby: ALWAYS ON
Adv. Power Management: DISABLED
Acoustic Level: DISABLED
Enable S.M.A.R.T.: true
S.M.A.R.T. extra options:

Wipe Disk ada4

Wipe Disk ada4

Wipe this disk?

☑ Confirm

Verify the name to ensure you have the correct disk chosen. When satisfied the disk can be wiped, set *Confirm* and click *CONTINUE*. A dialog shows the wipe progress.

6.4.2 - Replacement

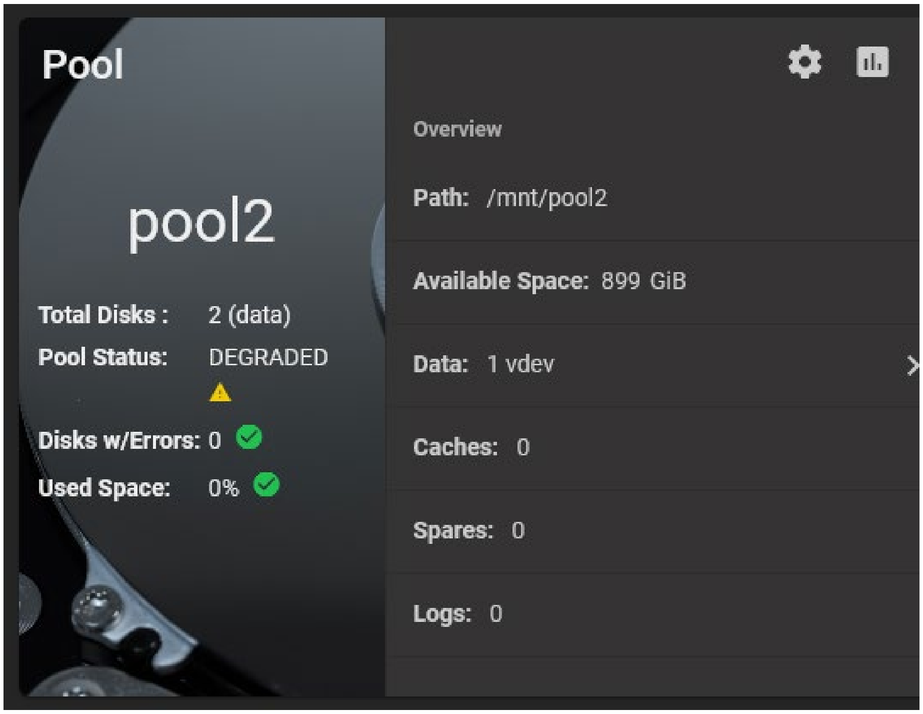
Hard drives or solid-state drives (SSDs) have a finite lifetime and can fail unexpectedly. When a disk fails in a Stripe (RAID0) pool, the entire pool has to be recreated and all data restored from backups. Creating non-stripe storage pools that have disk redundancy is always recommended.

To prevent further loss of redundancy or eventual data loss, always replace a failed disk as soon as possible! TrueNAS integrates new disks into a pool to restore the pool back to full functionality.

Replacing a Disk

Another disk of the same or greater capacity is required to replace a failed disk. This disk must be installed in the TrueNAS system and not part of an existing storage pool. Any data on the replacement disk is wiped as part of the process.

The TrueNAS **Dashboard** shows when a disk failure degrades a pool.



pool2

Total Disks : 2 (data)

Pool Status: DEGRADED ⚠

Disks w/Errors: 0 ✓

Used Space: 0% ✓

Overview

Path: /mnt/pool2

Available Space: 899 GiB

Data: 1 vdev

Caches: 0

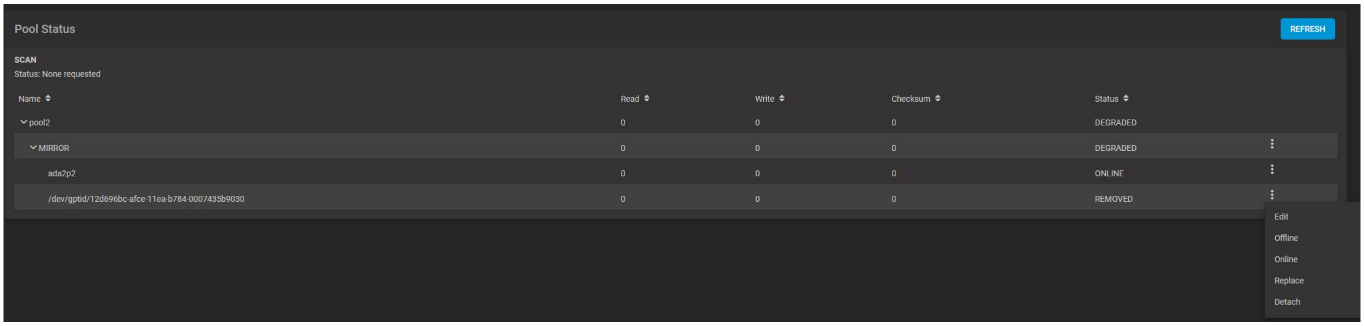
Spares: 0

Logs: 0

Click the settings on the pool card to go to the **Storage > Pools > Pool Status** screen and locate the failed disk.

Offline the Failed Disk

Clicking more_vert for the failed disk shows additional operations.



SCAN
Status: None requested

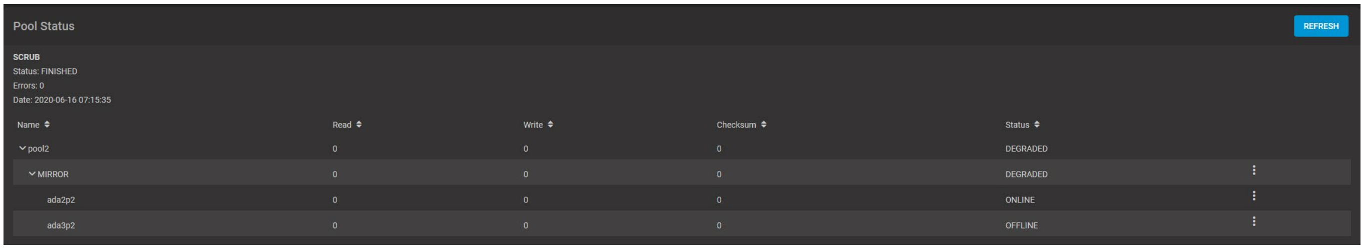
Name	Read	Write	Checksum	Status
pool2	0	0	0	DEGRADED
MIRROR	0	0	0	DEGRADED
ada2p2	0	0	0	ONLINE
/dev/gptid/12d696bc-afce-11ea-b784-0007435b9030	0	0	0	REMOVED

It is recommended to *Offline* the disk before starting the replacement. This removes the device from the pool and can prevent swap issues.

Can I use a disk that is failing but still active? expand □
There are some situations where a disk that has not completely failed can be left online to provide additional redundancy during the replacement procedure. **This is not recommended unless the exact condition of the failing disk is known.** Attempting to replace a heavily degraded disk without off-lining it first results in a significantly slower replacement process.

The offline failed? expand □
If the *Offline* operation fails with a “Disk offline failed - no valid replicas” message, go to **Storage > Pools**, click the settings for the degraded pool, and select *Scrub Pool*. When the scrub operation finishes, reopen the pool *Status* and try to *Offline* the disk again.

When the disk status shows as *Offline*, physically remove the disk from the system.



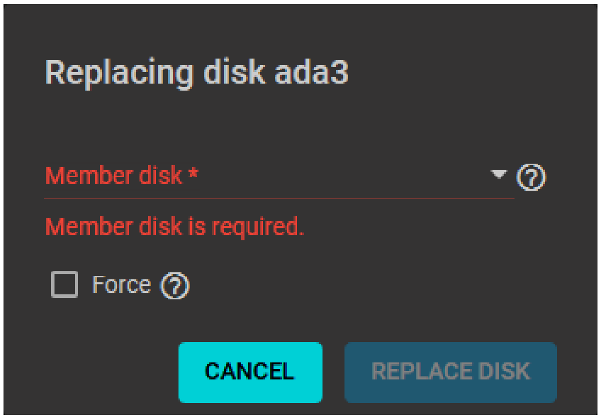
SCRUB
Status: FINISHED
Errors: 0
Date: 2020-06-16 07:15:35

Name	Read	Write	Checksum	Status
pool2	0	0	0	DEGRADED
MIRROR	0	0	0	DEGRADED
ada2p2	0	0	0	ONLINE
ada3p2	0	0	0	OFFLINE

If the replacement disk is not already physically added to the system, add it now.

Online the New Disk

In the **Pool Status**, open the options for the *Offline* disk and click *Replace*



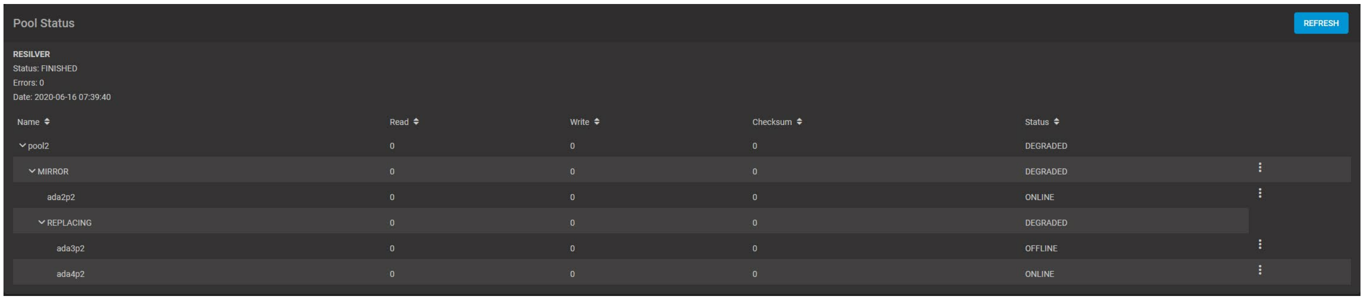
Member disk *

Member disk is required.

□ Force

Select a new member disk and click *Replace Disk*. The new disk must have the same or greater capacity as the disk being replaced. The replacement fails when the chosen disk has partitions or data present. To **destroy** any data on the replacement disk and allow the replacement to continue, set the *Force* option.

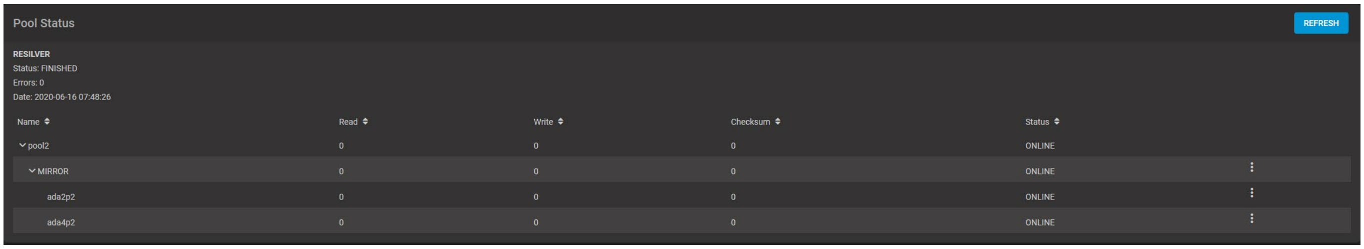
When the disk wipe completes and TrueNAS starts replacing the failed disk, the **Pool Status** changes to show the in-progress replacement.



RESILVER
Status: FINISHED
Errors: 0
Date: 2020-06-16 07:39:40

Name	Read	Write	Checksum	Status
pool2	0	0	0	DEGRADED
MIRROR	0	0	0	DEGRADED
ada2p2	0	0	0	ONLINE
REPLACING	0	0	0	DEGRADED
ada3p2	0	0	0	OFFLINE
ada4p2	0	0	0	ONLINE

TrueNAS resilvers the pool during the replacement process. For pools with large amounts of data, this can take a long time. When the resilver is complete, the pool status screen updates to show the new disk and the pool status returns to **Online**.



RESILVER
Status: FINISHED
Errors: 0
Date: 2020-06-16 07:48:26

Name	Read	Write	Checksum	Status
pool2	0	0	0	ONLINE
MIRROR	0	0	0	ONLINE
ada2p2	0	0	0	ONLINE
ada4p2	0	0	0	ONLINE

6.5 - Self-Encrypting Drives

TrueNAS version 11.1-U5 introduced Self-Encrypting Drive (SED) support.

Supported Specifications

- Legacy interface for older ATA devices. *Not recommended for security-critical environments*.
- TCG Opal 1 legacy specification.
- TCG OPAL 2 standard for newer consumer-grade devices.
- TCG Opalite is a reduced form of OPAL 2.
- TCG Pyrite Version 1 and Version 2 are similar to Opalite, but hardware encryption is removed. Pyrite provides a logical equivalent of the legacy ATA security for non-ATA devices. Only the drive firmware is used to protect the device.

  > Pyrite Version 1 SEDs do not have PSID support and can become unusable if the password is lost.

- TCG Enterprise is designed for systems with many data disks. These SEDs do not have the functionality to be unlocked before the operating system boots.

See this Trusted Computing Group and NVM Express® joint white paper for more details about these specifications.

TrueNAS Implementation

TrueNAS implements the security capabilities of camcontrol for legacy devices and sedutil-cli for TCG devices. When managing a SED from the command line, it is recommended to use the `sedhelper` wrapper script for `sedutil-cli` to ease SED administration and unlock the full capabilities of the device. Examples of using these commands to identify and deploy SEDs are provided below.

A SED can be configured before or after assigning the device to a pool.

By default, SEDs are not locked until the administrator takes ownership of them. Ownership is taken by explicitly configuring a global or per-device password in the web interface and adding the password to the SEDs. Adding SED passwords in the web interface also allows TrueNAS to automatically unlock SEDs.

A password-protected SED protects the data stored on the device when the device is physically removed from the system. This allows secure disposal of the device without having to first wipe the contents. Repurposing a SED on another system requires the SED password.

> For TrueNAS High Availability (HA) systems, SED drives are *only unlocked on the active controller*.

Deploying SEDs

Enter `sedutil-cli --scan` in the **Shell** to detect and list devices. The second column of the results identifies the drive type:

Character	Standard

no	non-SED device
1	Opal V1
2	Opal V2
E	Enterprise
L	Opalite
p	Pyrite V1
P	Pyrite V2
r	Ruby

Example:

```
root@truenas1:~ # sedutil-cli --scan
Scanning for Opal compliant disks
/dev/ada0  No  32GB SATA Flash Drive SFDK003L
/dev/ada1  No  32GB SATA Flash Drive SFDK003L
/dev/da0   No  HGST    HUS726020AL4210  A7J0
/dev/da1   No  HGST    HUS726020AL4210  A7J0
/dev/da10    E WDC     WUSTR1519ASS201  B925
/dev/da11    E WDC     WUSTR1519ASS201  B925
```

TrueNAS supports setting a global password for all detected SEDs or setting individual passwords for each SED. Using a global password for all SEDs is strongly recommended to simplify deployment and avoid maintaining separate passwords for each SED.

Setting a Global Password for SEDs

Go to **System > Advanced > SED Password** and enter the password. *Record this password and store it in a safe place!*

Now the SEDs must be configured with this password. Go to the **Shell** and enter `sedhelper setup <password>`, where `<password>` is the global password entered in **System > Advanced > SED Password**.

`sedhelper` ensures that all detected SEDs are properly configured to use the provided password:

```
root@truenas1:~ # sedhelper setup abcd1234
da9                   [OK]
da10                  [OK]
da11                  [OK]
```

Rerun `sedhelper setup <password>` every time a new SED is placed in the system to apply the global password to the new SED.

Creating Separate Passwords for Each SED

Go to **Storage > Disks**. Click the three dot menu (Options) for the confirmed SED, then **Edit**. Enter and confirm the password in the `SED Password` and `Confirm SED Password fields`.

The **Storage > Disks** screen shows which disks have a configured SED password. The `SED Password` column shows a mark when the disk has a password. Disks that are not a SED or are unlocked using the global password are not marked in this column.

The SED must be configured to use the new password. Go to the **Shell** and enter `sedhelper setup --disk <da1> <password>`, where `<da1>` is the SED to configure and `<password>` is the created password from **Storage > Disks > Edit Disks > SED Password**.

This process must be repeated for each SED and any SEDs added to the system in the future.

Remember SED passwords! If the SED password is lost, SEDs cannot be unlocked and their data is unavailable. Always record SED passwords whenever they are configured or modified and store them in a secure place!

Check SED Functionality

When SED devices are detected during system boot, TrueNAS checks for configured global and device-specific passwords.

Unlocking SEDs allows a pool to contain a mix of SED and non-SED devices. Devices with individual passwords are unlocked with their password. Devices without a device-specific password are unlocked using the global password.

To verify SED locking is working correctly, go to the **Shell**. Enter `sedutil-cli --listLockingRange 0 <password> <dev/da1>`, where `<dev/da1>` is the SED and `<password>` is the global or individual password for that SED. The command returns `ReadLockEnabled: 1`, `WriteLockEnabled: 1`, and `LockOnReset: 1` for drives with locking enabled:

```
root@truenas1:~ # sedutil-cli --listLockingRange 0 abcd1234 /dev/da9
Band[0]:
    Name:            Global_Range
    CommonName:      Locking
    RangeStart:      0
    RangeLength:     0
    ReadLockEnabled: 1
    WriteLockEnabled:1
    ReadLocked:      0
    WriteLocked:     0
    LockOnReset:     1
```

Managing SED Passwords and Data

This section contains command line instructions to manage SED passwords and data. The command used is sedutil-cli(8). Most SEDs are TCG-E (Enterprise) or TCG-Opal (Opal v2.0). Commands are different for the different drive types, so the first step is identifying which type is being used.

> These commands can be destructive to data and passwords. Keep backups and use the commands with caution.

Check SED version on a single drive, */dev/da0* in this example:

```
root@truenas:~ # sedutil-cli --isValidSED /dev/da0
/dev/da0 SED --E--- Micron_5N/A U402
```

All connected disks can be checked at once:

```
root@truenas:~ # sedutil-cli --scan
Scanning for Opal compliant disks
/dev/ada0 No 32GB SATA Flash Drive SFDK003L
/dev/ada1 No 32GB SATA Flash Drive SFDK003L
/dev/da0 E Micron_5N/A U402
/dev/da1 E Micron_5N/A U402
/dev/da12 E SEAGATE XS3840TE70014 0103
/dev/da13 E SEAGATE XS3840TE70014 0103
/dev/da14 E SEAGATE XS3840TE70014 0103
/dev/da2 E Micron_5N/A U402
/dev/da3 E Micron_5N/A U402
/dev/da4 E Micron_5N/A U402
/dev/da5 E Micron_5N/A U402
/dev/da6 E Micron_5N/A U402
/dev/da9 E Micron_5N/A U402
No more disks present ending scan
root@truenas:~ #
```

⊙ TCG-Opal Instructions

Reset the password without losing data: `sedutil-cli --revertNoErase <oldpassword> </dev/device>`

Use *both* of these commands to change the password without destroying data:

```
sedutil-cli --setSIDPassword <oldpassword> <newpassword> </dev/device>
sedutil-cli --setPassword <oldpassword> Admin1 <newpassword> </dev/device>
```

Wipe data and reset password to default MSID: `sedutil-cli --revertTPer <oldpassword> </dev/device>`

Wipe data and reset password using the PSID: `sedutil-cli --`

`yesIreallywanttoERASEALLmydatausingthePSID <PSINODASHED> </dev/device>` where is the PSID located on the pysical drive with no dashes (-).

○ **TCG-E Instructions**

Change or Reset the Password without Destroying Data

These commands must be run for every *LockingRange* or *band* on the drive. To determine the number of bands on a drive, use `sedutil-cli -v --listLockingRanges </dev/device>`. Increment the `BandMaster` number and rerun the command with `--setPassword` for every band that exists.

Use **all** of these commands to reset the password without losing data:

```
sedutil-cli --setSIDPassword <oldpassword> "" </dev/device>
sedutil-cli --setPassword <oldpassword> EraseMaster "" </dev/device>
sedutil-cli --setPassword <oldpassword> BandMaster0 "" </dev/device>
sedutil-cli --setPassword <oldpassword> BandMaster1 "" </dev/device>
```

Use **all** of these commands to change the password without destroying data:

```
sedutil-cli --setSIDPassword <oldpassword> <newpassword> </dev/device>
sedutil-cli --setPassword <oldpassword> EraseMaster <newpassword> </dev/device>
sedutil-cli --setPassword <oldpassword> BandMaster0 <newpassword> </dev/device>
sedutil-cli --setPassword <oldpassword> BandMaster1 <newpassword> </dev/device>
```

Reset Password and Wipe Data

Reset to default MSID:

```
sedutil-cli --eraseLockingRange 0 <password> </dev/device>
sedutil-cli --setSIDPassword <oldpassword> "" </dev/device>
sedutil-cli --setPassword <oldpassword> EraseMaster "" </dev/device>
```

Reset using the PSID:

```
sedutil-cli --PSIDrevertAdminSP <PSIDNODASHS> /dev/<device>
```

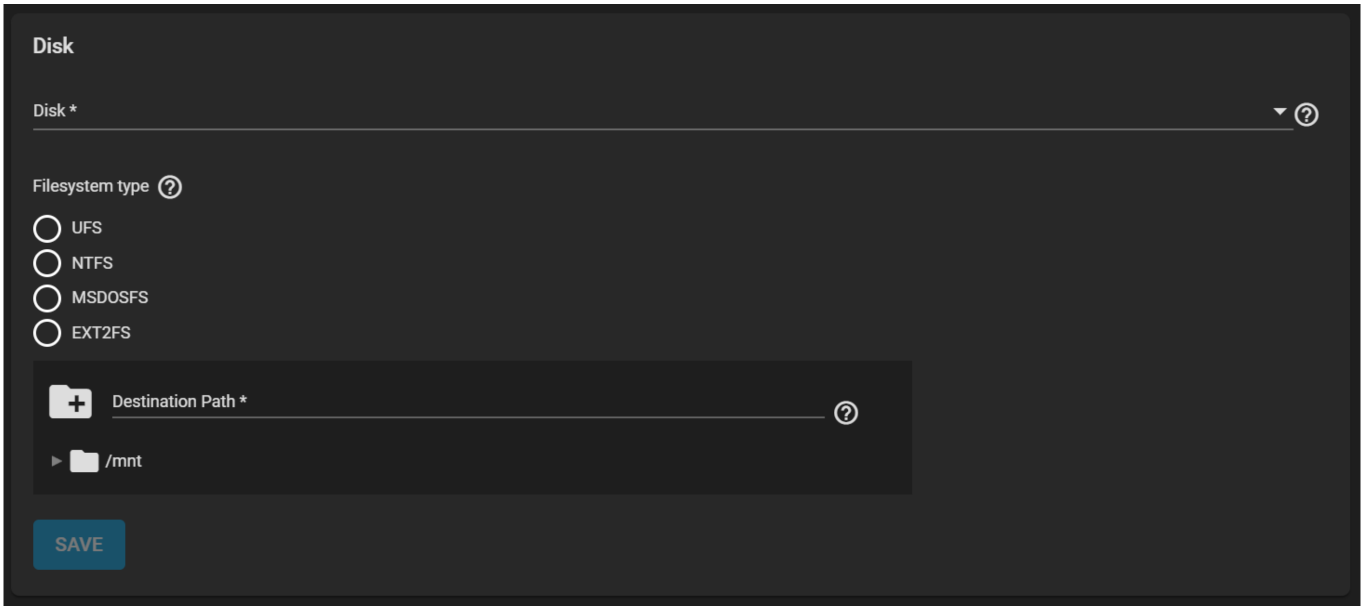
If it fails use:

```
sedutil-cli --PSIDrevert <PSIDNODASHS> /dev/<device>
```

6.6 - Import Disk

Use **Storage > Import Disk** to integrate UFS (BSD Unix), NTFS (Windows), MSDOS (FAT), or EXT2 (Linux) formatted disks into TrueNAS. This is a one-time import, copying the data from that disk into a TrueNAS dataset. Only one disk can be imported at a time, and the disk must be installed or physically connected to the TrueNAS system.

What about EXT3 or EXT4 filesystems? expand □
Importing an EXT3 or EXT4 filesystem is possible in some cases, although neither is fully supported. EXT3 journaling is not supported, so those filesystems must have an external `fsck` utility, like the one provided by E2fsprogs utilities, run on them before import. EXT4 filesystems with extended attributes or inodes greater than 128 bytes are not supported. EXT4 filesystems with EXT3 journaling must have an `fsck` run on them before import, as described above.



Disk

Disk *

Filesystem type

○ UFS
○ NTFS
○ MSDOSFS
○ EXT2FS

Destination Path *

/mnt

SAVE

Use the drop-down menu to select the *Disk* to import.

TrueNAS attempts to detect and select the the *Filesystem type*. Selecting the MSDOSFS filesystem shows an additional *MSDOSFS locale* drop-down menu. Use this option to select the locale when non-ASCII characters are present on the disk.

Finally, browse to the ZFS dataset to hold the copied data and define the *Destination Path*.

After clicking *SAVE*, the chosen *Disk* mounts and its contents copied to the specified dataset at the end of the *Destination Path*. To monitor an in-progress import, open the Task Manager by clicking the assignment in the interface top bar. The disk unmounts after the copy operation completes. A dialog allows viewing or downloading the disk import log.

The import was interrupted! expand □
Use the same import procedure to restart the task. Choose the same *Destination Path* as the interrupted import for TrueNAS to scan the destination for previously imported files and resume importing any remaining files.

7 - Directory Services

7.1 - Active Directory

The Active Directory (AD) service shares resources in a Windows network. AD provides authentication and authorization services for the users in a network, eliminating the need to recreate the user accounts on TrueNAS.

Once joined to an AD domain, you can use domain users and groups in local ACLs on files and directories. You can also set up shares to act as a file server.

Joining an AD domain also configures the Privileged Access Manager (PAM) to let domain users log on via SSH or authenticate to local services.

Users can configure AD services on Windows or Unix-like operating systems running Samba version 4.

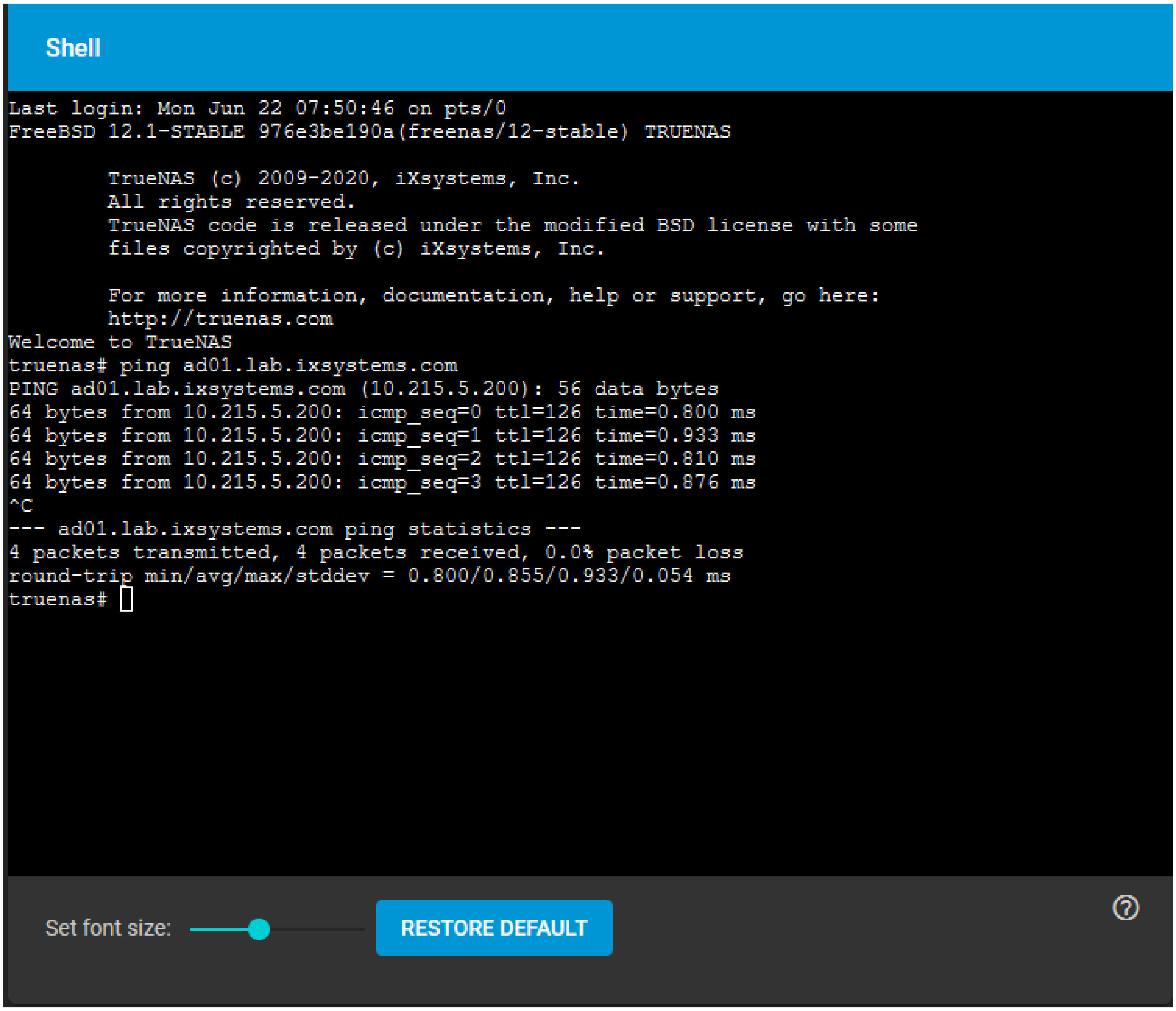
To configure a connection, you will need to know the Active Directory domain controller's domain and that system's account credentials.

Preparation

Users can take a few steps before configuring Active Directory to ensure the connection process goes smoothly.

Verify Name Resolution

To confirm that name resolution is functioning, go to the **Shell** and use `ping` to check the connection to the AD domain controller.



```
Last login: Mon Jun 22 07:50:46 on pts/0
FreeBSD 12.1-STABLE 976e3be190a(freenas/12-stable) TRUENAS

        TrueNAS (c) 2009-2020, iXsystems, Inc.
        All rights reserved.
        TrueNAS code is released under the modified BSD license with some
        files copyrighted by (c) iXsystems, Inc.

        For more information, documentation, help or support, go here:
        http://truenas.com
Welcome to TrueNAS
truenas# ping ad01.lab.ixsystems.com
PING ad01.lab.ixsystems.com (10.215.5.200): 56 data bytes
64 bytes from 10.215.5.200: icmp_seq=0 ttl=126 time=0.800 ms
64 bytes from 10.215.5.200: icmp_seq=1 ttl=126 time=0.933 ms
64 bytes from 10.215.5.200: icmp_seq=2 ttl=126 time=0.810 ms
64 bytes from 10.215.5.200: icmp_seq=3 ttl=126 time=0.876 ms
^C
--- ad01.lab.ixsystems.com ping statistics ---
4 packets transmitted, 4 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 0.800/0.855/0.933/0.054 ms
truenas# 
```

When packets are being sent and received without loss, the connection is verified. Press `Ctrl + C` to cancel the `ping`.

Another option is to use `host -t srv _ldap._tcp.domainname.com` to check the network's SRV records and verify DNS resolution.

The ping failed! expand □
If the ping fails, go to **Network > Global Configuration** and update the *DNS Servers* and *Default Gateway* settings so the connection to your Active Directory Domain Controller can start. Use more than one *Nameserver* for the AD domain controllers so DNS queries for requisite SRV records can succeed. Using more than one *Nameserver* helps maintain the AD connection whenever a domain controller becomes unavailable.

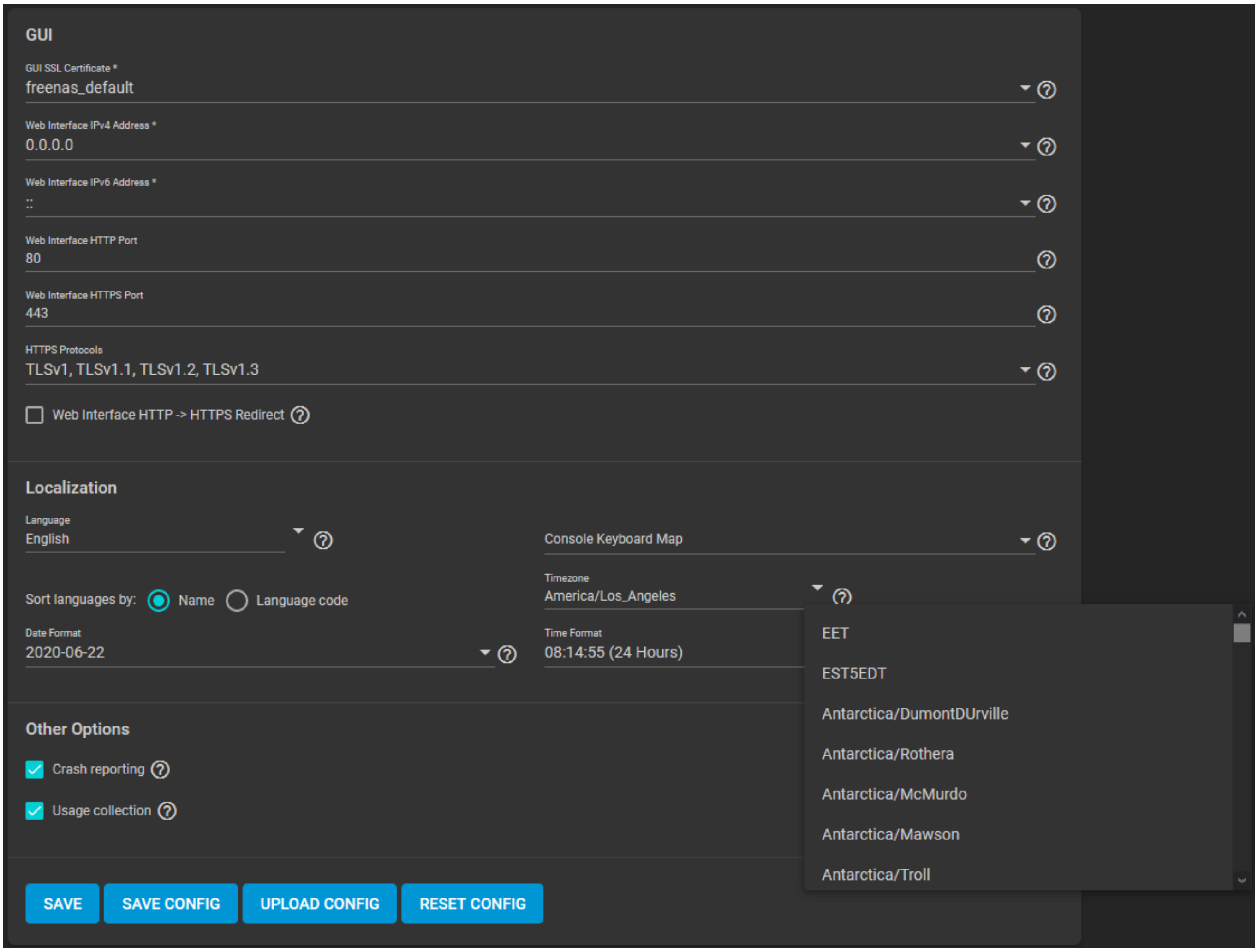
○ Time Synchronization

Active Directory relies on Kerberos, a time-sensitive protocol. During the domain join process, the AD domain controller with the PDC Emulator FSMO Role is added as the preferred NTP server. If your environment requires something different, you can change NTP server settings in **System > NTP Servers**.

The local system time cannot be out of sync by more than **five minutes** with the AD domain controller time in a default AD environment. Use an external time source when configuring a virtualized domain controller. TrueNAS creates an **Alert** if the system time gets out of sync with the AD domain controller time.

There are a few options in TrueNAS to ensure both systems are synchronized:

- Go to **System > General** and make sure the *Timezone* matches the AD Domain Controller.



GUI

GUI SSL Certificate *
freenas_default

Web Interface IPv4 Address *
0.0.0.0

Web Interface IPv6 Address *
::

Web Interface HTTP Port
80

Web Interface HTTPS Port
443

HTTPS Protocols
TLSv1, TLSv1.1, TLSv1.2, TLSv1.3

□ Web Interface HTTP -> HTTPS Redirect

Localization

Language
English

Console Keyboard Map

Sort languages by: ● Name ○ Language code

Timezone
America/Los_Angeles

Date Format
2020-06-22

Time Format
08:14:55 (24 Hours)

Other Options

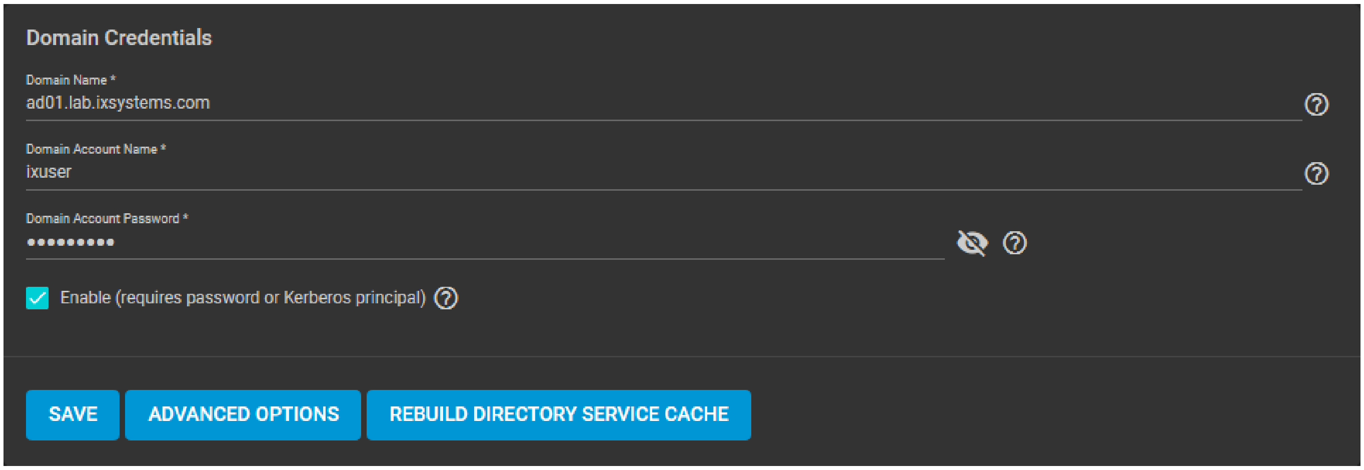
☑ Crash reporting

☑ Usage collection

- Set either localtime or universal time in the system BIOS.

Connect to the Active Directory Domain

To connect to Active Directory, go to **Directory Services > Active Directory** and enter the AD *Domain Name* and account credentials. Set *Enable* to attempt to join the AD domain immediately after saving the configuration.



Domain Credentials

Domain Name *
ad01.lab.ixsystems.com

Domain Account Name *
ixuser

Domain Account Password *
•••••••••

☑ Enable (requires password or Kerberos principal)

Advanced options are available for fine-tuning the AD configuration, but the preconfigured defaults are generally suitable.

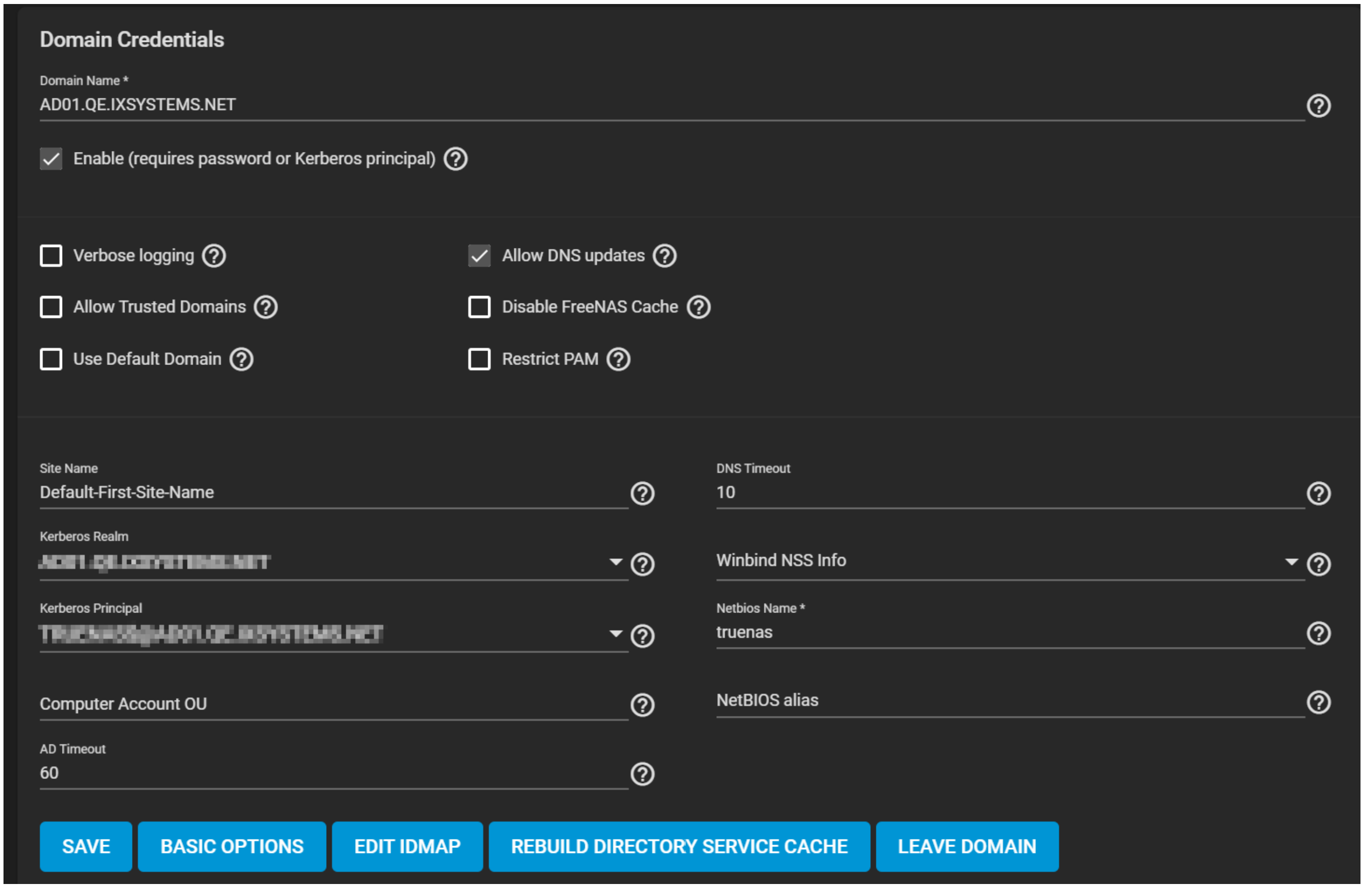
I don't see any AD information! expand □

TrueNAS can take a few minutes to populate the AD information after configuring the Active Directory service. To check the AD join progress, open the assignment **Task Manager** in the upper-right corner. TrueNAS displays any errors during the join process in the **Task Manager**.

When the import is complete, AD users and groups become available while configuring basic dataset permissions or an [Access Control List (ACL)]() with TrueNAS cache enabled (enabled by default).

Joining AD also adds default [Kerberos]() realms and generates a default `AD_MACHINE_ACCOUNT` keytab. TrueNAS automatically begins using this default keytab and removes any administrator credentials stored in the TrueNAS configuration file.

Advanced Options



Domain Credentials

Domain Name *
AD01.QE.IXSYSTEMS.NET

☑ Enable (requires password or Kerberos principal)

□ Verbose logging
☑ Allow DNS updates
□ Allow Trusted Domains
□ Disable FreeNAS Cache
□ Use Default Domain
□ Restrict PAM

Site Name: Default-First-Site-Name
DNS Timeout: 10
Kerberos Realm: [redacted]
Winbind NSS Info
Kerberos Principal: [redacted]
Netbios Name *: truenas
Computer Account OU
NetBIOS alias
AD Timeout: 60

Setting	Description
Verbose logging	Set to log attempts to join the domain to /var/log/messages.
Allow Trusted Domains	When set, usernames do not include a domain name. Unset to force domain names to be prepended to user names. One possible reason for unsetting this value is to prevent username collisions when Allow Trusted Domains is set and there are identical usernames in more than one domain
Use Default Domain	Unset to prepend the domain name to the username. Unset to prevent name collisions when Allow Trusted Domains is set and multiple domains use the same username.
Allow DNS Updates	Set to enable Samba to do DNS updates when joining a domain.

Disable FreeNAS Cache	Set to disable caching AD users and groups. This can help when unable to bind to a domain with a large number of users or groups.
Restrict PAM	Set to restrict SSH access in certain circumstances to only members of BUILTIN\Administrators.
Site Name	Enter the relative distinguished name of the site object in the Active Directory.
Kerberos Realm	Select an existing realm that was added in Directory Services > Kerberos Realms.
Kerberos Principal	Select the location of the principal in the keytab created in Directory Services > Kerberos Keytabs.
Computer Account OU	The OU in which new computer accounts are created. The OU string is read from top to bottom without RDNs. Slashes ("/") are used as delimiters, like Computers/Servers/NAS. The backslash ("\") is used to escape characters but not as a separator. Backslashes are interpreted at multiple levels and might require doubling or even quadrupling to take effect. When this field is blank, new computer accounts are created in the Active Directory default OU.
AD Timeout	Number of seconds before timeout. To view the AD connection status, open the interface Task Manager.
DNS Timeout	Number of seconds before a timeout. Increase this value if AD DNS queries time out.
Winbind NSS Info	Choose the schema to use when querying AD for user/group info. *rfc2307* uses the schema support included in Windows 2003 R2, *sfu* is for Service For Unix 3.0 or 3.5, and *sfu20* is for Service For Unix 2.0.
Netbios Name	Netbios Name of this NAS. This name must differ from the Workgroup name and be no greater than 15 characters.
NetBIOS alias	Alternative names that SMB clients can use when connecting to this NAS. Can be no greater than 15 characters.
EDIT IDMAP	Navigates to **Directory Services > Idmap** so the user can edit the Active Directory’s Idmap
LEAVE DOMAIN	Disconnects the TrueNAS system from the Active Directory.

FTP Access

While SFTP is recommended over FTP, joined systems do allow FTP access. Please keep these caveats in mind:

- By default, authentication uses *DOMAIN\username* as the user name.
- A user home directory needs to exist before joining.
- An AD user cannot be added to the FTP group. Enable local user auth for FTP instead.
- An existing samba **homes** share created in the GUI is set as the *template homedir* for AD users. This means that AD user home directories are set inside that path. Proper permissions are vital.
- There are no guarantees about how `proftpd` handles ACLs.
- The admin (or `pam_mkhomedir`) must ensure that paths exist when AD users have populated homedir information in their LDAP schema.
- When the admin is pulling home directories from their LDAP schema, take extra caution to insure that users aren’t writing files to the boot device.

Troubleshooting

If the cache becomes out of sync or fewer users than expected are available in the permissions editors, resync it using **Directory Service > Active Directory > REBUILD DIRECTORY SERVICE CACHE**.

If you are using Windows Server with 2008 R2 or older, try creating a **Computer** entry on the Windows server Organizational Unit (OU). When creating this entry, enter the TrueNAS hostname in the name field. Make sure it is the same name as the one set in the *Hostname* field in **Network > Global Configuration**, and the *NetBIOS alias* from **Directory Service > Active Directory > Advanced Options**.

Shell Commands expand □

You can go to the **Shell** and enter various commands to get more details about the AD connection and users:

- AD current state: `midclt call activedirectory.get_state`.
- Details about the currently connected Lightweight Directory Access Protocol (LDAP) server: `midclt call activedirectory.domain_info | jq`. Example:

```
truenas# midclt call activedirectory.domain_info | jq
{
  "LDAP server": "192.168.1.125",
  "LDAP server name": "DC01.HOMEDOM.FUN",
  "Realm": "HOMEDOM.FUN",
  "Bind Path": "dc=HOMEDOM,dc=FUN",
  "LDAP port": 389,
  "Server time": 1593026080,
  "KDC server": "192.168.1.125",
  "Server time offset": 5,
  "Last machine account password change": 1592423446
}
```

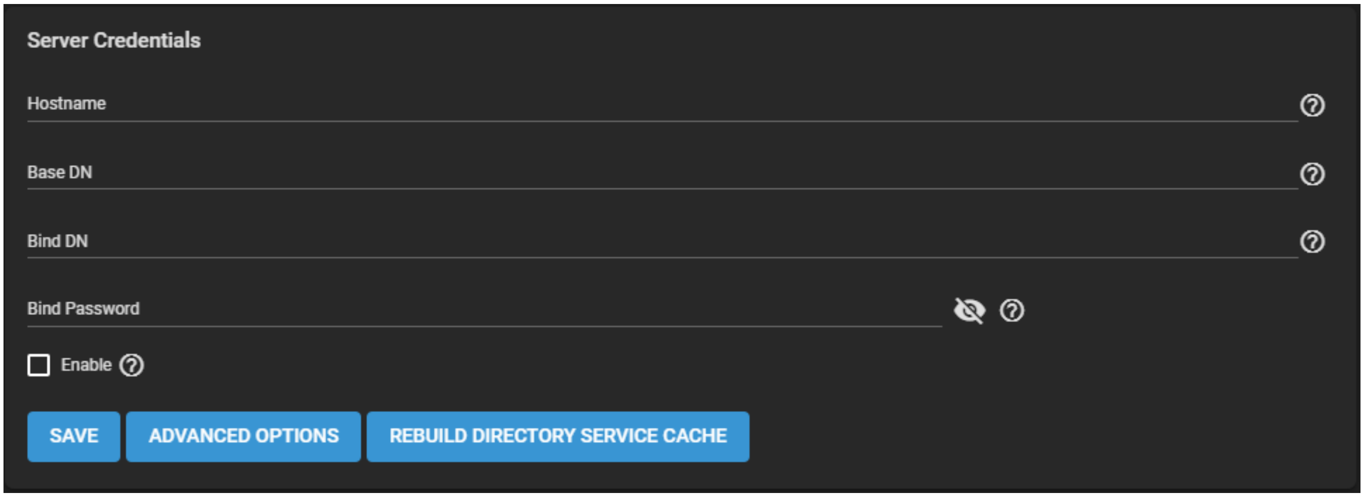
- View AD users: `wbinfo -u`. To see more details about a user, enter `getent passwd DOMAIN\\<user>`, replacing `<user>` with the desired user name. If `wbinfo -u` shows more users than appear to be available when configuring permissions and the TrueNAS cache is enabled, go to **Directory Services > Active Directory** and increase the *AD Timeout* value.
- View AD groups: `wbinfo -g`. To see more details, enter `getent group DOMAIN\\domain\ users`.
- View domains: `wbinfo -m`.
- Test AD connection: `wbinfo -t`. A successful test shows a message similar to `checking the trust secret for domain YOURDOMAIN via RPC calls succeeded`.
- User connection test to an SMB share: `smbclient '//127.0.0.1/smbshare -U AD01.LAB.IXSYSTEMS.COM\ixuser`, replacing `127.0.0.1` with your server address, `smbshare` with the SMB share name, `AD01.LAB.IXSYSTEMS.COM` with your trusted domain, and `ixuser` with the user account name for authentication testing.

7.2 - LDAP

TrueNAS includes an Open LDAP client for accessing information from an LDAP server. An LDAP server provides directory services for finding network resources such as users and their associated permissions.

Does LDAP work with SMB? expand □
LDAP authentication for SMB shares is disabled unless the LDAP directory has been configured for and populated with Samba attributes. The most popular script for performing this task is `smbldap-tools`. The LDAP server must support SSL/TLS and the certificate for the LDAP server CA must be imported. Non-CA certificates are not currently supported.

To integrate an LDAP server with TrueNAS, go to **Directory Services > LDAP**.



Enter any LDAP server hostnames or IP addresses. Separate entries with an empty space. Entering multiple hostnames or IP addresses creates an LDAP failover priority list.

What does this do? expand □
If a host does not respond, the next host in the list is tried until a new connection is established.

Enter the *Base DN*. This is the top level of the LDAP directory tree to be used when searching for resources. For example, `dc=test,dc=org`.

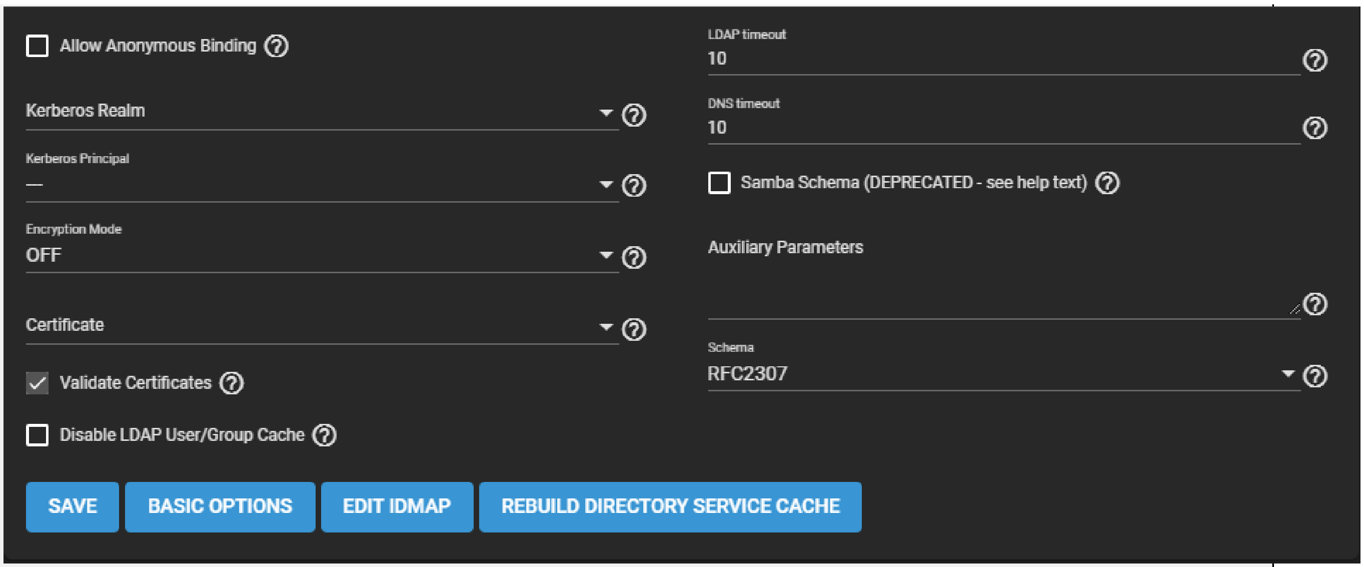
Enter the *Bind DN*. This is the administrative account name on the LDAP server. For example, `cn=Manager,dc=test,dc=org`.

Next, enter the *Bind Password*. This is the password associated with the *Bind DN* account.

The final basic option is *Enable*. Unsetting *Enable* disables the LDAP configuration without deleting it. It can be enabled at a later time without reconfiguring the options.

Advanced Configuration expand □

To further modify the LDAP configuration, click *ADVANCED OPTIONS*.



□ Allow Anonymous Binding

Kerberos Realm

Kerberos Principal: —

Encryption Mode: OFF

Certificate

☑ Validate Certificates

□ Disable LDAP User/Group Cache

LDAP timeout: 10

DNS timeout: 10

□ Samba Schema (DEPRECATED - see help text)

Auxiliary Parameters

Schema: RFC2307

Setting *Allow Anonymous Binding* disables authentication and allows read and write access to any client.

If a Kerberos realm has been added to TrueNAS, it can be selected from the *Kerberos Realm* dropdown. Likewise, if a Kerberos keytab has been created, select it in the *Kerberos Principal* dropdown.

If an encryption mode for the LDAP connection is desired, select one of these options from the *Encryption Mode* dropdown:

- *OFF*: do not encrypt the LDAP connection.
- *ON*: encrypt the LDAP connection with SSL on port 636.
- *START_TLS*: encrypt the LDAP connection with STARTTLS on the default LDAP port *389*.

A certificate is not required when using username/password or Kerberos authentication. If certificate authentication is desired, select a certificate to use from the *Certificate* dropdown. To configure LDAP certificate-based authentication, create a Certificate Signing Request for the LDAP provider to sign.

To validate the authenticity of the certificate, set *Validate Certificates*.

Set *Disable LDAP User/Group Cache* to disable caching LDAP users and groups in large LDAP environments. When caching is disabled, LDAP users and groups do not appear in dropdown menus, but are still accepted when manually entered.

Increase *LDAP timeout* if a Kerberos ticket queries are not responding within the default time. *LDAP timeout* is in seconds. Increase *DNS timeout* if DNS queries take too long to respond. *DNS timeout* is in seconds.

> *Samba Schema* is deprecated in Samba 4.13.0. Set *Samba Schema* if LDAP authentication for SMB shares is required and the LDAP server is already configured with Samba attributes. If *Samba Schema* is set, select the type of schema from the *Schema* dropdown.

Auxiliary Parameters can be specified for nslcd.conf.

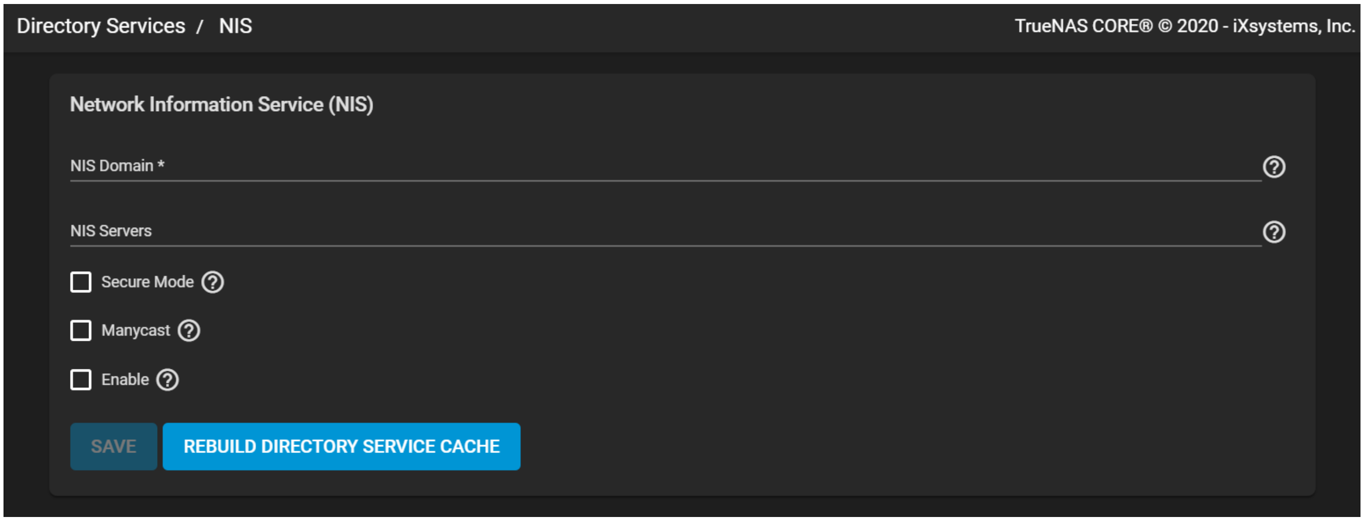
7.3 - NIS

NIS (Network Information Service) is a client–server directory service protocol for distributing system configuration data such as user and host names between computers on a computer network.

What exactly does this do? expand □
A NIS system maintains and distributes a central directory of user and group information, hostnames, e-mail aliases and other text-based tables of information in a computer network. In FreeBSD, the list of users is placed in /etc/passwd and authentication hashes in /etc/shadow. NIS adds another “global” user list to identify users on any NIS domain client.

NIS is limited in scalability and security. For modern networks, LDAP has replaced NIS.

To configure NIS, go to **Directory Services > NIS**.


Directory Services / NIS
TrueNAS CORE® © 2020 - iXsystems, Inc.
Network Information Service (NIS)
NIS Domain *
NIS Servers
□ Secure Mode
□ Manycast
□ Enable
SAVE
REBUILD DIRECTORY SERVICE CACHE

Enter the *NIS Domain* name and list any *NIS Servers* (hostnames or IP addresses). Press `Enter` to separate server entries. Configure the remaining options as needed:

- *Secure Mode* : Set to have ypbind(8) refuse to bind to any NIS server not running as *root* on a TCP port over *1024*.
- *Manycast* : Set for `ypbind` to bind to the fastest responding server.
- *Enable* : Unset to disable the configuration without deleting it.

When ready, *SAVE* the configuration.

7.4 - Kerberos

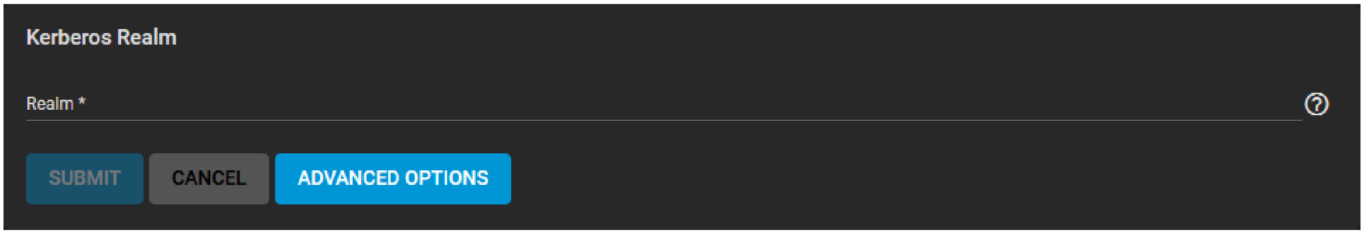
Kerberos is a web authentication protocol that uses strong cryptography to prove the identity of both client and server over an insecure network connection.

Kerberos uses "realms" and "keytabs" to authenticate clients and servers. A Kerberos realm is an authorized domain that a Kerberos server can use to authenticate a client. By default, TrueNAS creates a Kerberos realm for the local system. A keytab ("key table") is a file that stores encryption keys for various authentication scenarios.

TrueNAS allows configuring both Kerberos realms and keytabs.

Kerberos Realms

Your network must contain a Key Distribution Center (KDC) to add a realm. Users can configure Kerberos realms by navigating to **Directory Services** > **Kerberos Realms** and clicking *ADD*.



Enter the *Realm* name and click *SUBMIT*.

Advanced Options expand □

Setting	Description
KDC	Enter the name of the Key Distribution Center. Separate multiple values by pressing `Enter`.
Admin Server	Define the server where all changes to the database are performed. Separate multiple values by pressing `Enter`.
Password Server	Define the server where all password changes are performed. Separate multiple values by pressing `Enter`.

Kerberos Keytabs

Kerberos keytabs allow systems and clients to join an Active Directory or LDAP without a password. With keytabs, the TrueNAS system database does not store the Active Directory or LDAP administrator account password, which can be a security risk in some environments.

When using a keytab, create and use a less privileged account to perform any required queries. The TrueNAS system database stores the password for that account.

Create Keytab on Windows Server for Active Directory

To create the keytab on a Windows Server system, open a Command Prompt and use the ktpass command:

```
ktpass -princ USERNAME@REALM.COM -pass PASSWORD -crypto ENCRYPTION TYPE -ptype KRB5_NT_PRINCIPAL
-kvno 0 -out c:\PATH\KEYTABNAME.KEYTAB
```

`USERNAME@REALM.COM` is the Windows Server user and principal name written in the format username@KERBEROS.REALM. The Kerberos Realm is typically in all caps, but the Kerberos Realm case should match the realm name. See this note about using `/princ` for more details.

`PASSWORD` is the Windows Server user's password.

`ENCRYPTION TYPE` is the cryptographic type you want to use. Setting `ENCRYPTION TYPE` to `ALL` allows using all supported cryptographic types. Users can specify each key instead of ALL:

- *DES-CBC-CRC* is used for compatibility.
- *DES-CBC-MD5* is used for compatibility and adheres more closely to the MIT implementation.
- *RC4-HMAC-NT* uses 128-bit encryption.
- *AES256-SHA1* uses AES256-CTS-HMAC-SHA1-96 encryption.
- *AES128-SHA1* uses AES128-CTS-HMAC-SHA1-96 encryption. Specifying cryptographic types creates a keytab with sufficient privileges to grant tickets.

`PATH\KEYTABNAME.KEYTAB` is the path where you want to save the keytab and the name you want it to have.

An example ktpass command would look like this:

```
ktpass -princ admin@WINDOWSSERVER.NET -pass Abcd1234! -crypto ALL -ptype KRB5_NT_PRINCIPAL -kvno
0 -out c:\kerberos\freenas.keytab
```

Add Windows Keytab to TrueNAS

After generating the keytab, add it to the TrueNAS system in **Directory Services > Kerberos Keytabs > Add Kerberos Keytab**.

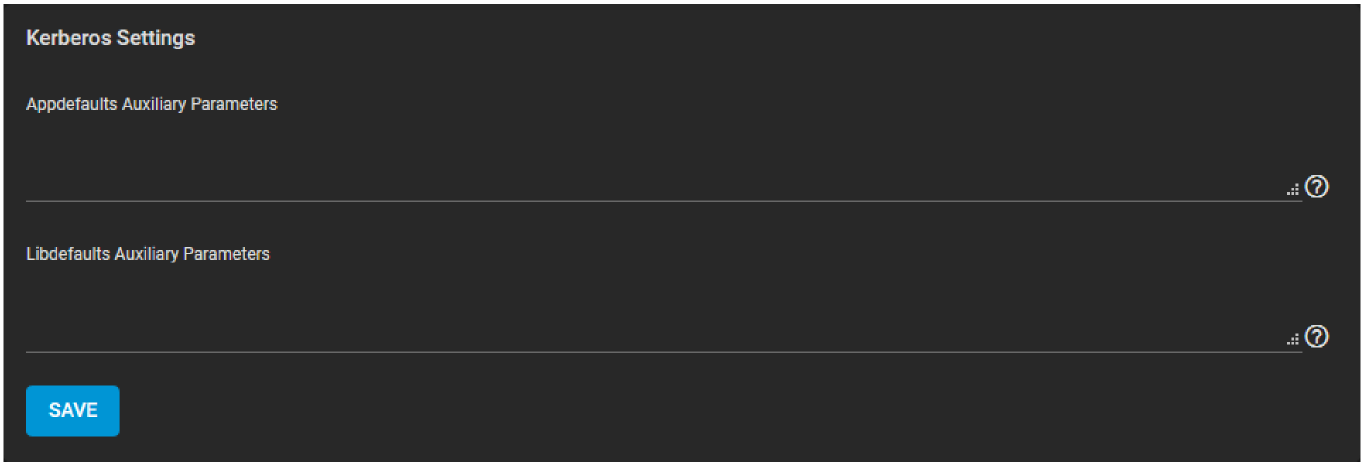
To instruct the Active Directory service to use the keytab, go to **Directory Services > Active Directory** and click *Advanced Options*. Select the installed keytab using the *Kerberos Principal* drop-down.

When using a keytab with Active Directory, *username* and *userpass* in the keytab should match the *Domain Account Name* and *Domain Account Password* fields in **Directory Services > Active Directory**.

To instruct LDAP to use a principal from the keytab, go to **Directory Services > Active Directory** and click *Advanced Options*, then select the installed keytab using the *Kerberos Principal* drop-down.

Kerberos Settings

Additional Kerberos options are in **Directory Services > Kerberos Settings**.



Kerberos Settings

Appdefaults Auxiliary Parameters

Libdefaults Auxiliary Parameters

- *Appdefaults Auxiliary Parameters*: Define any additional settings for use by some Kerberos applications. The available settings and syntax is listed in the [appdefaults] section of krb.conf(5).
- *Libdefaults Auxiliary Parameters*: Define any settings used by the Kerberos library. The available settings and their syntax are listed in the [libdefaults] section of krb.conf(5).

8 - Sharing

File sharing is a core benefit of a NAS. TrueNAS helps foster collaboration between users through network shares.
TrueNAS can use AFP, iSCSI shares, Unix NFS shares, Windows SMB shares, and WebDAV shares.

Ready to get started? Choose a topic or article from the left-side Navigation pane. Click the **<** symbol to expand the menu to show the topics under this section.

8.1 - Apple Shares (AFP)

8.1.1 - Share Creation

The Apple Filing Protocol (AFP) is a network protocol that allows file sharing over a network. AFP is similar to SMB and NFS shares but made specifically for Apple systems.

> Beginning in 2013, Apple began using the SMB sharing protocol as the default file sharing option. It has ceased development of the AFP sharing protocol. Use SMB sharing instead of AFP, unless sharing files with legacy Apple products.
>
> If using an AFP share, create the dataset with the **Share Type** set to **Generic**.
>
> Refer to https://developer.apple.com/library/archive/documentation/FileManagement/Conceptual/APFS_Guide/FAQ/FAQ.html

To create a new share, make sure a dataset is available with all the data for sharing.

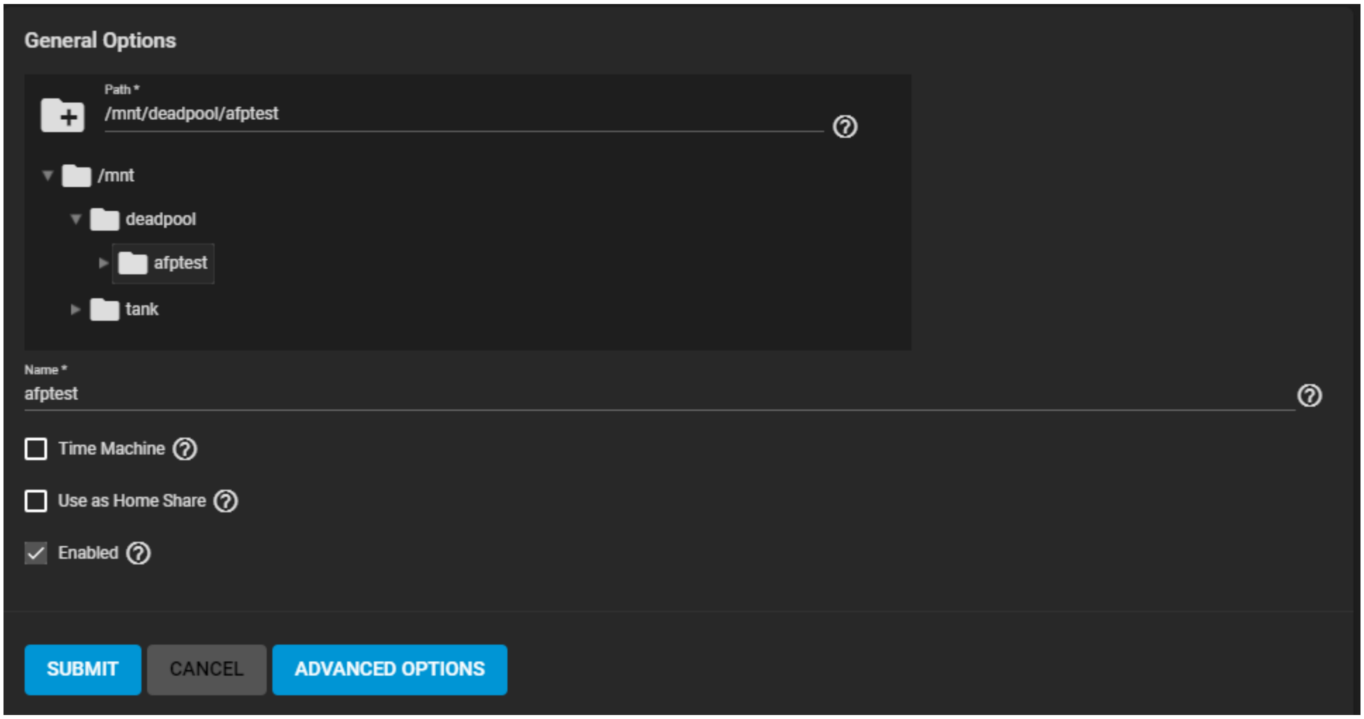
AFP Share Configuration

To configure the new share, go to **Sharing > Apple Shares (AFP)** and click **ADD**. You must confirm that you intend to create an AFP share because it is now deprecated. Next, use the file browser to select the dataset created to share and enter a descriptive name for the share.

When the share is to have Time Machine backups, set **Time Machine**. This advertises the share to other Mac systems as a disk that stores Time Machine backups. It is not recommended to have multiple AFP shares configured for Time Machine backups.

Setting **Use as Home Share** creates home directories for users that connect to the share. Only one AFP share can be a home share.

The **Enable** option for an AFP share is the default selection. To create the share but not immediately enable it, unset **Enable**. Click **SUBMIT** to create the share.


General Options

Path * /mnt/deadpool/afptest

Name * afptest

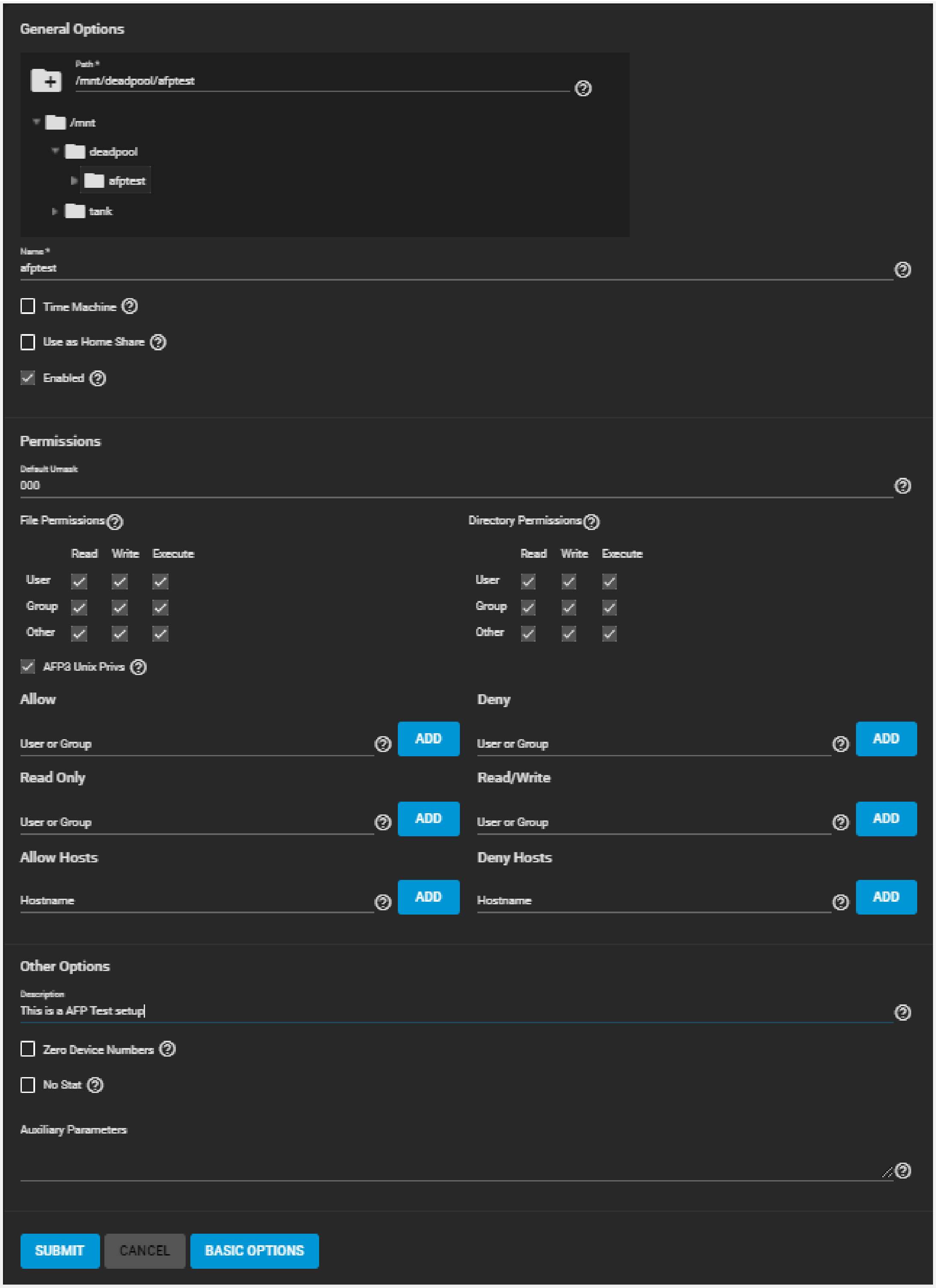
□ Time Machine

□ Use as Home Share

☑ Enabled

Advanced Options expand □

Opening the **ADVANCED OPTIONS** allows you to modify the share using the **Permissions**, **Description**, and **Auxiliary Parameters** settings.



General Options

Path *: /mnt/deadpool/afptest

- /mnt
  - deadpool
    - afptest
  - tank

Name *: afptest

□ Time Machine

□ Use as Home Share

☑ Enabled

Permissions

Default Umask: 000

File Permissions

	Read	Write	Execute
User	☑	☑	☑
Group	☑	☑	☑
Other	☑	☑	☑

Directory Permissions

	Read	Write	Execute
User	☑	☑	☑
Group	☑	☑	☑
Other	☑	☑	☑

☑ AFP3 Unix Privs

Allow: User or Group ADD

Deny: User or Group ADD

Read Only: User or Group ADD

Read/Write: User or Group ADD

Allow Hosts: Hostname ADD

Deny Hosts: Hostname ADD

Other Options

Description: This is a AFP Test setup

□ Zero Device Numbers

□ No Stat

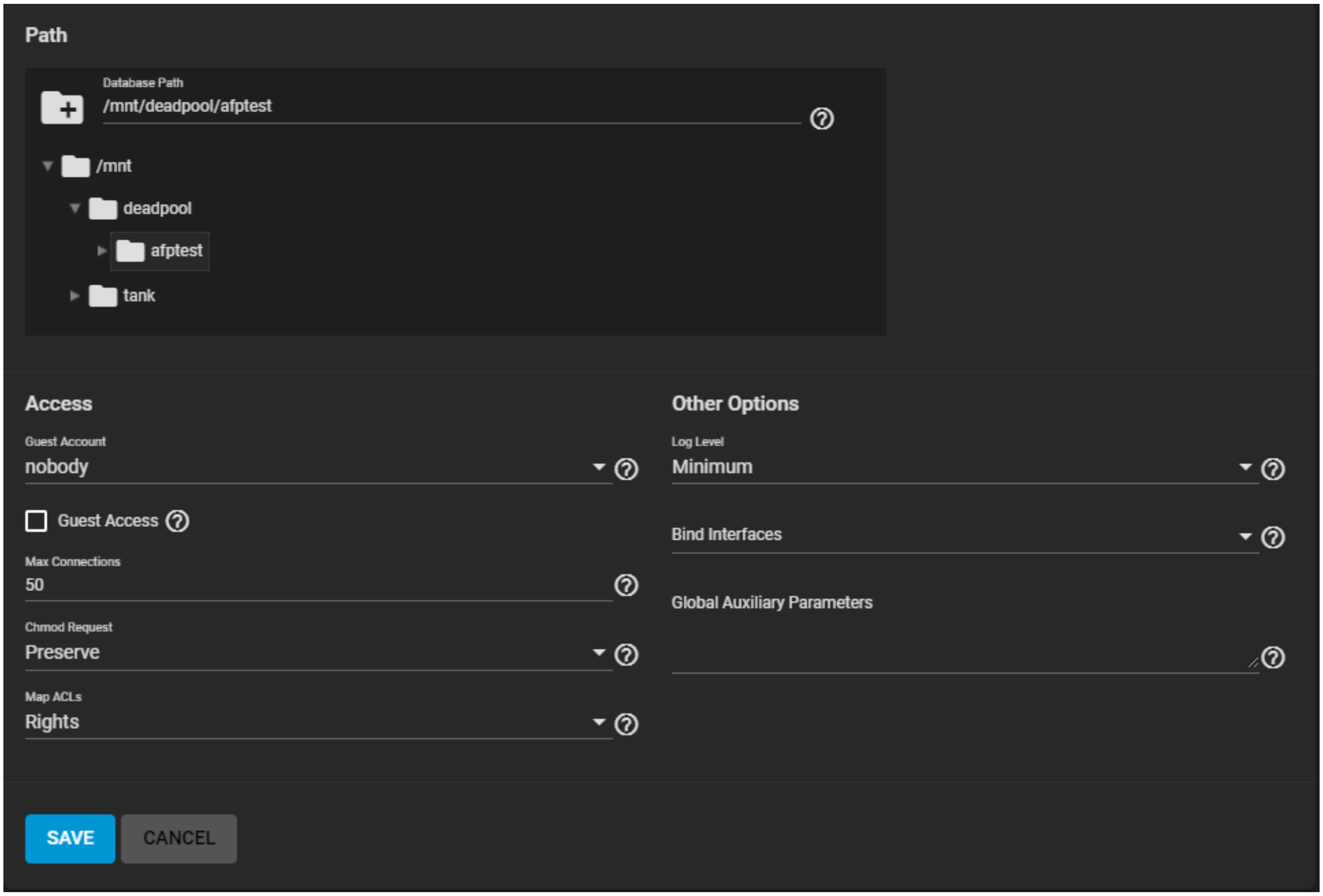
Auxiliary Parameters

To edit an existing AFP share, go to **Sharing > Apple Shares (AFP)** and click □.

AFP Service

To begin advertising the AFP shared location, go to **Services** and use the **AFP** toggle to set it to running. To automatically start the service after TrueNAS boots, select **Start Automatically**.

We recommend you use the default settings for the AFP service. To adjust the service settings, click □.



Path

Database Path
/mnt/deadpool/afptest

/mnt
deadpool
afptest
tank

Access

Guest Account
nobody

□ Guest Access

Max Connections
50

Chmod Request
Preserve

Map ACLs
Rights

Other Options

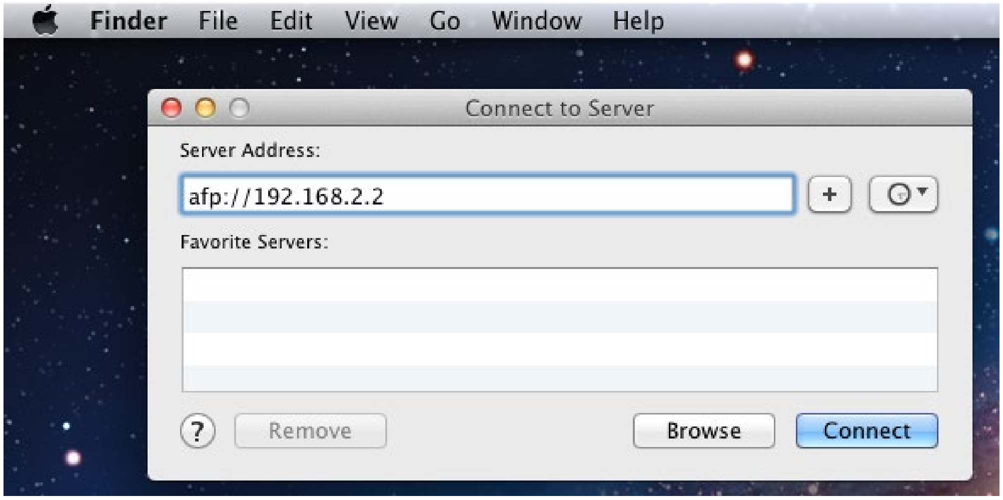
Log Level
Minimum

Bind Interfaces

Global Auxiliary Parameters

Connecting to the AFP Share

Use an Apple operating system to connect to the share. First, open the Apple **Finder** app and click **Go > Connect to Server…** in the Apple top menu bar. Next, enter `afp://{IPofTrueNASsystem}` and click **Connect**. For example, entering `afp://192.168.2.2` connects to the TrueNAS AFP share at `192.168.2.2`.



Server Address:
afp://192.168.2.2

Favorite Servers:

8.2 - Block Shares (iSCSI)

iSCSI (Internet Small Computer Systems Interface) represents standards for using Internet-based protocols for linking binary data storage device aggregations. IBM and Cisco submitted the draft standards in March 2000. Since then, iSCSI has seen widespread adoption into enterprise IT environments.

iSCSI functions through encapsulation. The OSI (Open Systems Interconnection Model) encapsulates SCSI commands and storage data within the session stack. The OSI further encapsulates the session stack within the transport stack, the transport stack within the network stack, and the network stack within the data stack. Transmitting data this way permits block-level access to storage devices over LANs, WANs, and even the Internet itself (although performance may suffer if your data traffic is traversing the Internet).

The table below shows where iSCSI sits in the OSI network stack:

OSI Layer Number	OSI Layer Name	Activity as it relates to iSCSI
7	Application	An application tells the CPU that it needs to write data to non-volatile storage.
6	Presentation	OSI creates a SCSI Command, SCSI Response, or SCSI data payload to hold the application data and communicate it to non-volatile storage.
5	Session	Communication between the source and the destination devices begins. This communication establishes when the conversation starts, what it will talk about, and when the conversion ends. This entire dialogue represents the session. OSI encapsulates the SCSI Command, SCSI Response, or SCSI data payload containing the application data within an iSCSI Protocol Data Unit (PDU).
4	Transport	OSI encapsulates the iSCSI PDU within a TCP segment.
3	Network	OSI encapsulates the TCP segment within an IP packet.
2	Data	OSI encapsulates the IP packet within the Ethernet frame.
1	Physical	The Ethernet frame transmits as bits (zeros and ones).

Unlike other sharing protocols on TrueNAS, an iSCSI share allows block sharing *and* file sharing. Block sharing provides the benefit of block-level access to data on the TrueNAS. iSCSI exports disk devices (zvols on TrueNAS) over a network that other iSCSI clients (initiators) can attach and mount.

iSCSI Terminology expand □

- **CHAP (Challenge-Handshake Authentication Protocol)**: an authentication method that uses a shared secret and three-way authentication to determine if a system is authorized to access the storage device. It also periodically confirms that the session has not been hijacked by another system. In iSCSI, the client (initiator) performs the CHAP authentication.

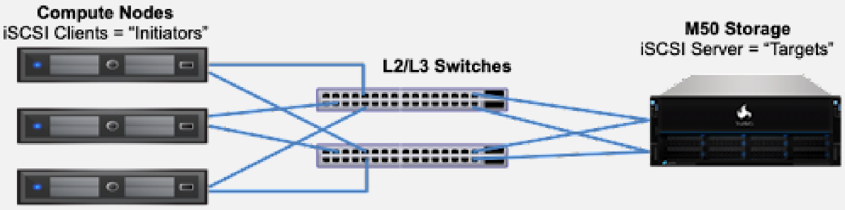
- **Mutual CHAP**: a CHAP type in which both ends of the communication authenticate to each other.

- **Internet Storage Name Service (iSNS)**: protocol for the automated discovery of iSCSI devices on a TCP/IP network.

- **Extent**: the storage unit to be shared. It can either be a file or a device.

- **Portal**: indicates which IP addresses and ports to listen on for connection requests.

- **Initiators and Targets**: iSCSI introduces the concept of *initiators* and *targets* which act as sources and destinations respectively. iSCSI initiators and targets follow a client/server model. Below is a diagram of a typical iSCSI network. The TrueNAS storage array acts as the iSCSI target and can be accessed by many of the different iSCSI initiator types, including software and hardware-accelerated initiators.



The iSCSI protocol standards require that iSCSI initiators and targets be represented as iSCSI nodes. It also requires that each node be given a unique iSCSI name. To represent these unique nodes via their names, iSCSI requires the use of one of two naming conventions and formats, IQN or EUI. iSCSI also allows the use of iSCSI aliases which are not required to be unique and can be help manage nodes.

- **LUN**: *Logical Unit Number* representing a logical SCSI device. An initiator negotiates with a target to establish connectivity to a LUN. The result is an iSCSI connection that emulates a connection to a SCSI hard disk. Initiators treat iSCSI LUNs as if they were a raw SCSI or SATA hard drive. Rather than mounting remote directories, initiators format and directly manage filesystems on iSCSI LUNs. When configuring multiple iSCSI LUNs, create a new target for each LUN. Since iSCSI multiplexes a target with multiple LUNs over the same TCP connection, there can be TCP contention when more than one target accesses the same LUN. TrueNAS supports up to 1024 LUNs.
- **Jumbo Frames**: Jumbo frames are the name given to Ethernet frames that exceed the default 1500 byte size. This parameter is typically referenced by the nomenclature as maximum transmission unit (MTU). MTU that exceeds the default 1500 bytes necessitates that all devices transmitting Ethernet frames between the source and destination support the specific jumbo frame MTU setting, which means that NICs, dependent hardware iSCSI, independent hardware iSCSI cards, ingress and egress Ethernet switch ports, and the NICs of the storage array must all support the same jumbo frame MTU value. So, how does one decide if they should use jumbo frames?

  Administrative time is consumed configuring Jumbo Frames and troubleshooting if/when things go sideways. Some network switches might also have ASICs optimized for processing MTU 1500 frames while others might be optimized for larger frames. Systems administrators should also account for the impact on host CPU utilization. Although Jumbo Frames are designed to increase data throughput, it may measurably increase latency (as is the case with some un-optimized switch ASICs); latency is typically more important than throughput in a VMware environment. Some iSCSI applications might see a net benefit running jumbo frames despite possible increased latency. Systems administrators should test jumbo frames on their workload with lab infrastructure as much as possible before updating the MTU on their production network.

TrueNAS Enterprise Feature:

- **ALUA**: *Asymmetric Logical Unit Access* allows a client computer to discover the best path to the storage on a TrueNAS system. HA storage clusters can provide multiple paths to the same storage. For example, the disks are directly connected to the primary computer and provide high speed and bandwidth when accessed through that primary computer. The same disks are also available through the secondary computer, but speed and bandwidth are restricted. With ALUA, clients automatically ask for and use the best path to the storage. If one of the TrueNAS HA computers becomes inaccessible, the clients automatically switch to the next best alternate path to the storage. When a better path becomes available, as when the primary host becomes available again, the clients automatically switch back to that better path to the storage.

Do not enable ALUA on TrueNAS unless it is also supported by and enabled on the client computers. ALUA only works when enabled on both the client and server.

iSCSI Configuration Methods

There are a few different approaches for configuring and managing iSCSI-shared data:

- TrueNAS CORE web interface: the TrueNAS web interface is fully capable of configuring iSCSI shares. This requires creating and populating zvol block devices with data, then setting up the iSCSI Share. TrueNAS Enterprise licensed customers also have additional options to configure the share with Fibre Channel.

- TrueNAS SCALE web interface: TrueNAS SCALE offers a similar experience to TrueNAS CORE for managing data with iSCSI; create and populate the block storage, then configure the iSCSI share.

- TrueCommand instances that have many TrueNAS systems connected can manage iSCSI Volumes from the TrueCommand web interface. TrueCommand allows creating block devices and configuring iSCSI Targets and Initiators from one central location.

- TrueNAS Enterprise customers that use vCenter to manage their systems can use the TrueNAS vCenter Plugin to connect their TrueNAS systems to vCenter and create and share iSCSI datastores. This is all managed through the vCenter web interface.

8.2.1 - iSCSI Shares

To get started, make sure you have created a zvol or a dataset with at least one file to share.

Go to **Sharing > Block Shares (iSCSI)**. You can either set one up manually or use the wizard to guide you through creation.

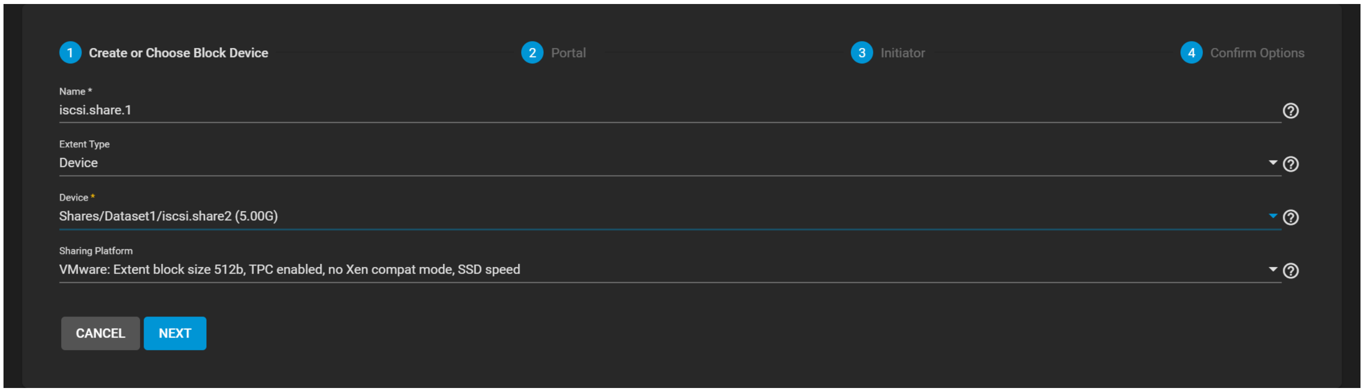
Wizard Setup

⊙ Block Device

First, enter a name for the iSCSI share. It can only contain lowercase alphanumeric characters plus a dot (.), dash (-), or colon (:). We recommend keeping the name short or at most 63 characters. Next, choose the *Extent Type*.

- If the *Extent Type* is *Device*, select the Zvol to share from the *Device* menu.
- If the *Extent Type* is *File*, select the path to the Extent and indicate the file size.

Select the type of platform that will be using the share. For example, if using the share from an updated Linux OS, choose *Modern OS*.



Name *
iscsi.share.1

Extent Type
Device

Device *
Shares/Dataset1/iscsi.share2 (5.00G)

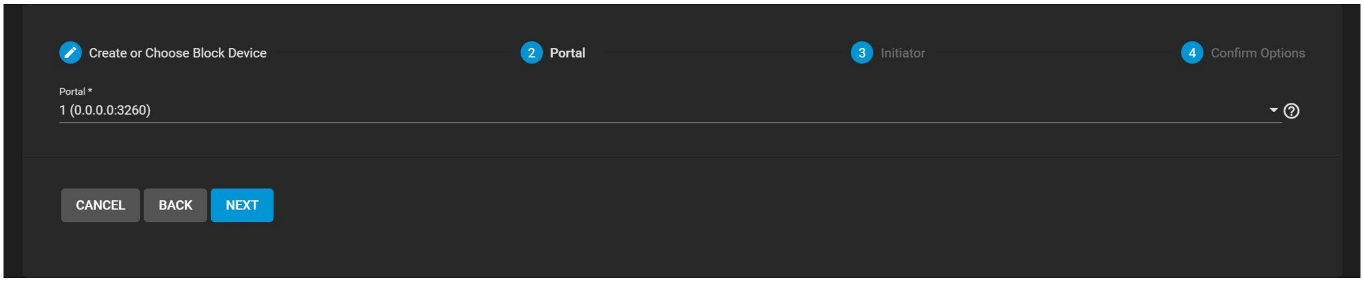
Sharing Platform
VMware: Extent block size 512b, TPC enabled, no Xen compat mode, SSD speed

○ Portal

Now you will either create a new portal or select an existing one from the dropdown.

If you create a new portal, you will need to select a *Discovery Authentication Method*.

If you set the *Discovery Authentication Method* to *CHAP* or *MUTUAL CHAP*, you will also need to select a *Discovery Authentication Group*. If no group exists, click *Create New* from the drop-down and enter a *Group ID*, *User*, and *Secret*.



Portal *
1 (0.0.0.0:3260)

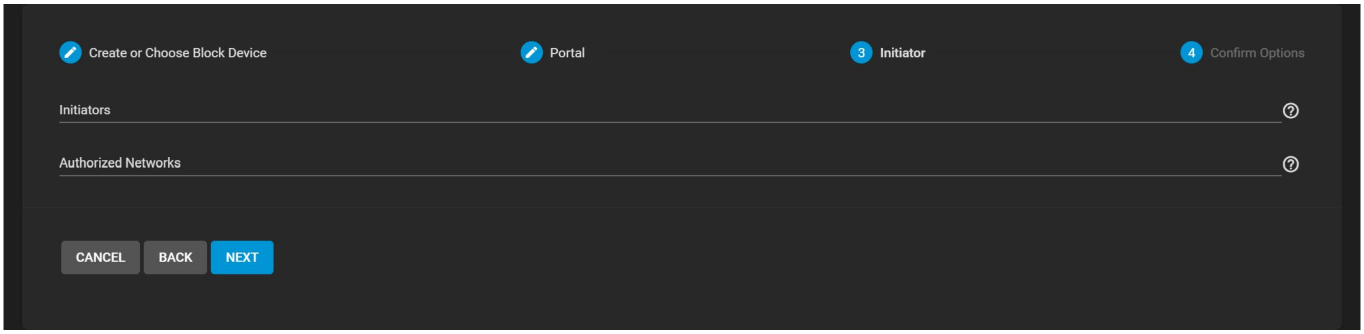
When the *Discovery Authentication Method* is *NONE*, the *Discovery Authentication Group* can be left empty.

Select *0.0.0.0* or *::* from the *IP Address* dropdown and click *NEXT*.

What are these options? expand □
0.0.0.0 listens on all IPv4 addresses and *::* listens on all IPv6 addresses.

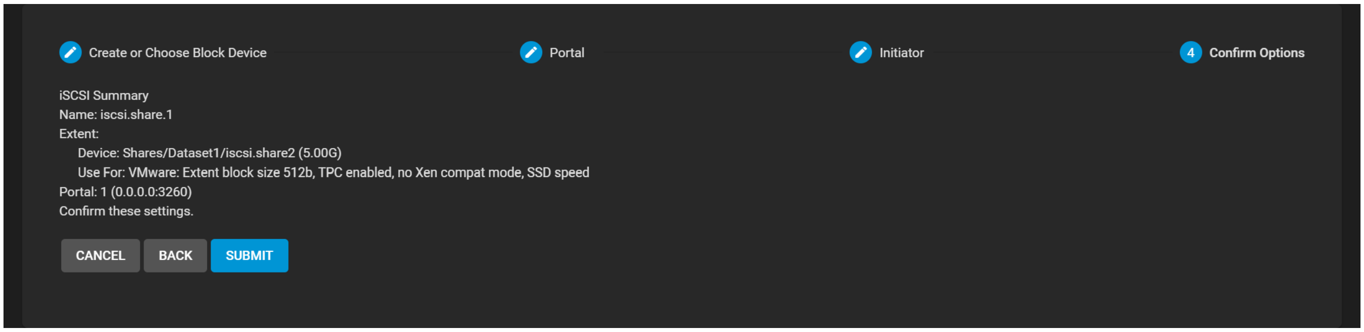
○ Initiator

Decide which initiators or networks can use the iSCSI share. Leave the list empty to allow all initiators or networks, or add entries to the list to limit access to those systems.



○ Confirm

Confirm the settings are correct and click *SUBMIT*.

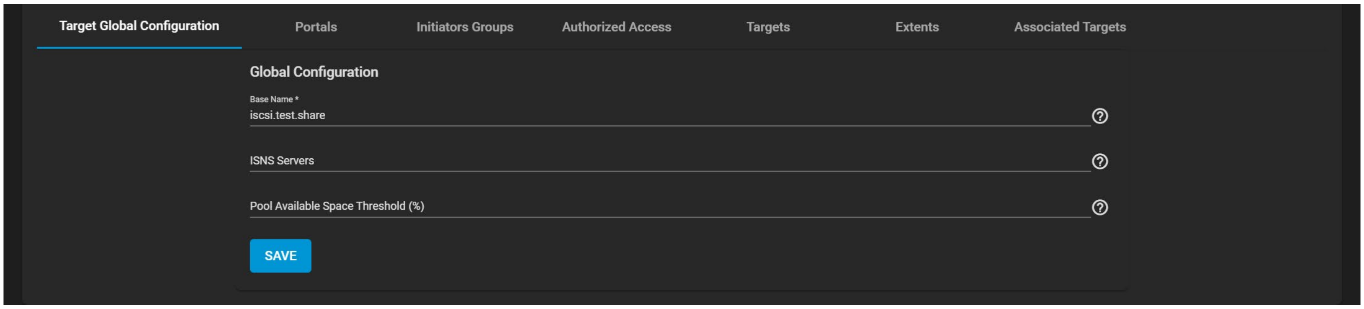


iSCSI Summary
Name: iscsi.share.1
Extent:
    Device: Shares/Dataset1/iscsi.share2 (5.00G)
    Use For: VMware: Extent block size 512b, TPC enabled, no Xen compat mode, SSD speed
Portal: 1 (0.0.0.0:3260)
Confirm these settings.

Manual Setup

⊙ Target Global Configuration

The *Target Global Configuration* tab lets users configure settings that will apply to all iSCSI shares.

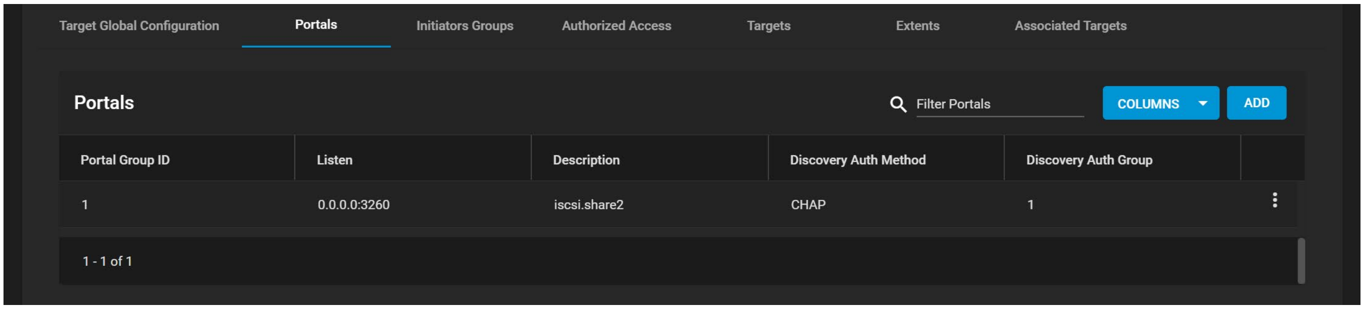


Base Name *: iscsi.test.share

Setting	Description
Base Name	Lowercase alphanumeric characters plus dot (.), dash (-), and colon (:) are allowed. See the Constructing iSCSI names using the *iqn.format* section of [RFC3721]().
ISNS Servers	Hostnames or IP addresses of the ISNS servers to be registered with the iSCSI targets and portals of the system. Separate entries by pressing `Enter`.
Pool Available Space Threshold (%)	Generate an alert when the pool has this percent space remaining. This is typically configured at the pool level when using zvols or at the extent level for both file and device-based extents.

○ Portals

The *Portals* tab lets users create new portals or edit existing ones in the list.

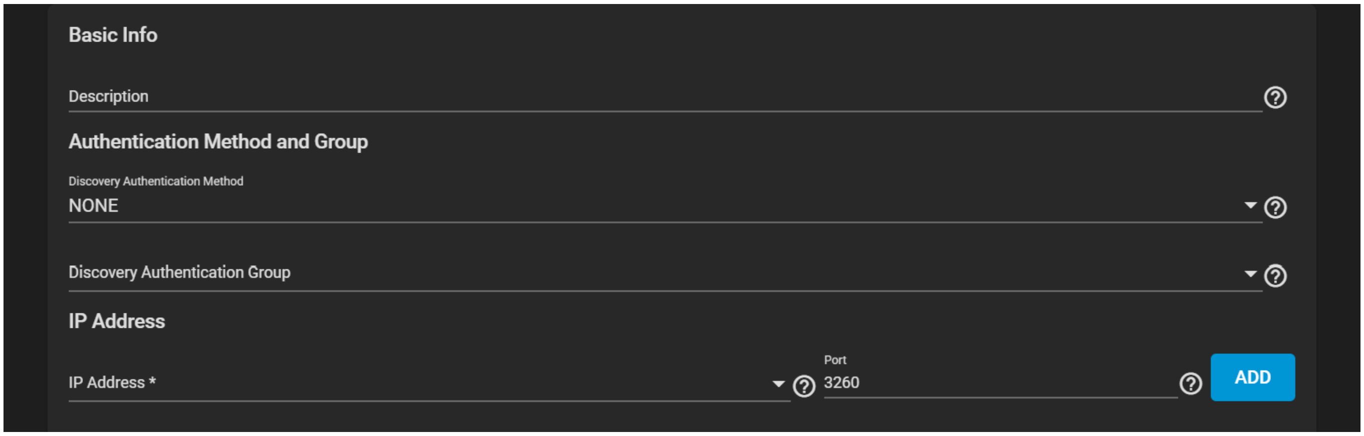


Portal Group ID	Listen	Description	Discovery Auth Method	Discovery Auth Group
1	0.0.0.0:3260	iscsi.share2	CHAP	1

1 - 1 of 1

To add a new portal, click *ADD* and enter the basic and IP address information.

To edit an existing portal, click more_vert next to the portal and select *Edit*.


Basic Info
Description
Authentication Method and Group
Discovery Authentication Group
IP Address
IP Address *
ADD

Discovery Authentication Method: NONE

Port: 3260

Basic Info

Setting	Description
Description	Optional description. Portals are automatically assigned a numeric group.

Authentication Method and Group

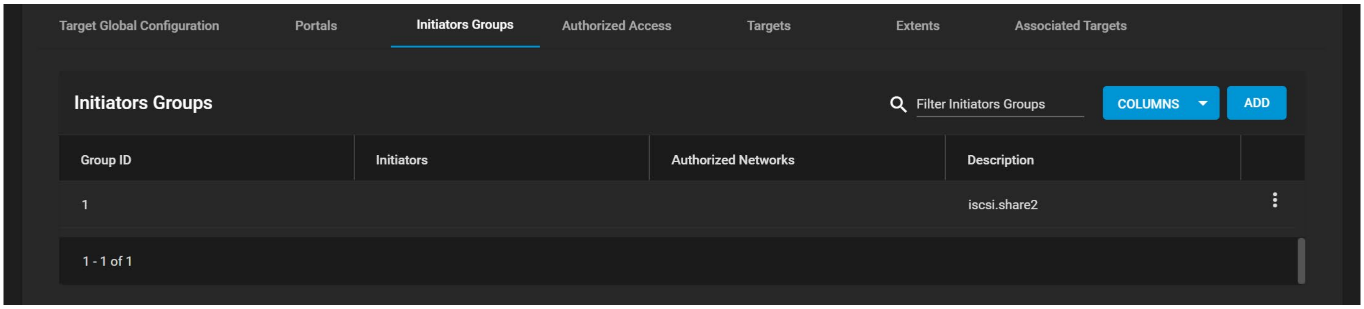
Setting	Description
Discovery Authentication Method	iSCSI supports multiple authentication methods that the target uses to discover valid devices. *None* allows anonymous discovery while *CHAP* and *Mutual CHAP* require authentication.
Discovery Authentication Group	Group ID created in Authorized Access. Required when the Discovery Authentication Method is CHAP or Mutual CHAP.

IP Address

Setting	Description
IP Address	Select the IP addresses to be listened on by the portal. Click ADD to add IP addresses with a different network port. *0.0.0.0* listens on all IPv4 addresses and *::* listens on all IPv6 addresses.
Port	TCP port used to access the iSCSI target. Default is *3260*.
ADD	Adds another IP address row.

○ Initiators Groups

The *Initiators Groups* tab lets users create new authorized access client groups or edit existing ones in the list.



Group ID	Initiators	Authorized Networks	Description
1			iscsi.share2

1 - 1 of 1

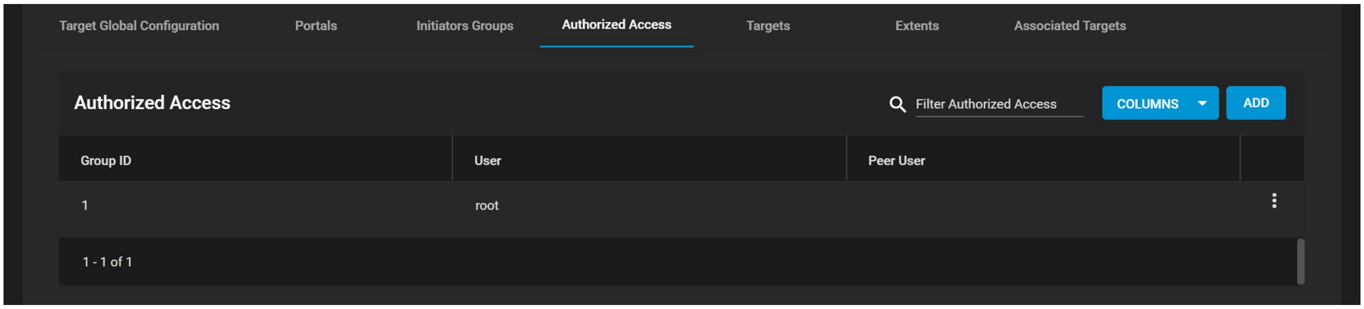
To add a new initiators group, click *ADD* and either leave *Allow All Initiators* checked or configure your own allowed initiators and authorized networks.

To edit an existing initiators group, click more_vert next to the initiators group and select *Edit*.

Setting	Description
Allow All Initiators	Allows All Initiators when checked.
Allowed Initiators (IQN)	Initiators allowed access to this system. Enter an iSCSI Qualified Name (IQN) and click + to add it to the list. Example: *iqn.1994-09.org.freebsd:freenas.local*.
Authorized Networks	Network addresses allowed use this initiator. Each address can include an optional CIDR netmask. Click + to add the network address to the list. Example: *192.168.2.0/24*.
Description	Any notes about initiators.

○ Authorized Access

The *Authorized Access* tab lets users create new authorized access networks or edit existing ones in the list.

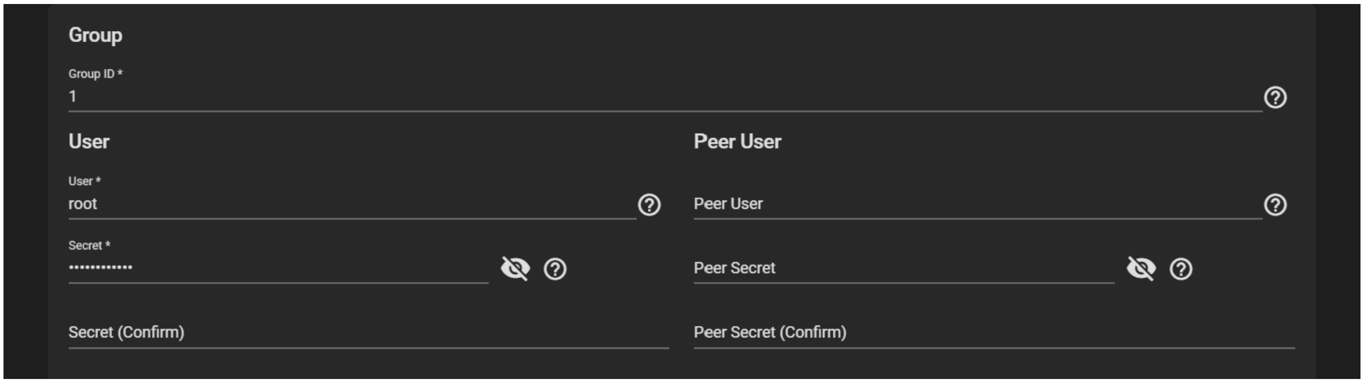


Group ID	User	Peer User
1	root	

1 - 1 of 1

To add a new authorized access network, click *ADD* and fill out the group, user, and peer user information.

To edit an existing authorized access network, click more_vert next to it and select *Edit*.


Group

Group ID *
1

User

User *
root

Secret *
••••••••••••

Secret (Confirm)

Peer User

Peer User

Peer Secret

Peer Secret (Confirm)

Group

Setting	Description
Group ID	Allow different groups to be configured with different authentication profiles. Example: all users with a group ID of 1 will inherit the authentication profile associated with Group 1.

User

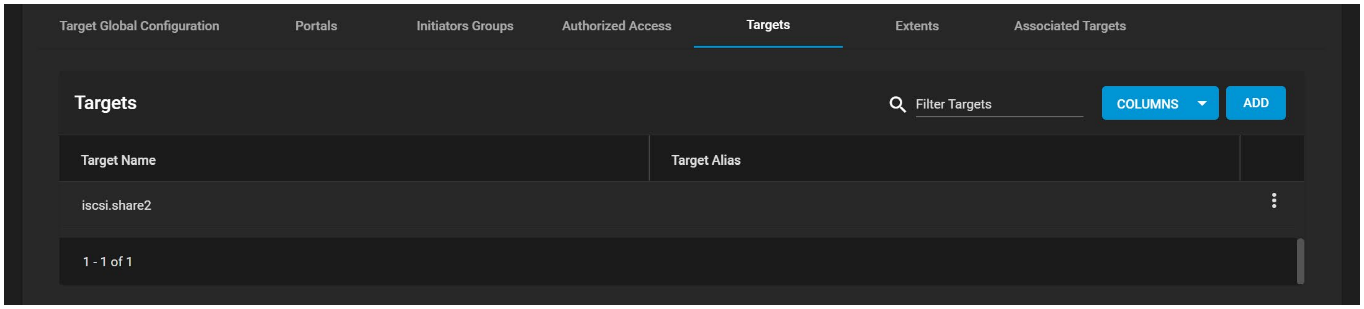
Setting	Description
User	User account to create for CHAP authentication with the user on the remote system. Many initiators use the initiator name as the user name.
Secret	User password. Must be at least 12 and no more than 16 characters long.
Secret (Confirm)	Confirm the user password.

Peer User

Setting	Description
Peer User	Only entered when configuring mutual CHAP. Usually the same value as User.
Peer Secret	Mutual secret password. Required when Peer User is set. Must be different than the Secret.
Peer Secret (Confirm)	Confirm the mutual secret password.

○ Targets

The *Targets* tab lets users create new TrueNAS storage resources or edit existing ones in the list.

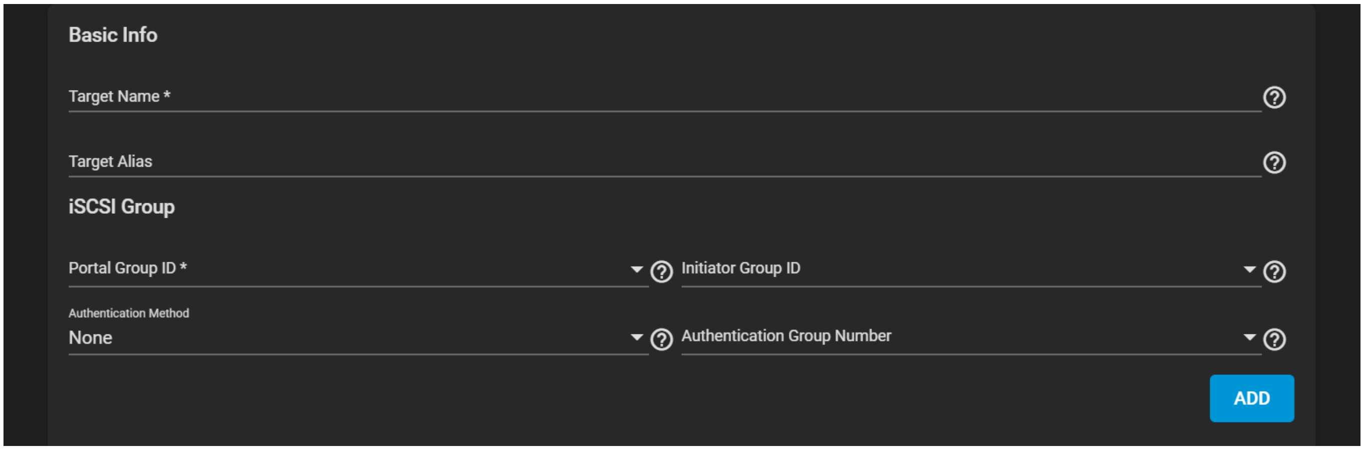


Target Name	Target Alias
iscsi.share2	

1 - 1 of 1

To add a new target, click *ADD* and enter the basic and iSCSI group information.

To edit an existing target, click more_vert next to it and select *Edit*.



Authentication Method
None

Basic Info

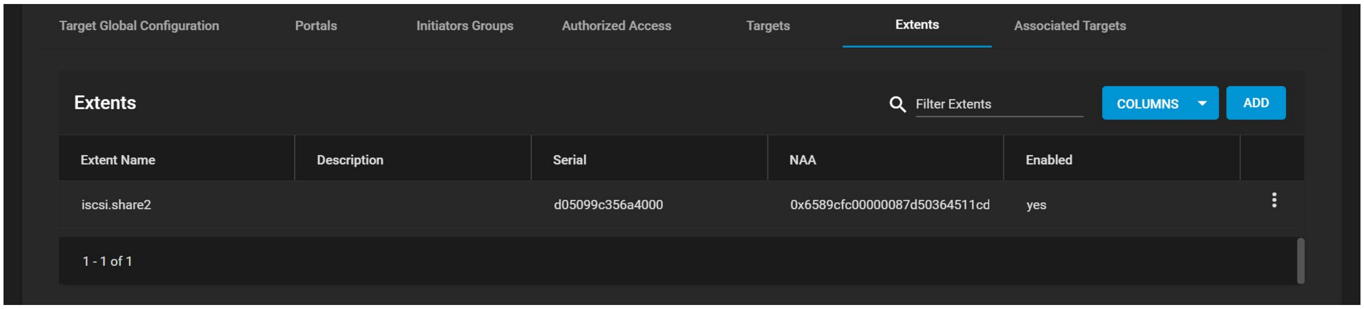
Setting	Description
Target Name	The base name is automatically prepended if the target name does not start with iqn. Lowercase alphanumeric characters plus dot (.), dash (-), and colon (:) are allowed. See the Constructing iSCSI names using the iqn.format section of [RFC3721]().
Target Alias	Optional user-friendly name.

iSCSI Group

Setting	Description
Portal Group ID	Leave empty or select an existing portal to use.
Initiator Group ID	Select which existing initiator group has access to the target.
Authentication Method	Choices are *None*, *Auto*, *CHAP*, or *Mutual CHAP*.
Authentication Group Number	Select *None* or an integer. This value represents the number of existing authorized accesses.

- **Extents**

The *Extents* tab lets users create new shared storage units or edit existing ones in the list.



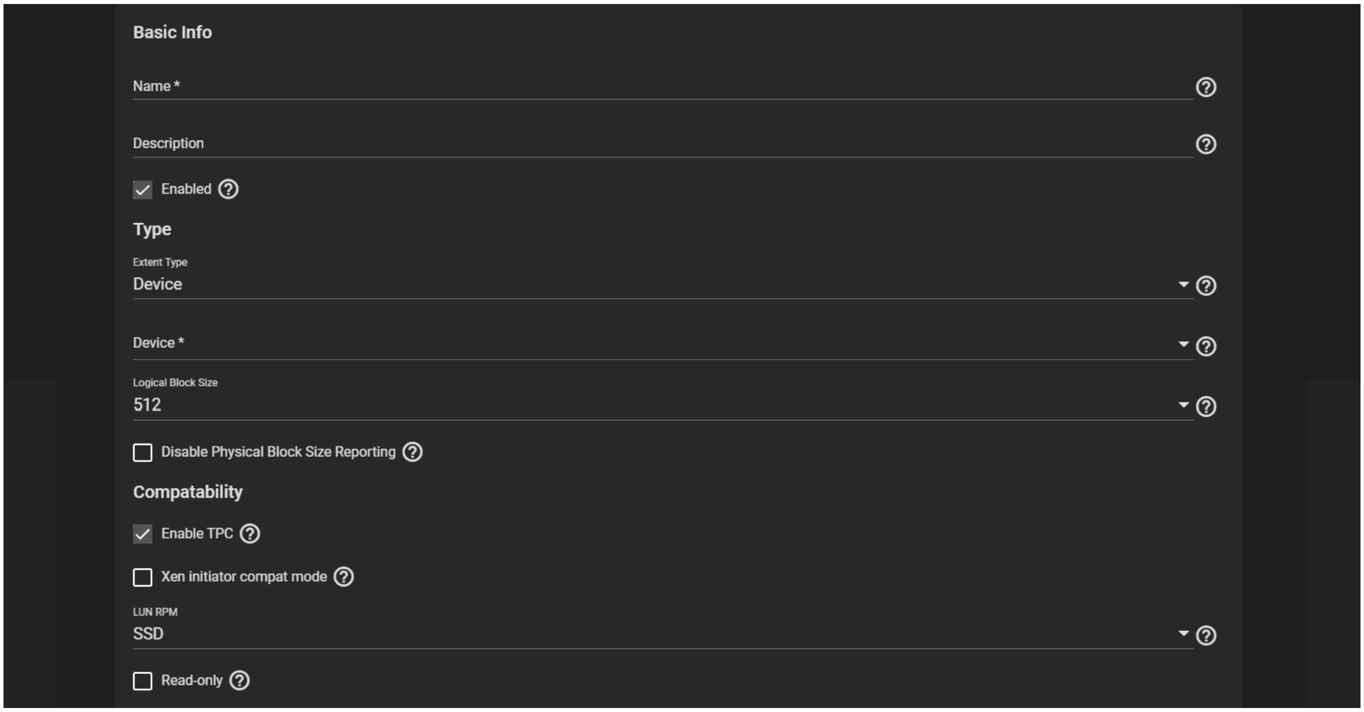
Extents

Extent Name	Description	Serial	NAA	Enabled
iscsi.share2		d05099c356a4000	0x6589cfc00000087d50364511cd	yes

1 - 1 of 1

To add a new extent, click *ADD* and enter the basic, type, and compatibility information.

To edit an existing extent, click more_vert next to it and select *Edit*.



Basic Info

Name *

Description

☑ Enabled

Type

Extent Type: Device

Device *

Logical Block Size: 512

□ Disable Physical Block Size Reporting

Compatability

☑ Enable TPC

□ Xen initiator compat mode

LUN RPM: SSD

□ Read-only

Basic Info

Setting	Description
Name	Name of the extent. If the *Extent* size is not 0, it cannot be an existing file within the pool or dataset.
Description	Notes about this extent.
Enabled	Set to enable the iSCSI extent.

Type

Setting	Description
Extent Type	*Device* provides virtual storage access to zvols, zvol snapshots, or physical devices. *File* provides virtual storage access to a single file.
Device	Only appears if *Device* is selected. Select the unformatted disk, controller, or zvol snapshot.
Path to the Extent	Only appears if *File* is selected. Browse to an existing file. Create a new file by browsing to a dataset and appending /{filename.ext} to the path. Users cannot create extents inside a jail root directory.

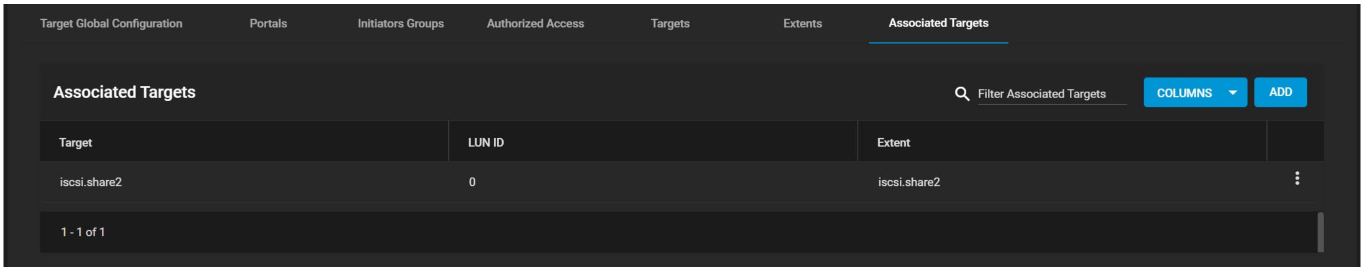
Filesize	Only appears if *File* is selected. Entering 0 uses the actual file size and requires that the file already exists. Otherwise, specify the file size for the new file.
Logical Block Size	Leave at the default of 512 unless the initiator requires a different block size.
Disable Physical Block Size Reporting	Set if the initiator does not support physical block size values over 4K (MS SQL).

Compatibility

Setting	Description
Enable TPC	Set to allow an initiator to bypass normal access control and access any scannable target. This allows xcopy operations that are otherwise blocked by access control.
Xen initiator compat mode	Set when using Xen as the iSCSI initiator.
LUN RPM	Do **NOT** change this setting when using Windows as the initiator. Only needs to be changed in large environments where the number of systems using a specific RPM is needed for accurate reporting statistics.
Read-only	Set to prevent the initiator from initializing this LUN.

○ Associated Targets

The *Associated Targets* tab lets users create new associated TrueNAS storage resources or edit existing ones in the list.



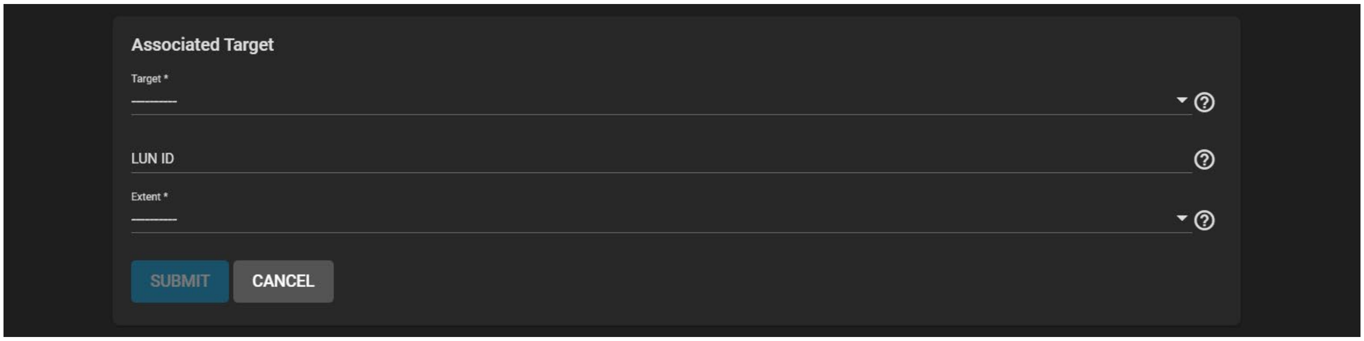
Associated Targets

Target	LUN ID	Extent
iscsi.share2	0	iscsi.share2

1 - 1 of 1

To add a new associated target, click *ADD* and fill out the information.

To edit an existing associated target, click more_vert next to it and select *Edit*.



Associated Target

Target *

LUN ID

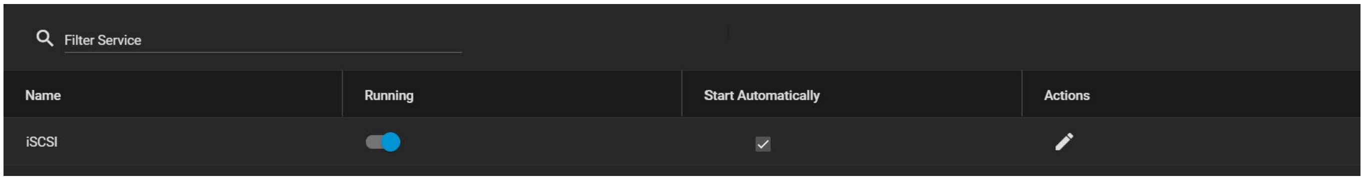
Extent *

Setting	Description
Target	Select an existing target.
LUN ID	Select the value or enter a value between 0 and 1023. Some initiators expect a value below 256. Leave this field blank to automatically assign the next available ID.

Extent	Select an existing extent.

Starting the iSCSI Service

To turn on the iSCSI service, go to **Services** and toggle *iSCSI*. Set *Start Automatically* to start it when TrueNAS boots up.



Filter Service

Name	Running	Start Automatically	Actions
iSCSI		☑	

Clicking the edit returns to the options in **Sharing > iSCSI**.

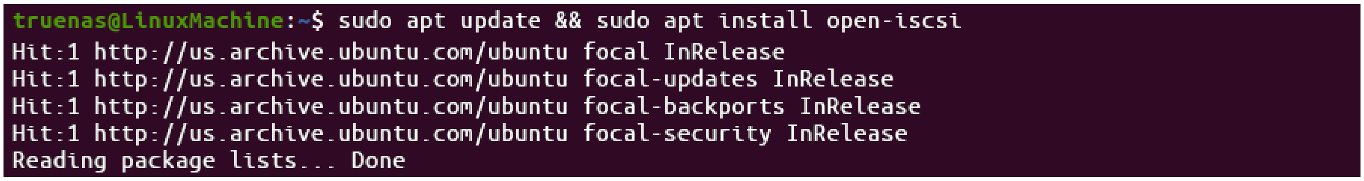
Using the iSCSI Share

Connecting to and using an iSCSI share can differ between operating systems:

⊙ **Linux**

iSCSI Utilities and Service

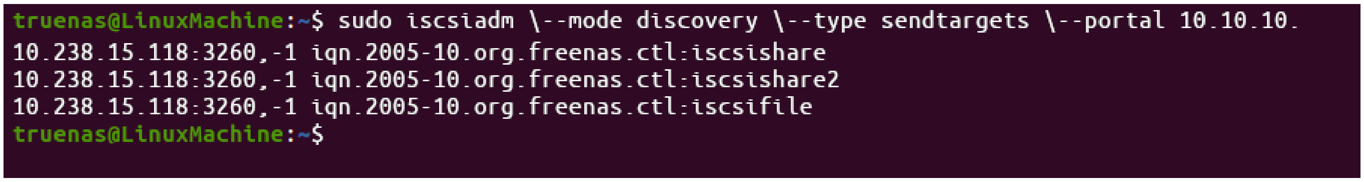
First, open the command line and ensure that the `open-iscsi` utility is installed. To install the utility on an Ubuntu/Debian distribution, enter `sudo apt update && sudo apt install open-iscsi`. After the installation completes, ensure the *iscsid* service is running: `sudo service iscsid start`. With the *iscsid* service started, run the `iscsiadm` command with the discovery arguments and get the necessary information to connect to the share.



```
truenas@LinuxMachine:~$ sudo apt update && sudo apt install open-iscsi
Hit:1 http://us.archive.ubuntu.com/ubuntu focal InRelease
Hit:1 http://us.archive.ubuntu.com/ubuntu focal-updates InRelease
Hit:1 http://us.archive.ubuntu.com/ubuntu focal-backports InRelease
Hit:1 http://us.archive.ubuntu.com/ubuntu focal-security InRelease
Reading package lists... Done
```

Discover and Log In to the iSCSI Share

Run the command `sudo iscsiadm \--mode discovery \--type sendtargets \--portal {IPADDRESS}`. The output provides the basename and target name that TrueNAS configured.



```
truenas@LinuxMachine:~$ sudo iscsiadm \--mode discovery \--type sendtargets \--portal 10.10.10.
10.238.15.118:3260,-1 iqn.2005-10.org.freenas.ctl:iscsishare
10.238.15.118:3260,-1 iqn.2005-10.org.freenas.ctl:iscsishare2
10.238.15.118:3260,-1 iqn.2005-10.org.freenas.ctl:iscsifile
truenas@LinuxMachine:~$
```

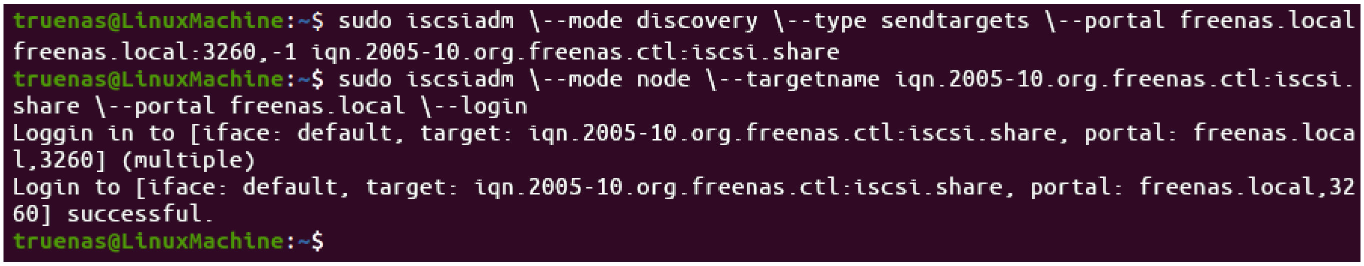
Alternatively, enter `sudo iscsiadm -m discovery -t st -p {IPADDRESS}` to get the same output. Note the basename and target name given in the output, since they you need them to log in to the iSCSI share.

When a Portal Discovery Authentication Method is CHAP, add the three following lines to /etc/iscsi/iscsid.conf.

```
discovery.sendtargets.auth.authmethod = CHAP
discovery.sendtargets.auth.username = user
discovery.sendtargets.auth.password = secret
```

The user for `discovery.sendtargets.auth.username` is set in the *Authorized Access* used by the *Portal* of the iSCSI share. Likewise, the password to use for `discovery.sendtargets.auth.password` is the *Authorized Access* secret. Without those lines, the iscsiadm will not discover the Portal with the CHAP authentication method.

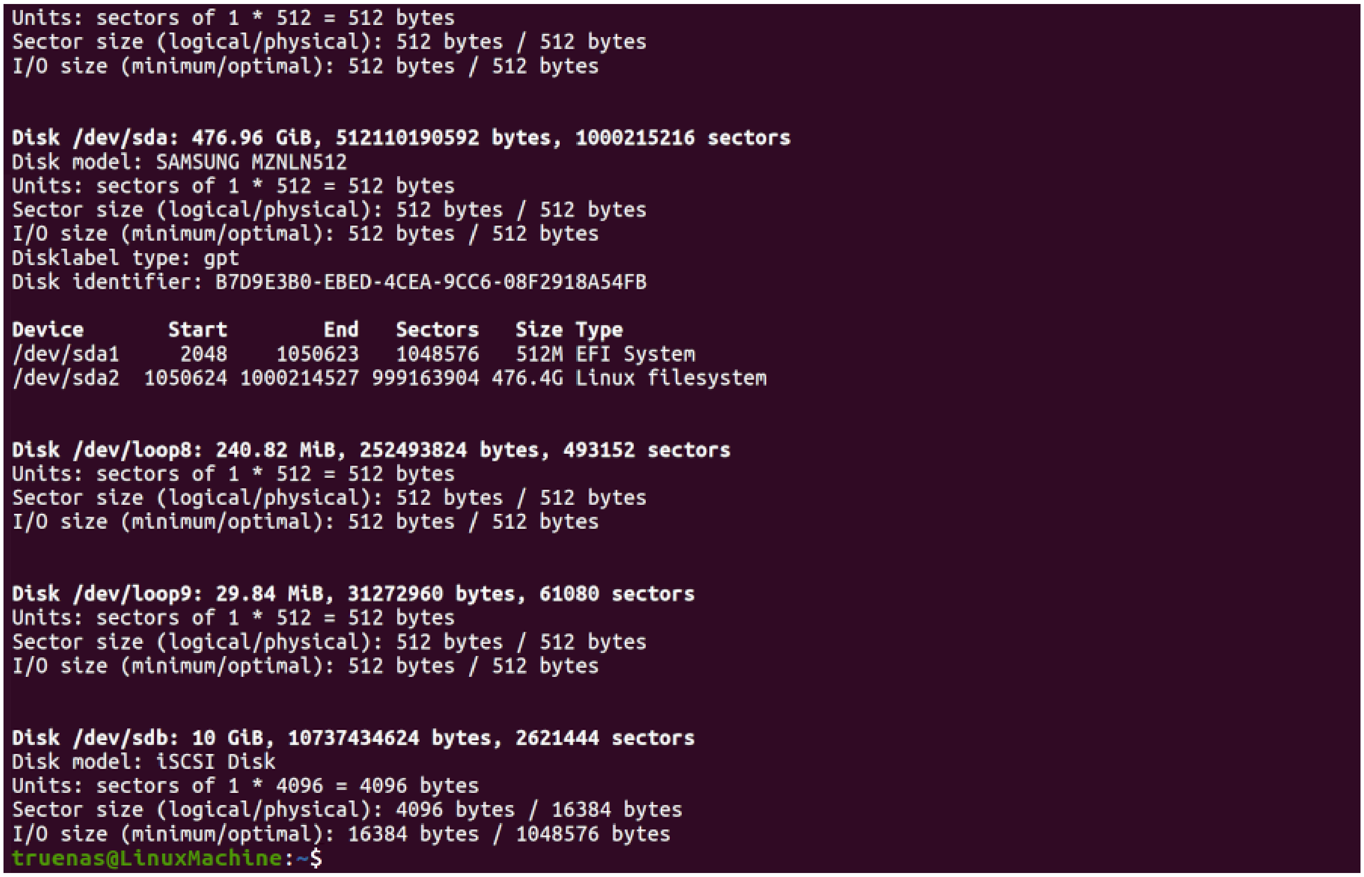
Next, enter `sudo iscsiadm \--mode node \--targetname {BASENAME}:{TARGETNAME} \--portal {IPADDRESS} \--login`, where *{BASENAME}* and *{TARGETNAME}* is the information from the discovery command.



```
truenas@LinuxMachine:~$ sudo iscsiadm \--mode discovery \--type sendtargets \--portal freenas.local
freenas.local:3260,-1 iqn.2005-10.org.freenas.ctl:iscsi.share
truenas@LinuxMachine:~$ sudo iscsiadm \--mode node \--targetname iqn.2005-10.org.freenas.ctl:iscsi.
share \--portal freenas.local \--login
Loggin in to [iface: default, target: iqn.2005-10.org.freenas.ctl:iscsi.share, portal: freenas.loca
l,3260] (multiple)
Login to [iface: default, target: iqn.2005-10.org.freenas.ctl:iscsi.share, portal: freenas.local,32
60] successful.
truenas@LinuxMachine:~$
```

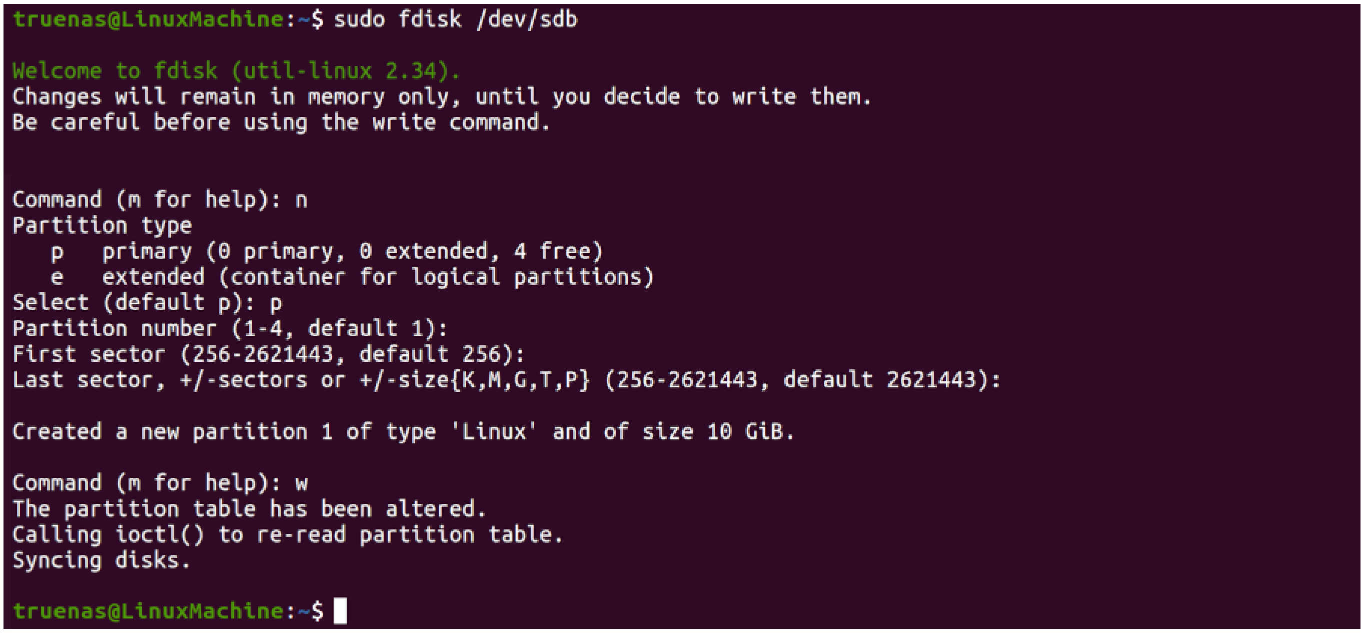
Partition iSCSI Disk

When the iSCSI share login succeeds, the device shared through iSCSI shows on the Linux system as an *iSCSI Disk*. To view a list of connected disks in Linux, enter `sudo fdisk -l`.



```
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes


Disk /dev/sda: 476.96 GiB, 512110190592 bytes, 1000215216 sectors
Disk model: SAMSUNG MZNLN512
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes
Disklabel type: gpt
Disk identifier: B7D9E3B0-EBED-4CEA-9CC6-08F2918A54FB

Device       Start        End   Sectors   Size Type
/dev/sda1     2048    1050623   1048576   512M EFI System
/dev/sda2  1050624 1000214527 999163904 476.4G Linux filesystem


Disk /dev/loop8: 240.82 MiB, 252493824 bytes, 493152 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes


Disk /dev/loop9: 29.84 MiB, 31272960 bytes, 61080 sectors
Units: sectors of 1 * 512 = 512 bytes
Sector size (logical/physical): 512 bytes / 512 bytes
I/O size (minimum/optimal): 512 bytes / 512 bytes


Disk /dev/sdb: 10 GiB, 10737434624 bytes, 2621444 sectors
Disk model: iSCSI Disk
Units: sectors of 1 * 4096 = 4096 bytes
Sector size (logical/physical): 4096 bytes / 16384 bytes
I/O size (minimum/optimal): 16384 bytes / 1048576 bytes
truenas@LinuxMachine:~$
```

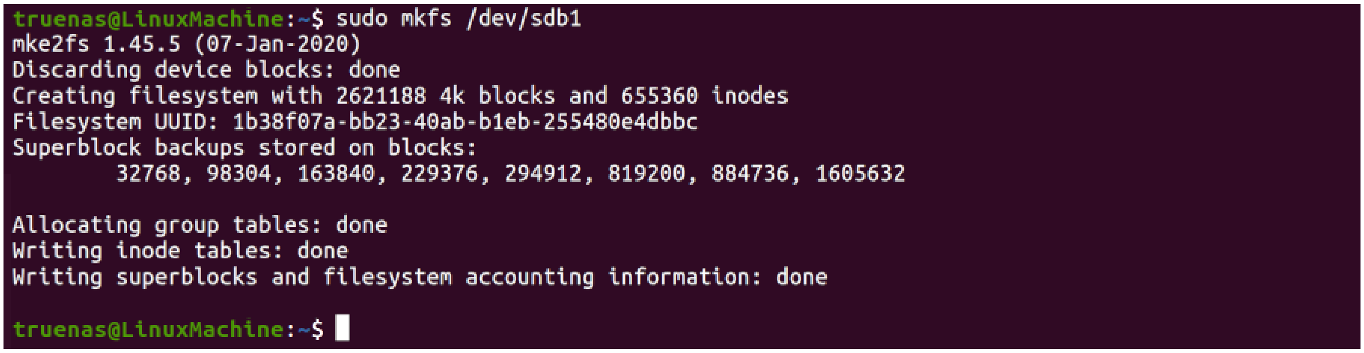
Because the connected iSCSI disk is raw, you must partition it. Identify the iSCSI device in the list and enter `sudo fdisk {/PATH/TO/iSCSIDEVICE}`.



```
truenas@LinuxMachine:~$ sudo fdisk /dev/sdb

Welcome to fdisk (util-linux 2.34).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.


Command (m for help): n
Partition type
   p   primary (0 primary, 0 extended, 4 free)
   e   extended (container for logical partitions)
Select (default p): p
Partition number (1-4, default 1):
First sector (256-2621443, default 256):
Last sector, +/-sectors or +/-size{K,M,G,T,P} (256-2621443, default 2621443):

Created a new partition 1 of type 'Linux' and of size 10 GiB.

Command (m for help): w
The partition table has been altered.
Calling ioctl() to re-read partition table.
Syncing disks.

truenas@LinuxMachine:~$ 
```

Shell lists the iSCSI device path in the `sudo fdisk -l` output. Use the `fdisk` command defaults when partitioning the disk.

Remember to type `w` when finished partitioning the disk. The `w` command tells `fdisk` to save any changes before quitting.

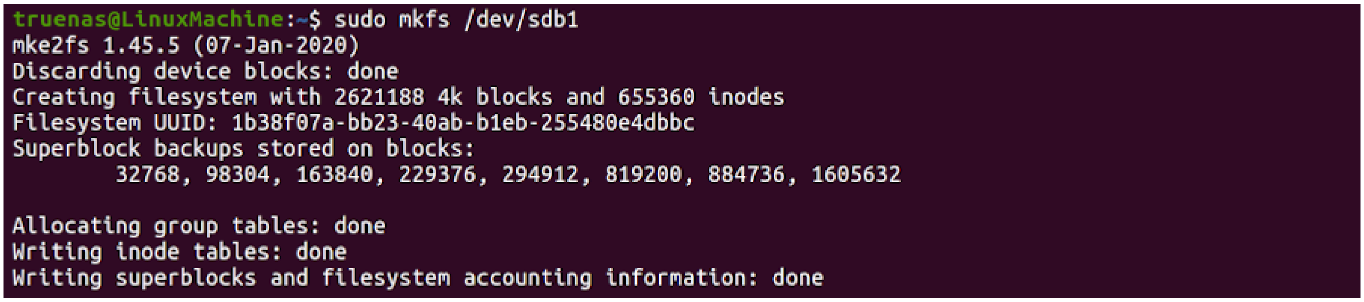


```
truenas@LinuxMachine:~$ sudo mkfs /dev/sdb1
mke2fs 1.45.5 (07-Jan-2020)
Discarding device blocks: done
Creating filesystem with 2621188 4k blocks and 655360 inodes
Filesystem UUID: 1b38f07a-bb23-40ab-b1eb-255480e4dbbc
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632

Allocating group tables: done
Writing inode tables: done
Writing superblocks and filesystem accounting information: done

truenas@LinuxMachine:~$ 
```

After creating the partition on the iSCSI disk, a partition slice displays on the device name. For example, /dev/sdb1. Enter `fdisk -l` to see the new partition slice.

Make a Filesystem on the iSCSI Disk

Finally, use `mkfs` to make a filesystem on the device's new partition slice. To create the default filesystem (ext2), enter `sudo mkfs {/PATH/TO/iSCSIDEVICEPARTITIONSLICE}`.



```
truenas@LinuxMachine:~$ sudo mkfs /dev/sdb1
mke2fs 1.45.5 (07-Jan-2020)
Discarding device blocks: done
Creating filesystem with 2621188 4k blocks and 655360 inodes
Filesystem UUID: 1b38f07a-bb23-40ab-b1eb-255480e4dbbc
Superblock backups stored on blocks:
        32768, 98304, 163840, 229376, 294912, 819200, 884736, 1605632

Allocating group tables: done
Writing inode tables: done
Writing superblocks and filesystem accounting information: done
```

Mount the iSCSI Device

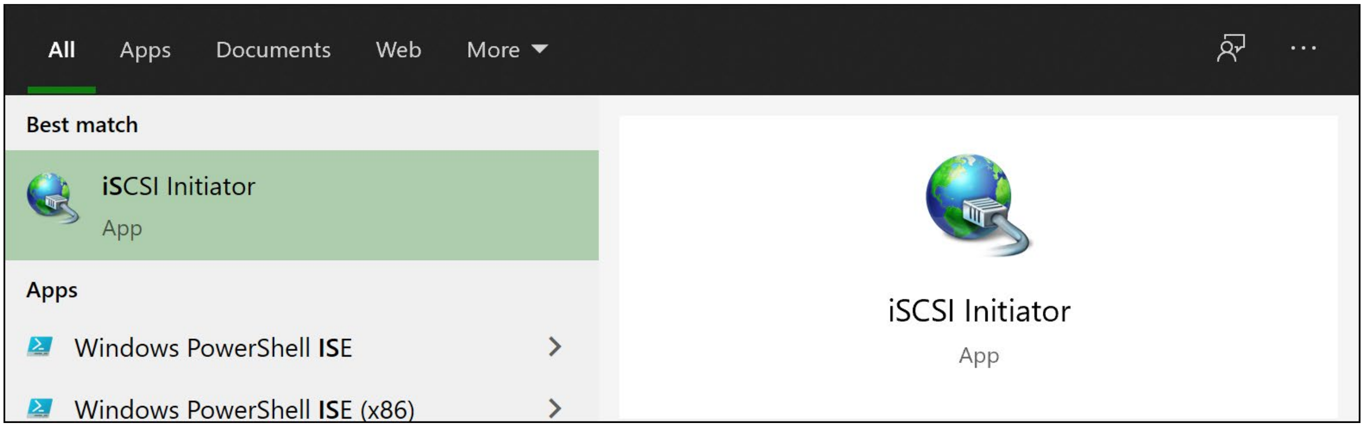
Now the iSCSI device can mount and share data. Enter `sudo mount`

`{/PATH/TO/iSCSIDEVICEPARTITIONSLICE}`. For example, `sudo mount /dev/sdb1 /mnt` mounts the iSCSI device *sdb1* to /mnt.

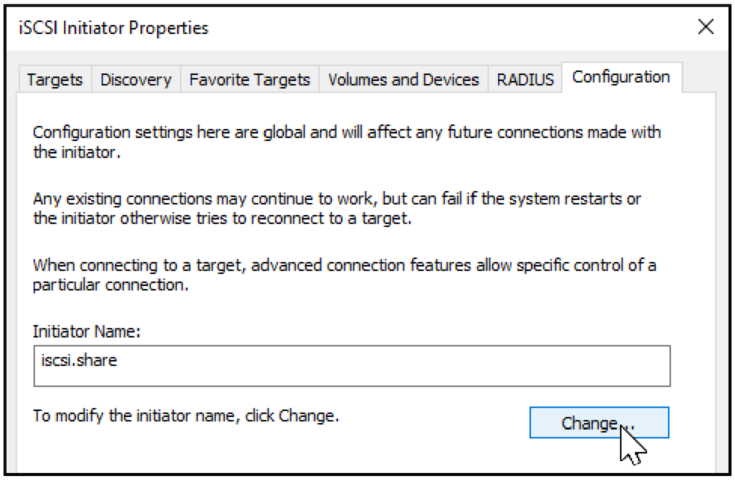
- **Windows**

To access the data on the iSCSI share, clients will need to use iSCSI Initiator software. An iSCSI Initiator client is pre-installed in Windows 7 to 10 Pro, and Windows Server 2008, 2012, and 2019. Windows Professional Edition is usually required.

First, click the Start Menu and search for the *iSCSI Initiator* application.



Next, go to the **Configuration** tab and click **Change** to change the iSCSI initiator to the same name created earlier. Click **OK**.



Configuration settings here are global and will affect any future connections made with the initiator.

Any existing connections may continue to work, but can fail if the system restarts or the initiator otherwise tries to reconnect to a target.

When connecting to a target, advanced connection features allow specific control of a particular connection.

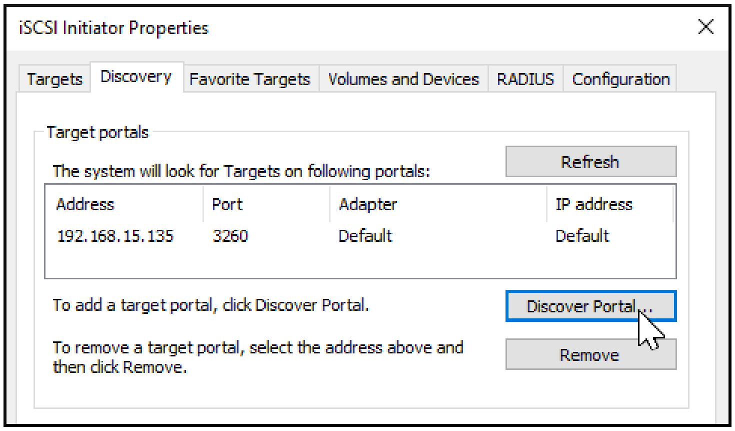
Initiator Name: iscsi.share

To modify the initiator name, click Change.

Next, switch to the **Discovery Tab**, click **Discover Portal**, and type in the TrueNAS IP address.

- If TrueNAS changed the port number from the default *3260*, enter the new port number.
- If you set up CHAP when creating the iSCSI share, click **Advanced...**, set *Enable CHAP log on*, and enter the initiator name and the same target/secret set earlier in TrueNAS.

Click **OK**.



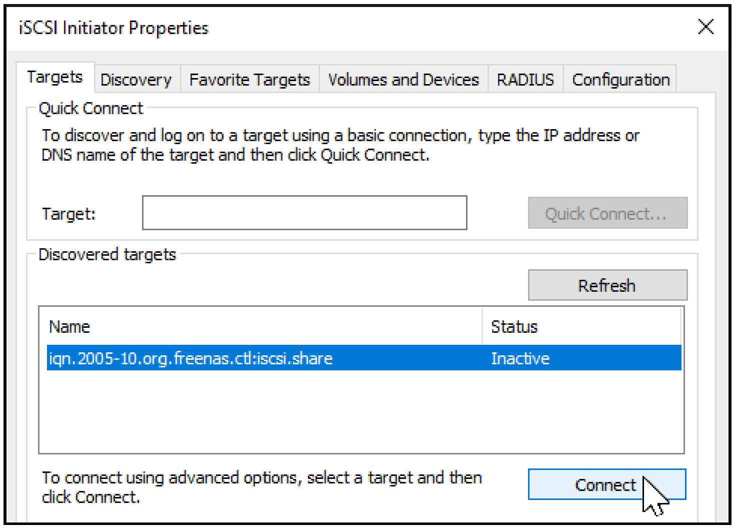
The system will look for Targets on following portals:

Address	Port	Adapter	IP address
192.168.15.135	3260	Default	Default

To add a target portal, click Discover Portal.

To remove a target portal, select the address above and then click Remove.

Go to the **Targets** tab, highlight the iSCSI target, and click **Connect**.



To discover and log on to a target using a basic connection, type the IP address or DNS name of the target and then click Quick Connect.

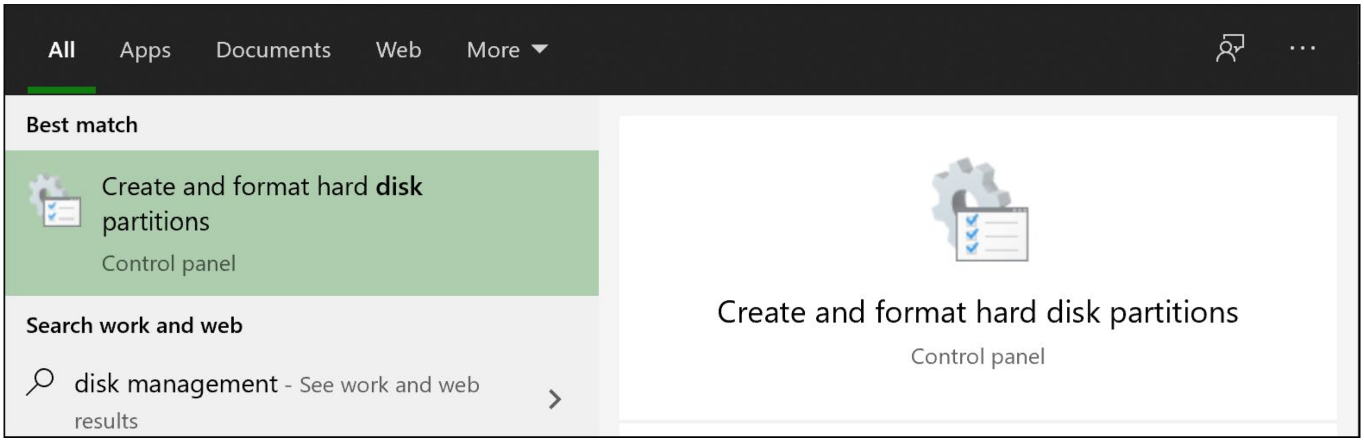
Target:

Name	Status
iqn.2005-10.org.freenas.ctl:iscsi.share	Inactive

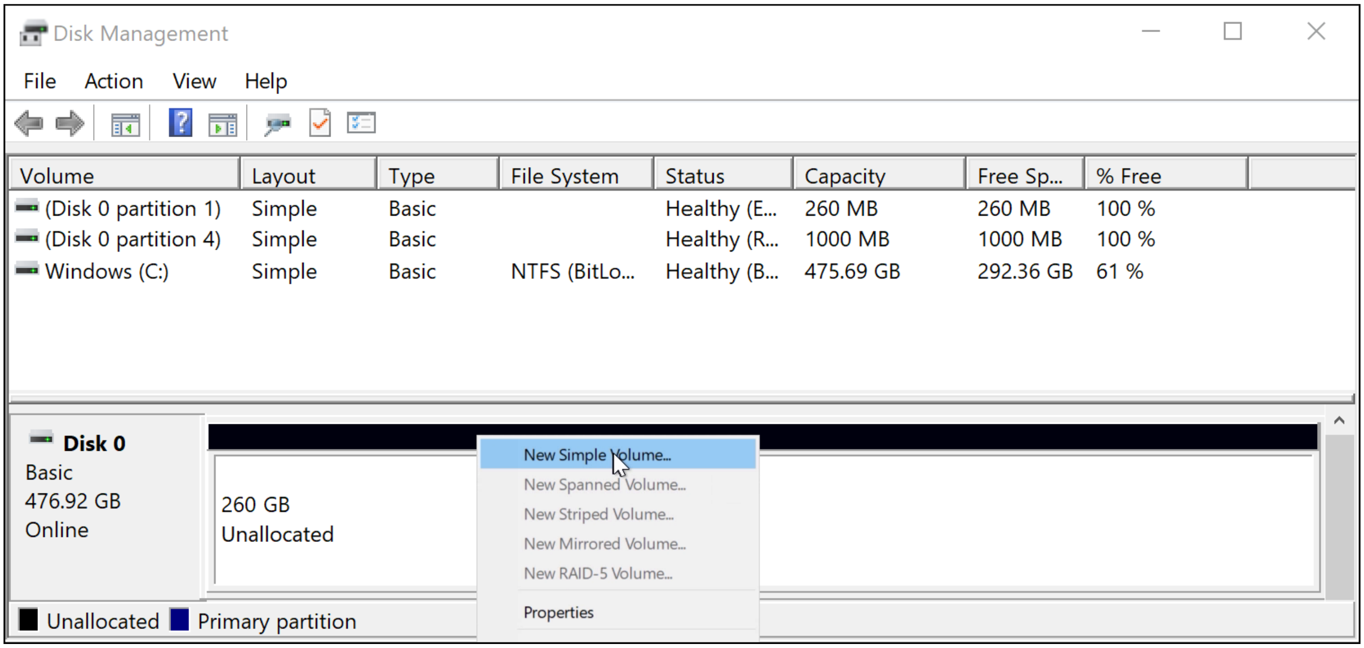
To connect using advanced options, select a target and then click Connect.

After Windows connects to the iSCSI target, you can partition the drive.

Search for and open the *Disk Management* app.


All
Apps
Documents
Web
More
Best match
Create and format hard **disk** partitions
Control panel
Search work and web
disk management - See work and web results
Create and format hard disk partitions
Control panel

Your drive should currently be *unallocated*. Right-click the drive and click **New Simple Volume…**.



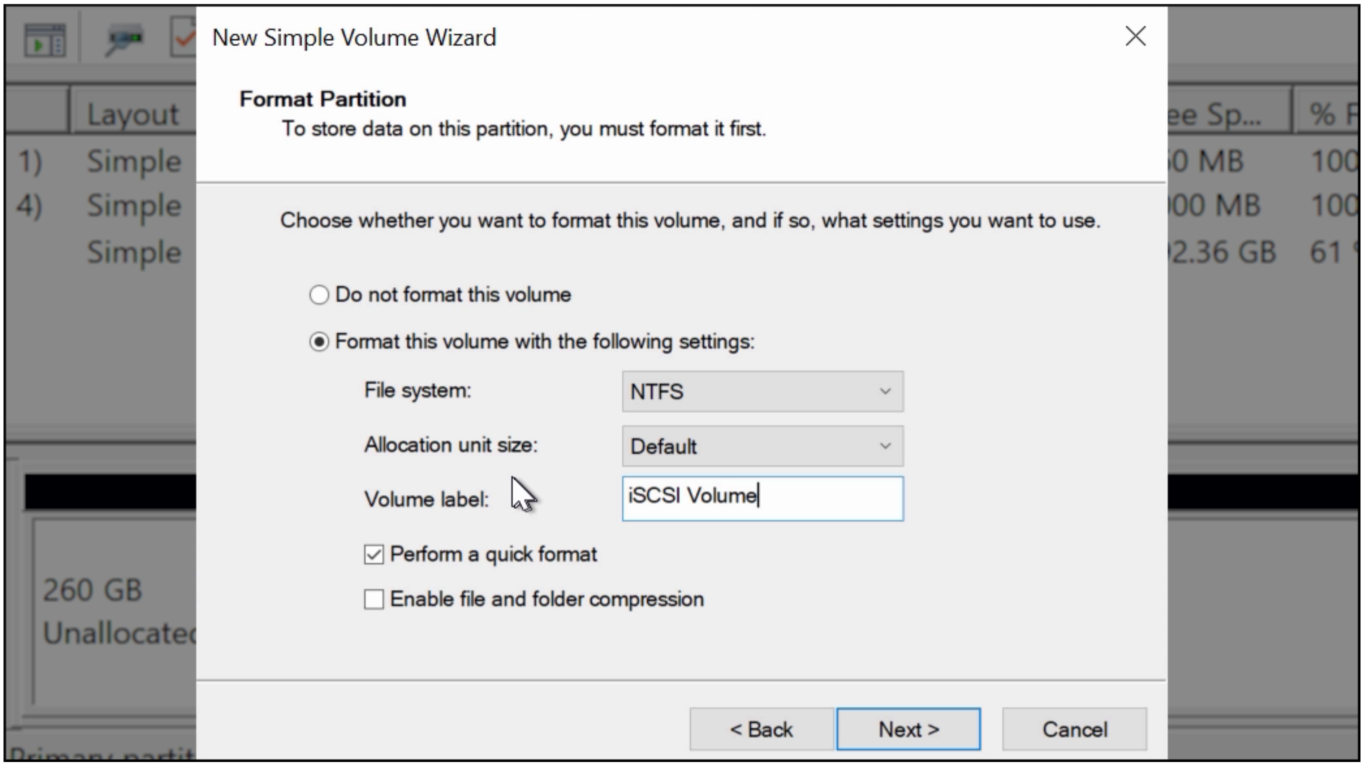
Volume	Layout	Type	File System	Status	Capacity	Free Sp...	% Free
(Disk 0 partition 1)	Simple	Basic		Healthy (E...	260 MB	260 MB	100 %
(Disk 0 partition 4)	Simple	Basic		Healthy (R...	1000 MB	1000 MB	100 %
Windows (C:)	Simple	Basic	NTFS (BitLo...	Healthy (B...	475.69 GB	292.36 GB	61 %

Disk 0
Basic
476.92 GB
Online

260 GB
Unallocated

■ Unallocated ■ Primary partition

Complete the Wizard to format the drive and assign a drive letter and name.



New Simple Volume Wizard

Format Partition
To store data on this partition, you must format it first.

Choose whether you want to format this volume, and if so, what settings you want to use.

○ Do not format this volume

● Format this volume with the following settings:

File system: NTFS

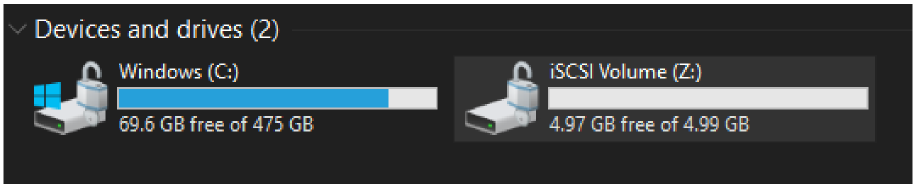
Allocation unit size: Default

Volume label: iSCSI Volume

☑ Perform a quick format

□ Enable file and folder compression

Finally, go to *This PC* or *My Computer* in File Explorer. The new iSCSI volume should show up under the list of drives. You should now be able to add, delete, and modify files and folders on your iSCSI drive.



Devices and drives (2)

Windows (C:)
69.6 GB free of 475 GB

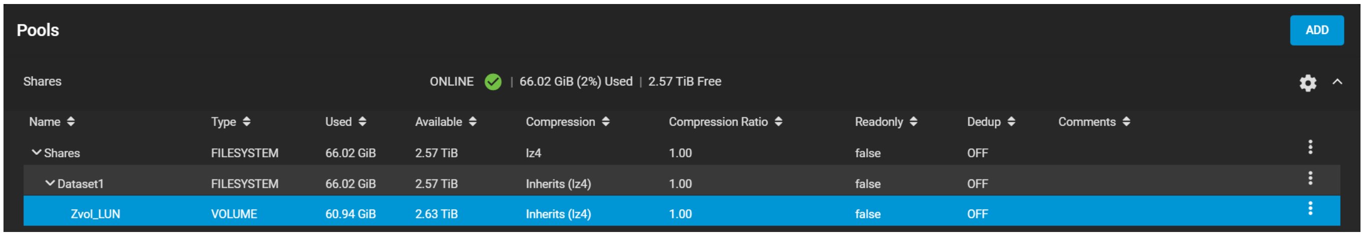
iSCSI Volume (Z:)
4.97 GB free of 4.99 GB

Expanding LUNs

TrueNAS lets users expand Zvol and file-based LUNs to increase the available storage that the iSCSI shares.

⊙ Zvol LUN

To expand a Zvol LUN, go to **Storage > Pools** and click the more_vert next to the Zvol LUN, then select *Edit Zvol*.



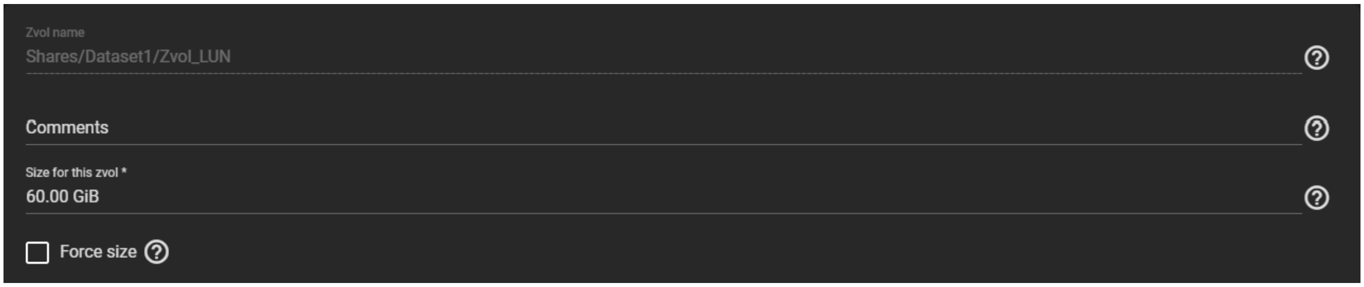
Pools

ADD

Shares — ONLINE ✓ | 66.02 GiB (2%) Used | 2.57 TiB Free

Name	Type	Used	Available	Compression	Compression Ratio	Readonly	Dedup	Comments
Shares	FILESYSTEM	66.02 GiB	2.57 TiB	lz4	1.00	false	OFF	
Dataset1	FILESYSTEM	66.02 GiB	2.57 TiB	Inherits (lz4)	1.00	false	OFF	
Zvol_LUN	VOLUME	60.94 GiB	2.63 TiB	Inherits (lz4)	1.00	false	OFF	

Enter a new size in the *Size for this zvol* field, then click *SAVE*.



Zvol name
Shares/Dataset1/Zvol_LUN

Comments

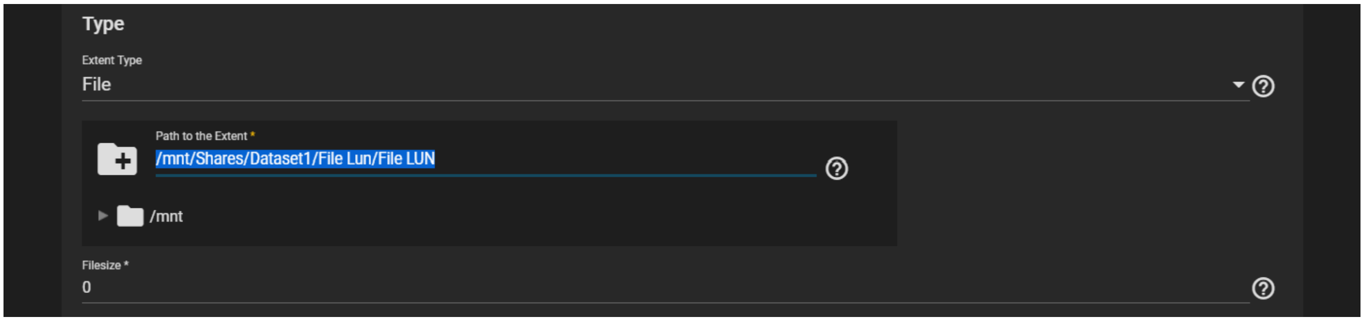
Size for this zvol *
60.00 GiB

□ Force size

To prevent data loss, the web interface does not allow users to reduce the Zvol's size. TrueNAS also does not allow users to increase the Zvol's size past 80% of the pool size.

○ File LUN

To expand a file-based LUN, you will need to know the path to the file. You can find the path by going to **Sharing > Block Shares (iSCSI)** and clicking the *Extents* tab. Click the more_vert next to the file-based LUN and select *Edit*.



Type

Extent Type
File

Path to the Extent *
/mnt/Shares/Dataset1/File Lun/File LUN

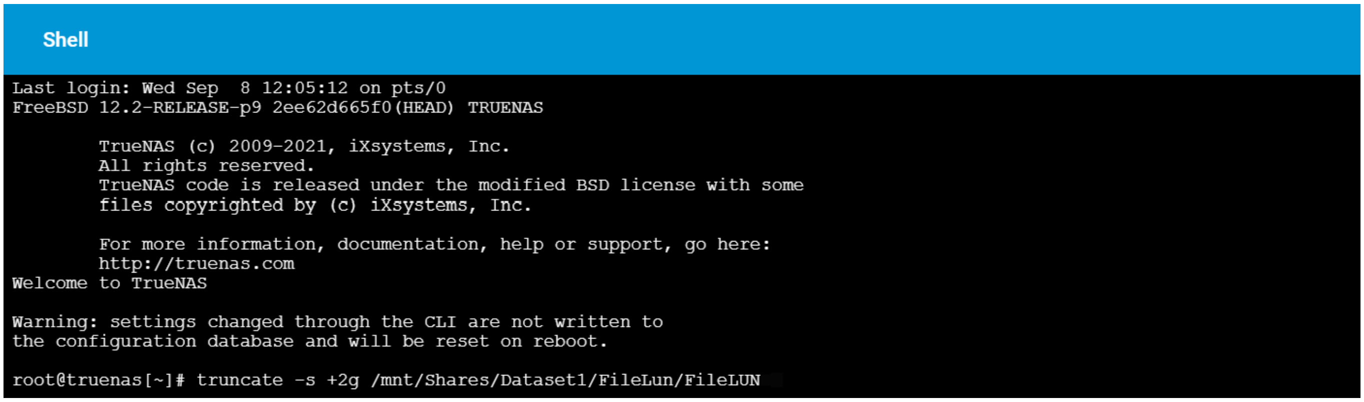
/mnt

Filesize *
0

Highlight and copy the path, then click *CANCEL*

Go to **Shell** and input `truncate -s +[size] [path to file]`, then press `Enter`.

The *[size]* is how much space you want to grow the file by, and the *[path to file]* is the file path you copied earlier.



```
Last login: Wed Sep  8 12:05:12 on pts/0
FreeBSD 12.2-RELEASE-p9 2ee62d665f0(HEAD) TRUENAS

        TrueNAS (c) 2009-2021, iXsystems, Inc.
        All rights reserved.
        TrueNAS code is released under the modified BSD license with some
        files copyrighted by (c) iXsystems, Inc.

        For more information, documentation, help or support, go here:
        http://truenas.com
Welcome to TrueNAS

Warning: settings changed through the CLI are not written to
the configuration database and will be reset on reboot.

root@truenas[~]# truncate -s +2g /mnt/Shares/Dataset1/FileLun/FileLUN
```

An example of the command could look like this: `truncate -s +2g /mnt/Shares/Dataset1/FileLun/FileLUN`

Lastly, go back to the extent in **Sharing > Block Shares (iSCSI)** and make sure the *Filesize* is set to *0* so that the share uses the actual file size.

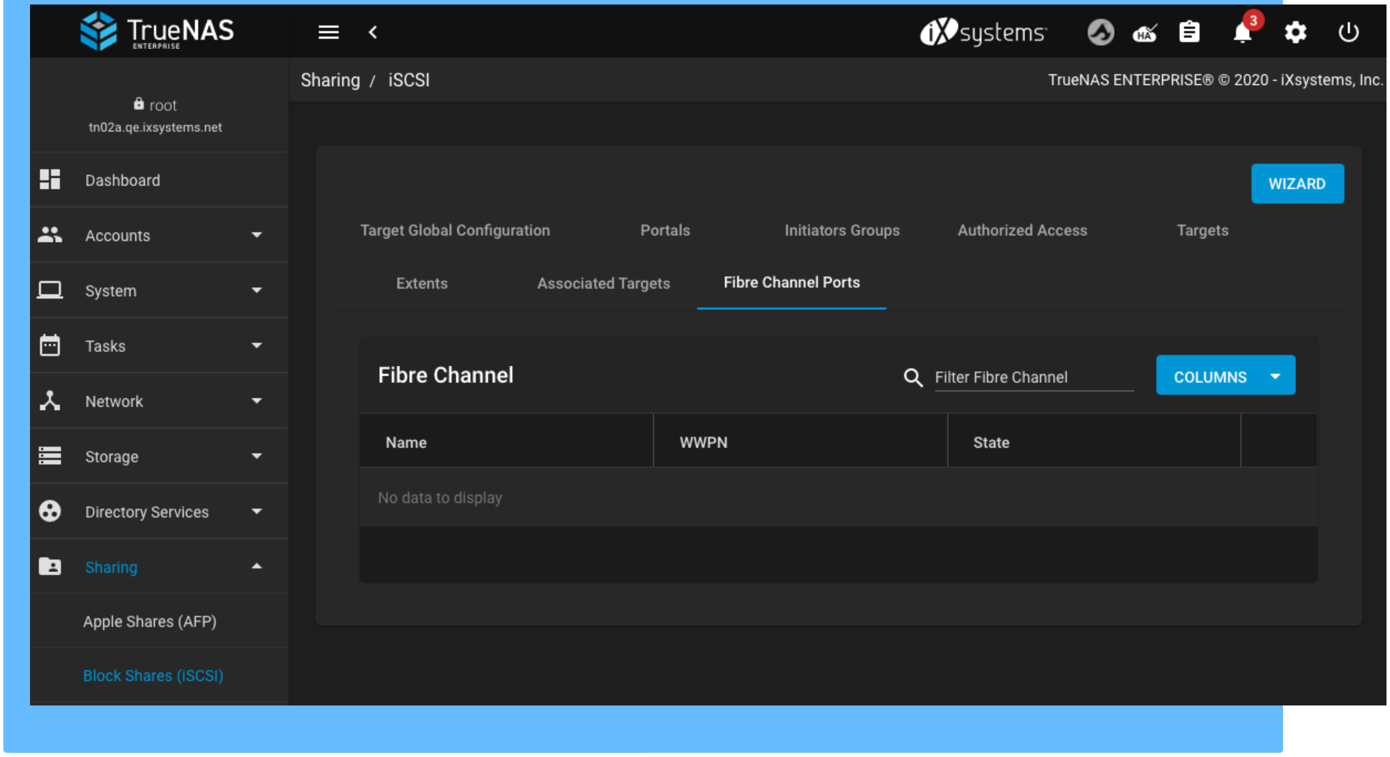
8.2.2 - Fibre Channel

Fibre Channel is a high-speed data transfer protocol providing in-order, lossless delivery of raw block data. Fibre Channel is primarily used to connect computer data storage to servers in storage area networks in commercial data centers. The Fibre Channel protocol is fast, cost effective, and reliable over a wide variety of storage workloads.

Which TrueNAS Products can use Fibre Channel? expand □

- TrueNAS R-Series(4x16 Gbps)
- TrueNAS X-10(2x8 Gbps)
- TrueNAS X-20(2x8 Gbps)
- TrueNAS M-40(4x16 Gbps)
- TrueNAS M-50(4x16 Gbps or 2x32 Gbps)
- TrueNAS M-60(4x32 Gbps)

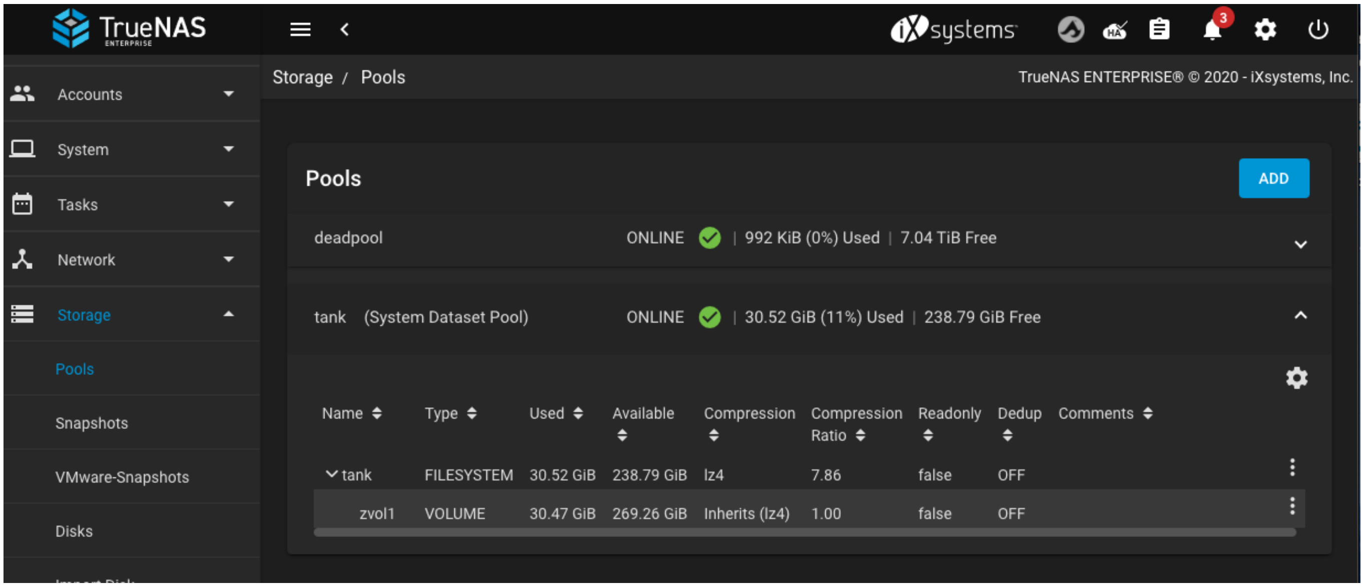
This is a TrueNAS Enterprise feature. TrueNAS systems licensed for Fibre Channel have *Fibre Channel Ports* added to **Sharing > Block Shares (iSCSI)**.



Fibre Channel ISCSI Share Example

Initiators and **Authorized Access** screens only apply to iSCSI and can be ignored when configuring Fibre Channel.

Go to **Storage > Pools**. Find an existing pool, click □ and *Add zvol* to create a new zvol.



Pools

deadpool ONLINE | 992 KiB (0%) Used | 7.04 TiB Free

tank (System Dataset Pool) ONLINE | 30.52 GiB (11%) Used | 238.79 GiB Free

Name	Type	Used	Available	Compression	Compression Ratio	Readonly	Dedup	Comments
tank	FILESYSTEM	30.52 GiB	238.79 GiB	lz4	7.86	false	OFF	
zvol1	VOLUME	30.47 GiB	269.26 GiB	Inherits (lz4)	1.00	false	OFF	

Configure these tabs in **Sharing > Block Shares (iSCSI)**:

◉ **Portals**

If a portal with listen interface `0.0.0.0:3260` does not exist, click *Add* and add this portal.

○ **Initiators Groups**

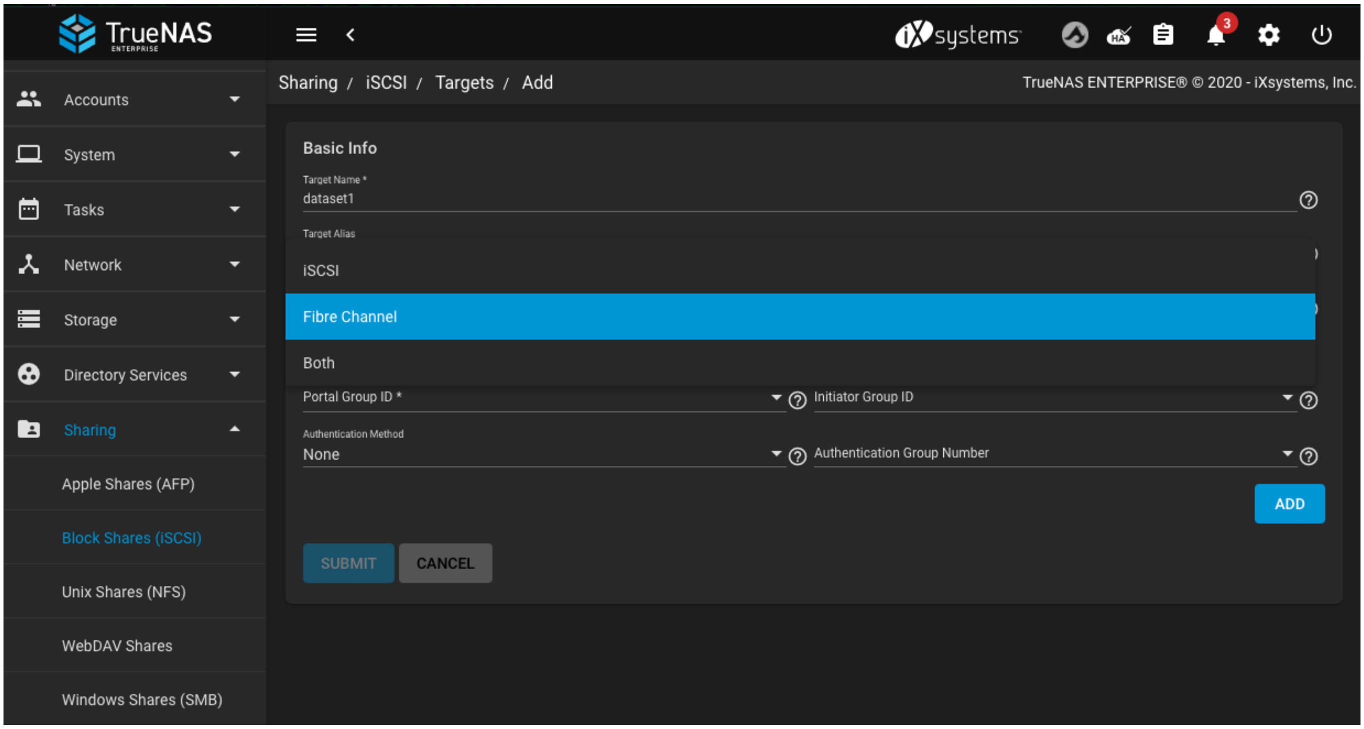
Name	Description
Connected Initiators	Initiators currently connected to the system. Shown in IQN format with an IP address. Set initiators and click an -> (arrow) to add the initiators to either the Allowed Initiators or Authorized Networks lists. Clicking Refresh updates the Connected Initiators list.
Allowed Initiators	Initiators allowed access to this system. Enter an iSCSI Qualified Name (IQN) and click + to add it to the list. Example: iqn.1994-09.org.freebsd:freenas.local
Authorized Networks	Network addresses allowed use this initiator. Each address can include an optional CIDR netmask. Click + to add the network address to the list. Example: `192.168.2.0/24`.
Description	Any notes about initiators.

○ **Authorized Access**

Name	Description
Group ID	Allow different groups to be configured with different authentication profiles. Example: all users with a group ID of 1 will inherit the authentication profile associated with Group 1.
User	User account to create for CHAP authentication with the user on the remote system. Many initiators use the initiator name as the user name.
Secret	User password. Must be at least 12 and no more than 16 characters long.
Peer User	Only entered when configuring mutual CHAP. Usually the same value as User.
Peer Secret	Mutual secret password. Required when Peer User is set. Must be different than the Secret.

○ **Targets**

Add a new target.



Sharing / iSCSI / Targets / Add

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Basic Info

Target Name * dataset1

Target Alias

iSCSI

Fibre Channel

Both

Portal Group ID *

Initiator Group ID

Authentication Method None

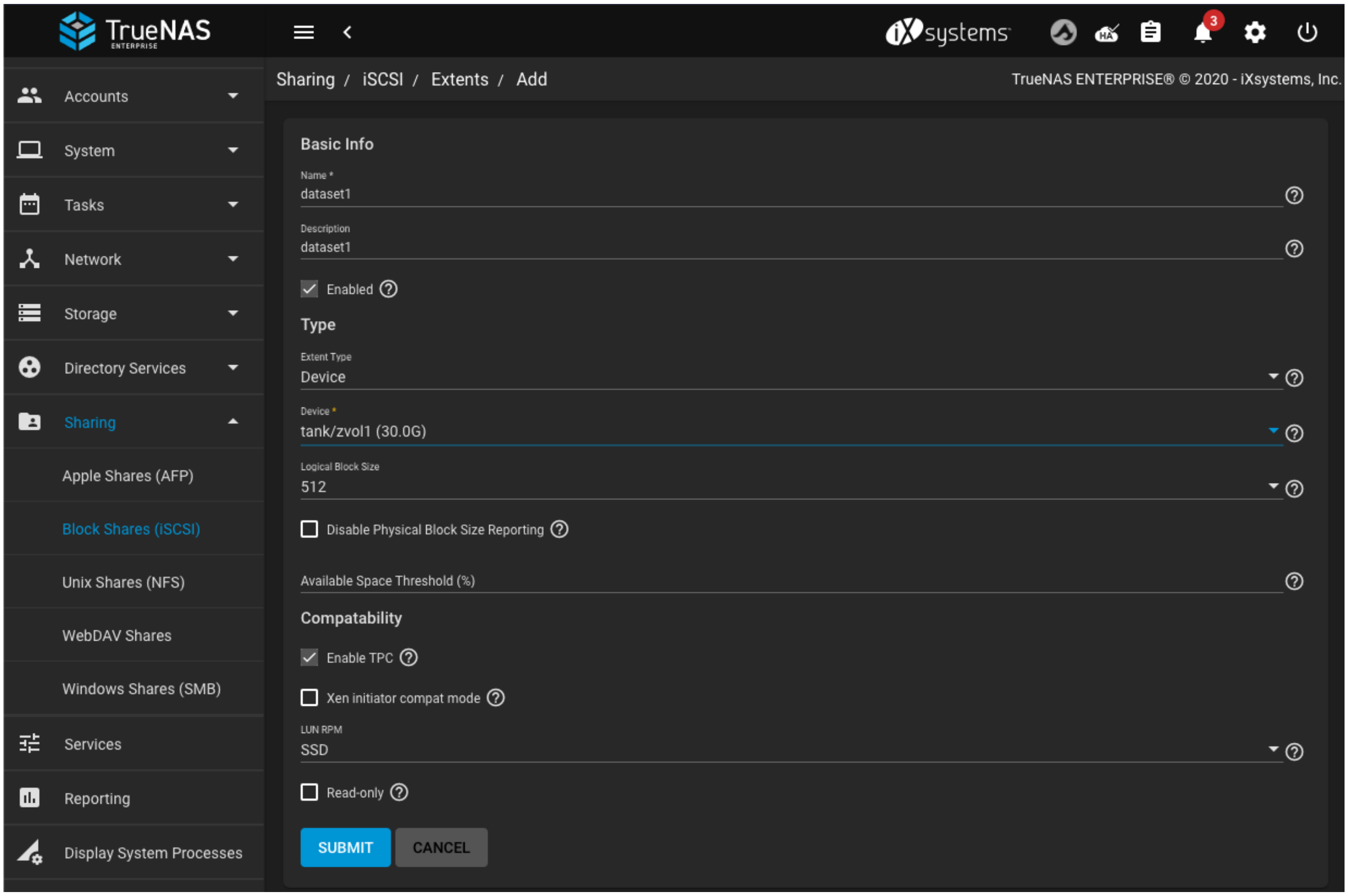
Authentication Group Number

Enter or select values specific to your use case for the *Target Name*, *Target Alias*, *Target Mode*, and *Portal Group*. The *Initiator Group ID* selects which existing initiator group has access to the target. Options for the *Authentication Method* are None, Auto, CHAP, or Mutual CHAP. *Authentication Group Number* can be set to none or an integer. This value represents the number of existing authorized accesses.

> An extra *Target Mode* option appears after going to *Targets* and clicking *ADD*. This new option is to select whether the target to create is iSCSI, Fibre Channel, or both.
>
> The *Target* Reporting tab provides Fibre Channel port bandwidth graphs.

○ Extents

Add a new extent.



Sharing / iSCSI / Extents / Add

Basic Info

Name *
dataset1

Description
dataset1

☑ Enabled

Type

Extent Type
Device

Device *
tank/zvol1 (30.0G)

Logical Block Size
512

☐ Disable Physical Block Size Reporting

Available Space Threshold (%)

Compatability

☑ Enable TPC

☐ Xen initiator compat mode

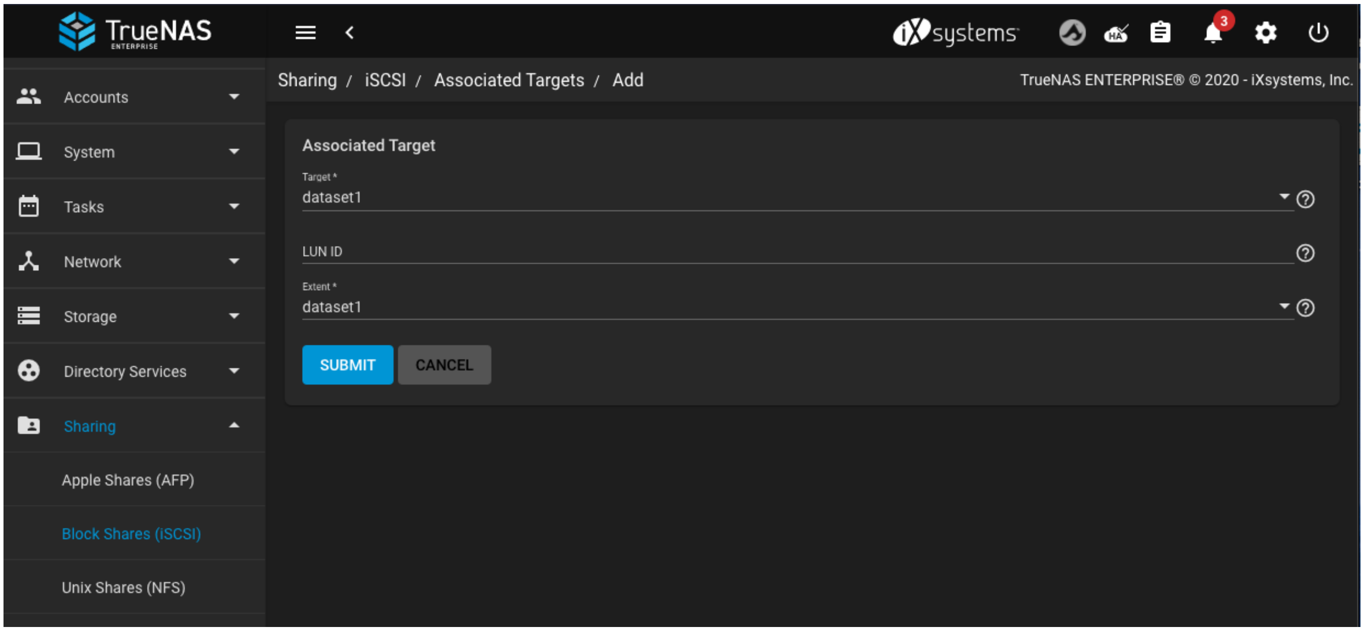
LUN RPM
SSD

☐ Read-only

Name	Description
Name	Name of the extent. If the Extent size is not 0, it cannot be an existing file within the pool or dataset.
Description	Notes about this extent.
Enabled	Set to enable the iSCSI extent.
Extent Type	Device provides virtual storage access to zvols, zvol snapshots, or physical devices. File provides virtual storage access to a single file.
Device	Only appears if Device is selected. Select the unformatted disk, controller, or zvol snapshot.
Logical Block Size	Leave at the default of 512 unless the initiator requires a different block size.
Disable Physical Block Size Reporting	Set if the initiator does not support physical block size values over 4K (MS SQL).
Enable TPC	Set to allow an initiator to bypass normal access control and access any scannable target. This allows xcopy operations which are otherwise blocked by access control.
Xen initiator compat mode	Set when using Xen as the iSCSI initiator.
LUN RPM	Do NOT change this setting when using Windows as the initiator. Only needs to be changed in large environments where the number of systems using a specific RPM is needed for accurate reporting statistics.
Read-only	Set to prevent the initiator from initializing this LUN.

○ **Associated Targets**

Add a new Associated Target.



Sharing / iSCSI / Associated Targets / Add

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Associated Target

Target *
dataset1

LUN ID

Extent *
dataset1

Select values for *Target* and *Extent*. The LUN ID is a value between 0 and 1023. Some initiators expect a value below 256. Leave this field blank to automatically assign the next available ID.

○ **Fibre Channel Ports**

Click chevron_right to expand the option, select options as presented under test data, and *Save*.

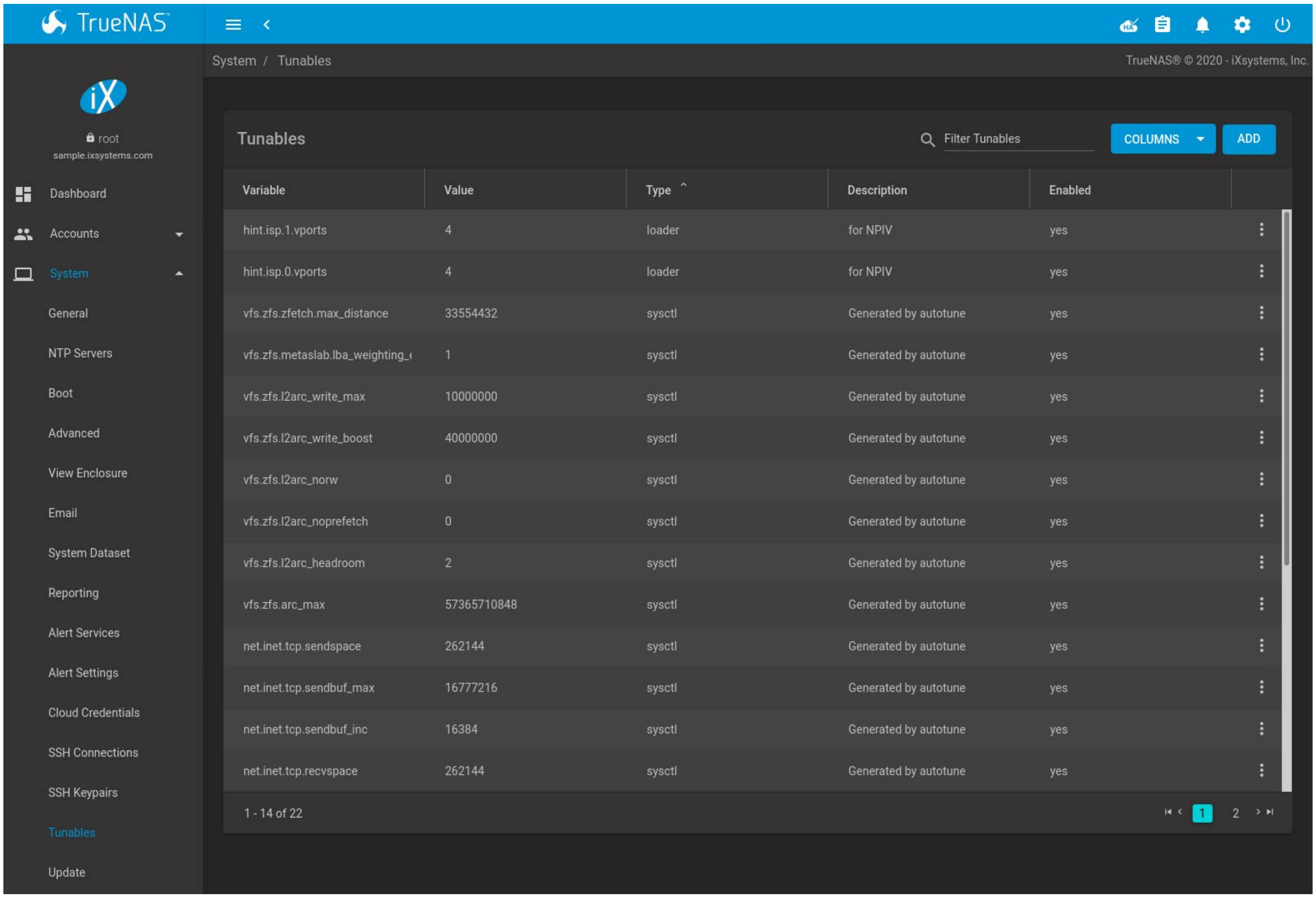
The iSCSI share does not work when the service is not turned on. To turn on the iSCSI service, go to **Services** and toggle **iSCSI**.

NPIV (N_Port ID Virtualization)

NPIV allows the administrator to use switch zoning to configure each virtual port as if it was a physical port in order to provide access control. This is important in an environment with a mix of Windows systems and virtual machines in order to prevent automatic or accidental reformatting of targets containing unrecognized filesystems. It can also be used to segregate data; for example, to prevent the engineering department from accessing data from the human resources department. Refer to the switch documentation for details on how to configure zoning of virtual ports.

To create virtual ports on the TrueNAS system, go to **System > Tunables** and click *ADD*. Enter these options:

- *Variable* : `input hint.isp.X.vports`, replacing *X* with the number of the physical interface.
- *Value* : input the number of virtual ports to create. There cannot be more than *125* SCSI target ports, including all physical Fibre Channel ports, all virtual ports, and all configured combinations of iSCSI portals and targets.
- *Type* : make sure *loader* is selected.



Tunables

Variable	Value	Type	Description	Enabled
hint.isp.1.vports	4	loader	for NPIV	yes
hint.isp.0.vports	4	loader	for NPIV	yes
vfs.zfs.zfetch.max_distance	33554432	sysctl	Generated by autotune	yes
vfs.zfs.metaslab.lba_weighting_	1	sysctl	Generated by autotune	yes
vfs.zfs.l2arc_write_max	10000000	sysctl	Generated by autotune	yes
vfs.zfs.l2arc_write_boost	40000000	sysctl	Generated by autotune	yes
vfs.zfs.l2arc_norw	0	sysctl	Generated by autotune	yes
vfs.zfs.l2arc_noprefetch	0	sysctl	Generated by autotune	yes
vfs.zfs.l2arc_headroom	2	sysctl	Generated by autotune	yes
vfs.zfs.arc_max	57365710848	sysctl	Generated by autotune	yes
net.inet.tcp.sendspace	262144	sysctl	Generated by autotune	yes
net.inet.tcp.sendbuf_max	16777216	sysctl	Generated by autotune	yes
net.inet.tcp.sendbuf_inc	16384	sysctl	Generated by autotune	yes
net.inet.tcp.recvspace	262144	sysctl	Generated by autotune	yes

1 - 14 of 22

In the example shown, two physical interfaces were each assigned *4* virtual ports. Two tunables were required, one for each physical interface. After the tunables are created, the configured number of virtual ports appears in **Sharing > Block Shares (iSCSI) > Fibre Channel Ports** screen so they can be associated with targets. They are also advertised to the switch so zoning can be configured on the switch.

After a virtual port has been associated with a target, it is added to the *Target* tab of Reporting where its bandwidth usage can be viewed.

8.3 - Unix Shares (NFS)

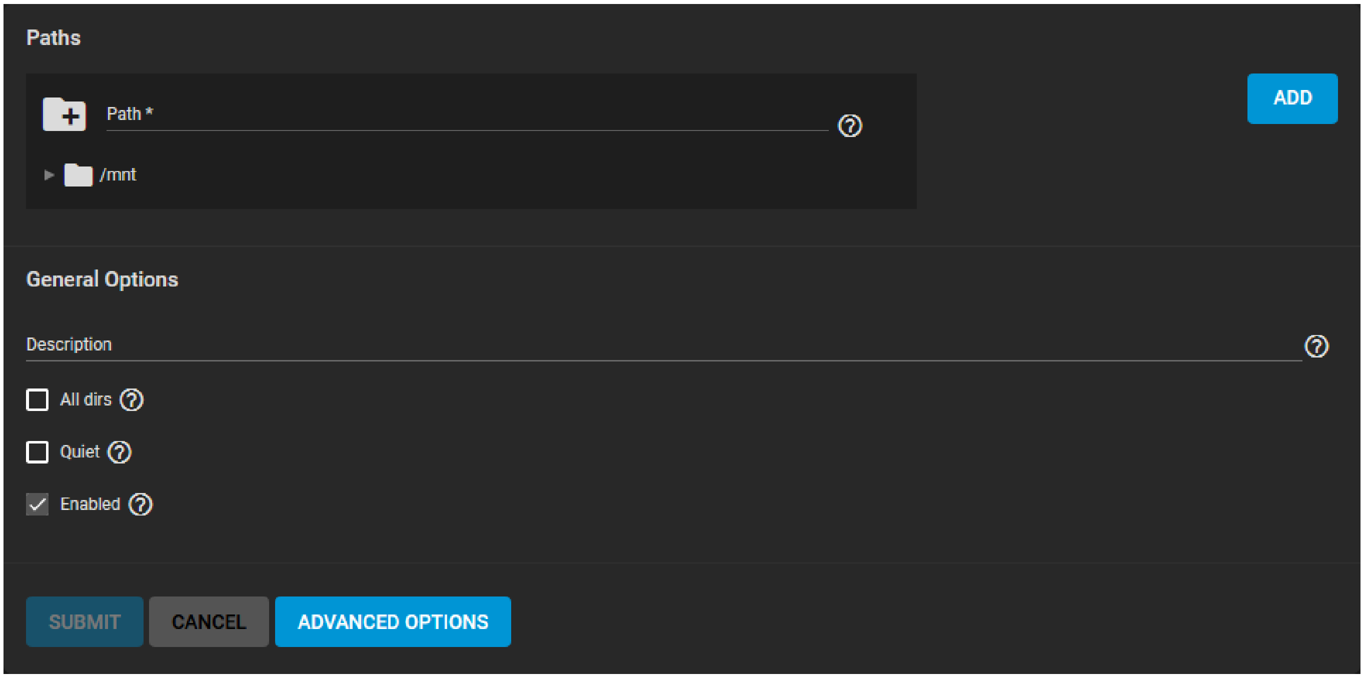
8.3.1 - Share Creation

Creating a Network File System (NFS) share on TrueNAS gives the benefit of making lots of data easily available for anyone with share access. Depending how the share is configured, users accessing the share can be restricted to read or write privileges.

To create a new share, make sure a dataset is available with all the data for sharing.

Creating an NFS Share

Go to **Sharing > Unix Shares (NFS)** and click *ADD*.

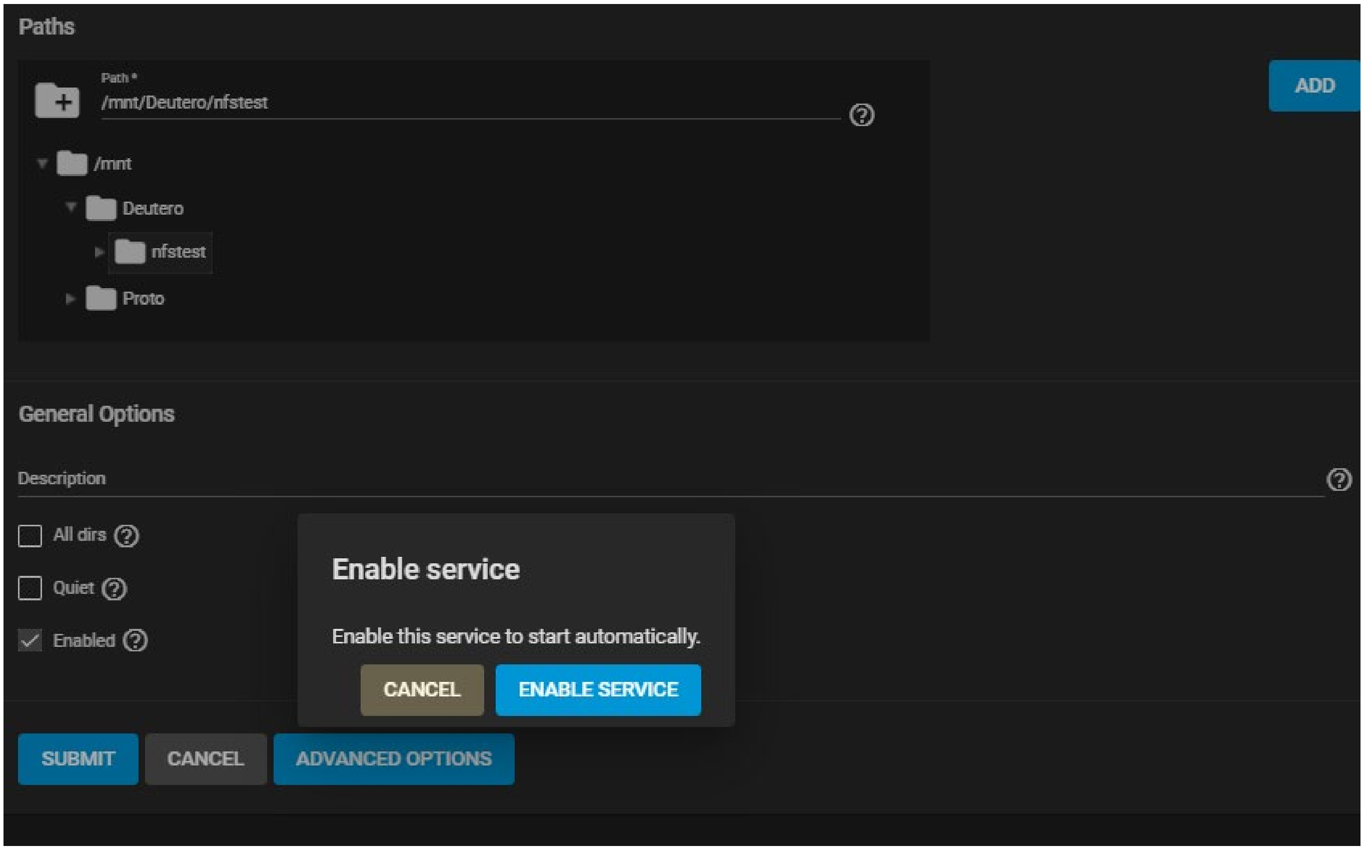


□ All dirs

□ Quiet

☑ Enabled

Use the file browser to select the dataset to be shared. An optional *Description* can be entered to help identify the share. Clicking *SUBMIT* creates the share. At the time of creation, you can select *ENABLE SERVICE* for the service to start and to automatically start after any reboots. If you wish to create the share but not immediately enable it, select *CANCEL*.



Path * /mnt/Deutero/nfstest

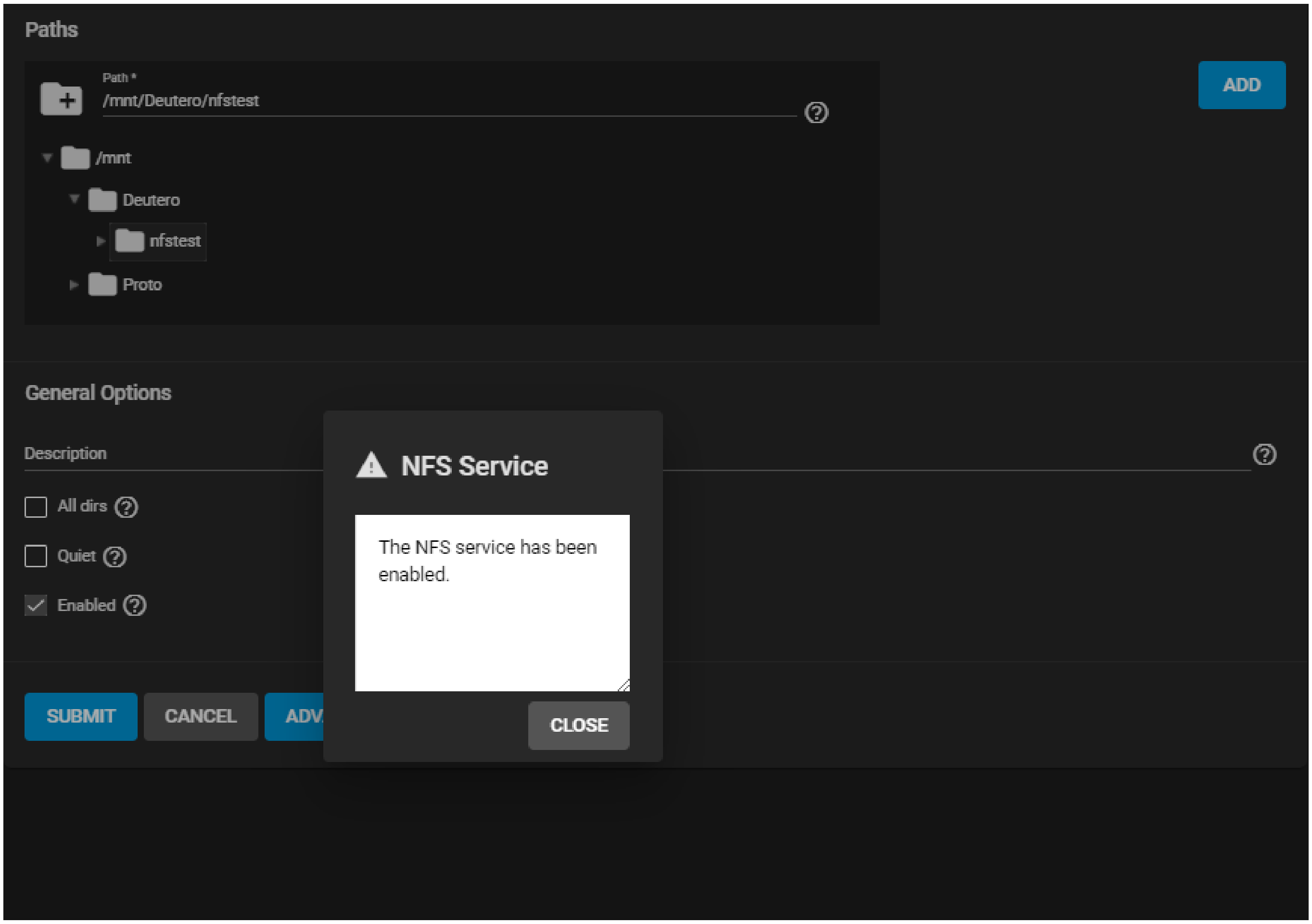
Enable service

Enable this service to start automatically.

☐ All dirs

☐ Quiet

☑ Enabled



Path * /mnt/Deutero/nfstest

NFS Service

The NFS service has been enabled.

☐ All dirs

☐ Quiet

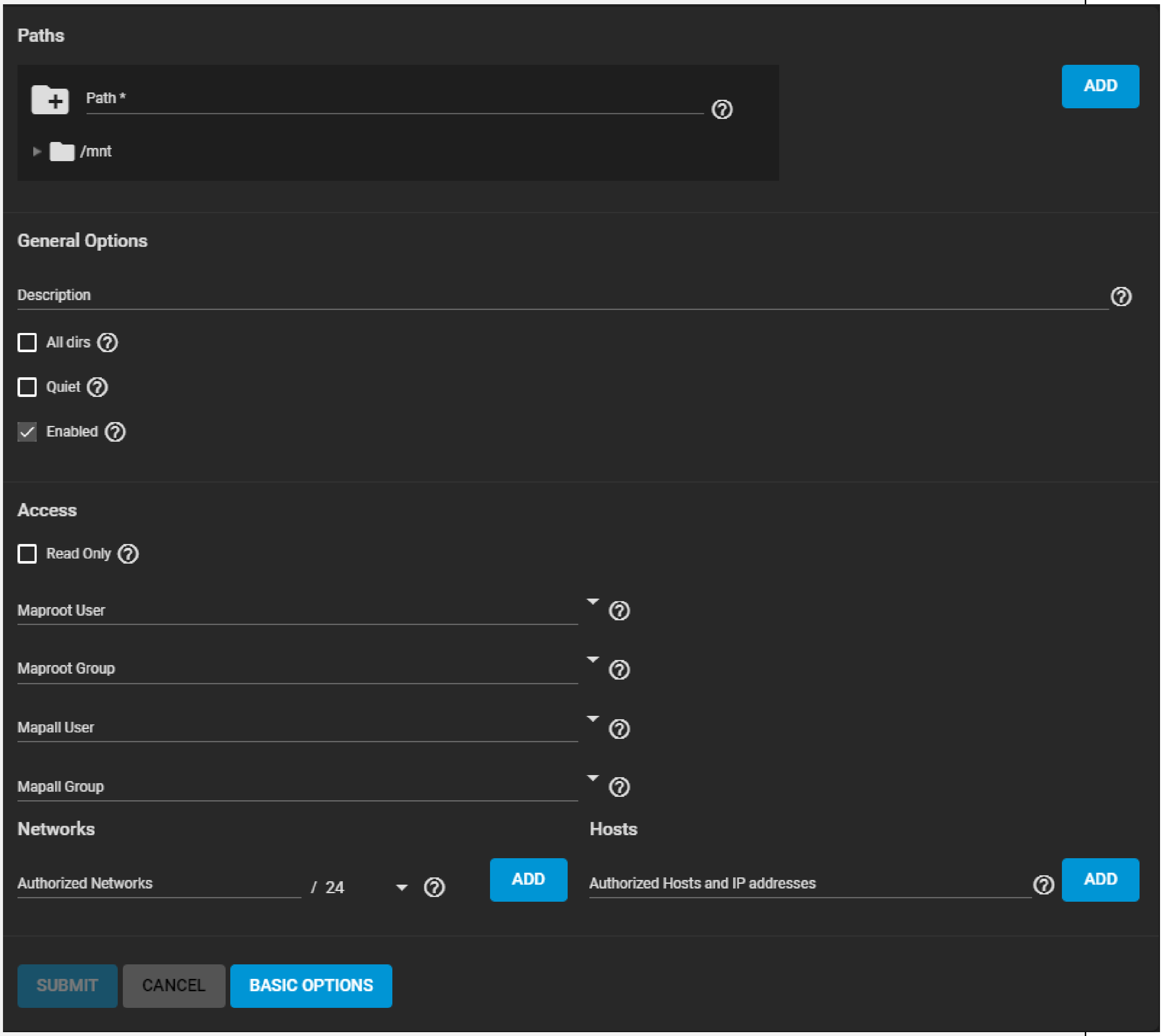
☑ Enabled

NFS Share Settings

Setting	Value	Description
Path	file browser	Type or browse to the full path to the pool or dataset to share. Click **ADD** to configure multiple paths.
Description	string	Enter any notes or reminders about the share.
All dirs	checkbox	Set to allow the client to mount any subdirectory within the **Path**. Leaving disabled only allows clients to mount the **Path** endpoint.
Quiet	checkbox	Enabling inhibits some syslog diagnostics to avoid error messages. See exports(5) for examples. Disabling allows all syslog diagnostics, which can lead to additional cosmetic error messages.
Enabled	checkbox	Enable this NFS share. Unset to disable this NFS share without deleting the configuration.

Advanced Options expand □

Opening the *ADVANCED OPTIONS* allows tuning the share access permissions and defining authorized networks.



Setting	Value	Description

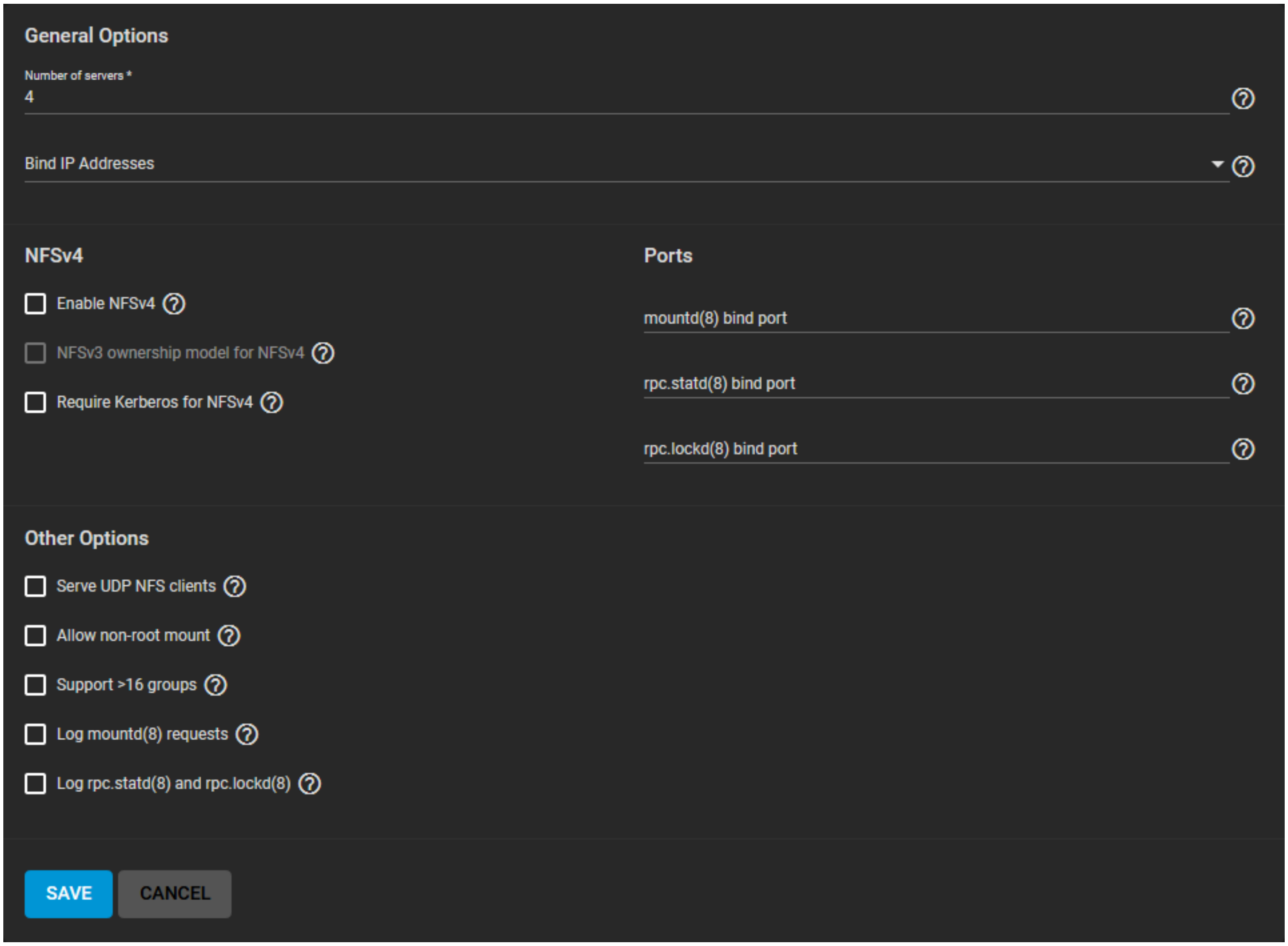
Read Only	checkbox	Prohibits writing to the share when set.
Maproot User	string or drop down	Select a user to apply that user’s permissions to the *root* user.
Maproot Group	string or drop down	Select a group to apply that group’s permissions to the *root* user.
Mapall User	string or drop down	Permissions for the chosen user applied to all clients.
Mapall Group	string or drop down	Permissions for the chosen group are applied to all clients.
Authorized Networks	IP address	Enter an allowed network in network/mask CIDR notation. Click **ADD** to define another authorized network. Defining an authorized network restricts access to all other networks. Leave empty to allow all networks.
Authorized Hosts and IP addresses	string	Enter a hostname or IP address to allow that system access to the NFS share. Click **ADD** to define another allowed system. Defining authorized systems restricts access to all other systems. Leave field empty to allow all systems access to the share.

To edit an existing NFS share, go to **Sharing > Unix Shares (NFS)** and click more_vert **> Edit**. The options available are identical to the share creation options.

Configure the NFS Service

To begin sharing the data, go to **Services** and click the *NFS* toggle. If you want NFS sharing to activate immediately after TrueNAS boots, set *Start Automatically*.

NFS service settings can be configured by clicking (Configure).



General Options

Number of servers * 4

Bind IP Addresses

NFSv4

□ Enable NFSv4

□ NFSv3 ownership model for NFSv4

□ Require Kerberos for NFSv4

Ports

mountd(8) bind port

rpc.statd(8) bind port

rpc.lockd(8) bind port

Other Options

□ Serve UDP NFS clients

□ Allow non-root mount

□ Support >16 groups

□ Log mountd(8) requests

□ Log rpc.statd(8) and rpc.lockd(8)

Setting	Value	Description
Number of servers	integer	Specify how many servers to create. Increase if NFS client responses are slow. Keep this less than or equal to the number of CPUs reported by `sysctl -n kern.smp.cpus` to limit CPU context switching.
Bind IP Addresses	drop down	Select IP addresses to listen to for NFS requests. Leave empty for NFS to listen to all available addresses.
Enable NFSv4	checkbox	Set to switch from NFSv3 to NFSv4.
NFSv3 ownership model for NFSv4	checkbox	Set when NFSv4 ACL support is needed without requiring the client and the server to sync users and groups.
Require Kerberos for NFSv4	checkbox	Set to force NFS shares to fail if the Kerberos ticket is unavailable.
Serve UDP NFS clients	checkbox	Set if NFS clients need to use the User Datagram Protocol (UDP).
Allow non-root mount	checkbox	Set only if required by the NFS client. Set to allow serving non-root mount requests.
Support >16 groups	checkbox	Set when a user is a member of more than 16 groups. This assumes group membership is configured correctly on the NFS server.
Log mountd(8)	checkbox	Set to log mountd syslog requests.

requests		
Log rpc.statd(8) and rpc.lockd(8)	checkbox	Set to log rpc.statd and rpc.lockd syslog requests.
mountd(8) bind port	integer	Enter a number to bind mountd only to that port.
rpc.statd(8) bind port	integer	Enter a number to bind rpc.statd only to that port.
rpc.lockd(8) bind port	integer	Enter a number to bind rpc.lockd only to that port.

Unless a specific setting is needed, it is recommended to use the default settings for the NFS service. When TrueNAS is already connected to Active Directory, setting *NFSv4* and *Require Kerberos for NFSv4* also requires a Kerberos Keytab.

Connecting to the NFS Share

Although you can connect to an NFS share with various operating systems, it is recommended to use a Linux/Unix operating system. First, download the `nfs-common` kernel module. This can be done using the package manager of the installed distribution. For example, on Ubuntu/Debian, enter `sudo apt-get install nfs-common` in the terminal.

After installing the module, connect to an NFS share by entering `sudo mount -t nfs {IPaddressOfTrueNASsystem}:{path/to/nfsShare} {localMountPoint}`. In the above example, *{IPaddressOfTrueNASsystem}* is the IP address of the remote TrueNAS system that contains the NFS share, *{path/to/nfsShare}* is the path to the NFS share on the TrueNAS system, and *{localMountPoint}* is a local directory on the host system configured for the mounted NFS share. For example, `sudo mount -t nfs 10.239.15.110:/mnt/pool1/photoDataset /mnt` will mount the NFS share *photoDataset* to the local directory `/mnt`.

By default, anyone that connects to the NFS share only has the *read* permission. To change the default permissions, edit the share, open the *Advanced Options*, and change the **Access** settings.

ESXI 6.7 or later is required for read/write functionality with NFSv4 shares.

8.4 - WebDAV Shares

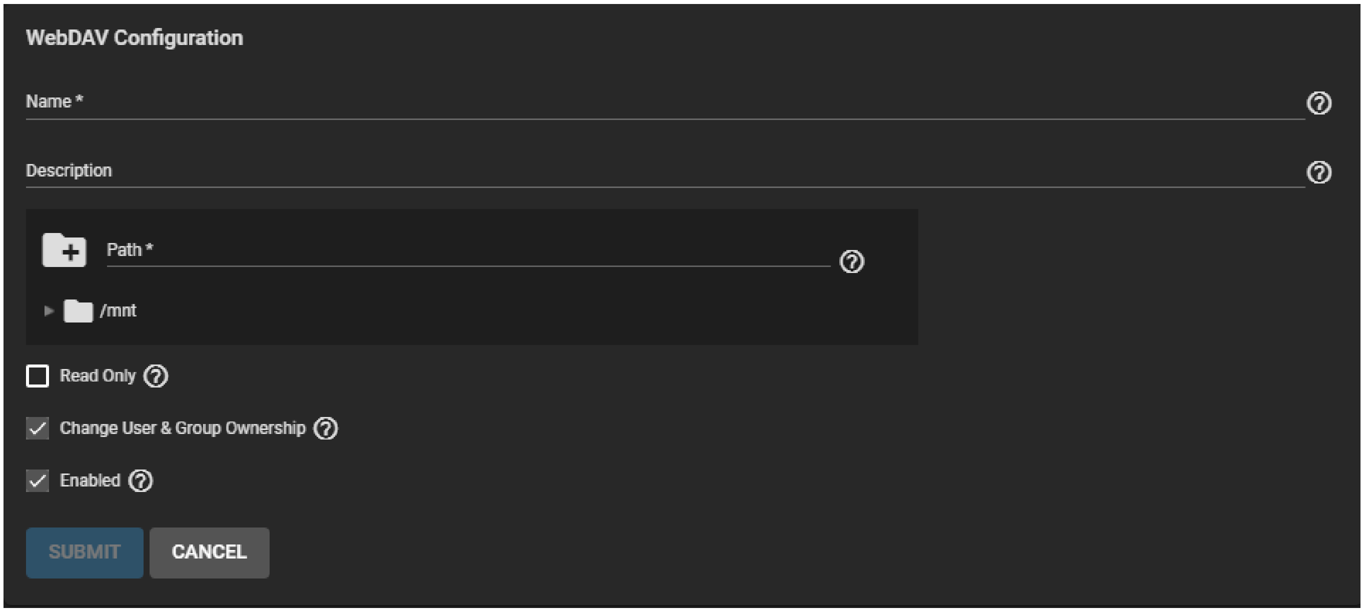
8.4.1 - Share Creation

A Web-based Distributed Authoring and Versioning (WebDAV) share makes it easy to share a TrueNAS dataset and its contents over the web.

To create a new share, make sure a dataset is available with all the data for sharing.

Share Configuration

Go to **Sharing > WebDAV Shares** and click *ADD*.



WebDAV Configuration

Name *

Description

Path *

/mnt

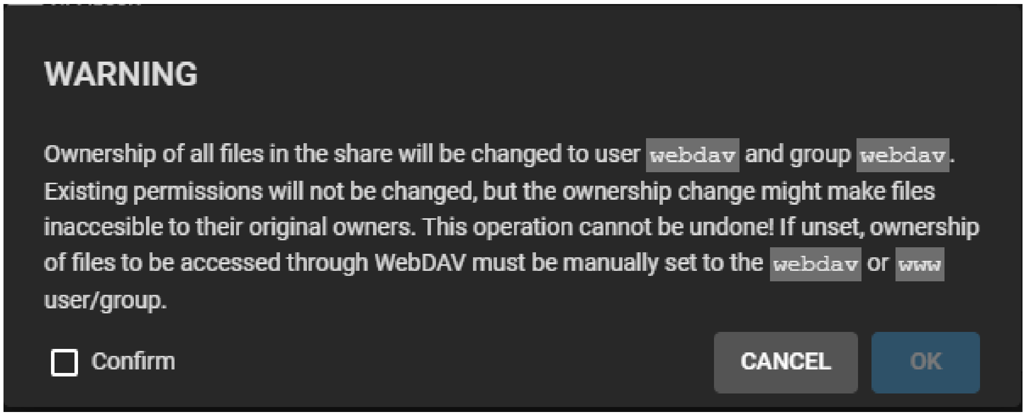
☐ Read Only

☑ Change User & Group Ownership

☑ Enabled

Enter a share *Name* and use the file browser to select the dataset to be shared. An optional *Description* helps to identify the share. To prevent user accounts from modifying the shared data, set *Read Only*.

By default, *Change User & Group Ownership* is set. This changes existing ownership of *ALL* files in the share to the *webdav* user and group accounts. The default simplifies WebDAV share permission, but is unexpected, so the web interface shows a warning:



WARNING

Ownership of all files in the share will be changed to user `webdav` and group `webdav`. Existing permissions will not be changed, but the ownership change might make files inaccesible to their original owners. This operation cannot be undone! If unset, ownership of files to be accessed through WebDAV must be manually set to the `webdav` or `www` user/group.

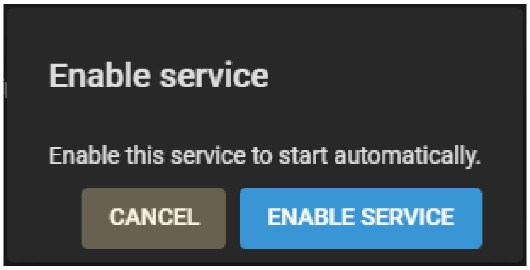
☐ Confirm

This warning does not show when *Change User & Group Ownsership* is unset. In that situation, shared file ownership must be manually set to the *webdav* or *www* user and group accounts.

By default, the new WebDAV share is immediately active. To create the share but not immediately activate it, unset *Enable*. Click *SUBMIT* to create the share.

Service Activation

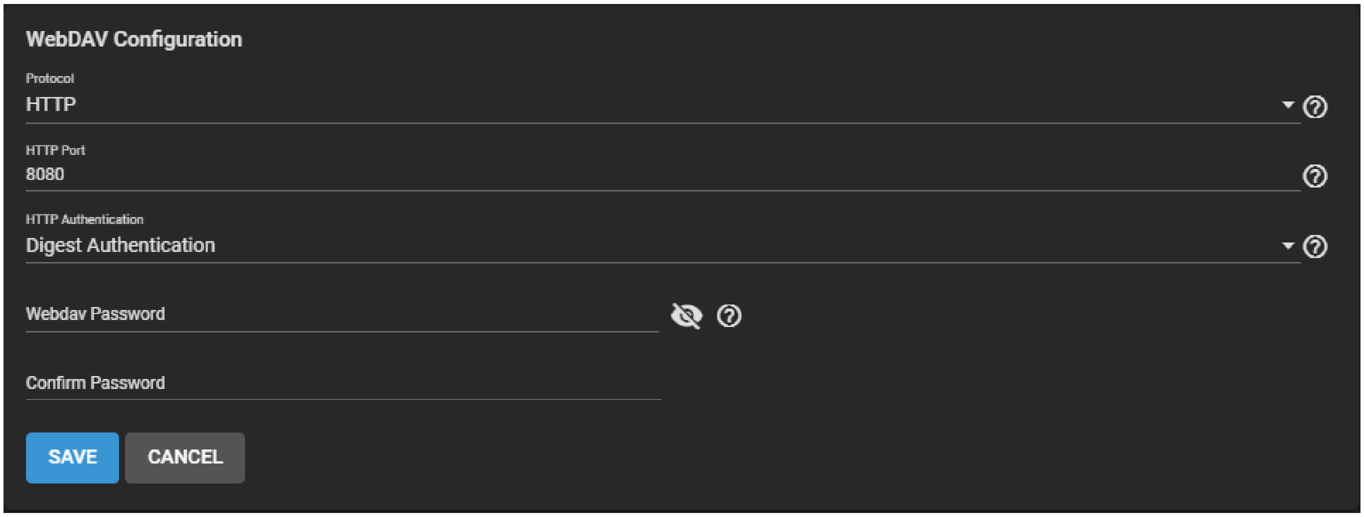
Creating a share immediately opens a dialog to activate the WebDAV service:



Enable service

Enable this service to start automatically.

To later enable or disable the WebDAV system service, go to **Services** and toggle *WebDAV*. To automatically start the service when TrueNAS boots, set *Start Automatically*. Click the edit to change the service settings.



WebDAV Configuration

Protocol: HTTP

HTTP Port: 8080

HTTP Authentication: Digest Authentication

Webdav Password

Confirm Password

For better data security, set the *Protocol* to *HTTPS*. This requires choosing an SSL certificate, but the *freenas_default* certificate is always available. All of the *Protocol* options require defining a *Port* number. Make sure the WebDAV service port is not already used on the network.

To prevent unauthorized access to the shared data, set the *HTTP Authentication* to either *Basic* or *Digest* and create a new *Webdav Password*.

Be sure to click *SAVE* after making any changes.

Connecting to the WebDAV Share

WebDAV shared data is accessible from a web browser. To see the shared data, open a new browser tab and enter `{PROTOCOL}://{TRUENASIP}:{PORT}/{SHAREPATH}`. Replace the elements in curly brackets `{}` with your chosen settings from the WebDAV share and service. Example: `https://10.2.1.1:8081/newdataset`

When the *Authentication* WebDAV service option is set to either *Basic* or *Digest*, a user name and password is required. Enter the user name *webdav* and the password defined in the WebDAV service.

8.5 - Windows Shares (SMB)

8.5.1 - Share Creation

Background

SMB (also known as CIFS) is the native file sharing system in Windows. SMB shares can connect to any major operating system, including Windows, MacOS, and Linux. SMB can be used in TrueNAS to share files among single or multiple users or devices.

SMB shares allow a wide range of permissions and security settings, and can support advanced permissions (ACLs) on Windows and other systems, as well as Windows Alternate Streams and Extended Metadata. SMB is suitable for the management and administration of large or small pools of data.

TrueNAS uses Samba to provide SMB services. There are multiple versions of the SMB protocol. An SMB client will typically negotiate the highest supported SMB protocol during SMB session negotiation. Industry-wide, the usage of the SMB1 protocol (sometimes referred to as NT1) is in the process of being deprecated. This deprecation is for security reasons. However, most SMB clients support SMB 2 or 3 protocols, even when they are not the default protocols.

Legacy SMB clients rely on NetBIOS Name Resolution to discover SMB servers on a network. The NetBIOS Name Server (nmbd) is disabled by default in TrueNAS. It can be enabled in **Network > Global Configuration** if this functionality is required.

MacOS clients use mDNS to discover the the presence of SMB servers on the network. The mDNS server (avahi) is enabled by default on TrueNAS.

Windows clients use WS-Discovery to discover the presence of SMB servers, but depending on the version of the Windows client, network discovery can be disabled by default.

Discoverability through broadcast protocols is a convenience feature and not required to access a SMB server.

First Steps

Create a Dataset

It is recommended to create a new dataset and set the *Share Type* to *SMB* for the new SMB share.

What does this do? expand □

The ZFS dataset is created with these settings:

- *aclmode* = “restricted”
- *case sensitivity* = “insensitive”

A default Access Control List is also applied to the dataset. This default ACL is restrictive and only allows access to the dataset owner and group. This ACL can be modified later according to your use case.

Create Local User Accounts

By default, all new local users are members of a built in SMB group called *builtin users*. This group can be used to grant access to all local users on the server. Additional groups can be used to fine-tune permissions to large numbers of users. User accounts built-in to TrueNAS or that do not have the *smb* flag set cannot be used for SMB access.

Why not just allow anonymous access to the share? expand □
Although anonymous or guest access to the share is possible, this is a security vulnerability and is being deprecated by the major SMB client vendors. This partly because signing and encryption are not possible for guest sessions.

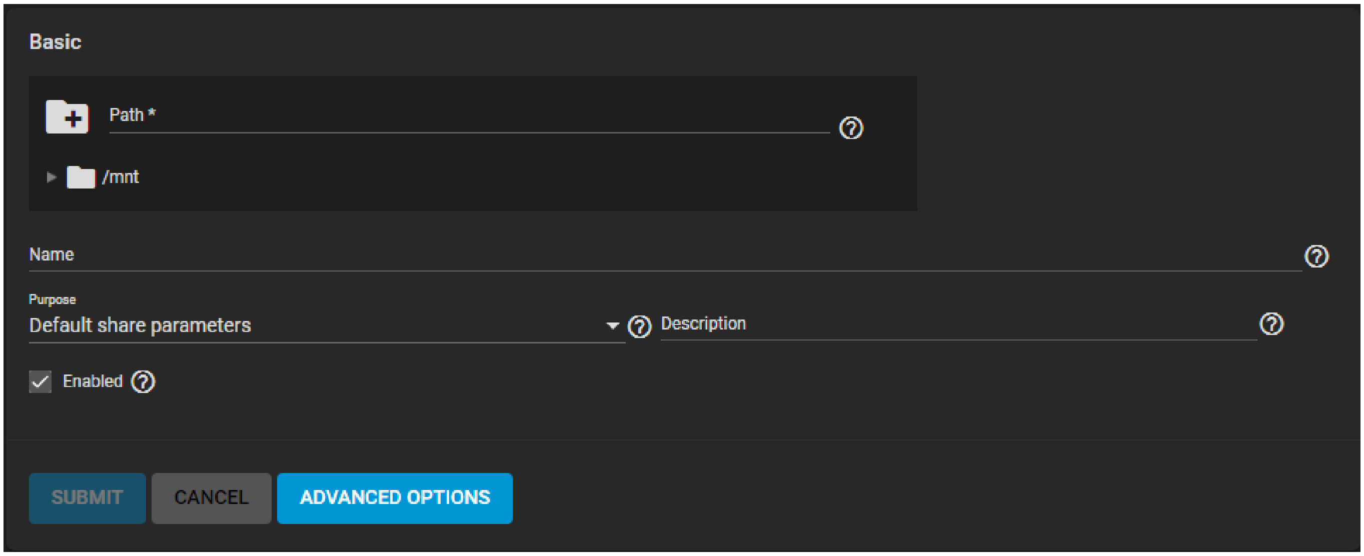
What about LDAP users? expand □
When LDAP has been configured and you want users from the LDAP server to have access the SMB share, go to **Directory Services > LDAP > ADVANCED MODE** and set *Samba Schema*. However, local TrueNAS user accounts will no longer have access to the share.

Tune the Dataset ACL

After a dataset and accounts are created, you will need to investigate your access requirements and adjust the dataset ACL to match. To edit the ACL, go to **Storage > Pools**, open the options for the new dataset, and click *Edit Permissions*. Many home users typically add a new entry that grants *FULL_CONTROL* to the *builtin_users* group with the flags set to *INHERIT*. See the Permissions article for more details.

Creating the SMB Share

To create a Windows SMB share, go to **Sharing > Windows Shares (SMB)** and click **ADD**.



The **Path** and **Name** of the SMB share define the absolute minimum amount of information required to create a new SMB share. The *Path* is the directory tree on the local filesystem that will be exported over the SMB protocol, and the *Name* is the name of the SMB share, which forms a part of the “full share pathname” when SMB clients perform an SMB tree connect. Because of the way that the *Name* is used in the SMB protocol, it must be less than or equal to 80 characters in length, and must not contain any invalid characters as specified in Microsoft documentation MS-FSCC section 2.1.6. If a *Name* is not supplied, then the last component of the *Path* will be used as the share name.

You can set a share *Purpose* to apply and lock pre-defined advanced options for the share. To retain full control over all the share *Advanced Options*, choose *No presets*.

What do all the presets do? expand □

The following table shows the preset options for the different *Purposes* and if those options are locked. An [x] indicates the option is enabled, [ ] means the option is disabled, and [text] indicates a specific value:

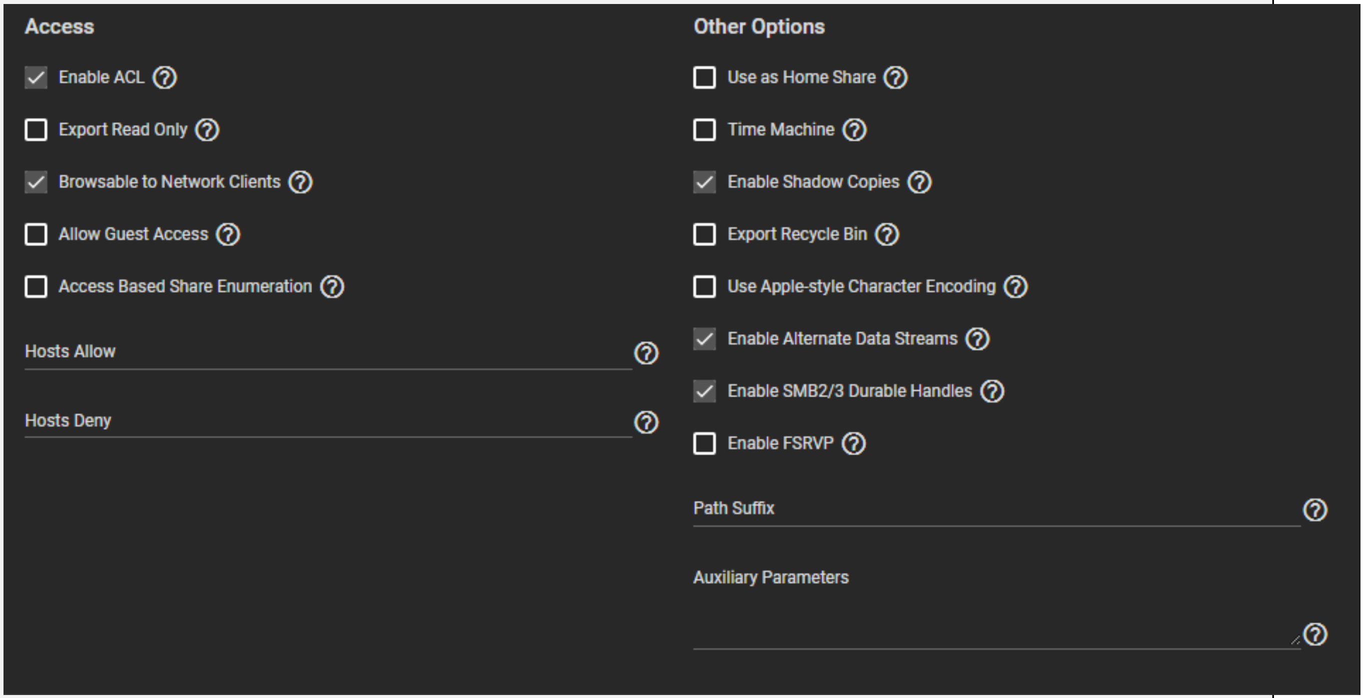
Default share parameters	Multi-user time machine	Multi-protocol (AFP/SMB) shares	Multi-protocol (NFSv3/SMB) shares	Private SMB Datasets and Shares	Files become readonly of SMB after 5 minutes
[x] Enable ACL (locked)	[x] Enable ACL (unlocked)	[x] Enable ACL (locked)	[ ] Enable ACL (locked)	[ ] Enable ACL (unlocked)	[ ] Enable ACL (unlocked)
[ ] Export Read Only (locked)	[ ] Export Read Only (unlocked)	[ ] Export Read Only (unlocked)	[ ] Export Read Only (unlocked)	[ ] Export Read Only (unlocked)	[ ] Export Read Only (unlocked)
[x] Browsable to Network Clients (locked)	[x] Browsable to Network Clients (unlocked)	[x] Browsable to Network Clients (unlocked)	[x] Browsable to Network Clients (unlocked)	[x] Browsable to Network Clients (unlocked)	[x] Browsable to Network Clients (unlocked)
[ ] Allow Guest Access (unlocked)	[ ] Allow Guest Access (unlocked)	[ ] Allow Guest Access (unlocked)	[ ] Allow Guest Access (unlocked)	[ ] Allow Guest Access (unlocked)	[ ] Allow Guest Access (unlocked)
[ ] Access Based Share Enumeration (locked)	[ ] Access Based Share Enumeration (unlocked)	[ ] Access Based Share Enumeration (unlocked)	[ ] Access Based Share Enumeration (unlocked)	[ ] Access Based Share Enumeration (unlocked)	[ ] Access Based Share Enumeration (unlocked)
[ ] Hosts Allow (locked)	[ ] Hosts Allow (unlocked)	[ ] Hosts Allow (unlocked)	[ ] Hosts Allow (unlocked)	[ ] Hosts Allow (unlocked)	[ ] Hosts Allow (unlocked)
[ ] Hosts Deny (locked)	[ ] Hosts Deny (unlocked)	[ ] Hosts Deny (unlocked)	[ ] Hosts Deny (unlocked)	[ ] Hosts Deny (unlocked)	[ ] Hosts Deny (unlocked)
[ ] Use as Home Share (locked)	[ ] Use as Home Share (unlocked)	[ ] Use as Home Share (unlocked)	[ ] Use as Home Share (unlocked)	[ ] Use as Home Share (unlocked)	[ ] Use as Home Share (unlocked)
[ ] Time Machine (locked)	[ ] Time Machine (unlocked)	[ ] Time Machine (unlocked)	[ ] Time Machine (unlocked)	[ ] Time Machine (unlocked)	[ ] Time Machine (unlocked)
[x] Enable Shadow Copies (locked)	[x] Enable Shadow Copies (unlocked)	[x] Enable Shadow Copies (unlocked)	[x] Enable Shadow Copies (unlocked)	[x] Enable Shadow Copies (unlocked)	[x] Enable Shadow Copies (unlocked)
[ ] Export Recycle Bin	[ ] Export Recycle Bin	[ ] Export Recycle Bin	[ ] Export Recycle Bin	[ ] Export Recycle Bin	[ ] Export Recycle Bin

(locked)	(unlocked)	(unlocked)	(unlocked)	(unlocked)	(unlocked)
[ ] Use Apple-style Character Encoding (locked)	[ ] Use Apple-style Character Encoding (unlocked)	[x] Use Apple-style Character Encoding (locked)	[x] Use Apple-style Character Encoding (unlocked)	[x] Use Apple-style Character Encoding (unlocked)	[x] Use Apple-style Character Encoding (unlocked)
[x] Enable Alternate Data Streams (locked)	[x] Enable Alternate Data Streams (unlocked)	[x] Enable Alternate Data Streams (locked)	[ ] Enable Alternate Data Streams (locked)	[ ] Enable Alternate Data Streams (unlocked)	[ ] Enable Alternate Data Streams (unlocked)
[x] Enable SMB2/3 Durable Handles (locked)	[x] Enable SMB2/3 Durable Handles (unlocked)	[ ] Enable SMB2/3 Durable Handles (locked)	[ ] Enable SMB2/3 Durable Handles (locked)	[ ] Enable SMB2/3 Durable Handles (unlocked)	[ ] Enable SMB2/3 Durable Handles (unlocked)
[ ] Enable FSRVP (locked)	[ ] Enable FSRVP (unlocked)	[ ] Enable FSRVP (locked)	[ ] Enable FSRVP (unlocked)	[ ] Enable FSRVP (unlocked)	[ ] Enable FSRVP (unlocked)
[ ] Path Suffix (locked)	[%U] Path Suffix (locked)	[%U] Path Suffix (unlocked)	[%U] Path Suffix (unlocked)	[%U] Path Suffix (locked)	[ ] Path Suffix (locked)
[ ] Auxiliary Parameters (unlocked)	[ ] Auxiliary Parameters (unlocked)	[ ] Auxiliary Parameters (unlocked)	[ ] Auxiliary Parameters (unlocked)	[ ] Auxiliary Parameters (unlocked)	[ ] Auxiliary Parameters (unlocked)

An optional *Description* can be specified to help explain the purpose of the share.

Enabled allows this path to be shared when the SMB service is activated. Unsetting **Enabled** disables the share without deleting the configuration.

Advanced Options expand □



Access

☑ Enable ACL

☐ Export Read Only

☑ Browsable to Network Clients

☐ Allow Guest Access

☐ Access Based Share Enumeration

Hosts Allow

Hosts Deny

Other Options

☐ Use as Home Share

☐ Time Machine

☑ Enable Shadow Copies

☐ Export Recycle Bin

☐ Use Apple-style Character Encoding

☑ Enable Alternate Data Streams

☑ Enable SMB2/3 Durable Handles

☐ Enable FSRVP

Path Suffix

Auxiliary Parameters

Options are divided into **Access** and **Other Options** groups. *Access* options control various settings for allowing systems or users to access or modify the shared data.

Setting	Value	Description
Enable ACL	checkbox	Set to add Access Control List (ACL) support to the share. Unsetting disables ACL support and deletes any existing ACL for the share.
Export Read Only	checkbox	Prohibits writes to the share. Unset to allow writes to the share.
Browsable to Network Clients	checkbox	Determine whether this share name is included when browsing shares. Home shares are only visible to the owner regardless of this setting.
Allow Guest Access	checkbox	Privileges are the same as the guest account. Guest access is disabled by default in Windows 10 version 1709 and Windows Server version 1903. Additional client-side configuration is required to provide guest access to these clients. *MacOS clients*: Attempting to connect as a user that does not exist in FreeNAS *does not* automatically connect as the guest account. The *Connect As: Guest* option must be specifically chosen in MacOS to log in as the guest account. See the Apple documentation for more details.
Access Based Share Enumeration	checkbox	Setting this restricts share visibility to users with read or write access to the share. See the smb.conf manual page.
Hosts Allow	string	Enter a list of allowed hostnames or IP addresses. Separate entries by pressing `Enter`. A more detailed description with examples can be found here.
Hosts Deny	string	Enter a list of denied hostnames or IP addresses. Separate entries by pressing `Enter`.

The **Hosts Allow** and **Hosts Deny** fields work together to produce different situations:

- If neither *Hosts Allow* or *Hosts Deny* contains an entry, then SMB share access is allowed for any host.
- If there is a *Hosts Allow* list but no *Hosts Deny* list, then only allow hosts on the *Hosts Allow* list.
- If there is a *Hosts Deny* list but no *Hosts Allow* list, then allow all hosts that are not on the *Hosts Deny* list.
- If there is both a *Hosts Allow* and *Hosts Deny* list, then allow all hosts that are on the *Hosts Allow* list. If there is a host not on the *Hosts Allow* and not on the *Hosts Deny* list, then allow it.

The *Other Options* have settings for improving Apple software compatibility, ZFS snapshot features, and other advanced features.

Setting	Value	Description
Use as Home Share	checkbox	Allows the share to host user home directories. Each user is given a personal home directory when connecting to the share which is not accessible by other users. This allows for a personal, dynamic share. Only one share can be used as the home share. See the configuring Home Share article for detailed instructions.
Time Machine	checkbox	Enables Apple Time Machine backups on this share.
Enable Shadow Copies	checkbox	Export ZFS snapshots as Shadow Copies for Microsoft Volume Shadow Copy Service (VSS) clients.

Export Recycle Bin	checkbox	Files that are deleted from the same dataset are moved to the Recycle Bin and do not take any additional space. **Deleting files over NFS will remove the files permanently.** When the files are in a different dataset or a child dataset, they are copied to the dataset where the Recycle Bin is located. To prevent excessive space usage, files larger than *20 MiB* are deleted rather than moved. Adjust the **Auxiliary Parameter** `crossrename:sizelimit=` setting to allow larger files. For example, `crossrename:sizelimit=`*`50`* allows moves of files up to *50 MiB* in size. This means files can be permanently deleted or moved from the recycle bin. **This is not a replacement for ZFS snapshots.**
Use Apple-style Character Encoding	checkbox	By default, Samba uses a hashing algorithm for NTFS illegal characters. Enabling this option converts NTFS illegal characters in the same manner as MacOS SMB clients.
Enable Alternate Data Streams	checkbox	Allows multiple NTFS data streams. Disabling this option causes MacOS to write streams to files on the filesystem.
Enable SMB2/3 Durable Handles	checkbox	Allow using open file handles that can withstand short disconnections. Support for POSIX byte-range locks in Samba is also disabled. This option is not recommended when configuring multi-protocol or local access to files.
Enable FSRVP	checkbox	Enable support for the File Server Remote VSS Protocol (FSVRP). This protocol allows Remote Procedure Call (RPC) clients to manage snapshots for a specific SMB share. The share path must be a dataset mountpoint. Snapshots have the prefix `fss-` followed by a snapshot creation timestamp. A snapshot must have this prefix for an RPC user to delete it.
Path Suffix	string	Appends a suffix to the share connection path. This is used to provide unique shares on a per-user, per-computer, or per-IP address basis. Suffixes can contain a macro. See the smb.conf manual page for a list of supported macros. The connectpath must be preset before a client connects.
Auxiliary Parameters	string	Additional smb.conf settings.

Clicking **Submit** creates the share and adds it to the **Sharing > Windows Shares (SMB)** list. You can also choose to enable the SMB service at this time.

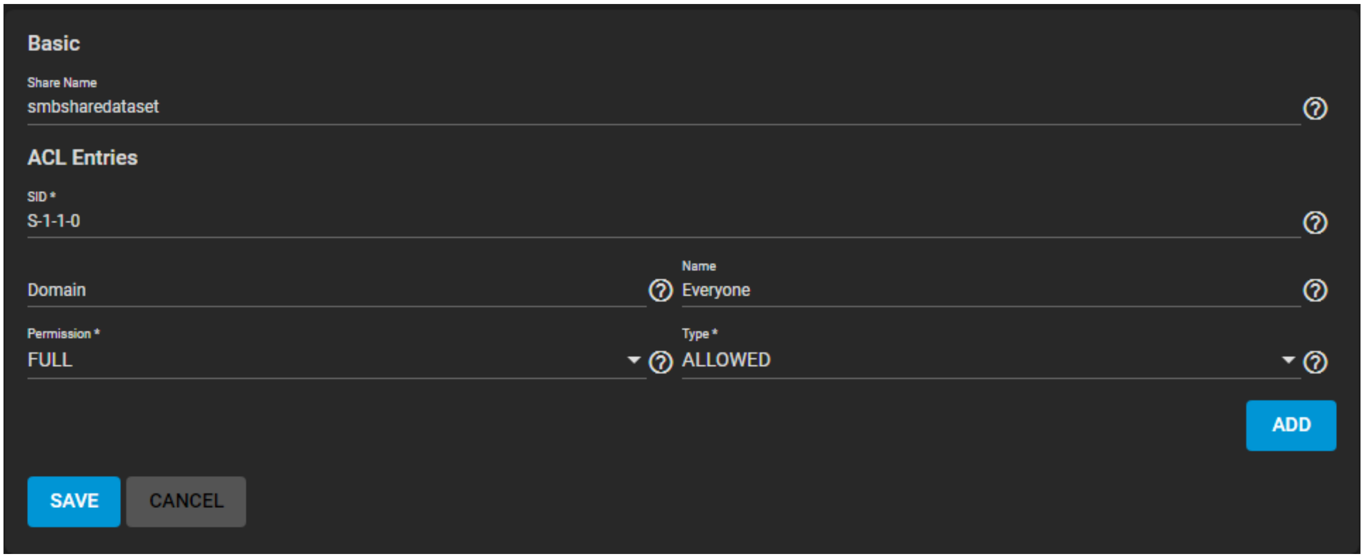
Share Management

After the SMB share is created, additional management options are available by going to **Sharing > Windows Shares (SMB)** and clicking □ for a share entry:

- **Edit**: Opens the share creation screen to reconfigure the share or disable it.
- **Edit Share ACL**: Opens a screen to configure an Access Control List (ACL) for the share. This is separate from filesystem permissions, and applies at the level of the entire SMB share. Permissions defined here are not interpreted by clients of other filesharing protocols or other SMB shares that export the same share *Path*. The default is open. This ACL is used to determine the browse list if *Access Based Share Enumeration* is enabled.
- **Edit Filesystem ACL**: Opens a screen to configure an Access Control List (ACL) for the path defined in the share **Path**.
- **Delete**: Remove the share configuration from TrueNAS. Data that was being shared is unaffected.

Configure Share ACL

To see the share ACL options, click more_vert > *Edit Share ACL*.



>

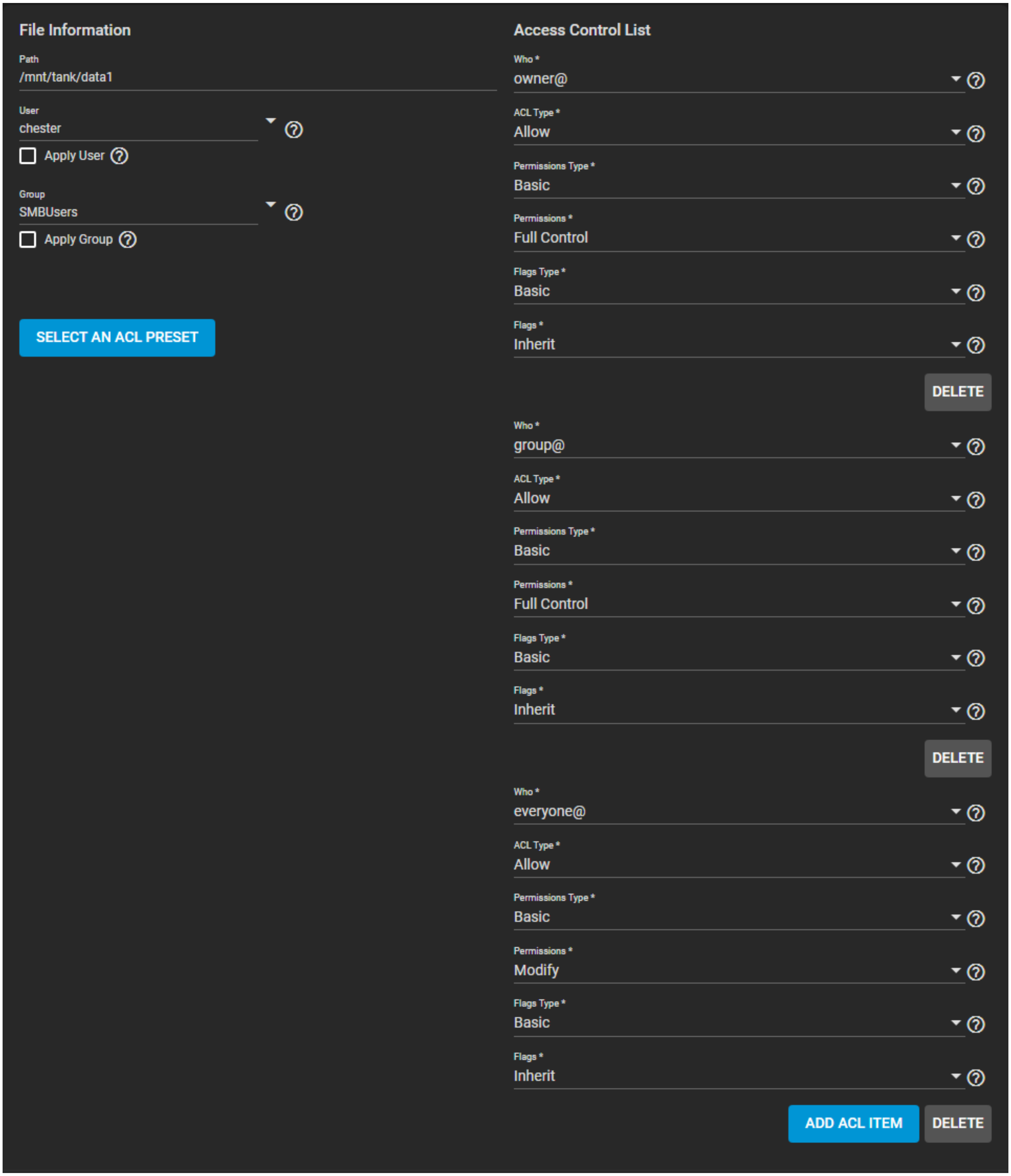
The *Share Name* is shown, but cannot be changed. *ACL Entries* are listed as a block of settings. Click *ADD* to register a new entry.

Setting	Value	Description
SID	string	Who this ACL entry (ACE) applies to, shown as a Windows Security Identifier. Either a *SID* or a *Domain* with *Name* is required for the ACL.
Domain	string	Domain for the user *Name*. Required when a **SID** is not entered. Local users have the SMB server NetBIOS name: *truenas\smbusers*.
Permission	drop down	Predefined permission combinations: *Read*: Read access and Execute permission on the object (RX). *Change*: Read access, Execute permission, Write access, and Delete object (RXWD). *Full*: Read access, Execute permission, Write access, Delete object, change Permissions, and take Ownership (RXWDPO). For more details, see smbacls(1).
Name	string	Who this ACL entry applies to, shown as a user name. Requires adding the user **Domain**.
Type	drop down	How permissions are applied to the share. *Allowed* denies all permissions by default except those that are manually defined. *Denied* allows all permissions by default except those that are manually defined.

Clicking *SAVE* stores the share ACL and applies it to the share immediately.

Configure Filesystem ACL

Click more_vert > *Edit Filesystem ACL* to quickly return to **Storage > Pools** and edit the dataset ACL.



File Information

Path
/mnt/tank/data1

User
chester

□ Apply User

Group
SMBUsers

□ Apply Group

Access Control List

Who *
owner@

ACL Type *
Allow

Permissions Type *
Basic

Permissions *
Full Control

Flags Type *
Basic

Flags *
Inherit

Who *
group@

ACL Type *
Allow

Permissions Type *
Basic

Permissions *
Full Control

Flags Type *
Basic

Flags *
Inherit

Who *
everyone@

ACL Type *
Allow

Permissions Type *
Basic

Permissions *
Modify

Flags Type *
Basic

Flags *
Inherit

This ACL is used to define the user accounts or groups that own or have specific permissions to the dataset that is being shared. The *User* and *Group* values show which accounts "own", or have full permissions to the dataset. Change the default settings to your preferred primary account and group and set the *Apply* check boxes before saving any changes.

ACL Presets

To rewrite the current ACL with a standardized preset, click *SELECT AN ACL PRESET* and choose an option:

⊙ Open

Has three entries:

- *owner@* has full dataset control.
- *group@* has full dataset control.
- All other accounts can modify the dataset contents.

○ Restricted

Has two entries:

- *owner@* has full dataset control.
- *group@* can modify the dataset contents.

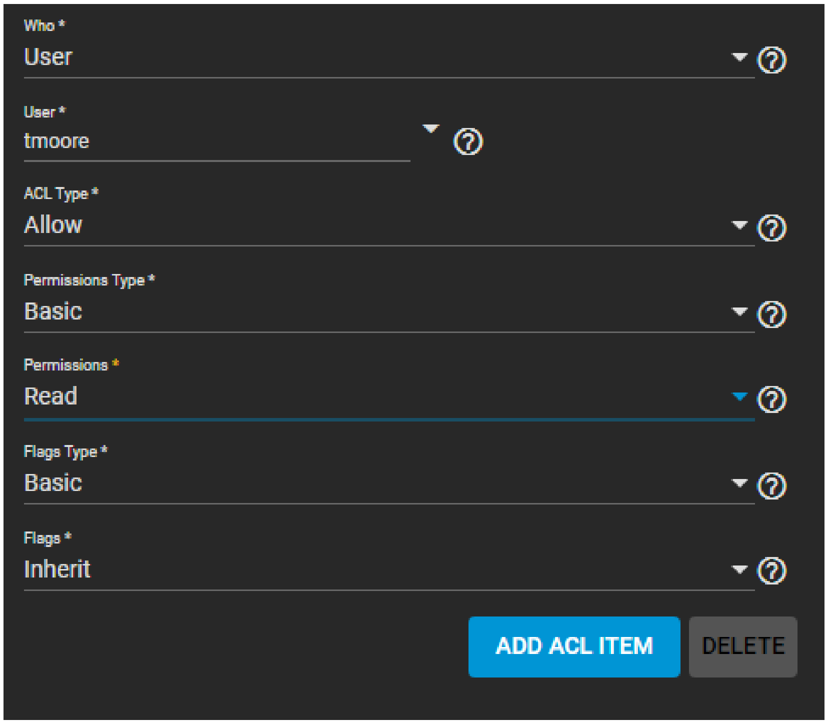
○ Home

Has three entries:

- *owner@* has full dataset control.
- *group@* can modify the dataset contents.
- All other accounts can traverse through the dataset.

Adding ACL Entries (ACEs)

To define permissions for a specific user account or group, click *ADD ACL ITEM*. Open the *Who* drop down, select *User* or *Group*, and choose a specific *User* or *Group* account. Define how the settings are applied to the account then choose which permissions to apply to that account. For example, to only allow the *tmoore* user permission to view dataset contents but not make changes, set the *ACL Type* to *Allow* and *Permissions* to *Read*.



Who *
User

User *
tmoore

ACL Type *
Allow

Permissions Type *
Basic

Permissions *
Read

Flags Type *
Basic

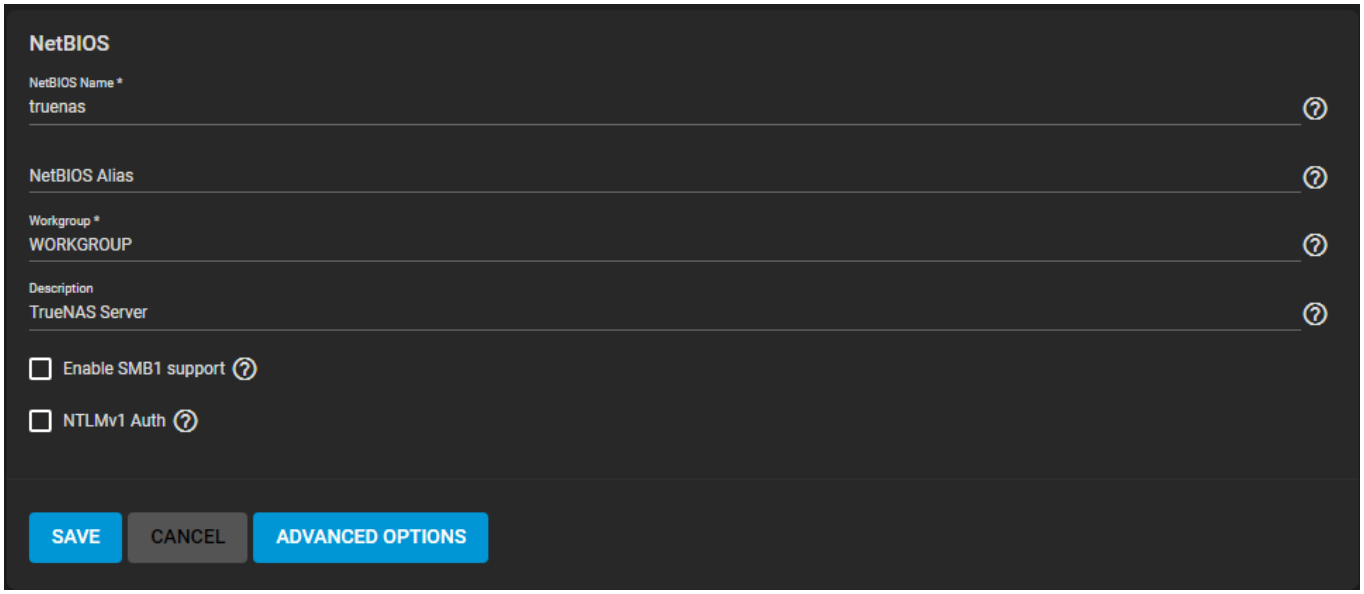
Flags *
Inherit

Activate the SMB Service

Connecting to an SMB share does not work when the related system service is not activated. To make SMB share available on the network, *Services* and click the toggle for *SMB*. If you want the service to activate whenever TrueNAS boots, set *Start Automatically*.

Service Configuration

The SMB service is configured by clicking edit. Unless a specific setting is needed or configuring for a specific network environment, it is recommended to use the default settings for the SMB service.



NetBIOS

NetBIOS Name * truenas

NetBIOS Alias

Workgroup * WORKGROUP

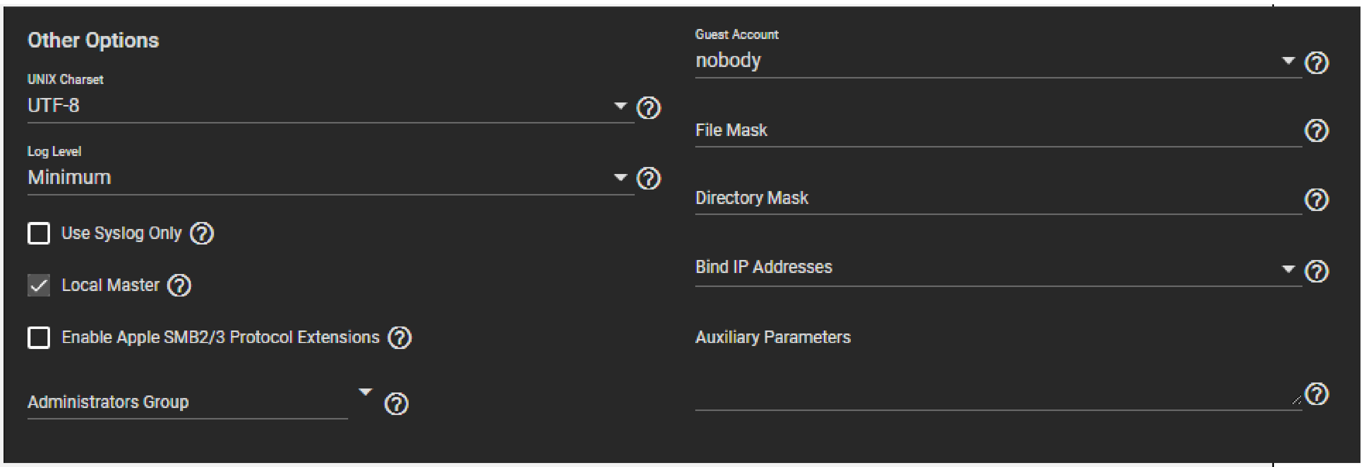
Description TrueNAS Server

□ Enable SMB1 support

□ NTLMv1 Auth

Setting	Value	Description
NetBIOS Name	string	Automatically populated with the original hostname of the system. This name is limited to 15 characters and cannot be the *Workgroup* name.
NetBIOS Alias	string	Enter any aliases, separated by spaces. Each alias can be up to 15 characters long.
Workgroup	string	Must match the Windows workgroup name. When this is unconfigured and Active Directory or LDAP are active, TrueNAS will detect and set the correct workgroup from these services.
Description	string	This allows entering any notes or descriptive details about the service configuration.
Enable SMB1 support	checkbox	Allow legacy SMB1 clients to connect to the server. Note that SMB1 is being deprecated and it is advised to upgrade clients to operating system versions that support modern versions of the SMB protocol.
NTLMv1 Auth	checkbox	When set, smbd attempts to authenticate users with the insecure and vulnerable NTLMv1 encryption. This setting allows backward compatibility with older versions of Windows, but is not recommended and should not be used on untrusted networks.

Advanced Options expand □



Other Options

UNIX Charset
UTF-8

Log Level
Minimum

□ Use Syslog Only

☑ Local Master

□ Enable Apple SMB2/3 Protocol Extensions

Administrators Group

Guest Account
nobody

File Mask

Directory Mask

Bind IP Addresses

Auxiliary Parameters

Setting	Value	Description
UNIX Charset	drop down	Character set used internally. *UTF-8* is standard for most systems as it supports all characters in all languages.
Log Level	drop down	Record SMB service messages up to the specified log level. By default, error and warning level messages are logged. It is not recommended to use a log level above MINIMUM for production servers.
Use Syslog Only	checkbox	Set to log authentication failures in */var/log/messages* instead of the default */var/log/samba4/log.smbd*.
Local Master	checkbox	Set to determine if the system participates in a browser election. Unset when the network contains an AD or LDAP server, or when Vista or Windows 7 machines are present.
Enable Apple SMB2/3 Protocol Extensions	checkbox	These protocol extensions can be used by macOS to improve the performance and behavioral characteristics of SMB shares. This is required for Time Machine support.
Administrators Group	drop down	Members of this group are local administrators and automatically have privileges to take ownership of any file in an SMB share, reset permissions, and administer the SMB server through the Computer Management MMC snap-in.
Guest Account	drop down	Account to be used for guest access. Default is *nobody*. The chosen account is required to have permissions to the shared pool or dataset. To adjust permissions, edit the dataset Access Control List (ACL), add a new entry for the chosen guest account, and configure the permissions in that entry. If the selected **Guest Account** is deleted the field resets to *nobody*.
File Mask	integer	Overrides default file creation mask of *0666* which creates files with read and write access for everybody.
Directory Mask	integer	Overrides default directory creation mask of *0777* which grants directory read, write and execute access for everybody.
Bind IP Addresses	drop down	Static IP addresses which SMB listens on for connections. Leaving all unselected defaults to listening on all active interfaces.
Auxiliary Parameters	string	Stores additional smb.conf. Auxiliary parameters may be used to override the default SMB server configuration, but such changes may adversely affect SMB server stability or behavior.

Mounting SMB Share on another machine.

⊙ **Linux**

Verify that the required CIFS packages are installed for your distribution of Linux. Create a mount point: `sudo mkdir /mnt/smb_share`.

Mount the volume. `sudo mount -t cifs //computer_name/share_name /mnt/smb_share`.

If your share requires user credentials, add the switch `-o username=` with your username after `cifs` and before the share address.

○ Windows

To mount the SMB share to a drive letter on windows, open the command line and run the following command with the appropiate drive letter, computer name, and share name.

```
net use Z: \\computer_name\share_name /PERSISTENT:YES
```

○ Apple

Open **Finder > Go > Connect To Server** Enter the SMB address: `smb://192.168.1.111`.

Input the username and password for the user assigned to that pool or Guest if Guest access is enabled on the share.

○ FreeBSD

Create a mount point: `sudo mkdir /mnt/smb_share`.

Mount the volume. `sudo mount_smbfs -I computer_name\share_name /mnt/smb_share`.

8.5.2 - Home Shares

TrueNAS offers the *Use as Home Share* option for organizations or SMEs that want to use a single SMB share to provide a personal directory to every user account.

> The *Use as Home Share* feature is available for a single TrueNAS SMB share. You can create additional SMB shares as described in the SMB sharing article but without the *Use as Home Share* option enabled.

Create a Pool and Join Active Directory

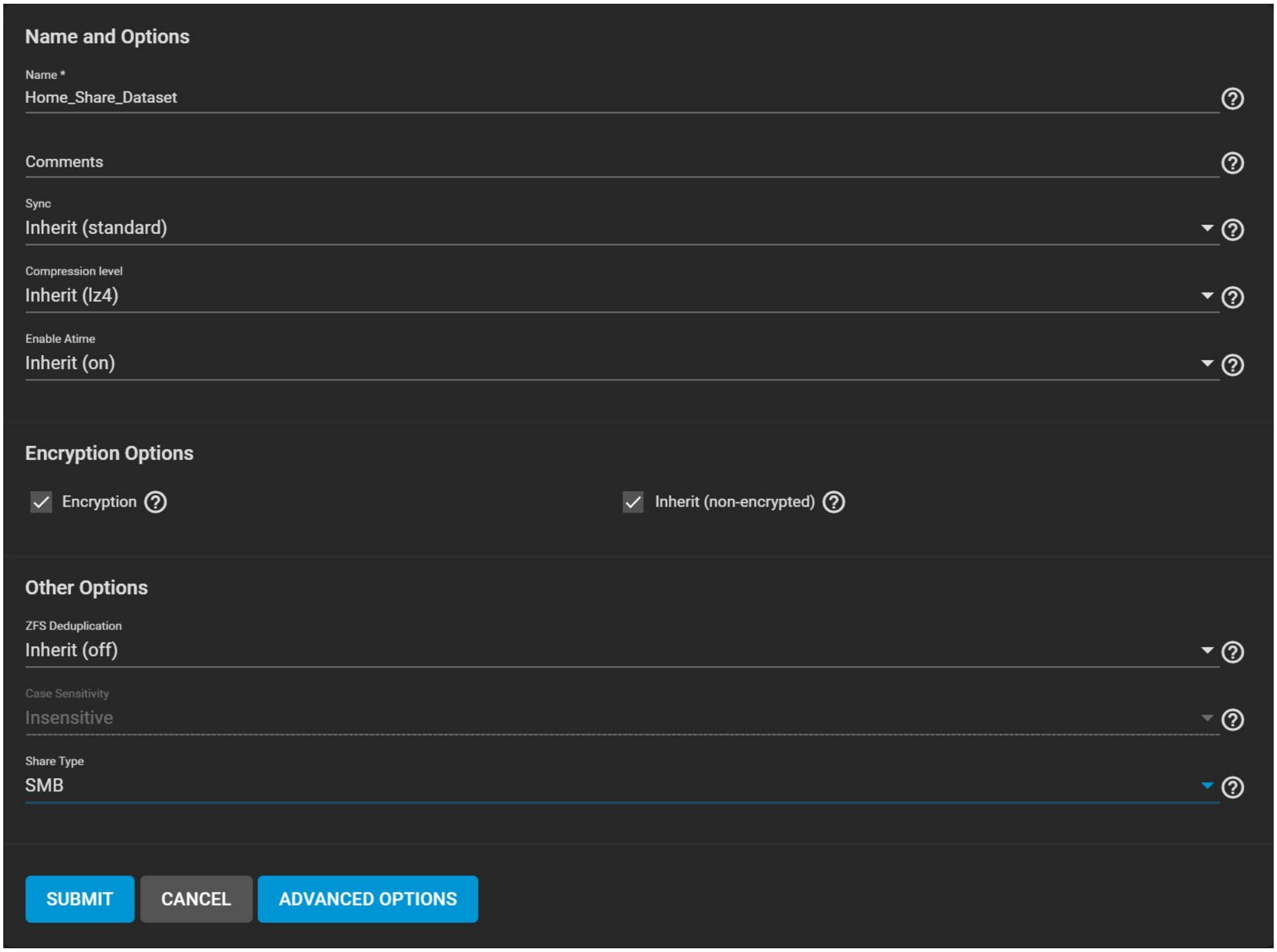
First, go to **Storage > Pools** and create a pool.

Next, set up the Active Directory that you will want to share resources with over your network.

Prepare a Dataset

Go to **Storage > Pools** and open the more_vert next to the root dataset in the pool you just created, then click *Add Dataset*.

Name the dataset (this article uses *Home_Share_Dataset* as an example) and set the *Share Type* to *SMB*.



Name and Options

Name * Home_Share_Dataset

Comments

Sync Inherit (standard)

Compression level Inherit (lz4)

Enable Atime Inherit (on)

Encryption Options

☑ Encryption ☑ Inherit (non-encrypted)

Other Options

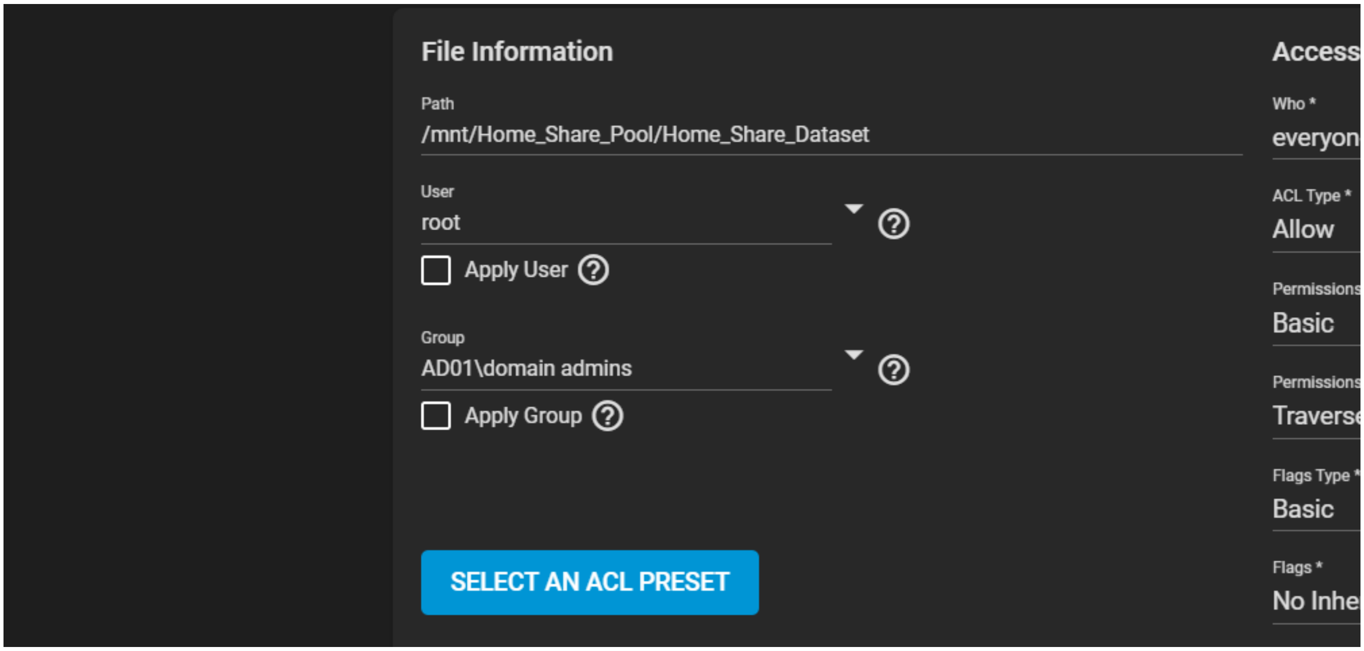
ZFS Deduplication Inherit (off)

Case Sensitivity Insensitive

Share Type SMB

After creating the dataset, go to **Storage > Pools** and open more_vert next to the new dataset. Select *Edit Permissions*.

Click the *Group* drop-down menu and change the owning group to your Active Directory's domain admins.



File Information

Path /mnt/Home_Share_Pool/Home_Share_Dataset

User root

☐ Apply User

Group AD01\domain admins

☐ Apply Group

Access

Who * everyon

ACL Type * Allow

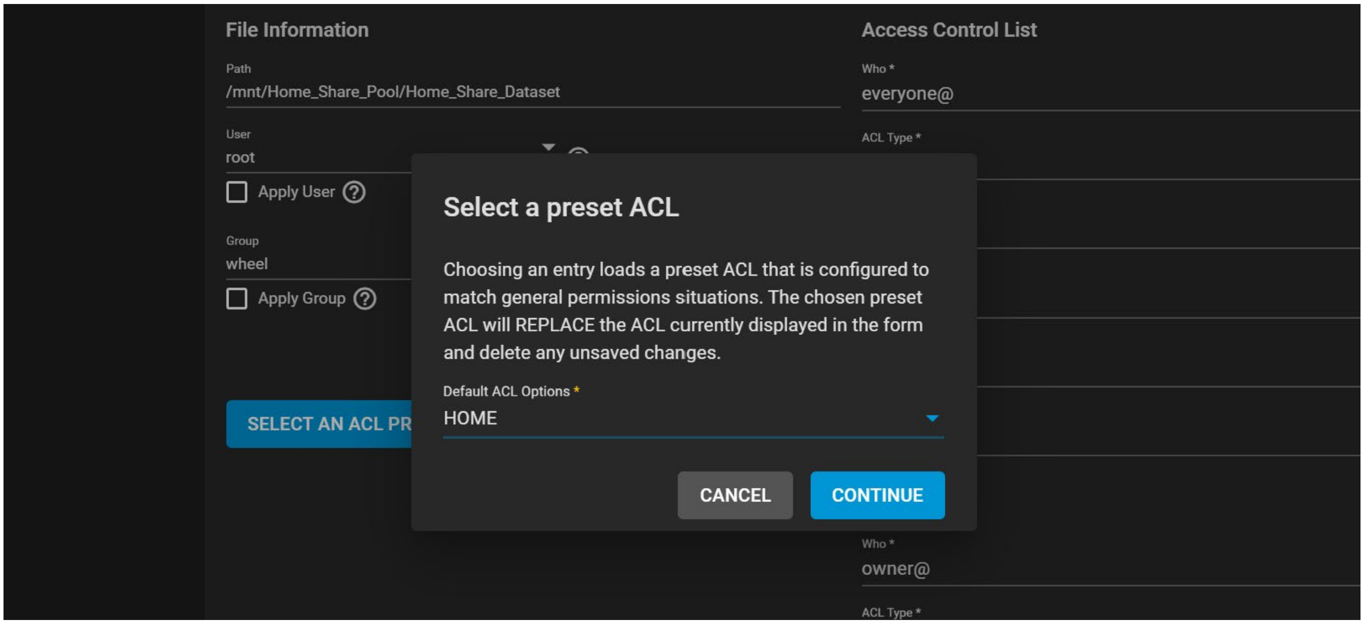
Permissions Basic

Permissions Traverse

Flags Type * Basic

Flags * No Inhe

Click *Select an ACL Preset* and choose *HOME*. Then, click *SAVE*.



Path: /mnt/Home_Share_Pool/Home_Share_Dataset

User: root

Group: wheel

Who *: everyone@

ACL Type *

Who *: owner@

ACL Type *

Select a preset ACL

Choosing an entry loads a preset ACL that is configured to match general permissions situations. The chosen preset ACL will REPLACE the ACL currently displayed in the form and delete any unsaved changes.

Default ACL Options *: HOME

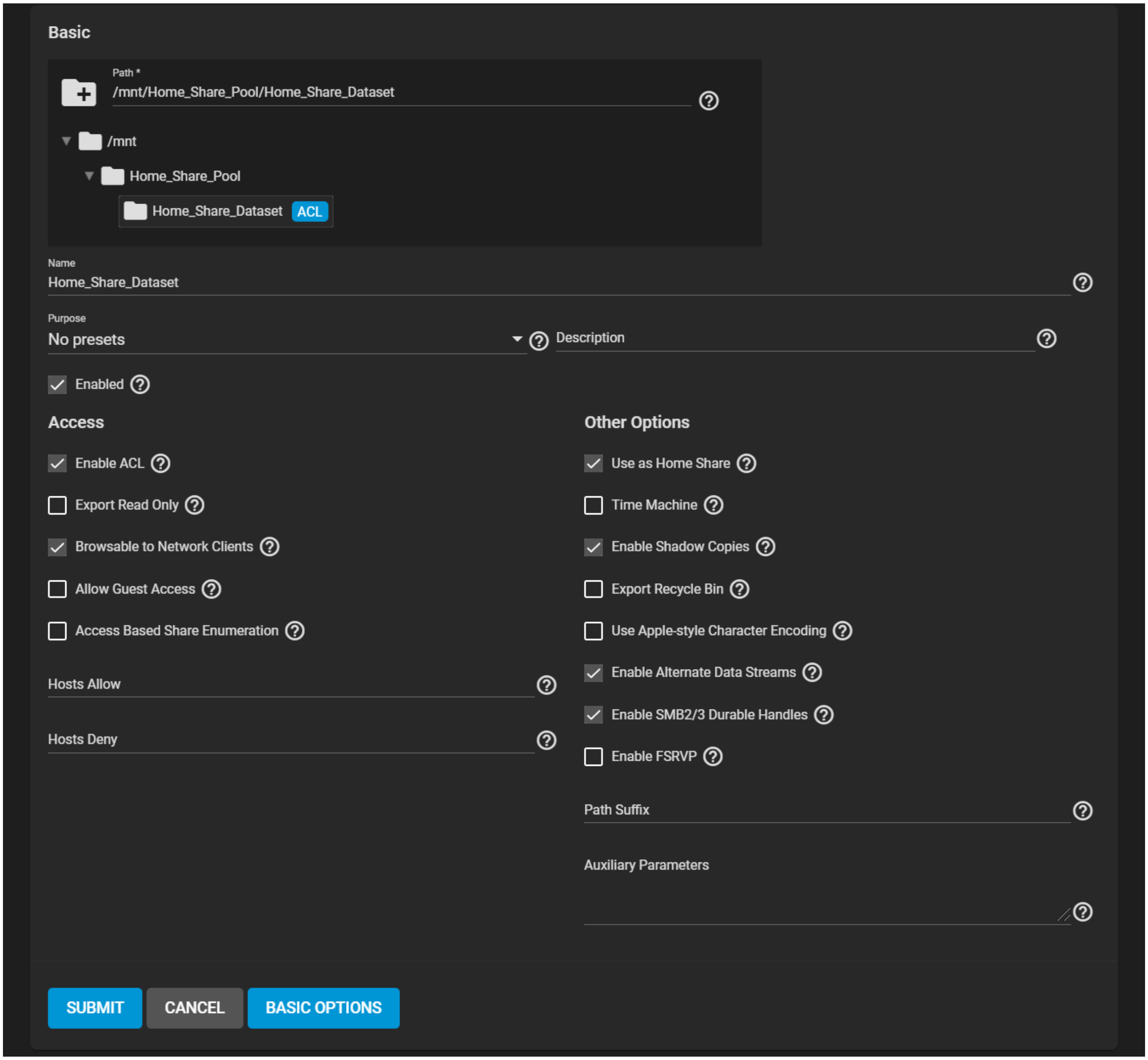
Create the Share

Go to **Sharing > Windows Shares (SMB)** and click *ADD*.

Set the *Path* to the prepared dataset (*Home_Share_Dataset* for example).

The *Name* automatically changes to be identical to the dataset. Leave this at the default.

Set the *Purpose* to *No presets*, then click *ADVANCED OPTIONS* and check *Use as Home Share*. Click *SUBMIT*.



Basic

Path *
/mnt/Home_Share_Pool/Home_Share_Dataset

- /mnt
  - Home_Share_Pool
    - Home_Share_Dataset ACL

Name
Home_Share_Dataset

Purpose
No presets

Description

☑ Enabled

Access

☑ Enable ACL

☐ Export Read Only

☑ Browsable to Network Clients

☐ Allow Guest Access

☐ Access Based Share Enumeration

Hosts Allow

Hosts Deny

Other Options

☑ Use as Home Share

☐ Time Machine

☑ Enable Shadow Copies

☐ Export Recycle Bin

☐ Use Apple-style Character Encoding

☑ Enable Alternate Data Streams

☑ Enable SMB2/3 Durable Handles

☐ Enable FSRVP

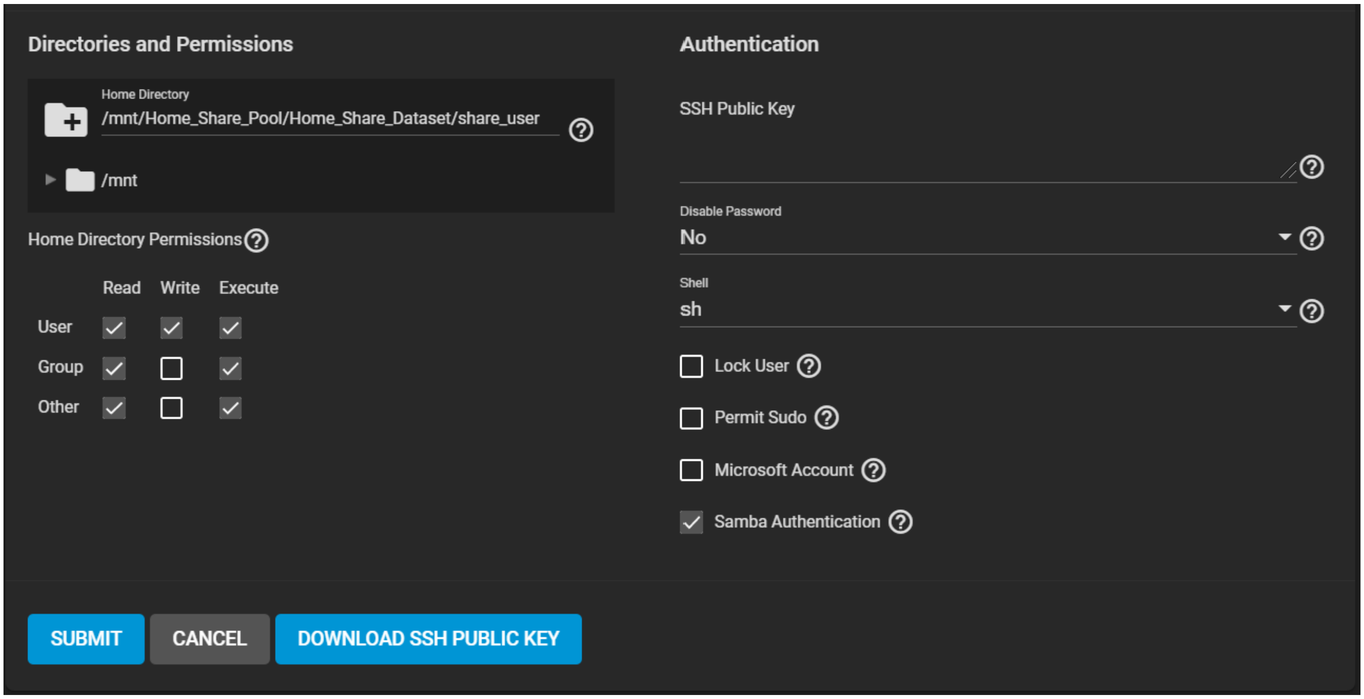
Path Suffix

Auxiliary Parameters

Click *SAVE* and enable the *SMB* service in **Services** to make the share is available on your network.

Add Users

Go to **Accounts > Users** and click *ADD*. Create a new user name and password. By default, the user *Home Directory* will be titled from the user account name and added as a new subdirectory of *Home_Share_Dataset*.



Directories and Permissions

Home Directory: /mnt/Home_Share_Pool/Home_Share_Dataset/share_user

▸ /mnt

Home Directory Permissions

	Read	Write	Execute
User	☑	☑	☑
Group	☑	□	☑
Other	☑	□	☑

Authentication

SSH Public Key:

Disable Password: No

Shell: sh

□ Lock User

□ Permit Sudo

□ Microsoft Account

☑ Samba Authentication

If existing users require access to the home share, go to **Accounts > Users** and edit an existing account.

Adjust the user’s home directory to the appropriate dataset and give it a name to create their own directory.

After the user accounts have been added and permissions configured, users can log in to the share and see a folder matching their user name.

8.5.3 - Shadow Copies

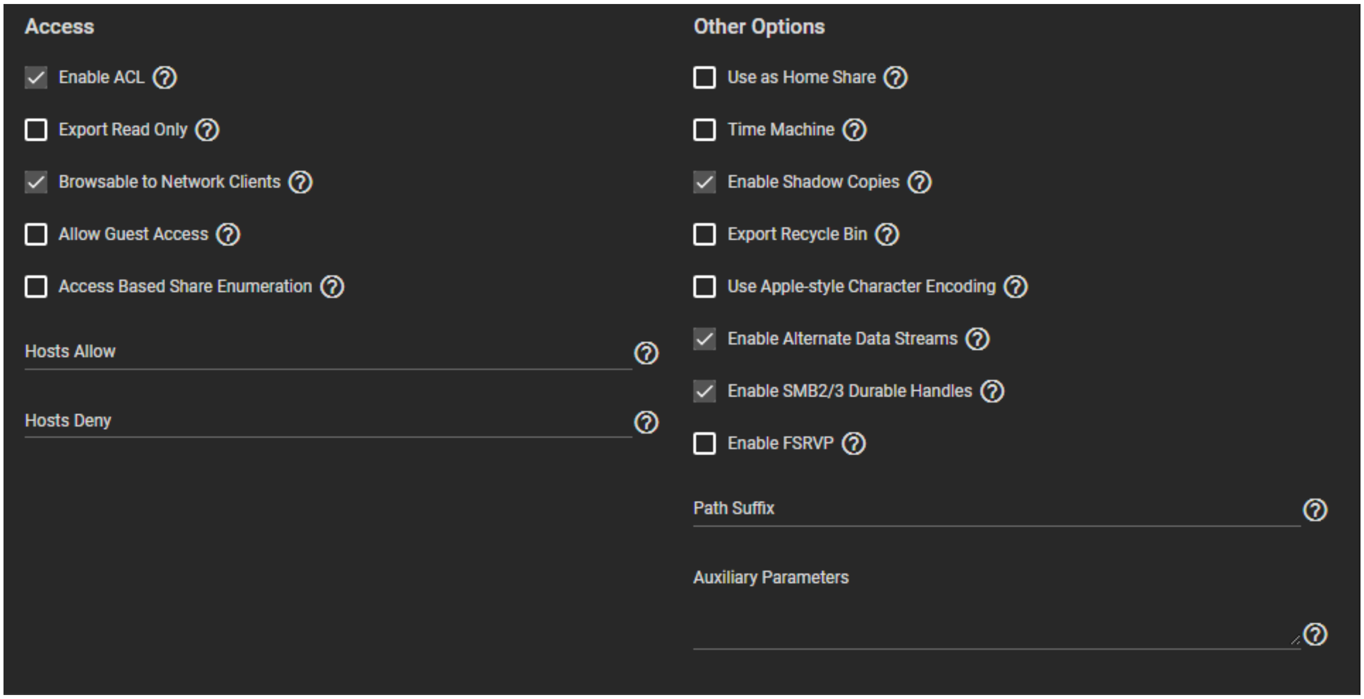
Shadow Copies, also known as the Volume Shadow Copy Service (VSS) or Previous Versions, is a Microsoft service for creating volume snapshots. Shadow copies can be used to restore previous versions of files from within Windows Explorer.

By default, all ZFS snapshots for a dataset underlying an SMB share path are presented to SMB clients through the volume shadow copy service or are accessible directly with SMB when the hidden ZFS snapshot directory is located within the path of the SMB share.

There are a few caveats about shadow copies to be aware of before activating the feature in TrueNAS:

- When the Windows system is not fully patched to the latest service pack, Shadow Copies might not work. If no previous versions of files to restore are visible, use Windows Update to ensure the system is fully up-to-date.
- Shadow copy support only works for ZFS pools or datasets.
- Appropriate permissions must be configured on the pool or dataset being shared by SMB.
- Users cannot use an SMB client to delete shadow copies. Instead, the administrator use the TrueNAS web interface to remove snapshots. Shadow copies can be disabled for an SMB share by unsetting *Enable shadow copies* for the SMB share. This does not prevent access to the hidden .zfs/snapshot directory for a ZFS dataset when the directory is located within the *Path* for an SMB share.

To enable Shadow Copies, go to **Sharing > Windows Shares (SMB)** and *Edit* an existing share. Open the *Advanced* options, find the **Other Options** and set *Enable Shadow Copies*.



Access

☑ Enable ACL

□ Export Read Only

☑ Browsable to Network Clients

□ Allow Guest Access

□ Access Based Share Enumeration

Hosts Allow

Hosts Deny

Other Options

□ Use as Home Share

□ Time Machine

☑ Enable Shadow Copies

□ Export Recycle Bin

□ Use Apple-style Character Encoding

☑ Enable Alternate Data Streams

☑ Enable SMB2/3 Durable Handles

□ Enable FSRVP

Path Suffix

Auxiliary Parameters

Windows 10 v2004 Issue expand □

Some users have experienced issues in the Windows 10 v2004 release where network shares can’t be accessed. The problem appears to come from a bug in gpedit.msc, the Local Group Policy Editor. Unfortunately, setting the *Allow insecure guest logon* flag value to *Enabled* in **Computer Configuration > Administrative Templates > Network > Lanman Workstation** appears to have no effect on the configuration.

To work around this issue, edit the Windows registry. Use *Regedit* and go to **HKLM\SYSTEM\CurrentControlSet\Services\LanmanWorkstation\Parameters**. The *DWORD AllowInsecureGuestAuth* is an incorrect value: *0x00000000*. Change this value to *0x00000001* (Hexadecimal 1) to allow adjusting the settings in gpedit.msc. This can be applied to a fleet of Windows machines with a Group Policy Update.

9 - Services

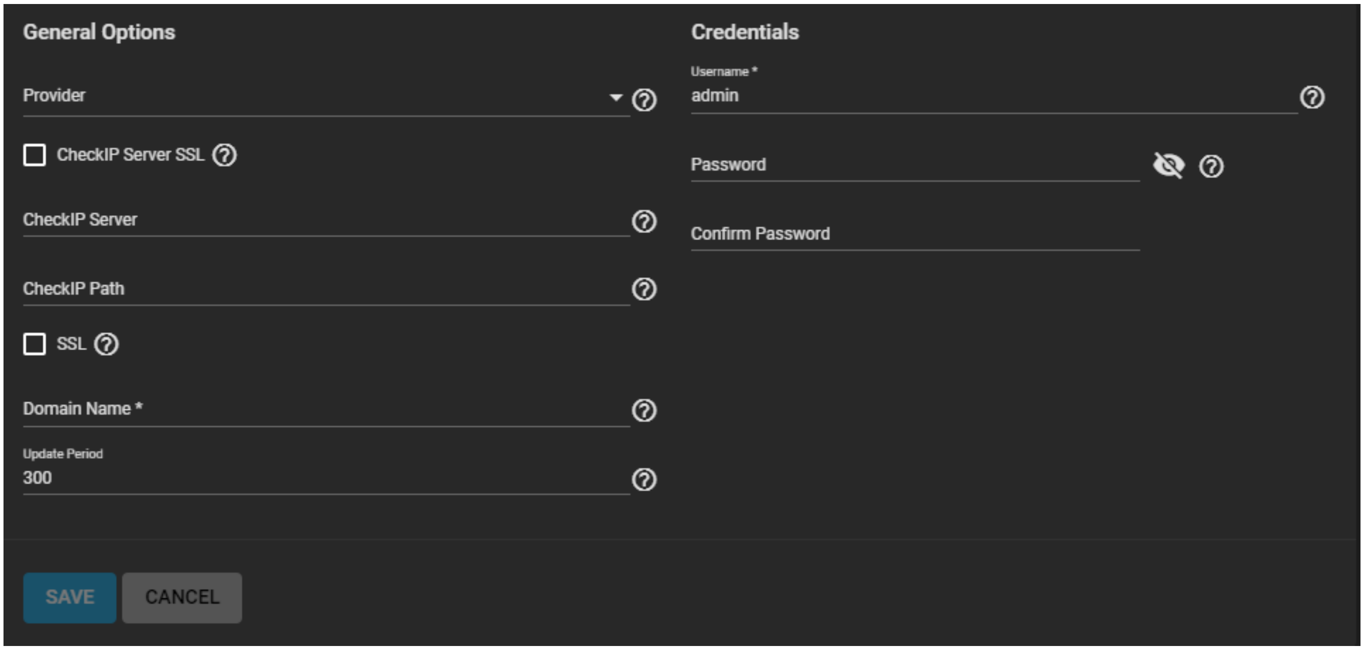
Services related to data sharing or automated tasks are documented in their respective Sharing or Tasks.

9.1 - Dynamic DNS

Dynamic Domain Name Service (DDNS) is useful when TrueNAS is connected to an ISP that periodically changes the IP address of the system. With dynamic DNS, the system can automatically associate its current IP address with a domain name and continue to provide access to TrueNAS even if the system IP address changes.

Configuring Dynamic DNS

DDNS requires registration with a DDNS service such as DynDNS before configuring TrueNAS. Have the DDNS service settings available or open in another browser tab when configuring TrueNAS. Log in to the TrueNAS web interface and go to **Services > Dynamic DNS**.



General Options

Provider

□ CheckIP Server SSL

CheckIP Server

CheckIP Path

□ SSL

Domain Name *

Update Period: 300

Credentials

Username *: admin

Password

Confirm Password

General Options

Name	Description
Provider	Several providers are supported. If a specific provider is not listed, select Custom Provider and enter the information in the Custom Server and Custom Path fields.
CheckIP-Server SSL	Use HTTPS for the connection to the CheckIP Server.
CheckIP Server	Name and port of the server that reports the external IP address. For example, entering checkip.dyndns.org:80 uses Dyn IP detection. to discover the remote socket IP address.
CheckIP Path	Path to the CheckIP Server. For example, `no-ip.com` uses a CheckIP Server of `dynamic.zoneedit.com` and CheckIP Path of /checkip.html.
SSL	Use HTTPS for the connection to the server that updates the DNS record.
Domain Name	Fully qualified domain name of the host with the dynamic IP address. Separate multiple domains with a space, comma (,), or semicolon (;). Example: `myname.dyndns.org; myothername.dyndns.org`.

Update Period	How often the IP is checked in seconds.

Credentials

Name	Description
Username	Username for logging in to the provider and updating the record.
Password	Password for logging in to the provider and updating the record.

The required values for these fields are provided by your DDNS solution. Start the DDNS service after choosing your *Provider* options and saving the settings.

9.2 - FTP, SFTP, and TFTP

The [File Transfer Protocol (FTP)]() is a simple option for data transfers. The additional SSH and Trivial FTP options provide secure or simple config file transfer methods, respectively.

Options for configuring **FTP**, **SSH**, and **TFTP** are in the system **Services**. Click the edit to configure the related service.

⊙ FTP

FTP requires a new dataset and local user account.

Go to **Storage > Pools** to add a new dataset.

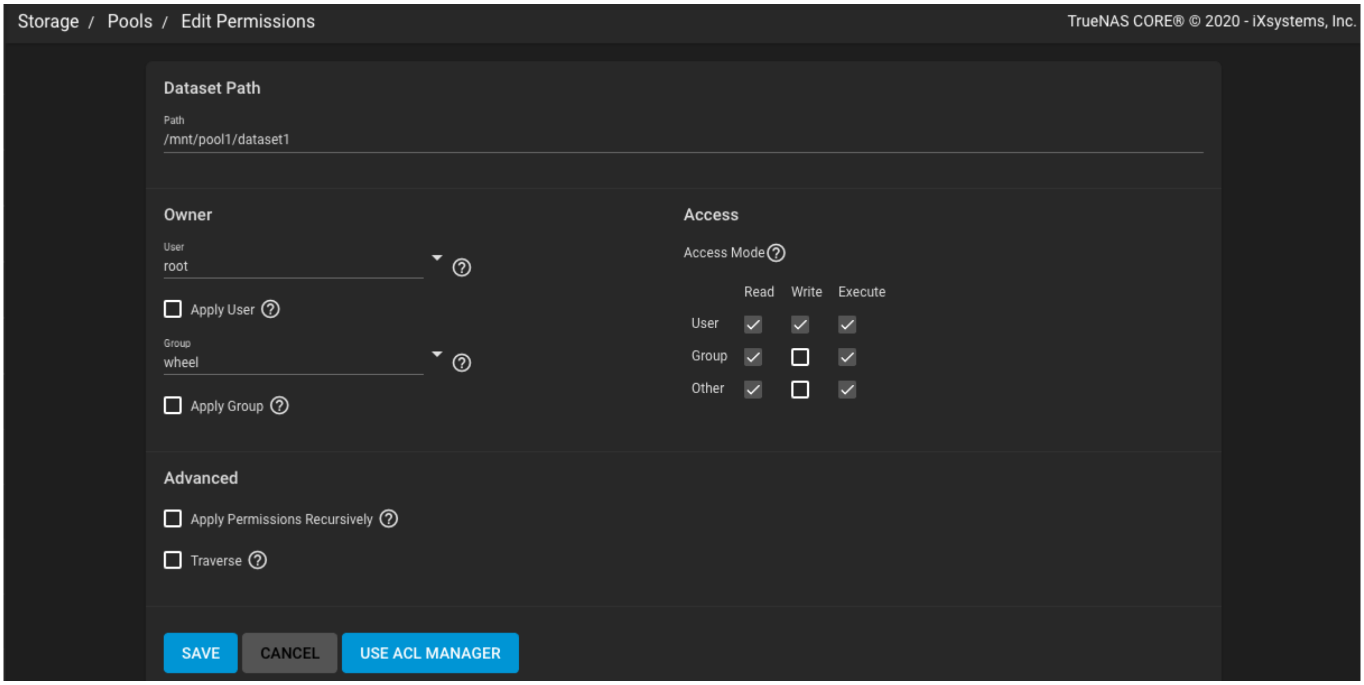
![StoragePoolsAddDataset](</images/CORE/12.0/StoragePoolsAddDataset.png “Adding a new Dataset”)

Next, go to **Accounts > Users > Add** to create a local user on the TrueNAS.

![AccountsUsersAdd](</images/CORE/12.0/AccountsUsersAdd.png “Adding a new User Account”)

Assign a user name, password, and link the newly created dataset for the FTP share as the home directory of the user. This can be done on a per user basis, or a global account for FTP can also be created, for example OurOrgFTPacnt, etc.

Return to **Storage > Pools**, find the new dataset, and click more_vert > *Edit Permissions*. Set the **Owner** fields (user and group) to the newly created user account. Be sure to click *Apply User* and *Apply Group* before saving.



Storage / Pools / Edit Permissions

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Dataset Path

Path
/mnt/pool1/dataset1

Owner

User
root

□ Apply User

Group
wheel

□ Apply Group

Access

Access Mode

	Read	Write	Execute
User	☑	☑	☑
Group	☑	□	☑
Other	☑	□	☑

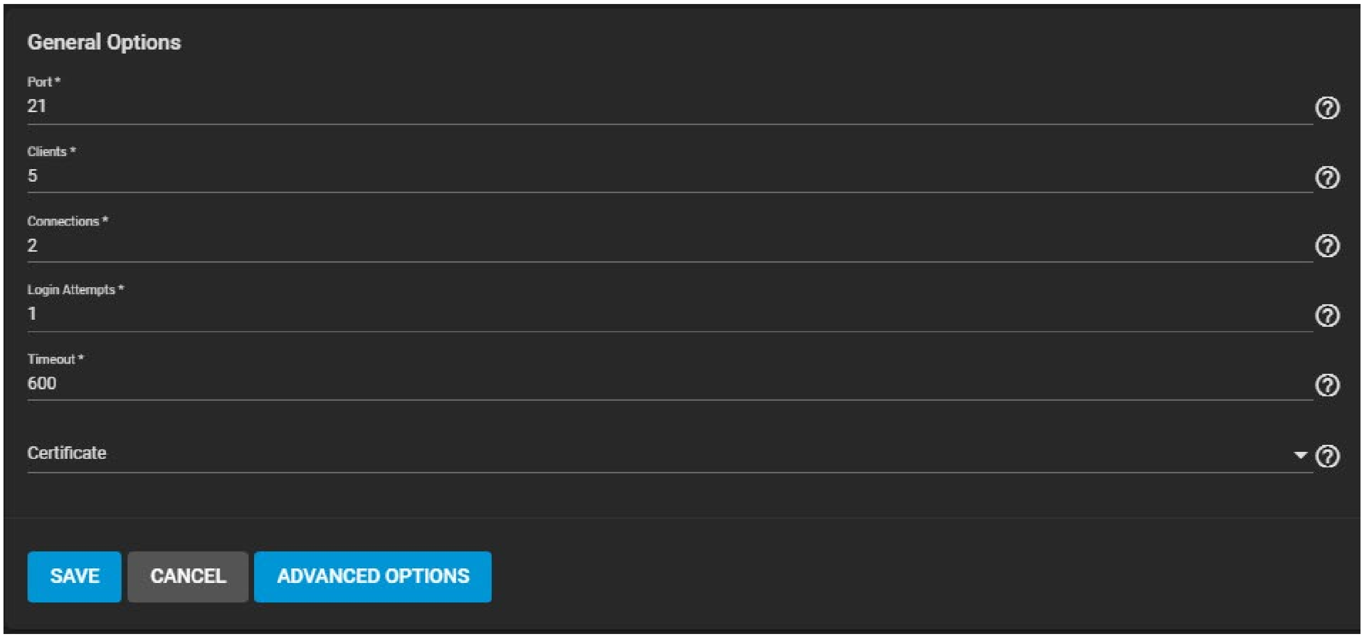
Advanced

□ Apply Permissions Recursively

□ Traverse

Service Configuration

To configure FTP, go to the **Services** page, find the **FTP** entry, and click the edit.



General Options

Port * 21

Clients * 5

Connections * 2

Login Attempts * 1

Timeout * 600

Certificate

Configure the options according to your environment and security considerations.

General Options

Name	Description
Port	Set the port the FTP service listens on.
Clients	The maximum number of simultaneous clients.
Connections	Set the maximum number of connections per IP address. 0 is unlimited.
Login Attempts	Enter the maximum attempts before client is disconnected. Increase if users are prone to typos.
Timeout	Maximum client idle time in seconds before disconnect.
Certificate	The SSL certificate to be used for TLS FTP connections. To create a certificate, go to **Certificates**.

Advanced

Access

Name	Description
Always Chroot	Set to only let users access their home directory if they are in the wheel group. This option increases security risk.
Allow Root Login	Allow anonymous FTP logins with access to the directory specified in *Path*.
Allow Anonymous Login	Allow any local user to log in. By default, only members of the *ftp* group are allowed to log in.
Allow Local User Login	Setting this option results in timeouts when `identd` is not running on the client.
Require IDENT Authentication	Sets default permissions for newly created files.
File Permissions	Sets default permissions for newly created directories.

TLS

Name	Description
Enable TLS	Allow encrypted connections. Requires a certificate (created or imported in **Certificates**.
TLS Policy	Define whether the control channel, data channel, both channels, or neither channel of an FTP session must occur over SSL/TLS. The policies are described here.
TLS Allow Client Renegotiations	We don't recommend this, since it breaks security measures. See mod_tls for details.
TLS Allow Dot Login	If set, TrueNAS checks the user home directory for a .tlslogin file containing one or more PEM-encoded certificates. If not found, the user is prompted for password authentication.
TLS Allow Per User	If set, allows user password to be sent unencrypted.
TLS Common Name Required	When set, the common name in the certificate must match the FQDN of the host.
TLS Enable Diagnostics	If set when troubleshooting a connection, logs more verbosely.
TLS Export Certificate Data	Set to export the certificate environment variables.
TLS No Certificate Request	Set if the client cannot connect from poorly handling the server certificate request.
TLS No Empty Fragments	We don't recommend this option, since it bypasses a security mechanism.
TLS No Session Reuse Required	This option reduces connection security. Only use it if the client does not understand reused SSL sessions.
TLS Export Standard Vars	If selected, sets several environment variables.
TLS DNS Name Required	If set, the client DNS name must resolve to its IP address and the cert must contain the same DNS name.
TLS IP Address Required	If set, the client certificate IP address must match the client IP address.

Bandwidth

Name	Description
Local User Upload Bandwidth: (Examples: 500 KiB, 500M, 2 TB) *	This field accepts human-readable input in KiBs or greater (M, GiB, TB, etc.). Default 0 KiB is unlimited.
Local User Download Bandwidth	This field accepts human-readable input in KiBs or greater (M, GiB, TB, etc.). Default 0 KiB is unlimited.
Anonymous User Upload Bandwidth	This field accepts human-readable input in KiBs or greater (M, GiB, TB, etc.). Default 0 KiB is unlimited.
Anonymous User Download Bandwidth	This field accepts human-readable input in KiBs or greater (M, GiB, TB, etc.). Default 0 KiB is unlimited.

Other Options

Name	Description
Minimum Passive Port	Used by clients in PASV mode. A default of 0 means any port above 1023.
Maximum Passive Port	Used by clients in PASV mode. A default of 0 means any port above 1023.
Enable FXP	Enable File eXchange Protocol. We don’t recommend this, since it leaves the server vulnerable to FTP bounce attacks.
Allow Transfer Resumption	Set to allow FTP clients to resume interrupted transfers.
Perform Reverse DNS Lookups	Performs reverse DNS lookups on client IPs. Causes long delays if reverse DNS isn’t configured.
Masquerade Address	Public IP address or hostname. Set if FTP clients cannot connect through a NAT device.
Display Login	The message shown to local login users after authentication. Not shown to anonymous login users.
Auxiliary Parameters	Used to add additional proftpd(8 parameters.

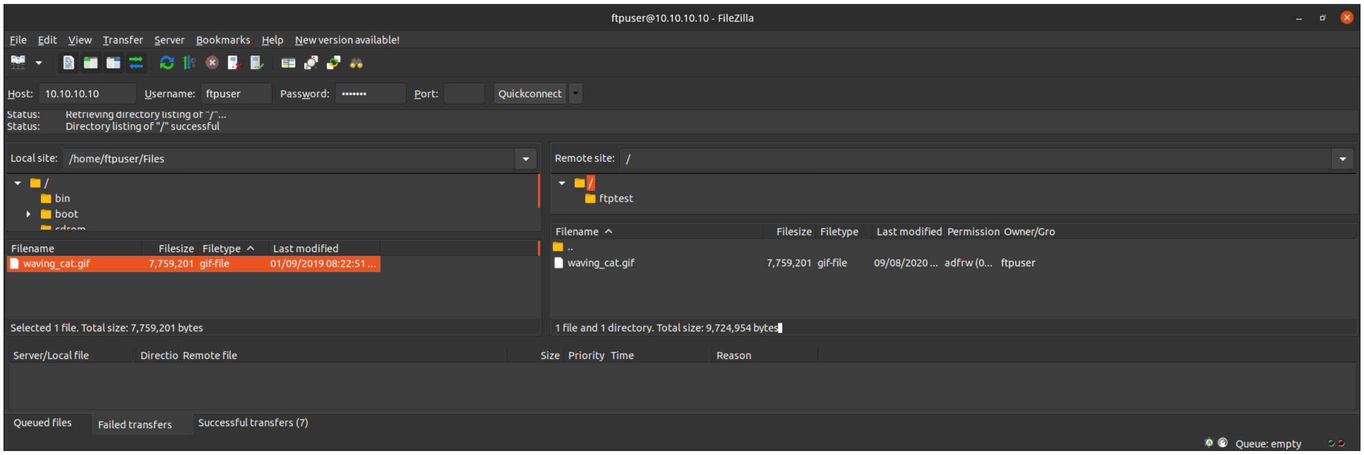
Ensure *chroot* is enabled as this helps confine FTP sessions to a local user’s home directory and allow *Local User Login*.

Unless necessary, do NOT allow anonymous or root access. For better security, enable TLS when possible. This is effectively FTPS. When FTP is exposed to a WAN, enable TLS.

FTP Connection

Use a browser or FTP client to connect to the TrueNAS FTP share. The images here show using FileZilla, a free option.

The user name and password are those of the local user account on the TrueNAS. The default directory is the same as the user’s /home directory. After connecting, directories can be created and files uploaded and downloaded.



ftpuser@10.10.10.10 - FileZilla

Host: 10.10.10.10 Username: ftpuser Password: ••••••• Port:

```
Status:     Retrieving directory listing of "/"...
Status:     Directory listing of "/" successful
```

Local site: /home/ftpuser/Files

```
/
  bin
  boot
  cdrom
```

Filename	Filesize	Filetype	Last modified
waving_cat.gif	7,759,201	gif-file	01/09/2019 08:22:51 ...

Selected 1 file. Total size: 7,759,201 bytes

Remote site: /

```
/
  ftptest
```

Filename	Filesize	Filetype	Last modified	Permission	Owner/Gro
..					
waving_cat.gif	7,759,201	gif-file	09/08/2020 ...	adfrw (0...	ftpuser

1 file and 1 directory. Total size: 9,724,954 bytes

Server/Local file	Directio	Remote file	Size	Priority	Time	Reason

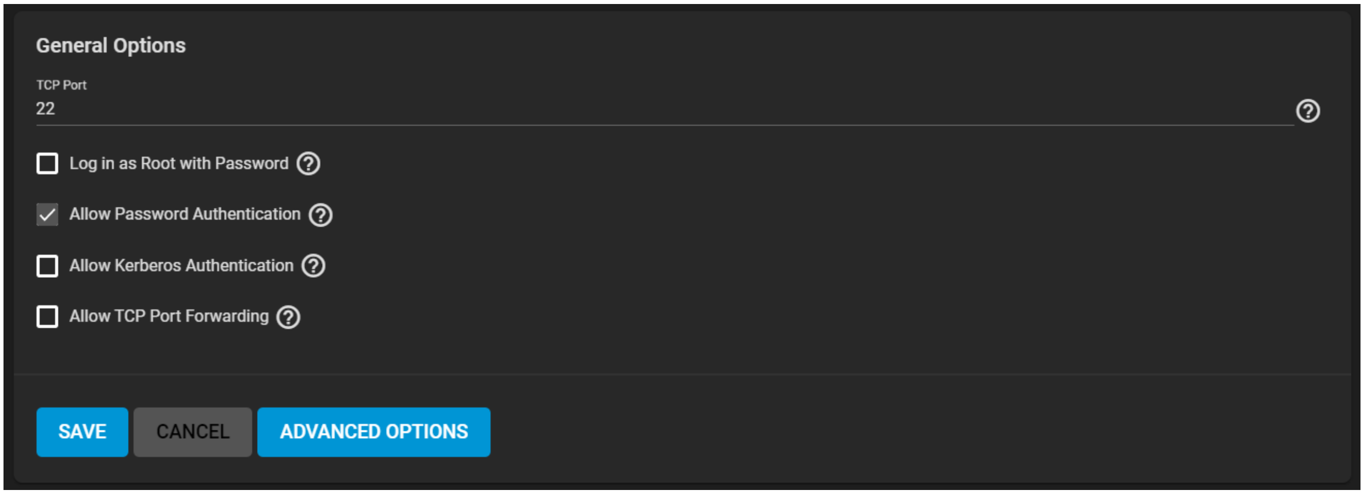
Queued files | Failed transfers | Successful transfers (7)

Queue: empty

○ SFTP

SFTP or SSH File Transfer Protocol, is available by enabling SSH remote access to the TrueNAS system. SFTP is more secure than standard FTP as it applies SSL encryption on all transfers by default.

Go to **Services**, find the **SSH** entry, and click the edit.



General Options

TCP Port

22

☐ Log in as Root with Password

☑ Allow Password Authentication

☐ Allow Kerberos Authentication

☐ Allow TCP Port Forwarding

Set *Allow Password Authentication* and decide if *Log in as Root with Password* is needed. SSH with root is a security vulnerability as it allows full remote control over the NAS with a terminal, not just SFTP transfer access. Review the remaining options and configure according to your environment or security needs.

SSH Service Options expand ☐

General Options

Name	Description
TCP Port	Open a port for SSH connection requests.
Log in as Root with Password	Root logins are discouraged. Allows root logins. A password must be set for the root user account.
Allow Password Authentication	Enabling allows SSH login authentication using a password. Warning: when directory services are enabled, this setting grants access to all users the directory service imported. When disabled, authentication requires keys for all users (requires additional SSH client and server setup).
Allow Kerberos Authentication	Before enabling, ensure valid entries exist in **Directory Services** (Kerberos Realms and Keytabs) and the system can communicate with the Kerberos Domain Controller.
Allow TCP Port Forwarding	Set to let users bypass firewall restrictions using the SSH port forwarding feature.

Advanced Options

Name	Description
Bind Interfaces	Select interfaces for SSH to listen on. Leave all options unselected for SSH to listen on all interfaces.
Compress Connections	Select the syslog(3) level of the SFTP server.
SFTP Log Level	Select the syslog(3) facility of the SFTP server.
SFTP Log Facility	Allow more ciphers for sshd(8) in addition to the defaults in sshd_config(5). *None* allows unencrypted SSH connections and AES128-CBC allows the 128-bit Advanced Encryption Standard.
Weak	WARNING: these ciphers are security vulnerabilities. Only allow them in a secure

Ciphers	network environment.
Auxiliary Parameters	Add any more sshd_config(5) options not covered in this screen. Enter one option per line. These options are case-sensitive. Typos can prevent the SSH service from starting.

SFTP Connections

Similar to the FTP setup, open FileZilla or another FTP client, or command line. This article shows using FileZilla as an example. Using FileZilla, enter *SFTP://'TrueNAS IP'*, *'username'*, *'password'*, and port **22** to connect.

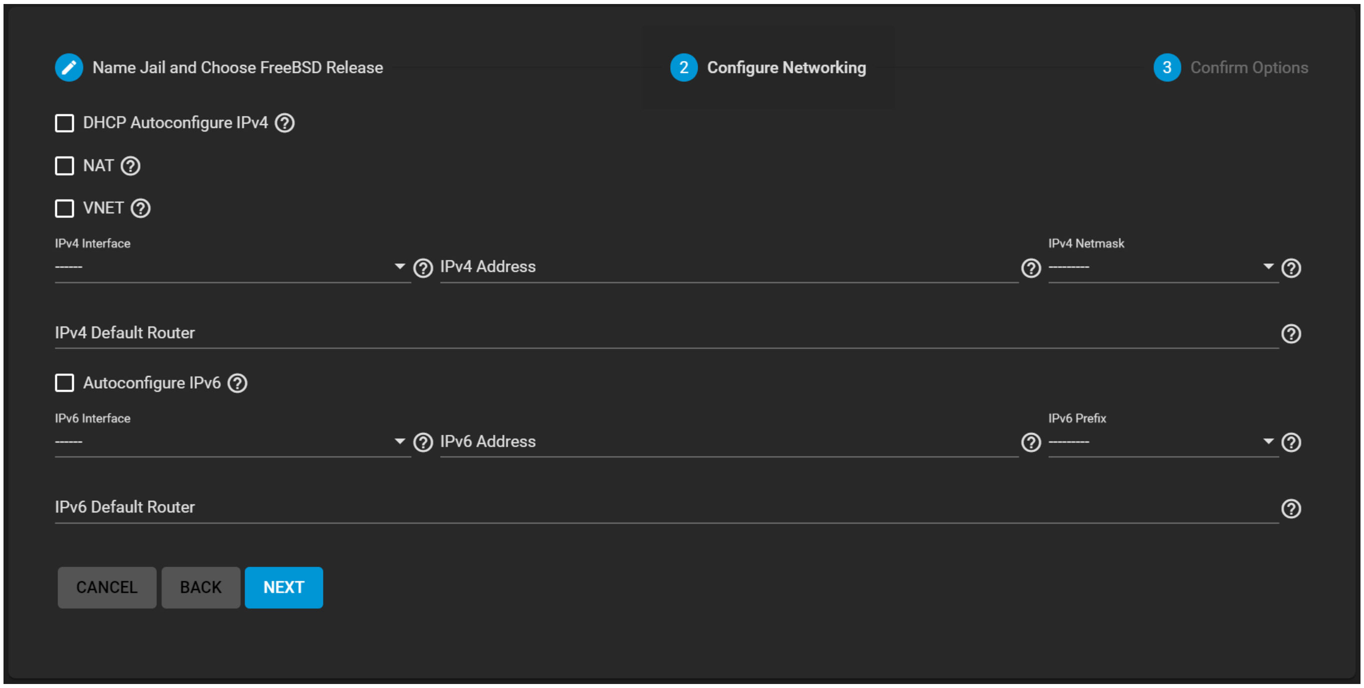
SFTP does not have chroot locking. While chroot is not 100% secure, the lack of chroot allows users to easily move up to the root directory and view internal system information. If this level of access is a concern, FTP with TLS may be the more secure choice.

SFTP in a TrueNAS Jail

Another way to allow SFTP access without granting read access to other areas of the NAS itself is to set up a jail and enable SSH.

Go to **Jails > Add**. Provide a name for the jail and pick a target FreeBSD image. 11.3 was used for the purpose of this guide.

Set the networking options to either DHCP or a static IP and confirm to create.



Name Jail and Choose FreeBSD Release — 2 Configure Networking — 3 Confirm Options

□ DHCP Autoconfigure IPv4

□ NAT

□ VNET

IPv4 Interface: ------ | IPv4 Address | IPv4 Netmask: --------

IPv4 Default Router

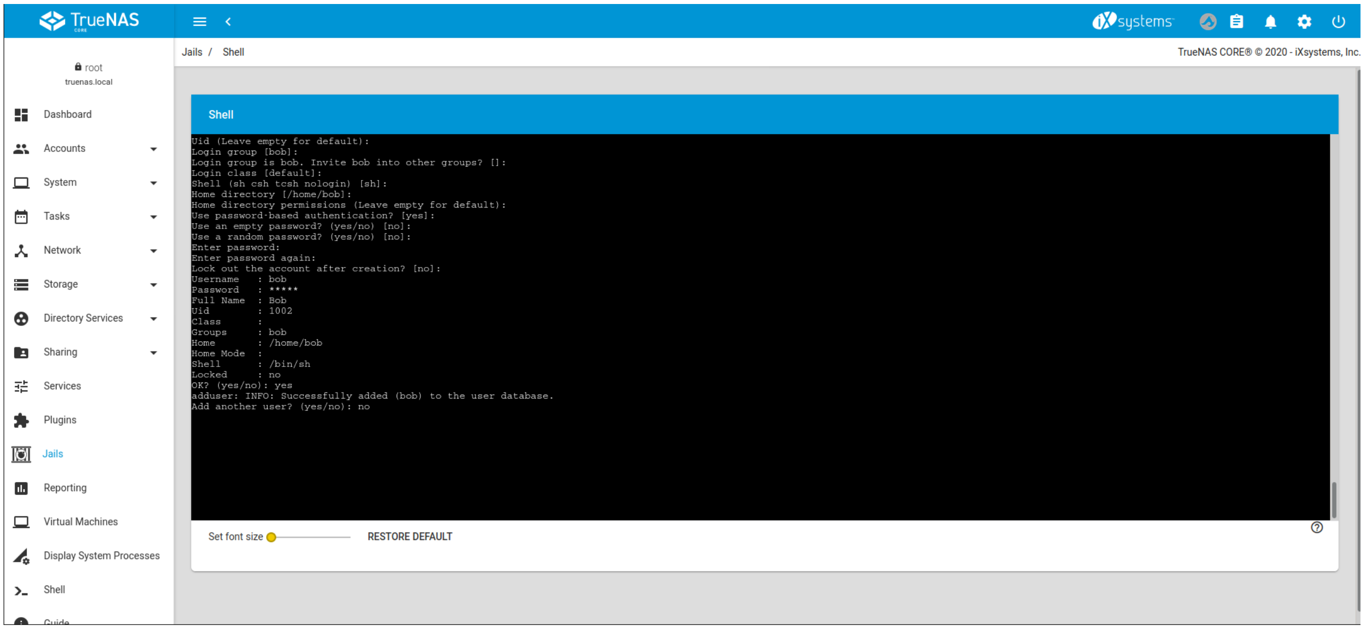
□ Autoconfigure IPv6

IPv6 Interface: ------ | IPv6 Address | IPv6 Prefix: --------

IPv6 Default Router

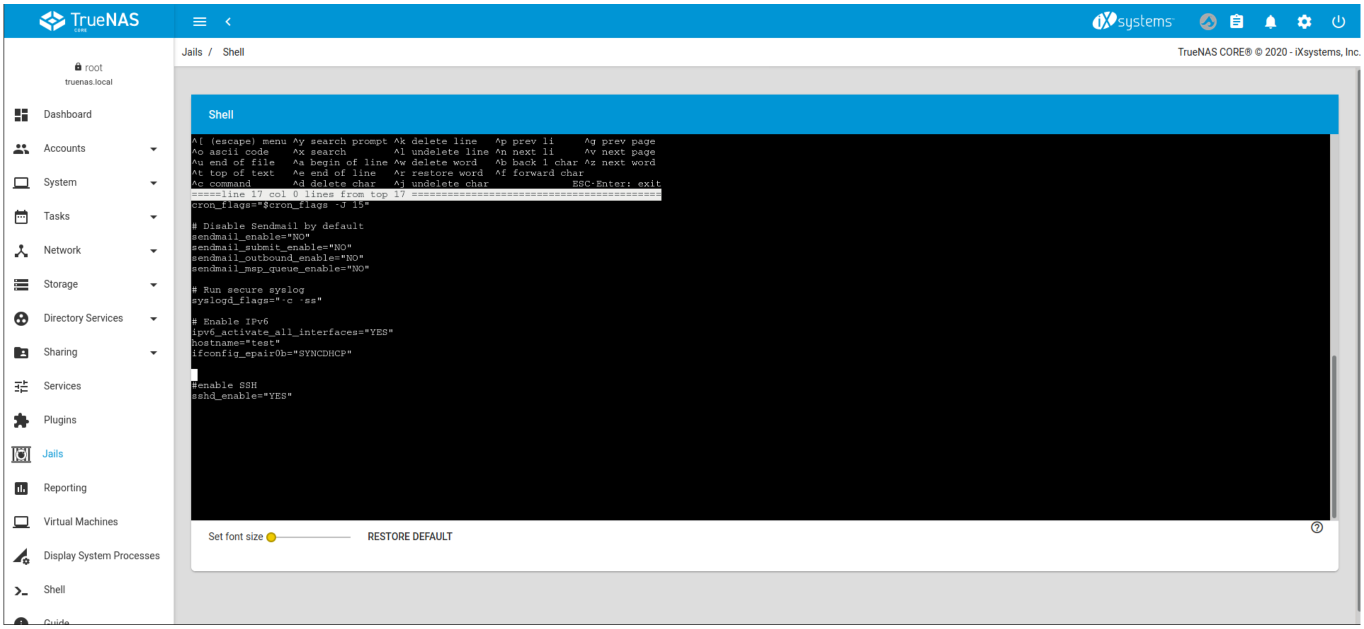
After the is created, open the jail menu by clicking the expand icon **>** on the right-hand side of the jail. Click *START* and open the *SHELL*.

Similar to the initial FTP setup, create a user in the jail. Enter `adduser` and follow the prompts including the password and home directory location. When complete, the jail asks to confirm the credentials.



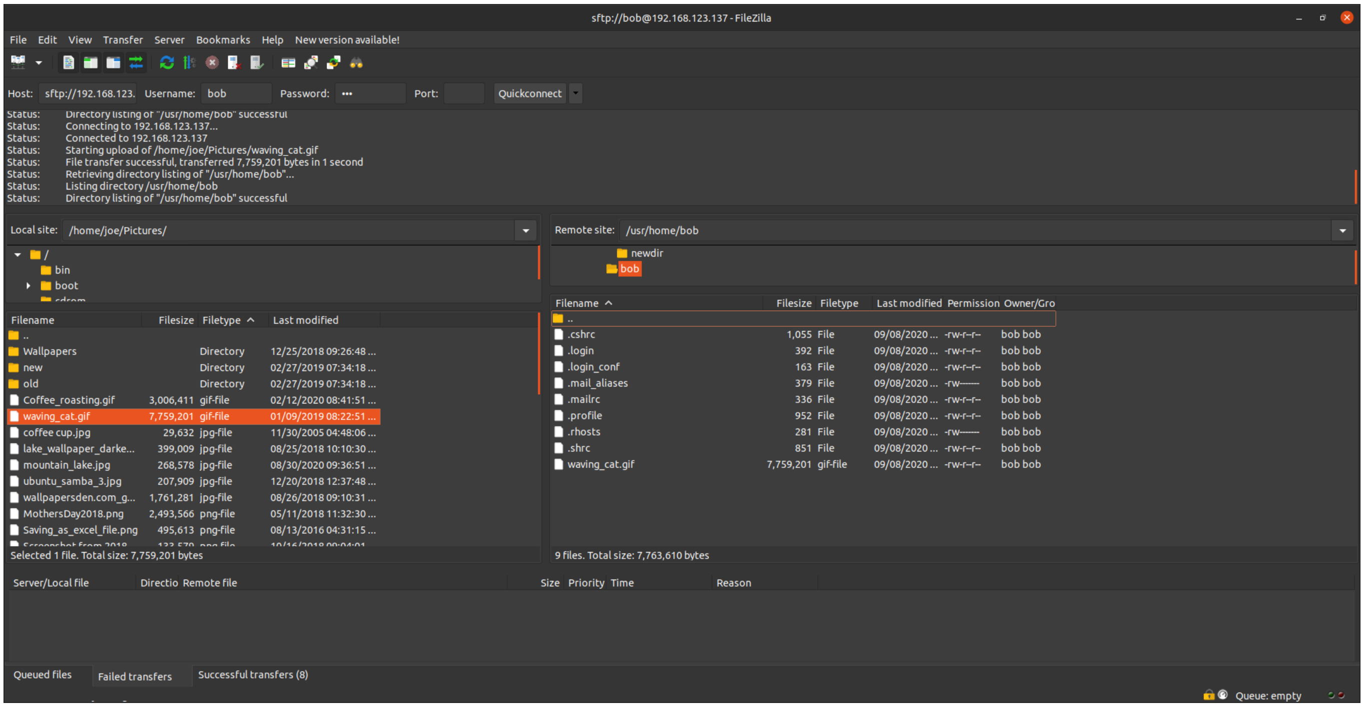
```
Uid (Leave empty for default):
Login group [bob]:
Login group is bob. Invite bob into other groups? []:
Login class [default]:
Shell (sh csh tcsh nologin) [sh]:
Home directory [/home/bob]:
Home directory permissions (Leave empty for default):
Use password-based authentication? [yes]:
Use an empty password? (yes/no) [no]:
Use a random password? (yes/no) [no]:
Enter password:
Enter password again:
Lock out the account after creation? [no]:
Username   : bob
Password   : *****
Full Name  : Bob
Uid        : 1002
Class      :
Groups     : bob
Home       : /home/bob
Home Mode  :
Shell      : /bin/sh
Locked     : no
OK? (yes/no): yes
adduser: INFO: Successfully added (bob) to the user database.
Add another user? (yes/no): no
```

Enable SSH by editing the /etc/rc.conf file. Type `vi /etc/rc.conf` or `ee /etc/rc.conf` depending on preference, add `sshd_enable = "YES"` to the file, save, and exit. Type `service sshd enabled` to enable the service (enabled vs start indicates whether sshd starts one time or on every reboot).



```
^[ (escape) menu ^y search prompt ^k delete line   ^p prev li     ^g prev page
^o ascii code    ^x search        ^l undelete line ^n next li     ^v next page
^u end of file   ^a begin of line ^w delete word   ^b back 1 char ^z next word
^t top of text   ^e end of line   ^r restore word  ^f forward char
^c command       ^d delete char   ^j undelete char              ESC-Enter: exit
=====line 17 col 0 lines from top 17 ========================================
cron_flags="$cron_flags -J 15"

# Disable Sendmail by default
sendmail_enable="NO"
sendmail_submit_enable="NO"
sendmail_outbound_enable="NO"
sendmail_msp_queue_enable="NO"

# Run secure syslog
syslogd_flags="-c -ss"

# Enable IPv6
ipv6_activate_all_interfaces="YES"
hostname="test"
ifconfig_epair0b="SYNCDHCP"


#enable SSH
sshd_enable="YES"
```

Using an FTP client, such as FileZilla, log in with the jail IP address and user credentials. Like with SSH on TrueNAS, browsing to other folders and locations beyond the user's home directory is possible, but unlike running on TrueNAS directly, only the components of the jail are available.



Host: sftp://192.168.123. Username: bob Password: ••• Port:

```
Status:     Directory listing of "/usr/home/bob" successful
Status:     Connecting to 192.168.123.137...
Status:     Connected to 192.168.123.137
Status:     Starting upload of /home/joe/Pictures/waving_cat.gif
Status:     File transfer successful, transferred 7,759,201 bytes in 1 second
Status:     Retrieving directory listing of "/usr/home/bob"...
Status:     Listing directory /usr/home/bob
Status:     Directory listing of "/usr/home/bob" successful
```

Local site: /home/joe/Pictures/

Filename	Filesize	Filetype	Last modified
..			
Wallpapers		Directory	12/25/2018 09:26:48 ...
new		Directory	02/27/2019 07:34:18 ...
old		Directory	02/27/2019 07:34:18 ...
Coffee_roasting.gif	3,006,411	gif-file	02/12/2020 08:41:51 ...
waving_cat.gif	7,759,201	gif-file	01/09/2019 08:22:51 ...
coffee cup.jpg	29,632	jpg-file	11/30/2005 04:48:06 ...
lake_wallpaper_darke...	399,009	jpg-file	08/25/2018 10:10:30 ...
mountain_lake.jpg	268,578	jpg-file	08/30/2020 09:36:51 ...
ubuntu_samba_3.jpg	207,909	jpg-file	12/20/2018 12:37:48 ...
wallpapersden.com_g...	1,761,281	jpg-file	08/26/2018 09:10:31 ...
MothersDay2018.png	2,493,566	png-file	05/11/2018 11:32:30 ...
Saving_as_excel_file.png	495,613	png-file	08/13/2016 04:31:15 ...

Selected 1 file. Total size: 7,759,201 bytes

Remote site: /usr/home/bob

Filename	Filesize	Filetype	Last modified	Permission	Owner/Gro
..					
.cshrc	1,055	File	09/08/2020 ...	-rw-r--r--	bob bob
.login	392	File	09/08/2020 ...	-rw-r--r--	bob bob
.login_conf	163	File	09/08/2020 ...	-rw-r--r--	bob bob
.mail_aliases	379	File	09/08/2020 ...	-rw-------	bob bob
.mailrc	336	File	09/08/2020 ...	-rw-r--r--	bob bob
.profile	952	File	09/08/2020 ...	-rw-r--r--	bob bob
.rhosts	281	File	09/08/2020 ...	-rw-------	bob bob
.shrc	851	File	09/08/2020 ...	-rw-r--r--	bob bob
waving_cat.gif	7,759,201	gif-file	09/08/2020 ...	-rw-r--r--	bob bob

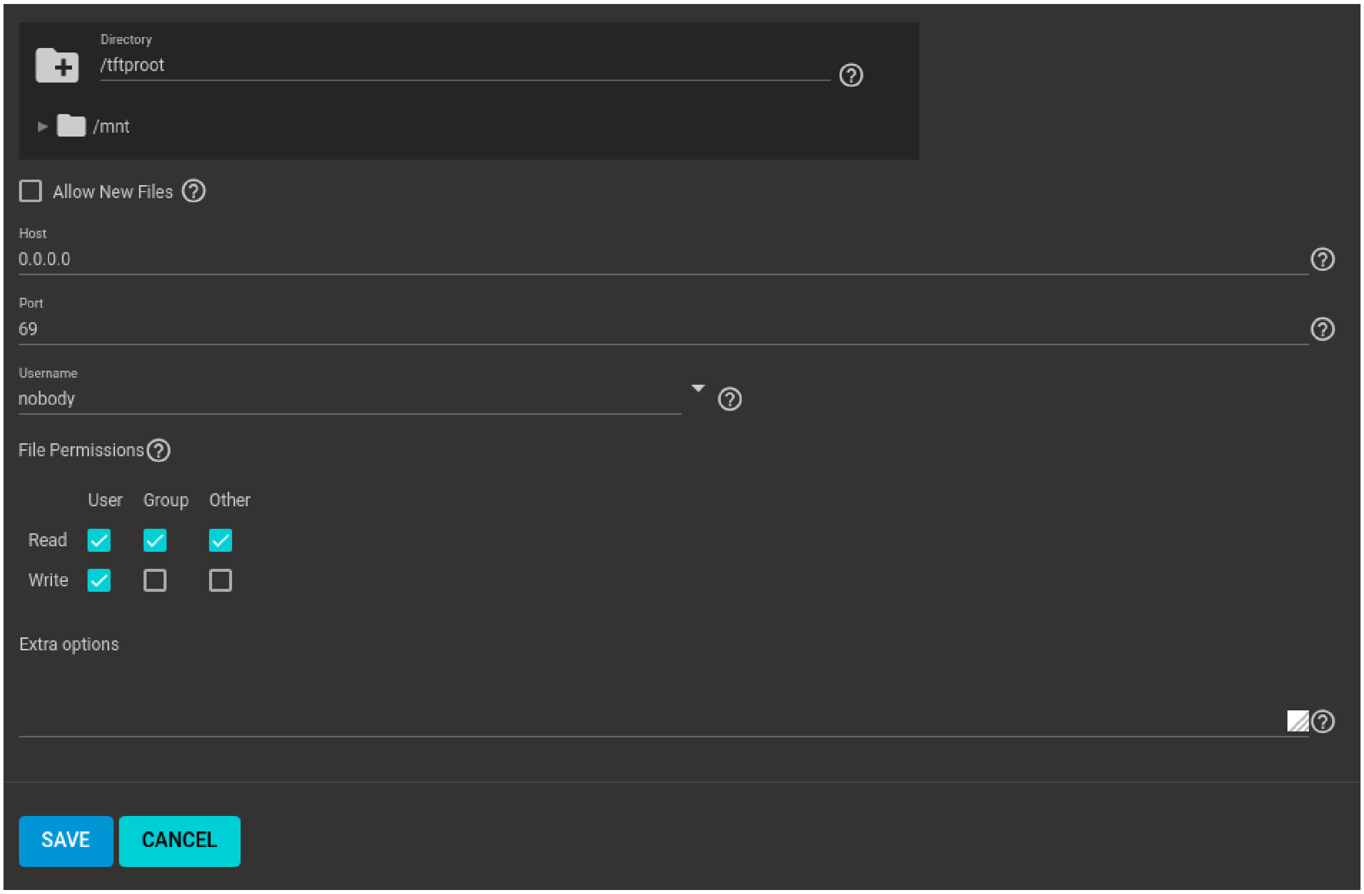
9 files. Total size: 7,763,610 bytes

Server/Local file	Directio	Remote file	Size	Priority	Time	Reason

○ TFTP

The Trivial File Transfer Protocol (TFTP) is a light-weight version of FTP typically used to transfer configuration or boot files between machines, such as routers, in a local environment. TFTP provides an extremely limited set of commands and provides no authentication.

When the TrueNAS system is only storing images and configuration files for network devices, configure and start the TFTP service. Starting the TFTP service opens UDP port *69*.



Directory: /tftproot

▸ /mnt

☐ Allow New Files

Host: 0.0.0.0

Port: 69

Username: nobody

File Permissions

	User	Group	Other
Read	☑	☑	☑
Write	☑	☐	☐

Extra options

Path

Name	Description
Directory	Browse to an existing directory to use for storage. Some devices can require a specific directory name. Consult the documentation for that device to see if there are any restrictions.

Connection

Name	Description
Host	The default host to use for TFTP transfers. Enter an IP address. Example: `192.0.2.1`
Port	The UDP port number that listens for TFTP requests. Example: `8050`
Username	Select the account to use for TFTP requests. This account must have permission to the Directory.

Access

Name	Description
File Permissions	Adjust the file permissions using the checkboxes.
Allow New Files	Set when network devices need to send files to the system.

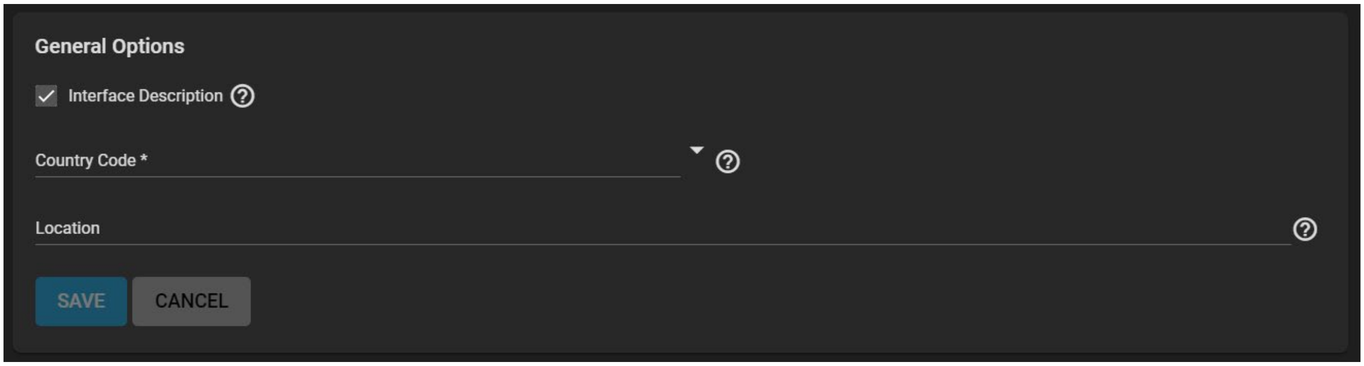
Other Options

Name	Description
Auxiliary Parameters	Add more options from tftpd. Add one option on each line.

9.3 - LLDP

Network devices use the Link Layer Discovery Protocol (LLDP) to advertise their identity, capabilities, and neighbors on an Ethernet network. TrueNAS uses the ladvd LLDP implementation. When the local network contains managed switches, configuring and starting the LLDP service tells the TrueNAS system to advertise itself on the network.

To configure LLDP, go to the **Services** page, find the **LLDP** entry, and click the □.



General Options

☑ Interface Description

Country Code *

Location

General Options

Name	Description
Interface Description	Enables receive mode. Any received peer information is saved in interface descriptions.
County Code	Two-letter ISO 3166-1 alpha-2 code used to enable LLDP location support.
Location	The physical location of the host.

Set *Interface Description* and enter a *Country Code* before turning the LLDP service on.

9.4 - OpenVPN

A virtual private network (VPN) is an extension of a private network over public resources. It allows clients to securely connect to a private network even when they are remotely using a public network. TrueNAS provides OpenVPN as a system level service to provide VPN Server or Client functionality. This means TrueNAS can act as a primary VPN server to allow remote clients access to data stored on the system using a single TCP or UDP port. Alternately, TrueNAS can integrate into a private network, even when the system is in a separate physical location or only has access to publicly visible networks.

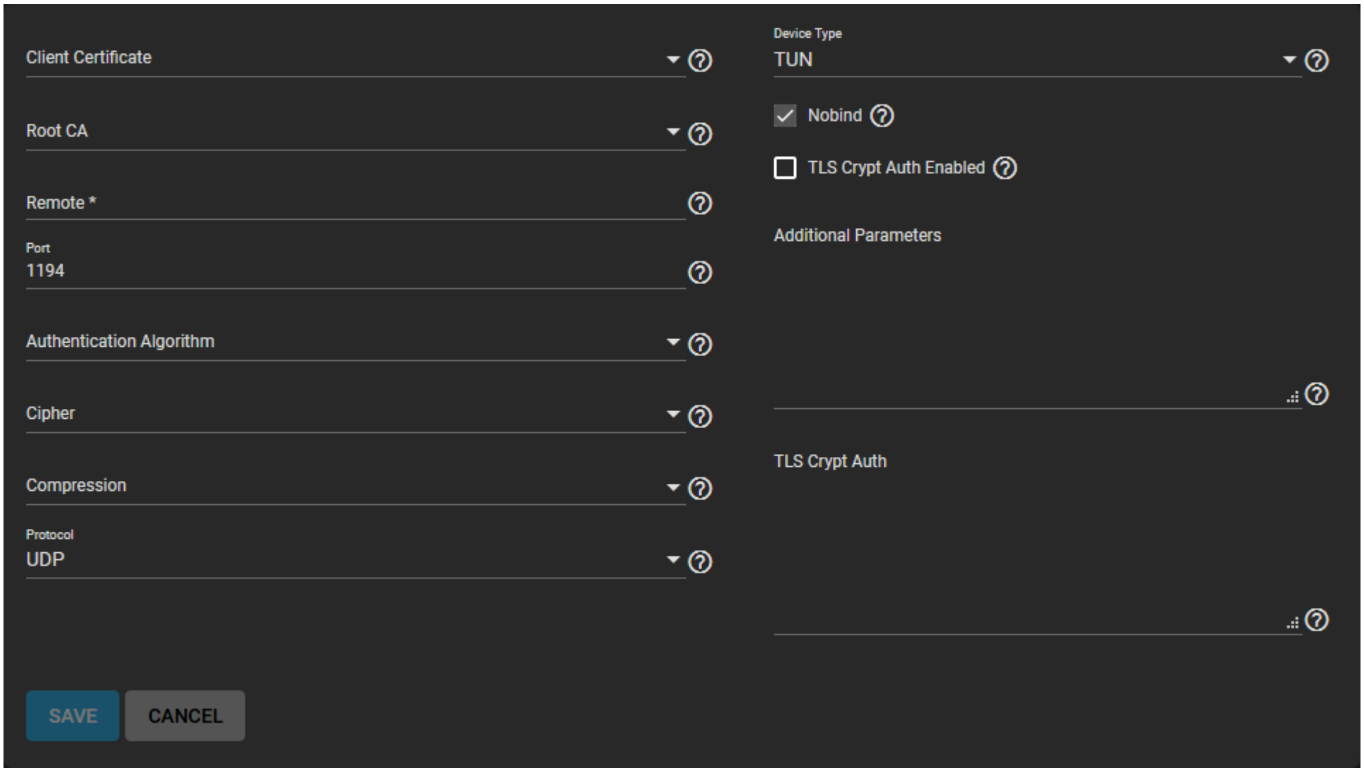
Before configuring TrueNAS as either an OpenVPN Server or Client, you will need an existing public key infrastructure (PKI) with Certificates and Certificate Authorities created in or imported to TrueNAS.

What does this do? expand ☐
This allows TrueNAS to authenticate with clients or servers by confirming network credentials were signed by a valid master Certificate Authority (CA). To read more about the required PKI for OpenVPN, see the OpenVPN PKI Overview.

The general process to configure OpenVPN (server or client) on TrueNAS is to select the networking credentials, set the connection details, and choose any additional security or protocol options.

OpenVPN Client

Go to the **Services** page and find the **OpenVPN Client** entry. Click the edit to configure the service.



Client Certificate

Root CA

Remote *

Port
1194

Authentication Algorithm

Cipher

Compression

Protocol
UDP

Device Type
TUN

☑ Nobind

☐ TLS Crypt Auth Enabled

Additional Parameters

TLS Crypt Auth

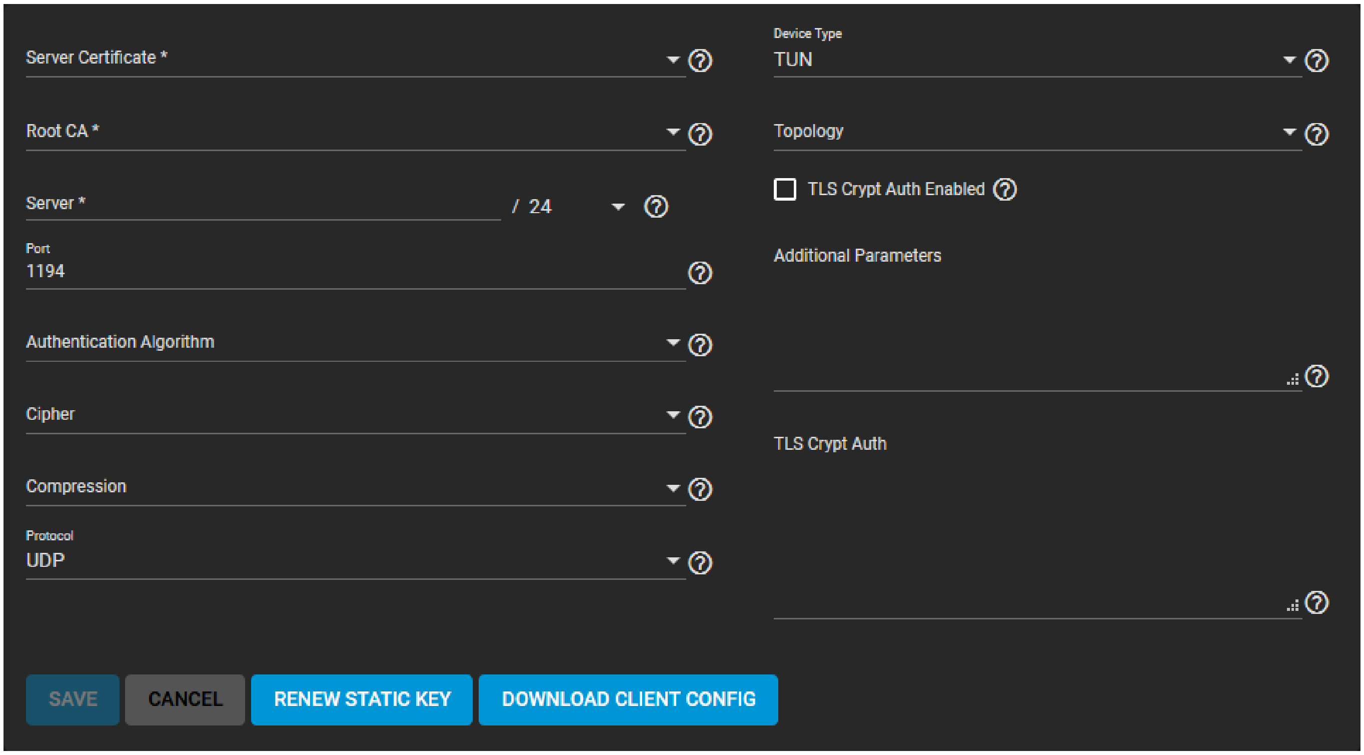
Choose the certificate to use as an OpenVPN client. This certificate must exist in TrueNAS and be in an active (unrevoked) state. Enter the host name or IP address of the *Remote* OpenVPN server.

Continue to review and choose any other [Connection Settings]() that fit with your network environment and performance requirements. The *Device Type* must match with the OpenVPN server *Device Type*. *Nobind* prevents using a fixed port for the client. By default, this is enabled to allow the OpenVPN client and server to run concurrently.

Finally, review the [Security Options]() and choose settings that meet your network security requirements. When the OpenVPN server is using TLS Encryption, copy the static TLS encryption key and paste into the *TLS Crypt Auth* field.

OpenVPN Server

Go to the **Services** page and find the **OpenVPN Server** entry. Click the edit to configure the service.



Server Certificate *

Root CA *

Server * / 24

Port
1194

Authentication Algorithm

Cipher

Compression

Protocol
UDP

Device Type
TUN

Topology

☐ TLS Crypt Auth Enabled

Additional Parameters

TLS Crypt Auth

Choose a *Server Certificate* for this OpenVPN server. The certificate must both exist on the TrueNAS system and be in an active (unrevoked) state.

Now define a IP address and netmask for the OpenVPN *Server*. Continue to choose the remaining [Connection Settings]() that fit with your network environment and performance requirements. When a *TUN Device Type* is selected, you can choose a virtual addressing *Topology* for the server:

- *NET30*: Use one */30* subnet per client in a point-to-point topology. Designed for use when connecting clients are Windows systems.
- *P2P*: Point-to-point topology that points the local server and remote client endpoints to each other. Each client is given one IP address. This is only recommmended when none of the clients are a Windows system.
- *SUBNET*: the interface uses an IP address and subnet. Each client is given one IP address. Windows clients require the *TAP-Win32 driver* version 8.2 or newer. *TAP* devices always use the *SUBNET Topology*.

The *Topology* selection is automatically applied to any connected clients.

When *TLS Crypt Auth Enabled* is set, TrueNAS generates a static key for the *TLS Crypt Auth* field after saving the options. To change this key, click *RENEW STATIC KEY*. This key is required for any clients connecting to the server. Keys are stored in the system database and are automatically included in a generated client config file, but a good practice is to back up keys in a secure location.

Finally, review the Security Options and choose settings that meet your network security requirements.

After configuring and saving your OpenVPN Server, generate client configuration files for importing to any OpenVPN client systems that are connecting to this server. You need the certificate from the client system already imported on the system. To generate the configuration file, click *DOWNLOAD CLIENT CONFIG* and select the *Client Certificate*.

Common Options (Client or Server)

Many of the fields for configuring an OpenVPN Server or Client are identical. These fields are discussed in this section, with specific configuration options listed in the Server and Client sections.

The *Additional Parameters* field manually sets any of the core OpenVPN config file options. See the OpenVPN Reference Manual for descriptions of each option.

Connection Settings

- *Root CA*: The Certificate Authority (CA) must be the root CA that was used to sign the Client and Server certificates.
- *Port*: This is the port that will be used for the OpenVPN connection.
- *Compression*: Choose a compression algorithm for traffic. Leave the field empty for data to be sent uncompressed. *LZO* is a standard compression algorithm that is backwards compatible with previous (pre-2.4) versions of OpenVPN. *LZ4* is a newer option that is typically faster with less system resources required.
- *Protocol*: Choose between *UDP* or *TCP* protocols for OpenVPN. *UDP* sends packets in a continuous stream while *TCP* sends packets sequentially. UDP is generally faster and less strict about dropped packets than TCP. To force the connection to be IPv4 or IPv6, choose one of the `4` or `6` *UDP* or *TCP* options.
- *Device Type*: use a *TUN* or *TAP* virtual networking device and layer with OpenVPN. This must be identical between the OpenVPN Server and any clients.

Security Options

Because using a VPN involves connecting to a private network while still sending data over less secure public resources, OpenVPN includes several security options. While not required, these security options help protect the data being sent into or out of the private network.

- *Authentication Algorithm*: This is used to validate packets that are sent over the network connection. Your network environment might require a specific algorithm. If no specific algorithm is required, *SHA1 HMAC* is a good standard algorithm to use.
- *Cipher*: This is an algorithm to encrypt data packets sent through the connection. While not required, choosing a *Cipher* can increase connection security. You might need to verify which ciphers are required for your networking environment. If there are no specific cipher requirements, *AES-256-GCM* is a good default choice.
- *TLS Encryption*: When *TLS Crypt Auth Enabled* is set, all TLS handshake messages are encrypted to add another layer of security. This requires a static key that is shared between OpenVPN server and clients.

Service Activation

When finished configuring the Server or Client service, click **SAVE**. Start the service by clicking the related toggle in **Services**. To check the current state of the service, hover over the toggle.

Setting *Start Automatically* means the service starts whenever TrueNAS completes booting and the network and data pools are running.

9.5 - S3

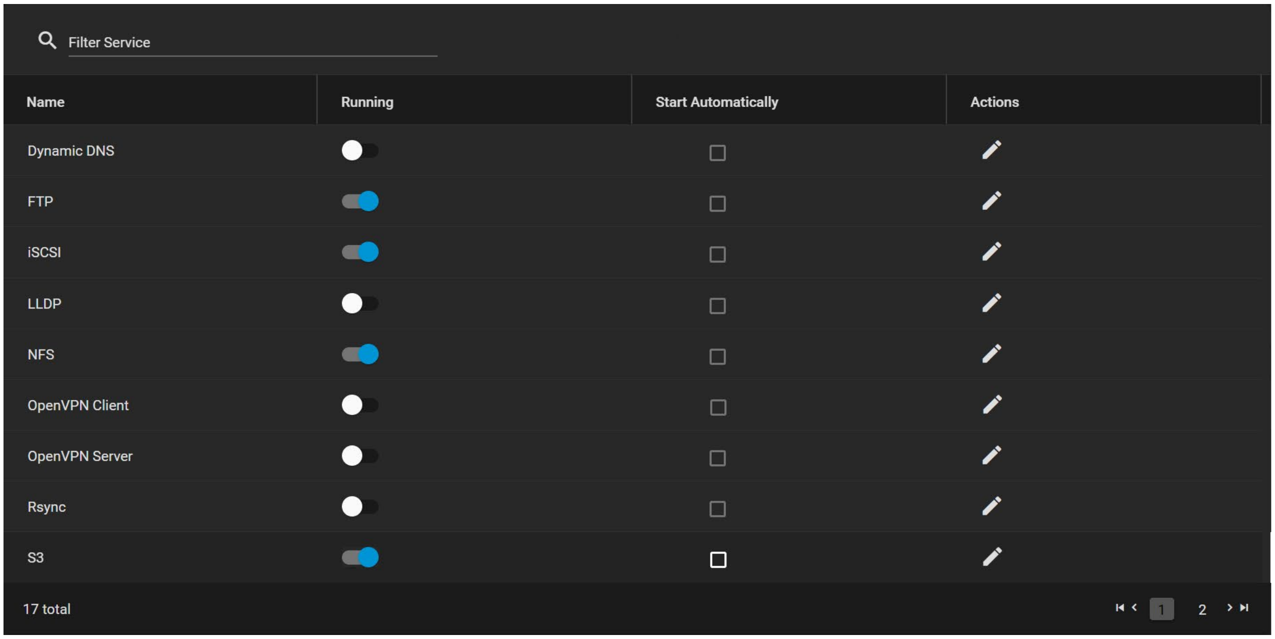
-
    - Setting up the S3 service
    - Minio Connections

S3 allows you to connect to TrueNAS from a networked client system with the Minio Browser, s3cmd, or S3 Browser.

Background expand □
S3 is an object storage protocol that many major cloud providers like Amazon Web Services™ use. On TrueNAS, the service is another way to store files and can be viewed with a web browser. Because S3 is the de facto standard for cloud-based storage, setting up an S3 service allows organizations or online application developers to use TrueNAS to replace or archive expensive cloud storage.

Setting up the S3 service

Go to the **Services** page and find the **S3** entry.



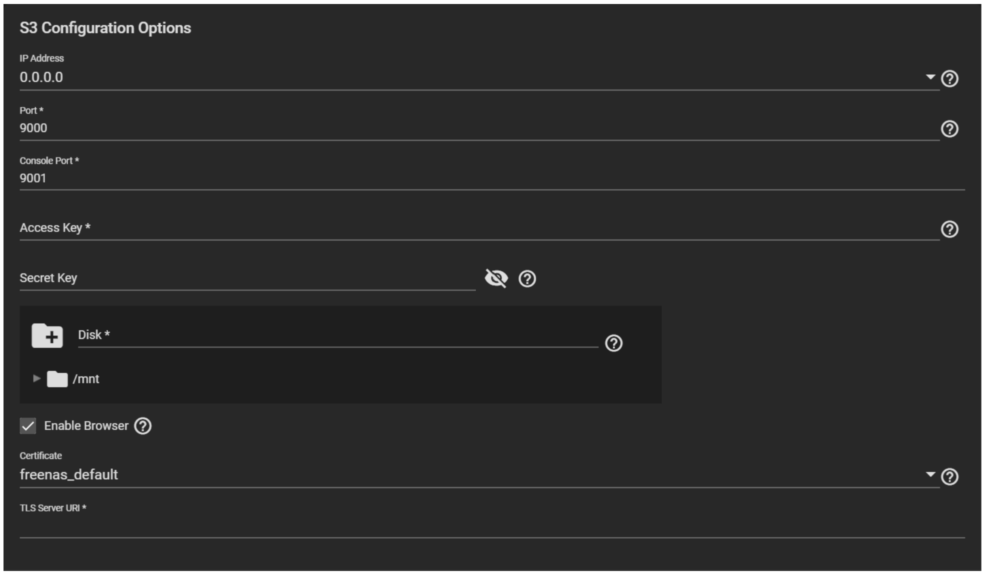
Filter Service

Name	Running	Start Automatically	Actions
Dynamic DNS	○	□	✎
FTP	●	□	✎
iSCSI	●	□	✎
LLDP	○	□	✎
NFS	●	□	✎
OpenVPN Client	○	□	✎
OpenVPN Server	○	□	✎
Rsync	○	□	✎
S3	●	□	✎

17 total

Click the toggle to start or stop the service. Setting *Start Automatically* starts the service when TrueNAS boots.

Click the edit to configure the service.



S3 Configuration Options

IP Address
0.0.0.0

Port *
9000

Console Port *
9001

Access Key *

Secret Key

Disk *
/mnt

☑ Enable Browser

Certificate
freenas_default

TLS Server URI *

Field Descriptions expand □

S3 Configuration Options

Name	Description
IP Address	Enter the IP address that runs the S3 service. *0.0.0.0* tells the server to listen on all IPv4 addresses. *::* allows the same for any IPv6 address. Select the TrueNAS IP address to constrain it to a specific network.
Port	Enter a static port for the MinIO web console. Default is 9001.
Console Port	Enter the TCP port that provides the S3 service.
Access Key	Enter the S3 access ID. See Access keys for more information.
Secret Key	Enter the S3 secret access key. See Access keys for more information.
Disk	Browse to a directory to define the S3 filesystem path.
Enable Browser	Enables the S3 service web UI. Access the MinIO web UI by entering the IP address and port number separated by a colon in the browser address bar. Example: *192.168.1.0:9000*.
Certificate	Use an SSL certificate created or imported in **Credentials > Certificates** for secure S3 connections.
TLS Server URI	If using an SSL certificate, enter the MinIO server’s proxy-able address

The IP address *0.0.0.0* allows the service to listen on any IPv4 address. *::* allows the same for any IPv6 address. Select the TrueNAS IP address to constrain it to a specific network.

Select a clean dataset. MinIO manages files as objects and CANNOT mix them with other dataset files. You can create new datasets by going to **Storage > Pools** and clicking more_vert > *Add Dataset*.

Configure the rest of the options as needed in your environment. Make sure to start the service after saving any changes.

Minio Connections

When *Enable Browser* is set, test access to the Minio Browser by opening a web browser and typing the TrueNAS IP address with the TCP port. The network firewall must let the *Port* through to create buckets and upload files. For example: `https://192.168.0.3:9000`.

MinIO supports several connection and use methods:

⊙ s3cmd

Linux or macOS users must have the s3cmd service installed before beginning this setup. On Windows, users can also refer to S3Express for a similar command-line experience.

> Ubuntu or other Linux distributions can access the configuration by running `s3cmd --configure` to walk through critical settings.

Enter the specified access key and the secret key. Under the *S3 Endpoint*, enter the TrueNAS IP address followed by TCP port, and reply *N* to the DNS-style bucket+hostname.

Save the file. On Linux, the default is in the home directory ~/.s3cfg.

If the connection has any issues, open .s3cfg again to troubleshoot. In Ubuntu, use `nano .s3cfg` or `vi .s3cfg` or `gedit .s3cfg` depending on the preferred text editor. For other operating systems, .s3cfg file location and editing tools may vary.

Scroll down to the host_bucket area and ensure the configuration has removed the `%(bucket)s.` portion and the address points to the *IP_address:TCP_port* for the system.

Correct Example

```
host_base = `192.168.123.207:9000`
host_bucket = `192.168.123.207:9000`
```

Incorrect Example

```
host_base = `192.168.123.207`
host_bucket = `%(bucket)s.192.168.123.207`
```

Poll the buckets using `s3cmd ls` to see the buckets created with the Minio Browser.

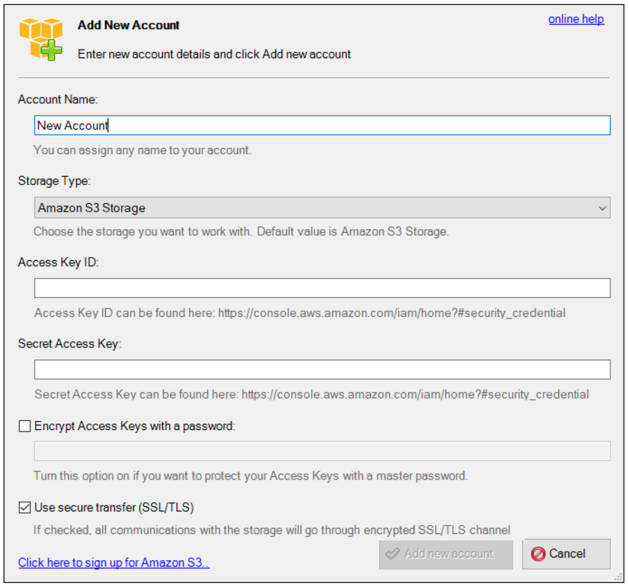
For more information on using Minio with `s3cmd`, see https://docs.minio.io/docs/s3cmd-with-minio.html and https://s3tools.org/s3cmd.

○ S3 Browser (Windows)

The Windows PC S3 Browser is another convenient way to connect to the Minio S3 from TrueNAS.

To set it up, first install the S3 Browser.

After installation completes, add a new account.



Add New Account

Enter new account details and click Add new account

Account Name:

New Account

You can assign any name to your account.

Storage Type:

Amazon S3 Storage

Choose the storage you want to work with. Default value is Amazon S3 Storage.

Access Key ID:

Access Key ID can be found here: https://console.aws.amazon.com/iam/home?#security_credential

Secret Access Key:

Secret Access Key can be found here: https://console.aws.amazon.com/iam/home?#security_credential

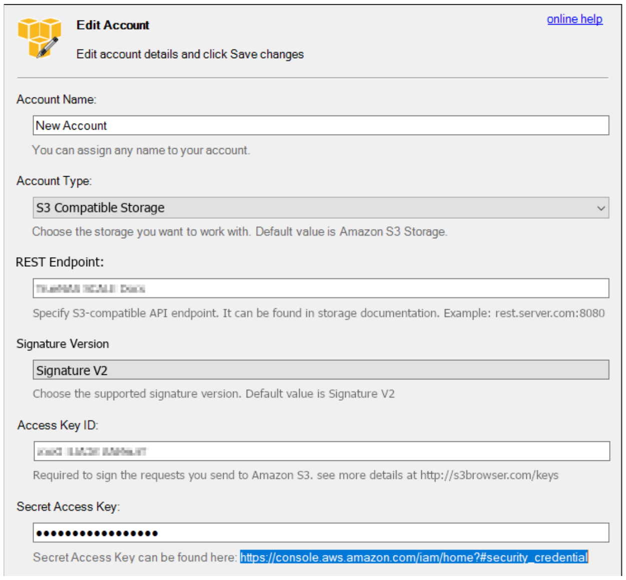
☐ Encrypt Access Keys with a password:

Turn this option on if you want to protect your Access Keys with a master password.

☑ Use secure transfer (SSL/TLS)

If checked, all communications with the storage will go through encrypted SSL/TLS channel

In the settings, select *S3 Compatible Storage* as the *Account Type*, then enter the Minio access point similar to the `s3cmd` setup (TrueNAS_IP_address:9000 or other port if set differently). Select the SSL settings appropriate for the particular setup. The S3 Browser assumes SSL by default, but it may be unset for a LAN attached session.



Edit Account

Edit account details and click Save changes

Account Name:

New Account

You can assign any name to your account.

Account Type:

S3 Compatible Storage

Choose the storage you want to work with. Default value is Amazon S3 Storage.

REST Endpoint:

[redacted]

Specify S3-compatible API endpoint. It can be found in storage documentation. Example: rest.server.com:8080

Signature Version

Signature V2

Choose the supported signature version. Default value is Signature V2

Access Key ID:

[redacted]

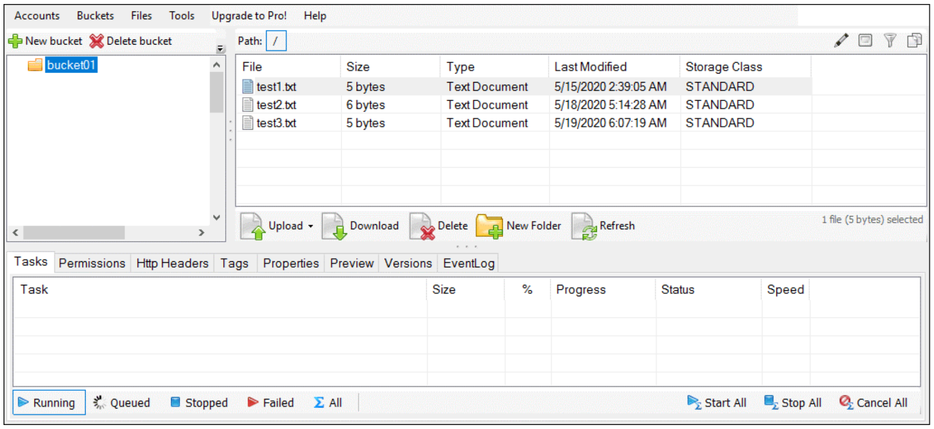
Required to sign the requests you send to Amazon S3. see more details at http://s3browser.com/keys

Secret Access Key:

•••••••••••••••••

Secret Access Key can be found here: https://console.aws.amazon.com/iam/home?#security_credential

It is possible to access, create new buckets, or upload files to created buckets.



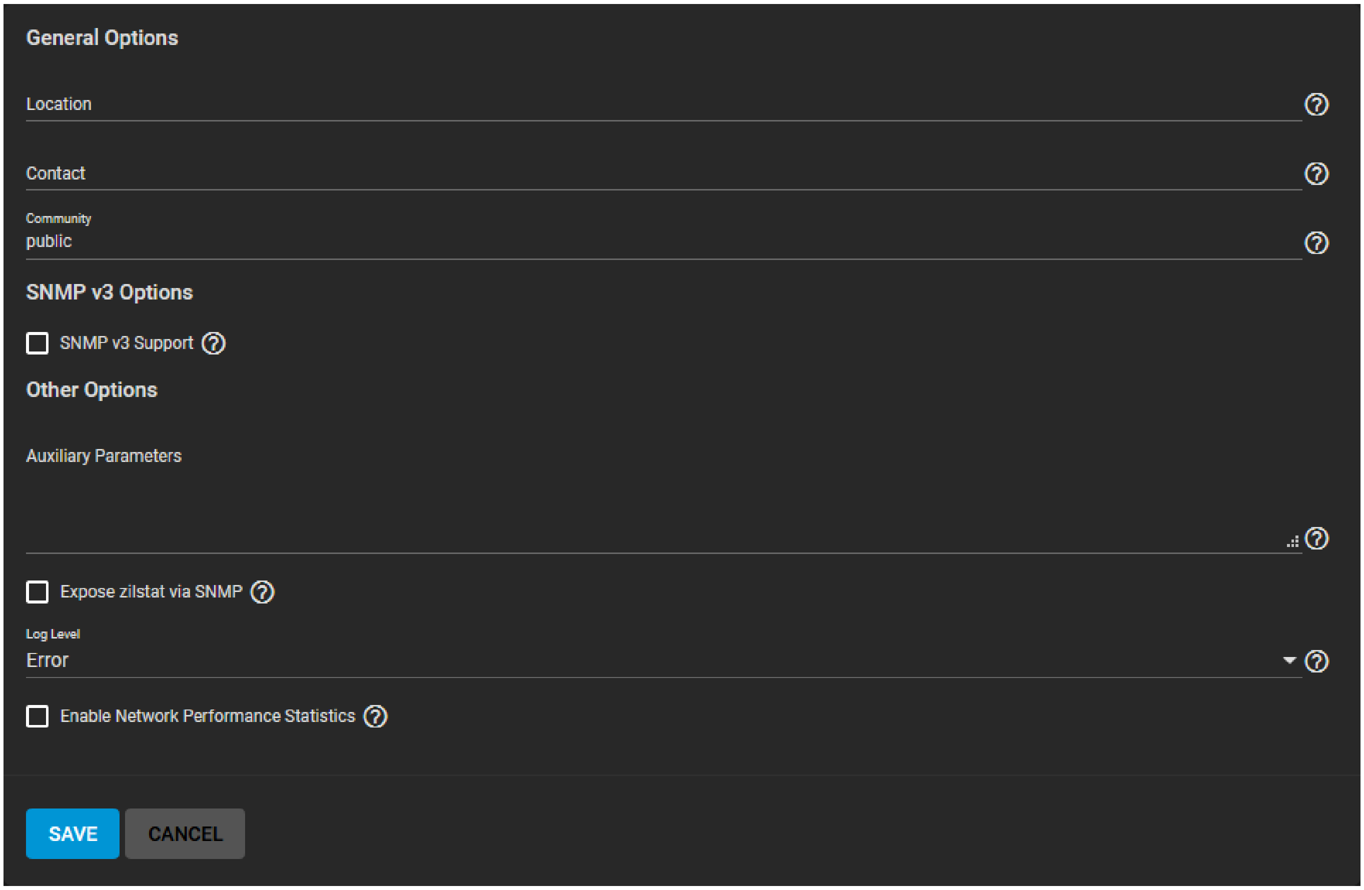
File	Size	Type	Last Modified	Storage Class
test1.txt	5 bytes	Text Document	5/15/2020 2:39:05 AM	STANDARD
test2.txt	6 bytes	Text Document	5/18/2020 5:14:28 AM	STANDARD
test3.txt	5 bytes	Text Document	5/19/2020 6:07:19 AM	STANDARD

1 file (5 bytes) selected

Task	Size	%	Progress	Status	Speed

9.6 - SNMP

SNMP (Simple Network Management Protocol) monitors network-attached devices for conditions that warrant administrative attention. TrueNAS uses Net-SNMP to provide SNMP. To configure SNMP, go to the **Services** page, find the **SNMP** entry, and click the □.



General Options

Location

Contact

Community
public

SNMP v3 Options

□ SNMP v3 Support

Other Options

Auxiliary Parameters

□ Expose zilstat via SNMP

Log Level
Error

□ Enable Network Performance Statistics

Field Descriptions expand □

General Options

Name	Description
Location	Enter the location of the system.
Contact	E-mail address that receives SNMP service messages.
Community	Change from *public* to increase system security. Can only contain alphanumeric characters, underscores (_), dashes (-), periods (.), and spaces. This can be left empty for SNMPv3 networks.

SNMP v3 Options

Name	Description
SNMP v3 Support	Set to to enable support for SNMP version 3. See snmpd.conf(5) for configuration details.
Username	Enter a username to register with this service.
Authentication Type	Choose an authentication method: `---` for none, *SHA*, or *MD5*
Password	Enter a password of at least eight characters.

Privacy Protocol	Choose a privacy protocol: `---` for none, *AES*, or *DES*
Privacy Passphrase	Enter a separate privacy passphrase. *Password* is used when this is left empty.

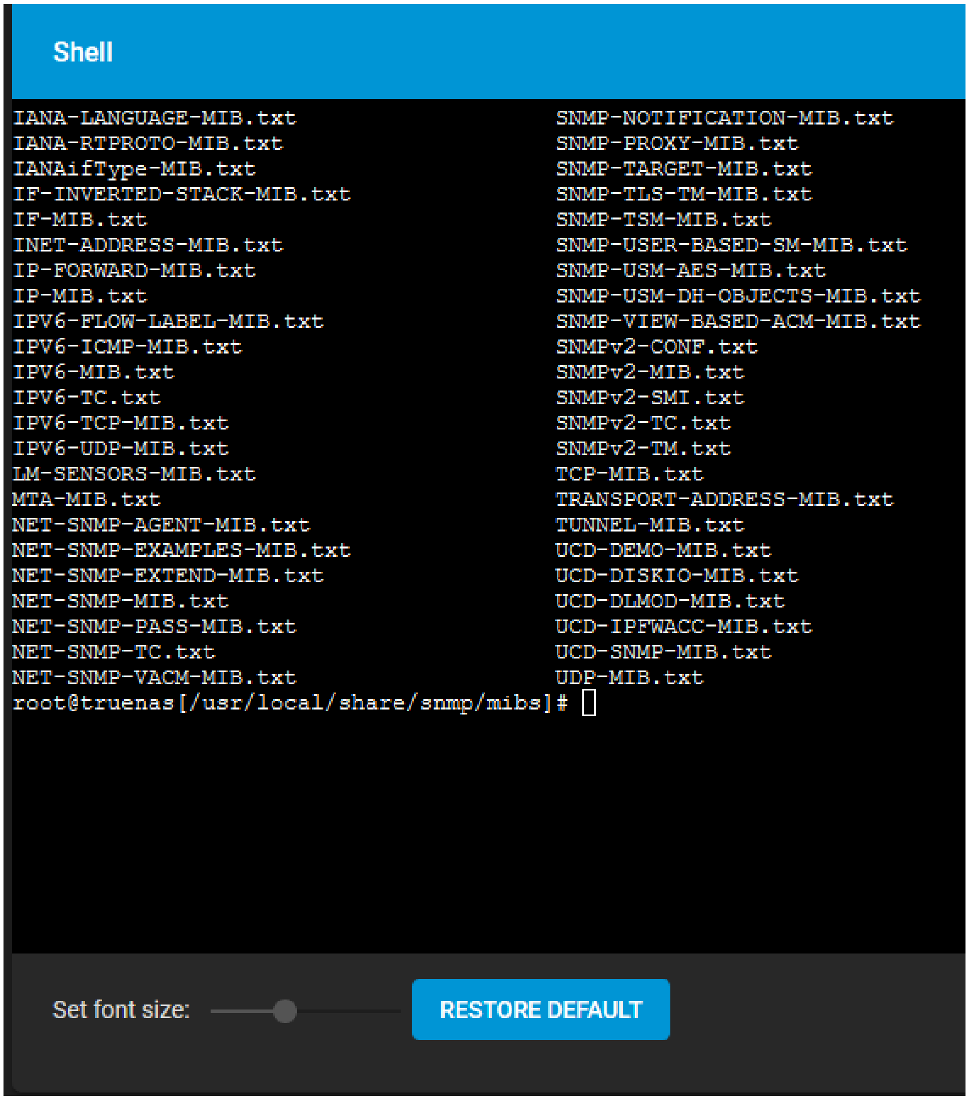
Other Options

Name	Description
Auxiliary Parameters	Enter any additional snmpd.conf options. Add one option for each line.
Expose zilstat via SNMP	Enabling this option may have performance implications on your pools.
Log Level	Choose how many log entries to create. Choices range from least (Emergency) to most (Debug).
Enable Network Performance Statistics	Include iftop network performance statistics in SNMP messages.

When starting the SNMP service, port *UDP 161* listens for SNMP requests.

Management Information Bases (MIBs)

Available Management Information Bases (MIBs) are located in /usr/local/share/snmp/mibs. This directory contains many files being routinely added or removed from the directory. Check the directory on your system by clicking **Shell** and entering `ls /usr/local/share/snmp/mibs`. Here is a sample of the directory contents:



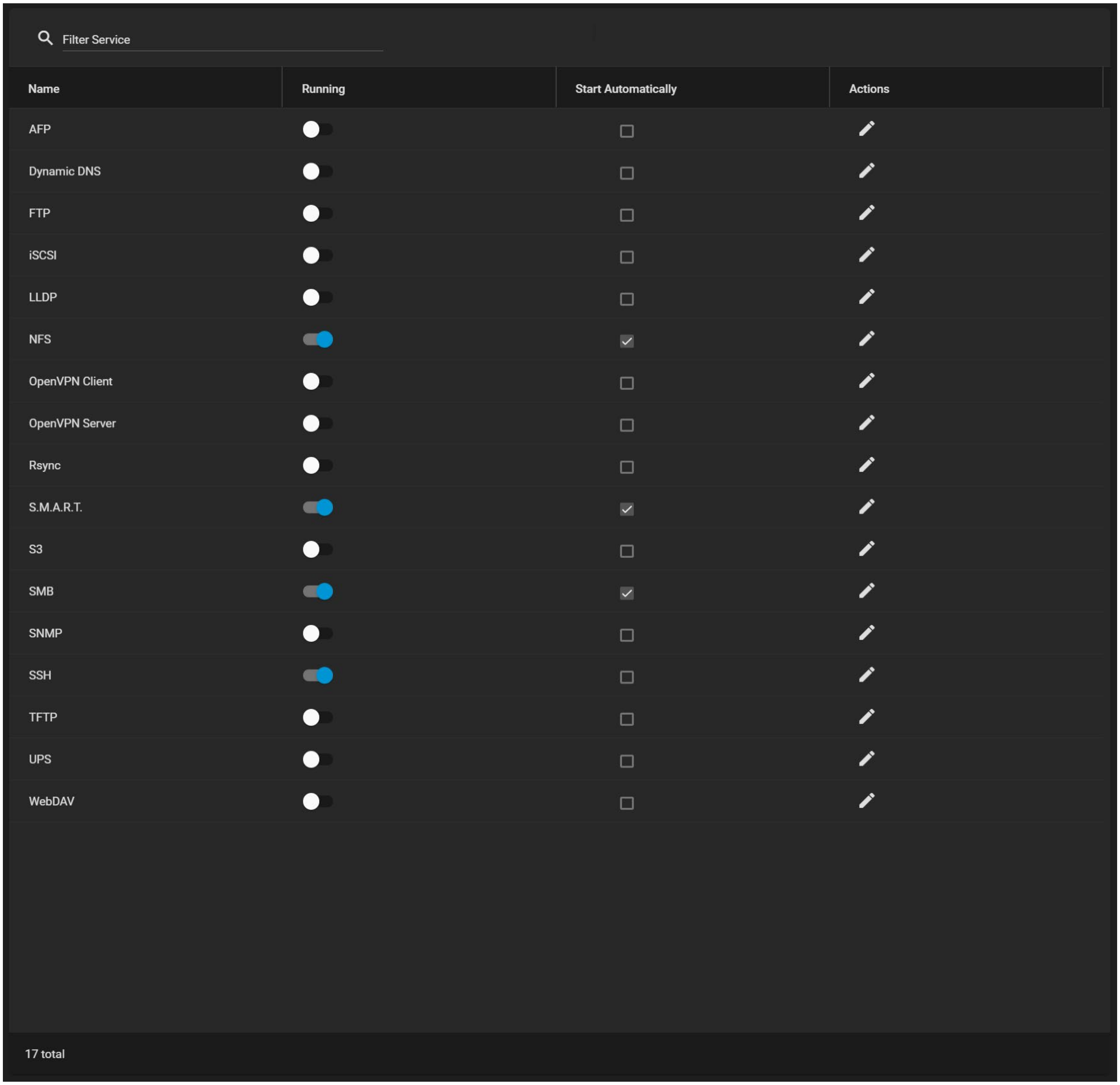
```
IANA-LANGUAGE-MIB.txt                   SNMP-NOTIFICATION-MIB.txt
IANA-RTPROTO-MIB.txt                    SNMP-PROXY-MIB.txt
IANAifType-MIB.txt                      SNMP-TARGET-MIB.txt
IF-INVERTED-STACK-MIB.txt               SNMP-TLS-TM-MIB.txt
IF-MIB.txt                              SNMP-TSM-MIB.txt
INET-ADDRESS-MIB.txt                    SNMP-USER-BASED-SM-MIB.txt
IP-FORWARD-MIB.txt                      SNMP-USM-AES-MIB.txt
IP-MIB.txt                              SNMP-USM-DH-OBJECTS-MIB.txt
IPV6-FLOW-LABEL-MIB.txt                 SNMP-VIEW-BASED-ACM-MIB.txt
IPV6-ICMP-MIB.txt                       SNMPv2-CONF.txt
IPV6-MIB.txt                            SNMPv2-MIB.txt
IPV6-TC.txt                             SNMPv2-SMI.txt
IPV6-TCP-MIB.txt                        SNMPv2-TC.txt
IPV6-UDP-MIB.txt                        SNMPv2-TM.txt
LM-SENSORS-MIB.txt                      TCP-MIB.txt
MTA-MIB.txt                             TRANSPORT-ADDRESS-MIB.txt
NET-SNMP-AGENT-MIB.txt                  TUNNEL-MIB.txt
NET-SNMP-EXAMPLES-MIB.txt               UCD-DEMO-MIB.txt
NET-SNMP-EXTEND-MIB.txt                 UCD-DISKIO-MIB.txt
NET-SNMP-MIB.txt                        UCD-DLMOD-MIB.txt
NET-SNMP-PASS-MIB.txt                   UCD-IPFWACC-MIB.txt
NET-SNMP-TC.txt                         UCD-SNMP-MIB.txt
NET-SNMP-VACM-MIB.txt                   UDP-MIB.txt
root@truenas[/usr/local/share/snmp/mibs]#
```

9.7 - SSH

The SSH service allows connections to TrueNAS with the Secure SHell Transport Layer Protocol. When TrueNAS is used as an SSH server, the users in the network must use SSH client software to transfer files with SSH.

> Allowing external connections to TrueNAS is a security vulnerability! Do not enable SSH unless external connections are required.

Activate or configure the SSH service on the **Services** page.



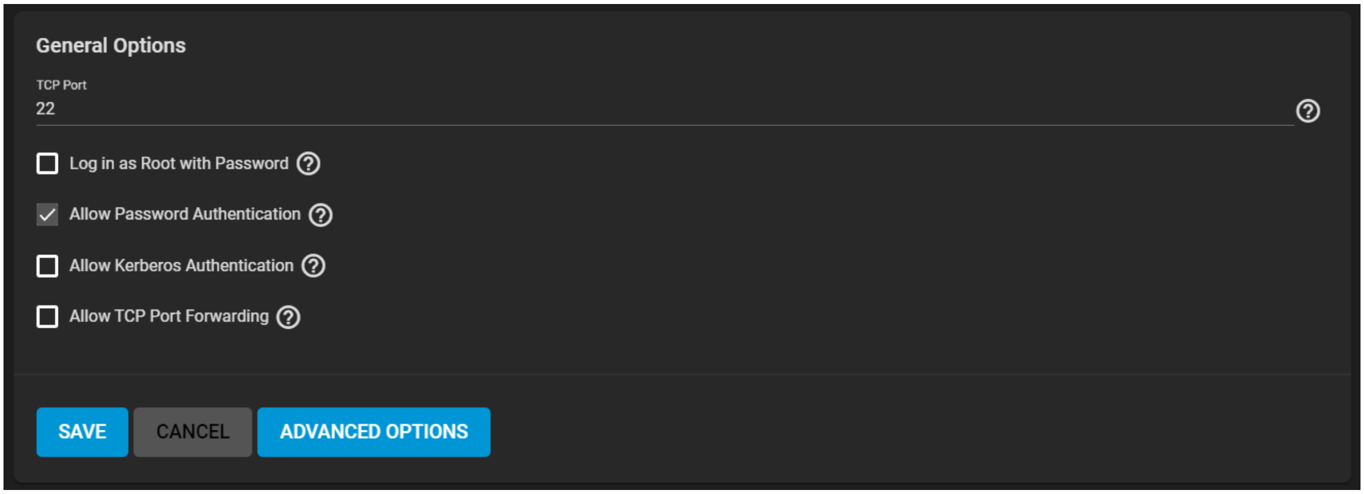
Filter Service

Name	Running	Start Automatically	Actions
AFP	○	□	✎
Dynamic DNS	○	□	✎
FTP	○	□	✎
iSCSI	○	□	✎
LLDP	○	□	✎
NFS	●	☑	✎
OpenVPN Client	○	□	✎
OpenVPN Server	○	□	✎
Rsync	○	□	✎
S.M.A.R.T.	●	☑	✎
S3	○	□	✎
SMB	●	☑	✎
SNMP	○	□	✎
SSH	●	□	✎
TFTP	○	□	✎
UPS	○	□	✎
WebDAV	○	□	✎

17 total

Clicking the toggle starts or stops the service, depending on the current state. Set *Start Automatically* for the service to start when TrueNAS boots.

To configure SSH, disable the service and click .



General Options

TCP Port
22

☐ Log in as Root with Password

☑ Allow Password Authentication

☐ Allow Kerberos Authentication

☐ Allow TCP Port Forwarding

Configure the options as needed to match your network environment.

SSH Service Fields expand □

General Options

Name	Description
TCP Port	Open a port for SSH connection requests.
Log in as Root with Password	Root logins are discouraged. Allows root logins. A password must be set for the root user account.
Allow Password Authentication	Enabling allows SSH login authentication using a password. Warning: when directory services are enabled, this setting grants access to all users the directory service imported. When disabled, authentication requires keys for all users (requires additional SSH client and server setup).
Allow Kerberos Authentication	Before enabling, ensure valid entries exist in **Directory Services** (Kerberos Realms and Keytabs) and the system can communicate with the Kerberos Domain Controller.
Allow TCP Port Forwarding	Set to let users bypass firewall restrictions using the SSH port forwarding feature.

Advanced Options

Name	Description
Bind Interfaces	Select interfaces for SSH to listen on. Leave all options unselected for SSH to listen on all interfaces.
Compress Connections	Select the syslog(3) level of the SFTP server.
SFTP Log Level	Select the syslog(3) facility of the SFTP server.
SFTP Log Facility	Allow more ciphers for sshd(8) in addition to the defaults in sshd_config(5). *None* allows unencrypted SSH connections and AES128-CBC allows the 128-bit Advanced Encryption Standard.
Weak Ciphers	WARNING: these ciphers are security vulnerabilities. Only allow them in a secure network environment.
Auxiliary	Add any more sshd_config(5) options not covered in this screen. Enter one option per

Parameters	line. These options are case-sensitive. Typos can prevent the SSH service from starting.

Remote systems could require *root* access to the system, but have all security precautions in place before allowing *root* access.

There are some additional options recommendations for the SSH service:

- Add `NoneEnabled no` to the *Auxiliary Parameters* to disable the insecure *none* cipher.
- Increase the *ClientAliveInterval* if SSH connections tend to drop.
- *ClientMaxStartup* defaults to *10*. Increase this value when more concurrent SSH connections are required.

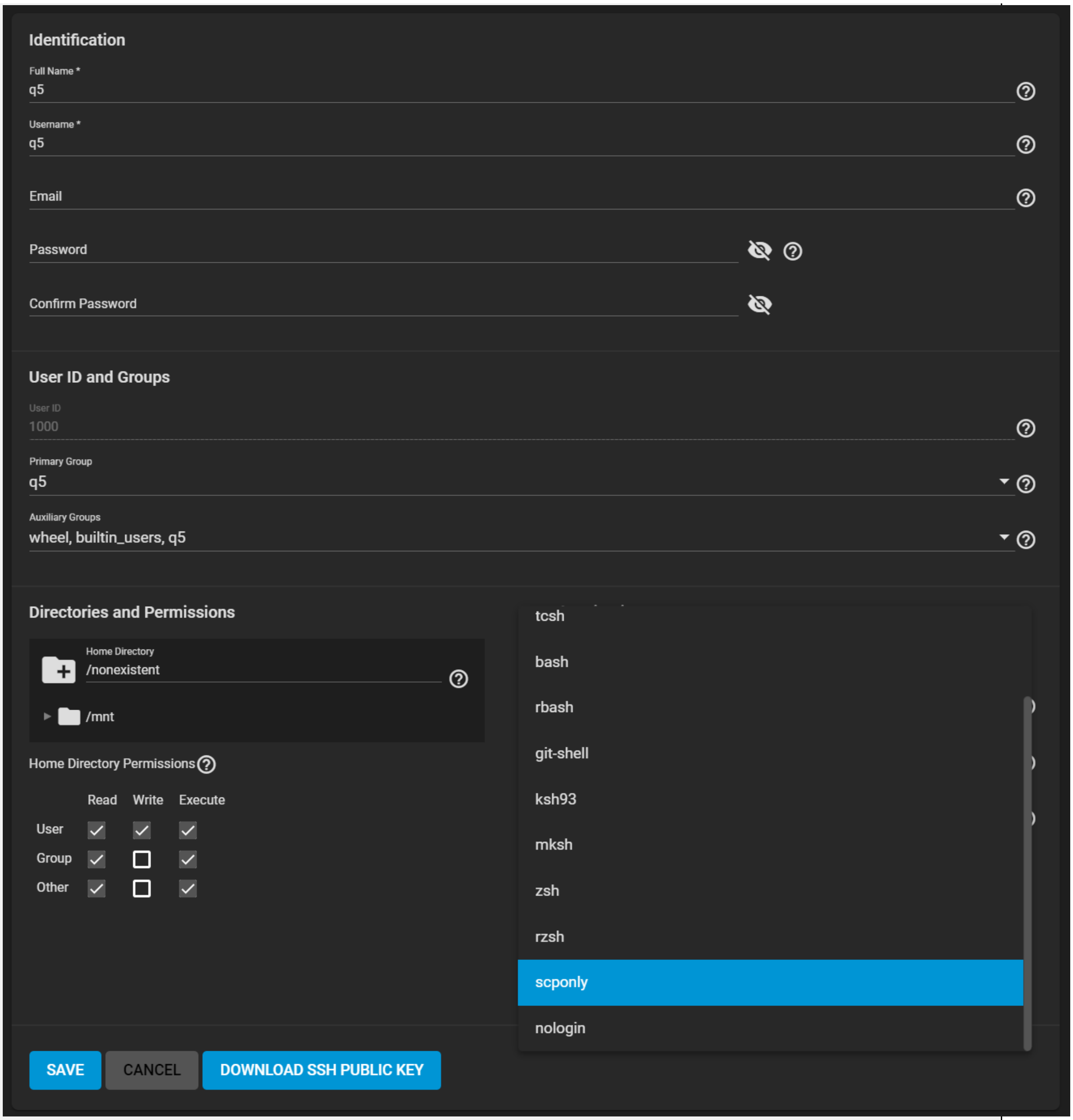
Don’t forget to re-enable the SSH service on the **Services** page when all configuration changes are complete. To create and store specific SSH connections and keypairs, go to the **System** menu section.

Advanced: Restricting Command Line Users to scp or sftp expand □

This only works for users that use command line versions of *scp* and *sftp*. When SSH is configured, authenticated users with a user account can use *ssh* to log into the TrueNAS system over the network. User accounts are created by going to **Accounts > Users** and clicking *ADD*.

By default, the user sees their home directory after logging in with SSH. However, the user can still find system locations outside their home directory, so take security precautions before granting users SSH access to the system. One method to increase security is to change a user’s shell to only allow file transfers. This allows users to use *scp* and *sftp* to transfer files between their local computer and their home directory on the TrueNAS system while restricting them from logging into the system using *ssh*.

To configure this scenario, go to **Accounts > Users** and edit the desired user account. Change the *Shell* to *scponly*. Repeat for each user that needs restricted SSH access.



Identification

Full Name *
q5

Username *
q5

Email

Password

Confirm Password

User ID and Groups

User ID
1000

Primary Group
q5

Auxiliary Groups
wheel, builtin_users, q5

Directories and Permissions

Home Directory
/nonexistent

/mnt

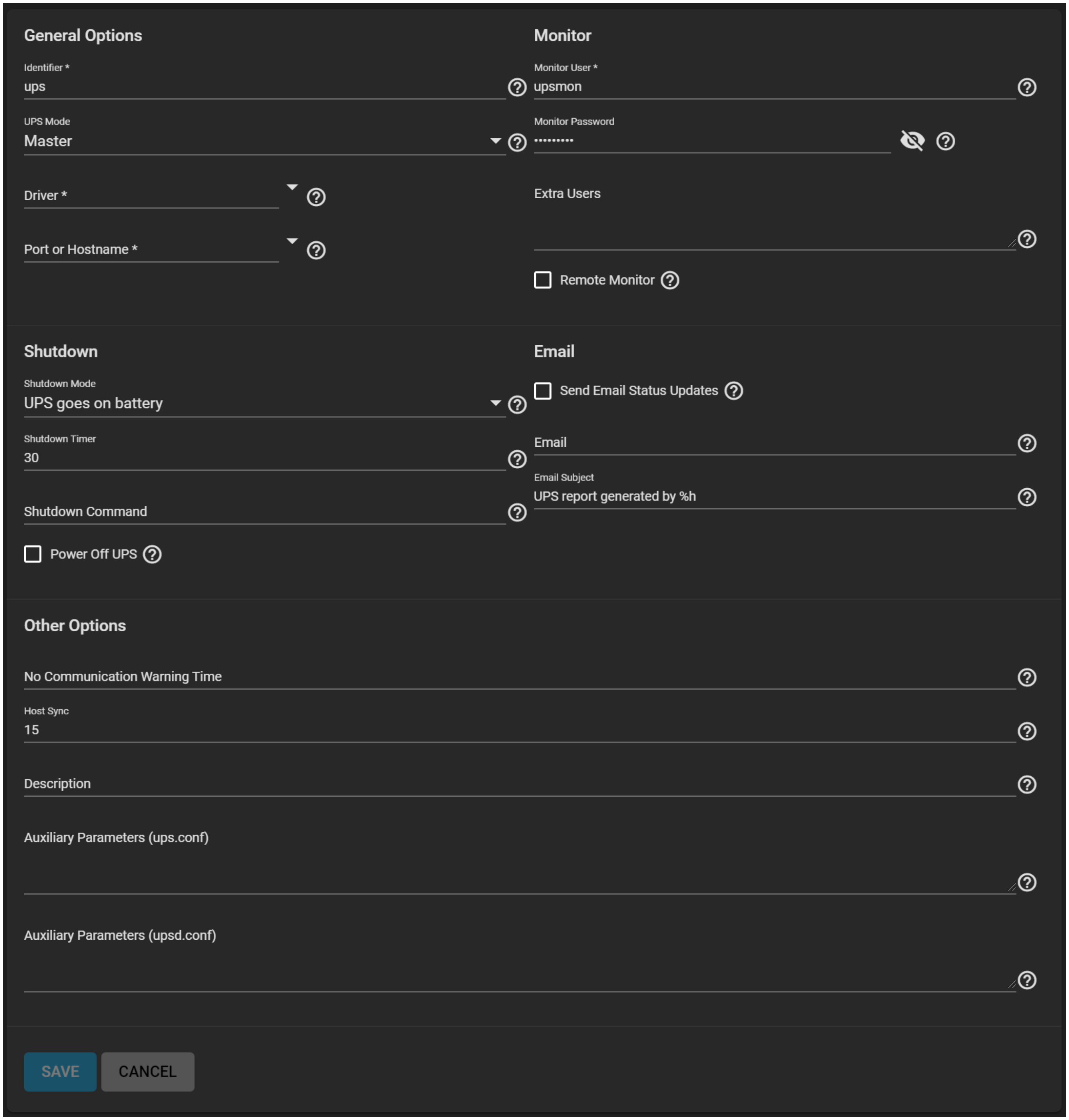
Home Directory Permissions

	Read	Write	Execute
User	✓	✓	✓
Group	✓	□	✓
Other	✓	□	✓

Test the configuration from another system by running the *sftp*, *ssh*, and *scp* commands as that user account. *sftp* and *scp* will work but *ssh* will fail.

9.8 - UPS

TrueNAS uses NUT (Network UPS Tools) to provide UPS support. When the TrueNAS system is connected to a UPS device, configure the UPS service by going to **Services**, finding the **UPS** entry, and clicking □.



General Options

Identifier * ups

UPS Mode Master

Driver *

Port or Hostname *

Monitor

Monitor User * upsmon

Monitor Password •••••••••

Extra Users

□ Remote Monitor

Shutdown

Shutdown Mode UPS goes on battery

Shutdown Timer 30

Shutdown Command

□ Power Off UPS

Email

□ Send Email Status Updates

Email

Email Subject UPS report generated by %h

Other Options

No Communication Warning Time

Host Sync 15

Description

Auxiliary Parameters (ups.conf)

Auxiliary Parameters (upsd.conf)

Specific Options expand □

General Options

Name	Description
Identifier	Describe the UPS device. It can contain alphanumeric, period, comma, hyphen, and underscore characters.

UPS Mode	Choose Master if the UPS is plugged directly into the system serial port. The UPS will remain the last item to shut down. Choose Slave to have this system shut down before Master. See the Network UPS Tools Overview.
Driver	See the Network UPS Tools compatibility listfor a list of supported UPS devices.
Port or Hostname	Serial or USB port connected to the UPS. To automatically detect and manage the USB port settings, select *auto*. When an SNMP driver is selected, enter the IP address or hostname of the SNMP UPS device.

Monitor

Name	Description
Monitor User	Enter a user to associate with this service. Keeping the default is recommended.
Monitor Password	Change the default password to improve system security. The new password cannot contain a space or #.Enter accounts that have administrative access. See upsd.users(5) for examples.
Extra Users	Enter accounts that have administrative access. See upsd.users(5) for examples.
Remote Monitor	Set for the default configuration to listen on all interfaces using the known values of user: upsmon and password: fixmepass.

Shutdown

Name	Description
Shutdown Mode	Choose when the UPS initiates shutdown.
Shutdown Timer	Enter a value in seconds for the the UPS to wait before initiating shutdown. Shutdown will not occur if power is restored while the timer is counting down. This value only applies when Shutdown mode is set to UPS goes on battery.
Shutdown Command	Enter a command to shut down the system when either battery power is low or the shutdown timer ends.
Power off UPS	Set for the UPS to power off after shutting down the system.

Email

Name	Description
Send Email Status Updates	Set enable sending messages to the address defined in the Email field.
Email	Enter any email addresses to receive status updates. Separate entries by pressing Enter.
Email Subject	Enter the subject for status emails.

Other Options

Name	Description
No Communication Warning Time	Enter a number of seconds to wait before alerting that the service cannot reach any UPS. Warnings continue until the situation is fixed.

Host Sync	Upsmon will wait up to this many seconds in master mode for the slaves to disconnect during a shutdown situation.
Description	Describe this service.
Auxiliary Parameters (ups.conf)	Enter any extra options from ups.conf.
Auxiliary Parameters (upsd.conf)	Enter any extra options from upsd.conf.

Some UPS models can be unresponsive with the default polling frequency. This shows in TrueNAS logs as a recurring error like `libusb_get_interrupt: Unknown error`. If this error occurs, decrease the polling frequency by adding an entry to *Auxiliary Parameters (ups.conf)*: `pollinterval = 10`. The default polling frequency is *two* seconds.

upsc(8) can get status variables like the current charge and input voltage from the UPS daemon. Run this from the **Shell** using the syntax `upsc ups@localhost`. The upsc(8) manual page has other usage examples.

upscmd(8) can send commands directly to the UPS, assuming the hardware supports the command being sent. Only users with administrative rights can use this command. These users are created in the *Extra Users* field.

How do I find a device name? expand □

For USB devices, the easiest way to determine the correct device name is to set *Show console messages* in **System > Advanced**. Plug in the USB device and look for a /dev/ugen or /dev/uhid device name in the console messages.

Can I attach Multiple Computers to One UPS? expand □

A UPS with adequate capacity can power multiple computers. One computer is connected to the UPS data port with a serial or USB cable. This primary system makes UPS status available on the network for other computers. The secondary computers are powered by the UPS, but receive UPS status data from the primary computer. See the NUT User Manual and NUT User Manual Pages.

10 - Applications

10.1 - Jails

10.1.1 - Create

This feature is generally available in TrueNAS CORE and supported by the TrueNAS Community. iXsystems customers with TrueNAS Enterprise hardware and an iXsystems Support contract can contact Support about accessing these features.

Jails are a lightweight, operating-system-level virtualization. One or multiple services can run in a jail, isolating those services from the host TrueNAS system. TrueNAS uses iocage for jail and plugin management. The main differences between a user-created jail and a plugin are that plugins are preconfigured and usually provide only a single service.

Why use a Jail instead of a VM? expand ☐
By default, jails run the FreeBSD operating system. These jails are independent instances of FreeBSD. The jail uses the host hardware and runs on the host kernel, avoiding most of the overhead usually associated with virtualization. The jail installs FreeBSD software management utilities so FreeBSD packages or ports can be installed from the jail command line. This allows for FreeBSD ports to be compiled and FreeBSD packages to be installed from the command line of the jail.

It is important to understand that users, groups, installed software, and configurations within a jail are isolated from both the TrueNAS host operating system and any other jails running on that system.

The ability to create multiple jails offers flexibility regarding software management. For example, an administrator can choose to provide application separation by installing different applications in each jail, to create one jail for all installed applications, or to mix and match how software is installed into each jail.

Jail Storage

A data storage pool must be created before using jails. Make sure the pool has enough storage for all the intended jails. The **Jails** screen displays a message and button to **CREATE POOL** if no pools exist on the TrueNAS system.

If pools exist, but none have been chosen for use with jails or plugins, a dialog appears to choose a pool. Select a pool and click **CHOOSE**.

To select a different pool for jail and plugin storage, click settings. A dialog shows the active pool. A different pool can be selected from the drop-down.

Jails and downloaded FreeBSD release files are stored in a dataset named `iocage/`.

The iocage dataset expand ☐

- At least *10* GiB of free space is recommended.
- Cannot be located on a Share.
- iocage automatically uses the first pool that is not a root pool for the TrueNAS system.
- A defaults.json file contains default settings used when a new jail is created. The file is created automatically when not already present. When the file is present but corrupted, iocage shows a

warning and uses default settings from memory.

- Each new jail installs into a new child dataset of iocage/. For example, with the iocage/jails dataset in *pool1*, a new jail called *jail1* installs into a new dataset named *pool1/iocage/jails/jail1*.
- FreeBSD releases are fetched as a child dataset into the /iocage/download dataset. This datset is then extracted into the /iocage/releases dataset to be used in jail creation. The dataset in /iocage/download can then be removed without affecting the availability of fetched releases or an existing jail.
- iocage/ datasets on activated pools are independent of each other and do not share any data.

iocage jail configs are stored in /mnt/poolname/iocage/jails/jailname. When iocage is updated, the config.json configuration file is backed up as /mnt/poolname/iocage/jails/jailname/config_backup.json. The backup file can be renamed to config.json to restore previous jail settings.

Creating Jails

TrueNAS has two options to create a jail. The *Jail Wizard* makes it easy to quickly create a jail. *ADVANCED JAIL CREATION* is an alternate method, where every possible jail option is configurable. There are numerous options spread across four different primary sections. This form is recommended for advanced users with very specific requirements for a jail.

Additional VMware Requirements expand □

Jail Networking

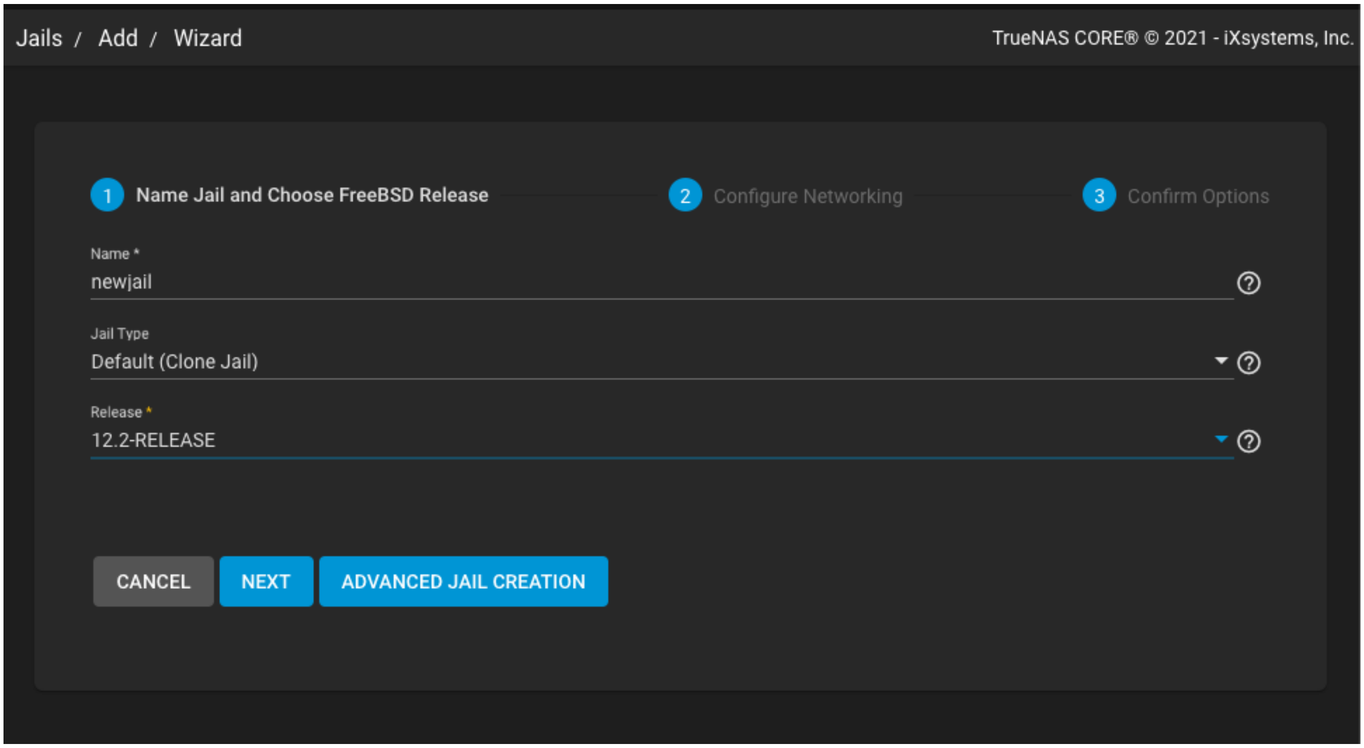
If you have installed TrueNAS in VMware, you will need functional networking to create a jail.

For the jail to have functional networking, you have to change the VMware settings to allow Promiscuous, MAC address changes, and Forged Transmits.

Setting	Description
Promiscuous Mode	When enabled at the virtual switch level, objects defined within all portgroups can receive all incoming traffic on the vSwitch.
MAC Address Changes	When set to **Accept**, ESXi accepts requests to change the effective MAC address to a different address than the initial MAC address.
Forged Transmits	When set to **Accept**, ESXi does not compare source and effective MAC addresses.

⊙ Jail Wizard

New jails can be created quickly by going to **Jails > ADD**.



Name *
newjail

Jail Type
Default (Clone Jail)

Release *
12.2-RELEASE

The wizard provides the simplest process to create and configure a new jail.

Enter a `Jail Name`. Names can contain letters, numbers, periods (`.`), dashes (`-`), and underscores (`_`).

Choose a `Jail Type`: *Default (Clone Jail)* or *Basejail*. Clone jails are clones of the specified FreeBSD RELEASE. They are linked to that RELEASE, even if they are upgraded. Basejails mount the specified RELEASE directories as nullfs mounts over the jail directories. Basejails are not linked to the original RELEASE when upgraded.

Jails can run FreeBSD versions up to the same version as the host TrueNAS system. Newer releases are not shown.

Versions of FreeBSD are downloaded the first time they are used in a jail. Additional jails created with the same version of FreeBSD are created faster because the download has already been completed.

Click *NEXT* to see a simplified list of networking options.

Jails support several different networking solutions:

- *VNET* adds a virtual network interface to the jail. This interface can set NAT, DHCP, or static jail network configurations. Since *VNET* provides the jail with an independent networking stack, it can broadcast an IP address, which is required by some applications.

- Network Address Translation (NAT), which uses the TrueNAS IP address and sets a unique port for the jail to use. *VNET* is required when *NAT* is selected.

- Set *DHCP Autoconfigure IPv4* for the jail to receive its IP address from a DHCP server.

- Manually configure networking by entering values for the *IPv4 Address* or *IPv6 Address* fields. Any combination of these fields can be configured. Multiple interfaces are supported for IPv4 and IPv6 addresses. To add more interfaces and addresses, click *ADD*.

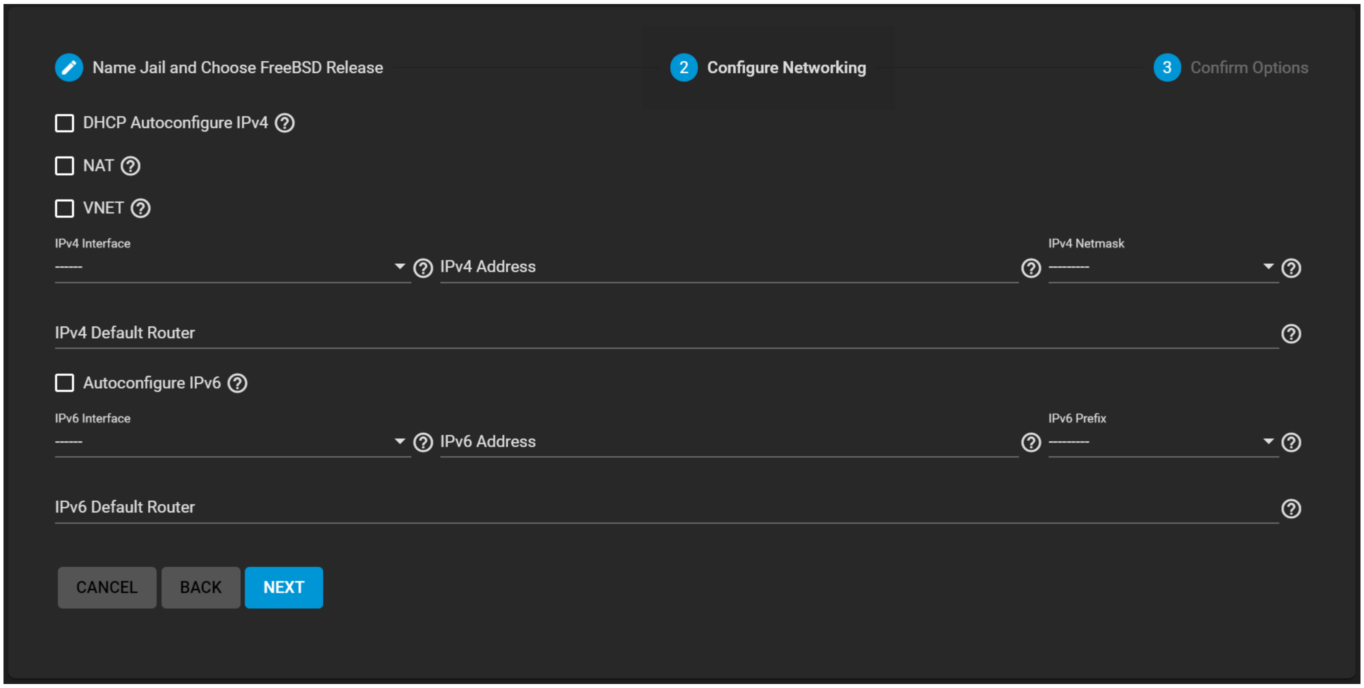
  Setting the *IPv4 Default Router* and *IPv6 Default Router* fields to *auto* automatically configures these values. *VNET* must be set to enable the **IPv4 Default Router** field. When no interface is selected when manually configuring IP addresses, TrueNAS automatically assigns the given jail IP address to the current active interface of the host system.

- Leaving all checkboxes unset and fields empty initializes the jail without any networking abilities.

Networking is added to the jail after creation by going to **Jails**, clicking chevron_right for a jail, then edit **> Basic Properties**.

Setting a proxy in the TrueNAS network settings also configures new jails to use the proxy settings, except when performing DNS lookups. Make sure a firewall is properly configured to maximize system security.

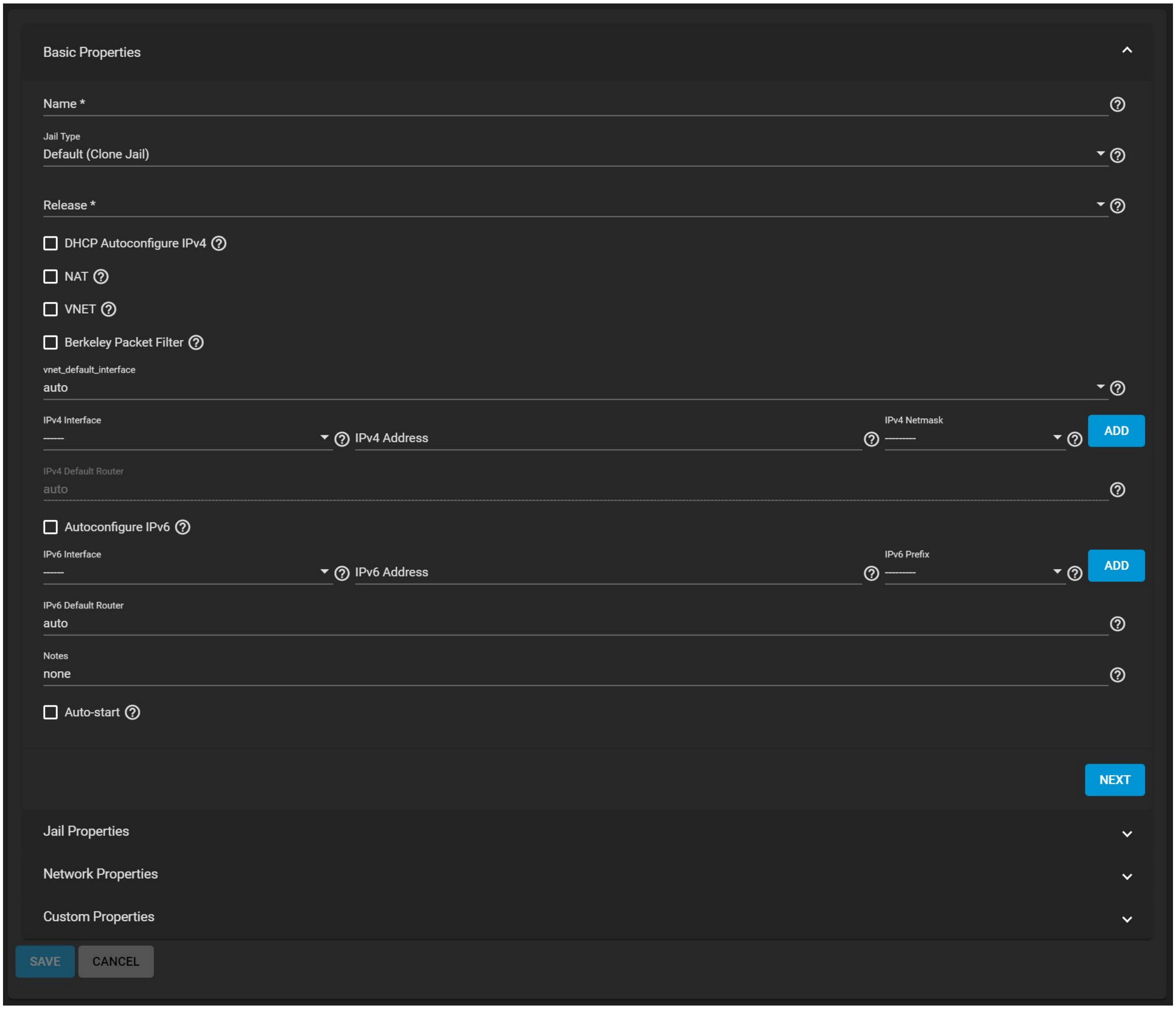
When pairing the jail with a physical interface, edit the network interface and set *Disable Hardware Offloading*. This prevents a network interface reset when the jail starts.



Click **NEXT** to view a summary screen of the chosen jail options. Click **SUBMIT** to create the new jail. After a few moments, the new jail is added to the primary jails list.

○ Advanced Jail Creation

The advanced jail creation form is opened by clicking **Jails > ADD**, then *ADVANCED JAIL CREATION*.



Basic Properties

Name *

Jail Type
Default (Clone Jail)

Release *

□ DHCP Autoconfigure IPv4

□ NAT

□ VNET

□ Berkeley Packet Filter

vnet_default_interface
auto

IPv4 Interface

IPv4 Address

IPv4 Netmask

IPv4 Default Router
auto

□ Autoconfigure IPv6

IPv6 Interface

IPv6 Address

IPv6 Prefix

IPv6 Default Router
auto

Notes
none

□ Auto-start

Options

A usable jail without any networking can be quickly created by setting only the required *Jail Name* and *Release*. Configure the remaining **Basic Properties** when the jail needs to communicate over the local network or out to the internet.

Basic Properties

Name	Description
Name	Required. Can contain letters, numbers, periods (.), dashes (-), and underscores (_).
Jail Type	Default (Clone Jail) or Basejail. Clone jails are clones of the specified RELEASE. They are linked to that RELEASE, even if they are upgraded. Basejails mount the specified RELEASE directories as nullfs mounts over the jail directories. Basejails are not linked to the original RELEASE when upgraded.
Release	FreeBSD release to use as the jail operating system. Jails can run FreeBSD versions up to the same version as the host system. Newer releases are not shown.
DHCP Autoconfigure IPv4	Set to autoconfigure jail networking with the Dynamic Host Configuration Protocol. VNET and Berkeley Packet Filter must also be enabled.

NAT	Network Address Translation (NAT). Transforms local network IP addresses into a single IP address. Set when the jail will share a single connection to the Internet with other systems on the network.
VNET	Set to use VNET(9) to emulate network devices for the jail. A fully virtualized per-jail network stack will be installed.
Berkeley Packet Filter	Set to use the Berkeley Packet Filter (BPF(4)) to data link layers in a protocol independent fashion.
vnet_default_interface	Set the default VNET interface. Only takes effect when VNET is set. Choose a specific interface or set to auto to use the interface that has the default route. Choose none to not set a default VNET interface.
IPv4 Interface	IPv4 interface for the jail.
IPv4 Address	Enter the IPv4 address for VNET(9) and shared IP jails.
IPv4 Netmask	IPv4 netmask for the jail.
IPv4 Default Router	A valid IPv4 address to use as the default route. Enter none to configure the jail with no IPv4 default route. A jail without a default route will not be able to access any networks.
AutoConfigure IPv6	Set to use SLAAC (Stateless Address Auto Configuration) to autoconfigure IPv6 in the jail.
IPv6 Interface	IPv6 interface for the jail.
IPv6 Address	Enter the IPv6 address for VNET(9) and shared IP jails.
IPv6 Netmask	IPv6 prefix for the jail.
IPv6 Default Router	A valid IPv6 address to use as the default route. Enter none to configure the jail without an IPv6 default route. A jail without a default route will not be able to access any networks.
Auto Start	Set to auto-start the jail at system boot time. Jails are started and stopped based on iocage priority. Set in the priority field under Custom Properties.

Additional settings are in the **Jail Properties**, **Network Properties**, and **Custom Properties** sections.

Jail Properties expand □

Jail Properties

Name	Description
devfs_ruleset	The devfs(8) ruleset number to enforce when mounting devfs in the jail. The default 0 means no ruleset is enforced. Mounting devfs inside a jail is only possible when the allow_mount and allow_mount_devfs permissions are enabled and enforce_statfs is set to a value lower than 2.
exec_start	Commands to run in the jail environment when the jail is created. Example: sh /etc/rc. The pseudo-parameters section of JAIL(8) describes exec.start usage.
exec_stop	Commands to run in the jail environment before the jail is removed and after exec.prestop commands are complete. Example: sh /etc/rc.shutdown.
exec_prestart	Commands to run in the system environment before a jail is started.
exec_poststart	Commands to run in the system environment after a jail is started and after any exec_start commands are finished.
exec_prestop	Commands to run in the system environment before a jail is stopped.
exec_poststop	Commands to run in the system environment after a jail is stopped.

exec_jail_user	Enter either root or another valid username. Inside the jail, commands run as this user.
exec_system_user	Run commands in the jail as this user. By default, commands are run as the current user.
securelevel	The value of the jail securelevel sysctl. A jail never has a lower securelevel than the host system. Setting this parameter allows a higher securelevel. If the host system securelevel is changed, the jail securelevel will be at least as secure.
sysvmsg	Allow or deny access to SYSV IPC message primitives. Inherit: All IPC objects on the system are visible to the jail. New: Only objects the jail creates using the private key namespace are visible. The system and parent jails have access to the jail objects but not private keys. Disable: The jail cannot perform any sysvmsg related system calls.
sysvsem	Allow or deny access to SYSV IPC semaphore primitives. Inherit: All IPC objects on the system are visible to the jail. New: Only objects the jail creates using the private key namespace are visible. The system and parent jails have access to the jail objects but not private keys. Disable: The jail cannot perform any sysvmem related system calls.
sysvshm	Allow or deny access to SYSV IPC shared memory primitives. Inherit: All IPC objects on the system are visible to the jail. New: Only objects the jail creates using the private key namespace are visible. The system and parent jails have access to the jail objects but not private keys.
vnet_interfaces	A space-delimited list of network interfaces attached to a VNET enabled jail after it is created. Interfaces are automatically released when the jail is removed.
allow_set_hostname	Allow the jail hostname to be changed with hostname(1) or sethostname(3).
allow_sysvipc	Choose whether a process in the jail has access to System V IPC primitives. Equivalent to setting sysvmsg, sysvsem, and sysvshm to Inherit. Deprecated in FreeBSD 11.0 and newer! Use sysvmsg, sysvsem, and sysvshm instead.
allow_raw_sockets	Set to allow raw sockets. Utilities like ping(8) and traceroute(8) require raw sockets. When set, source IP addresses are enforced to comply with the IP addresses bound to the jail, ignoring the IP_HDRINCL flag on the socket.
allow_chflags	Set to treat jail users as privileged and allow the manipulation of system file flags. securelevel constraints are still enforced.
allow_mlock	Enable running services that require mlock(2) in a jail.
allow_vmm	Allow the jail to access the bhyve virtual machine monitor (VMM). The jail must have FreeBSD 12.0 or newer installed with the vmm(4) kernel module loaded.
allow_quotas	Set to allow the jail root to administer quotas on jail filesystems. This includes filesystems the jail shares with other jails or with non-jailed parts of the system.
allow_socket_af	Set to allow access to other protocol stacks beyond IPv4, IPv6, local (UNIX), and route. Warning: jail functionality does not exist for all protocol stacks.
allow_mount	Set to allow privileged users inside the jail to mount and unmount filesystem types marked as jail-friendly.

Network Properties expand □

Network Properties

Name	Description
Interfaces	Enter up to four interface configurations in the format interface:bridge, separated by a comma (,). The left value is the virtual VNET interface name and the right value is the bridge name where the virtual interface should be attached.

host_domainname	Enter a NIS Domain name for the jail.
host_hostname	Set the jail hostname. Defaults to the jail UUID.
resolver	Add lines to the jail resolv.conf. Example: nameserver IP;search domain.local. Fields must be delimited with a semicolon (;), This is translated as new lines in resolv.conf. Enter none to inherit resolv.conf from the host.
ip4.saddrsel	Disable IPv4 source address selection for the jail in favor of the primary IPv4 address of the jail. Only available when the jail is not configured to use VNET.
ip6.saddrsel	Disable IPv6 source address selection for the jail in favor of the primary IPv6 address of the jail. Only available when the jail is not configured to use VNET.
ip4	Control the availability of IPv4 addresses. Inherit: Allow unrestricted access to all system addresses. New: Restrict addresses with ip4_addr. Disable: Stop the jail from using IPv4 entirely.
ip6	Control the availability of IPv6 addresses. Inherit: Allow unrestricted access to all system addresses. New: Restrict addresses with ip6_addr. Disable: Stop the jail from using IPv6 entirely.
mac_prefix	Enter a valid MAC address vendor prefix. Example: E4F4C6
vnet0_mac	Leave this field empty to generate random MAC addresses for the host and jail. To assign fixed MAC addresses, enter the MAC address to be assigned to the host, a space, then the MAC address to be assigned to the jail.

Custom Properties expand □

Custom Properties

Name	Description
priority	Numeric start priority for the jail at boot time. Valid priorities are between 1 and 99. Smaller values are higher priority. At system shutdown the priority is reversed. Example: 99
hostid	A new jail hostid, if desired. Example `hostid: 1a2bc345-678d-90e1-23fa-4b56c78901de`.
comment	Enter comments about the jail.
template	Set to set this jail as a template.
host_time	System host time to synchronize the time between jail and host.
jail_zfs	Set to enable automatic ZFS jailing inside the jail. The assigned ZFS dataset is fully controlled by the jail.
jail_zfs_dataset	Define the dataset to be jailed and fully handed over to a jail. Enter a ZFS filesystem name without a pool name. jail_zfs must be set for this option to work.
jail_zfs_mountpoint	Enter the mountpoint for the jail_zfs_dataset. Example: `/data example-dataset-name`
allow_tun	Reveal tun devices for the jail with an individual devfs ruleset. Allow the creation of tun devices in the jail
Autoconfigure IPv6 with rtsold	Use rtsold(8) as part of IPv6 autoconfiguration. Send ICMPv6 Router Solicitation messages to interfaces to discover new routers.
ip_hostname	Set to use DNS records during jail IP configuration to search the resolver and apply the first open IPv4 and IPv6 addresses. See jail(8).
assign_localhost	Set to add network interface lo0 to the jail and assign it the first available localhost address, starting with `127.0.0.2`. VNET must be unset. Jails using VNET

	configure a localhost as part of their virtualized network stack.

Creating Template Jails

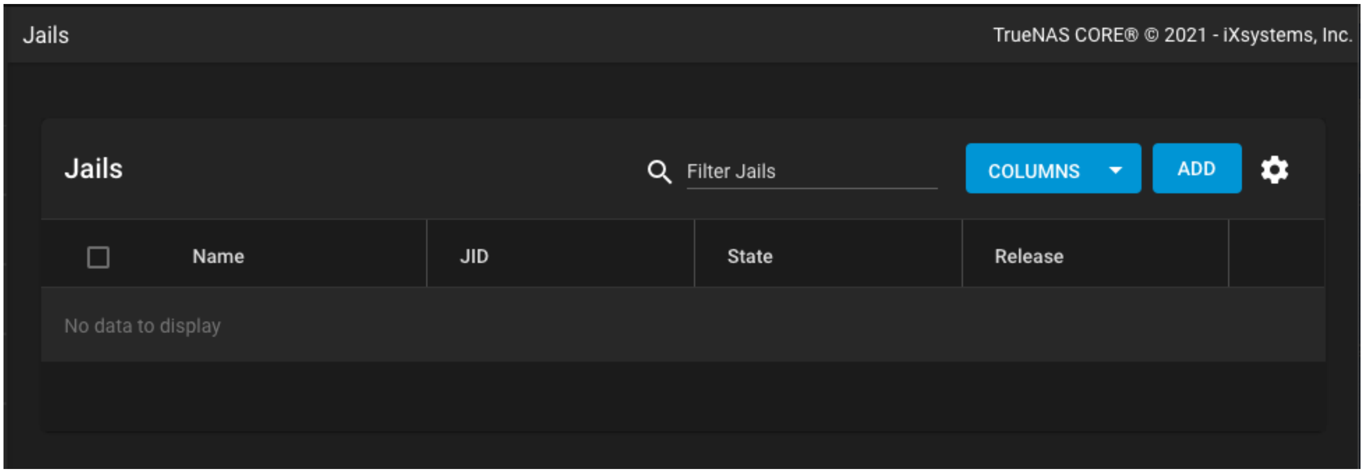
Template jails are basejails that can efficiently create jails with the same configuration. These steps create a template jail:

- Go to **Jails > ADD > ADVANCED JAIL CREATION**.
- Select *Basejail* as the *Jail Type*. Configure the jail with desired options.
- Set *template* in the `Custom Properties` section.
- Click *SAVE*.
- Click *ADD*.
- Enter a name for the template jail. Leave *Jail Type* as *Default (Clone Jail)*. Set *Release* to *basejailname(template)*, where *basejailname* is the name of the base jail created earlier.
- Complete the jail creation wizard.

10.1.2 - Manage

-
  - Updates and Upgrades
  - Accessing a Jail Using SSH

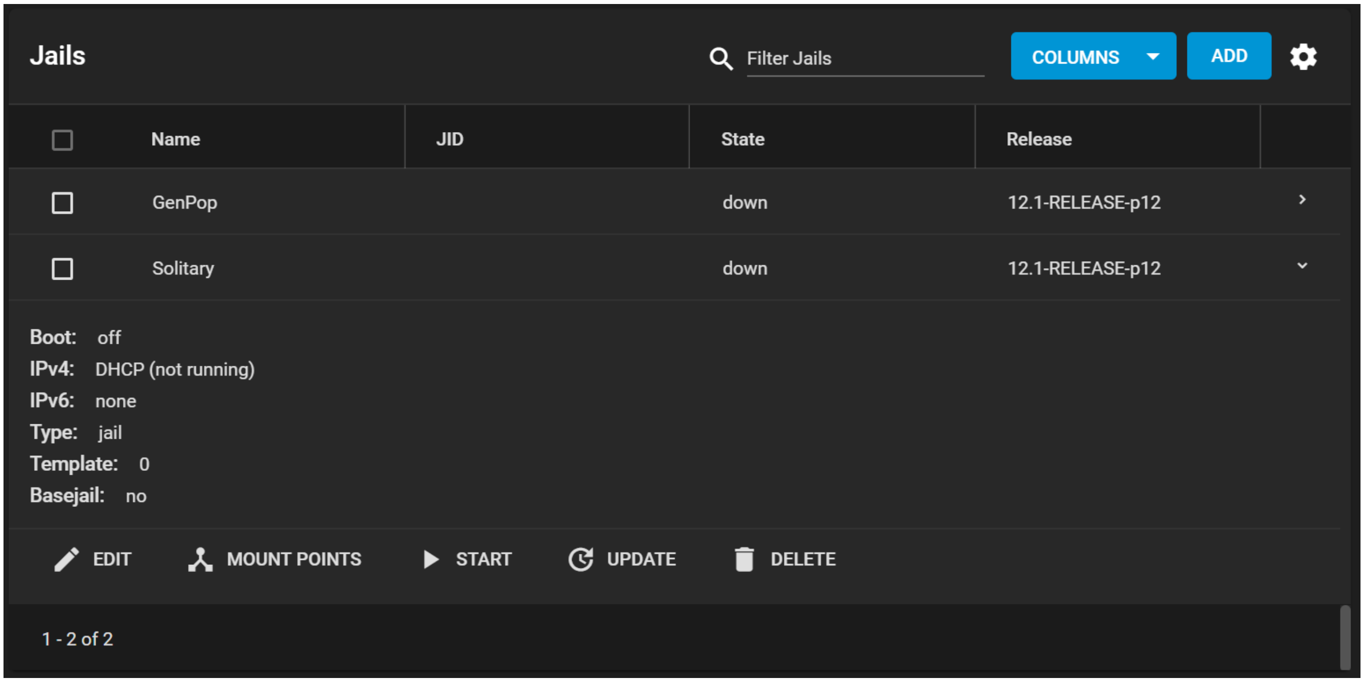
Going to the *Jails* screen shows a list of installed jails.



□	Name	JID	State	Release
No data to display				

Operations can be applied to multiple jails by selecting those jails with the checkboxes on the left. After selecting one or more jails, icons appear which can be used to play_arrow, stop, update, or delete those jails.

More information such as **IPV4**, **IPV6**, jail **TYPE**, and whether it is a **TEMPLATE** or **BASEJAIL** is seen by clicking **>** (Expand) for a jail. Additional options for that jail are also displayed.



□	Name	JID	State	Release
□	GenPop		down	12.1-RELEASE-p12
□	Solitary		down	12.1-RELEASE-p12

Boot: off
IPv4: DHCP (not running)
IPv6: none
Type: jail
Template: 0
Basejail: no

> Modify the IP address information for a jail by clicking chevron_right > **EDIT** instead of issuing the networking commands directly from the command line of the jail. This ensures changes are saved and survive a jail or TrueNAS reboot.

Name	Description

EDIT	Used to modify the settings described in Advanced Jail Creation. A jail cannot be edited while it is running. The settings can be viewed, but are read only.
MOUNT POINTS	Select an existing mount point to **EDIT** or click **ACTIONS** > **Add Mount Point** to create a mount point for the jail. A mount point gives a jail access to storage located elsewhere on the system. A jail must be stopped before adding, editing, or deleting a mount point. See Additional Storage for more details.
RESTART	Stop and immediately start an *up* jail.
START	Start a jail that has a current **STATE** of *down*.
STOP	Stop a jail that has a current **STATE** of *up*.
UPDATE	Runs freebsd-update to update the jail to the latest patch level of the installed FreeBSD release.
SHELL	Access a *root* command prompt to interact with a jail directly from the command line. Type `exit` to leave the command prompt.
DELETE	Caution: deleting the jail also deletes all of the jail contents and all associated snapshots. Back up the jail data, configuration, and programs first. There is no way to recover the contents of a jail after deletion!

Menu entries change depending on the jail state. For example, a stopped jail does not have a *STOP* or *SHELL* option.

Jail status messages and command output are stored in /var/log/iocage.log.

Updates and Upgrades

Click **>** (Expand) > *Update* to update a jail to the most current patch level of the installed FreeBSD release. This does **not** change the release. For example, a jail installed with *FreeBSD 11.2-RELEASE* can update to *p15* or the latest patch of 11.2, but not an *11.3-RELEASE-p#* version of FreeBSD.

A jail *upgrade* replaces the jail FreeBSD operating system with a new release of FreeBSD, such as taking a jail from *FreeBSD 11.2-RELEASE* to *11.3-RELEASE*. Upgrade a jail by stopping it, opening the TrueNAS **Shell** and entering `iocage upgrade name -r release`, where *name* is the plugin jail name and *release* is the desired FreeBSD release.

It is possible to manually remove unused releases from the `/iocage/releases/` dataset after upgrading a jail. The release must not be in use by any jail on the system!

Accessing a Jail Using SSH

The ssh daemon sshd(8) must be enabled in a jail to allow SSH access to that jail from another system.

The jail **STATE** must be up before the *SHELL* option is available. When the jail is not up, start it by clicking **Jails** > chevron_right > **START** for the desired jail. Click chevron_right, then **SHELL** to open a shell inside the jail:

```
FreeBSD 11.1-STABLE (FreeNAS.amd64) #0 0ale9f753(freenas/11-stable): FriApr 6 04:46:31 UTC 2018

Welcome to FreeBSD!

Release Notes, Errata: https://www.FreeBSD.org/releases/
Security Advisories:   https://www.FreeBSD.org/security/
FreeBSD Handbook:      https://www.FreeBSD.org/handbook/
FreeBSD FAQ:           https://www.FreeBSD.org/faq/
Questions List: https://lists.FreeBSD.org/mailman/listinfo/freebsd-questions/
FreeBSD Forums:        https://forums.FreeBSD.org/

Documents installed with the system are in the /usr/local/share/doc/freebsd/
directory, or can be installed later with: pkg install en-freebsd-doc
For other languages, replace "en" with a language code like de or fr.

Show the version of FreeBSD installed: freebsd-version ; uname -a
Please include that output and any error messages when posting questions.
```

```
Introduction to manual pages: man man
FreeBSD directory layout:     man hier

Edit /etc/motd to change this login announcement.
root@jailexamp:~ #
```

The **Shell** can also open a jail root shell. Open the **Shell** and enter `iocage console jailname`.

Enable sshd:

```
sysrc sshd_enable="YES"
sshd_enable: NO -> YES
```

Start the SSH daemon: `service sshd start`. The first time the service runs, the jail RSA key pair is generated and the key fingerprint is displayed. Add a user account with `adduser` and follow the prompts. `Enter` accepts the default value. Users that require root access must also be a member of the `wheel` group. Enter `wheel` when prompted to `invite user into other groups`?

```
root@jailexamp:~ # adduser
Username: jailuser
Full name: Jail User
Uid (Leave empty for default):
Login group [jailuser]:
Login group is jailuser. Invite jailuser into other groups? []: wheel
Login class [default]:
Shell (sh csh tcsh git-shell zsh rzsh nologin) [sh]: csh
Home directory [/home/jailuser]:
Home directory permissions (Leave empty for default):
Use password-based authentication? [yes]:
Use an empty password? (yes/no) [no]:
Use a random password? (yes/no) [no]:
Enter password:
Enter password again:
Lock out the account after creation? [no]:
Username   : jailuser
Password   : *****
Full Name  : Jail User
Uid        : 1002
Class      :
Groups     : jailuser wheel
Home       : /home/jailuser
Home Mode  :
Shell      : /bin/csh
Locked     : no
OK? (yes/no): yes
adduser: INFO: Successfully added (jailuser) to the user database.
Add another user? (yes/no): no
Goodbye!
root@jailexamp:~
```

After creating the user, set the jail *root* password to allow users to use `su` to gain superuser privileges. To set the jail *root* password, use `passwd`. Nothing is echoed back when using `passwd`:

```
root@jailexamp:~ # passwd
Changing local password for root
New Password:
Retype New Password:
root@jailexamp:~ #
```

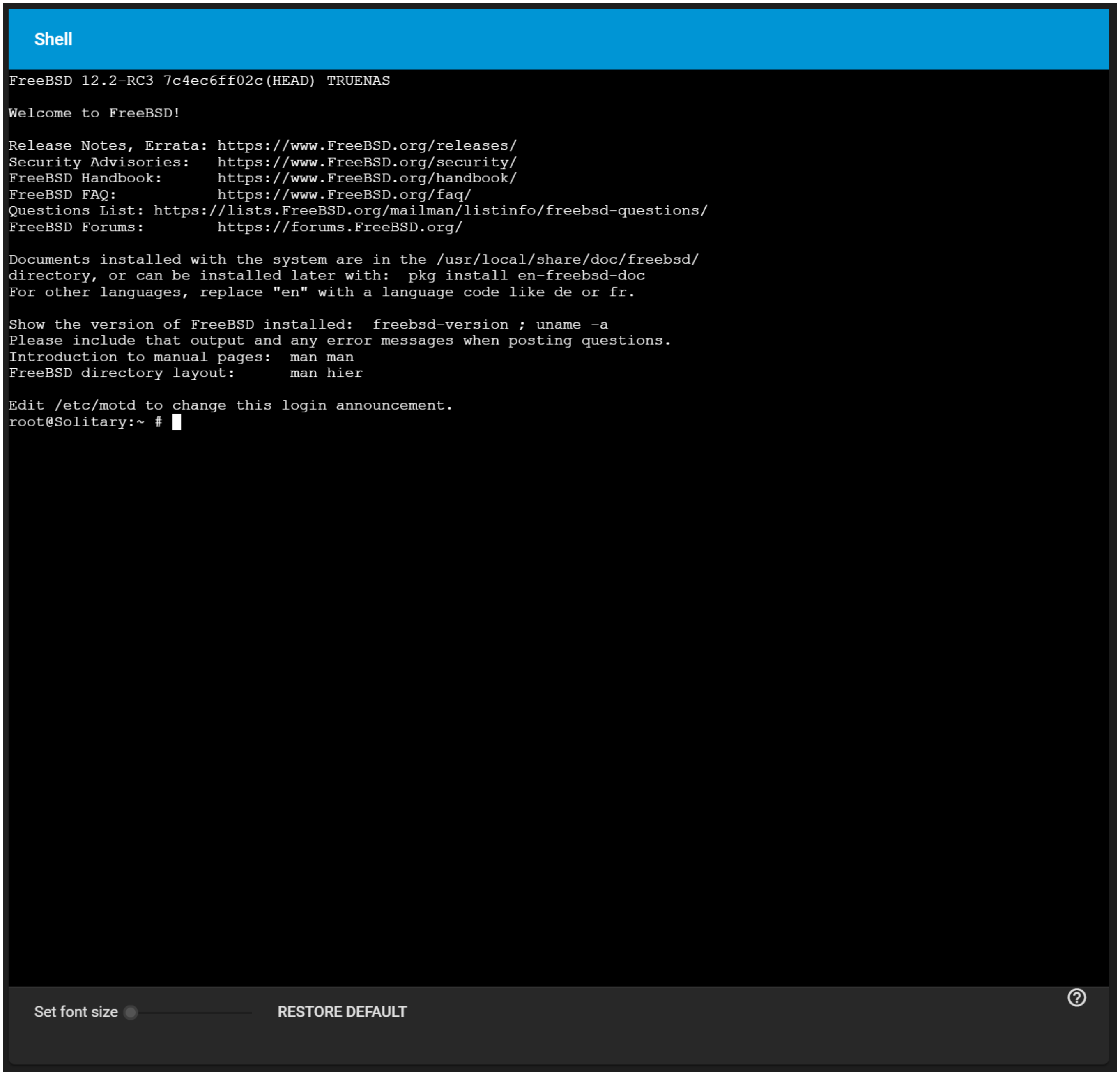
Finally, test that the user can successfully `ssh` into the jail from another system and gain superuser privileges. In this example, a user named `jailuser` uses `ssh` to access the jail at *192.168.2.3*. The host RSA key fingerprint must be verified the first time a user logs in.

```
ssh jailuser@192.168.2.3
The authenticity of host '192.168.2.3 (192.168.2.3)' can't be established.
RSA key fingerprint is 6f:93:e5:36:4f:54:ed:4b:9c:c8:c2:71:89:c1:58:f0.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '192.168.2.3' (RSA) to the list of known hosts.
Password:
```

Every jail has its own user accounts and service configuration. These steps must be repeated for each jail that requires SSH access.

10.1.3 - Installing Software

A jail is created with no software aside from the core packages installed as part of the selected version of FreeBSD. To install more software, go to the **Jails** screen and expand the jail entry. Start the jail, then click **> SHELL** when the jail has booted.



```
FreeBSD 12.2-RC3 7c4ec6ff02c(HEAD) TRUENAS

Welcome to FreeBSD!

Release Notes, Errata: https://www.FreeBSD.org/releases/
Security Advisories:   https://www.FreeBSD.org/security/
FreeBSD Handbook:      https://www.FreeBSD.org/handbook/
FreeBSD FAQ:           https://www.FreeBSD.org/faq/
Questions List: https://lists.FreeBSD.org/mailman/listinfo/freebsd-questions/
FreeBSD Forums:        https://forums.FreeBSD.org/

Documents installed with the system are in the /usr/local/share/doc/freebsd/
directory, or can be installed later with:  pkg install en-freebsd-doc
For other languages, replace "en" with a language code like de or fr.

Show the version of FreeBSD installed:  freebsd-version ; uname -a
Please include that output and any error messages when posting questions.
Introduction to manual pages:  man man
FreeBSD directory layout:      man hier

Edit /etc/motd to change this login announcement.
root@Solitary:~ #
```

Installing FreeBSD Packages

The quickest and easiest way to install software inside the jail is to install a FreeBSD package. FreeBSD packages are precompiled and contain all the binaries and a list of dependencies required for the software to run on a FreeBSD system.

A huge amount of software has been ported to FreeBSD. Most of that software is available as packages. One way to find FreeBSD software is to use the search bar at FreshPorts.org.

After finding the name of the desired package, use the `pkg install` command to install it. For example, to install the **audiotag** package, enter `pkg install audiotag`. When prompted, press `y` to complete the installation. Messages show the download and installation status.

A successful installation is confirmed by querying the package database:

```
pkg info -f audiotag
audiotag-0.19_1
Name:            audiotag
Version:         0.19_1
Installed on:    Fri Nov 21 10:10:34 PST 2014
Origin:          audio/audiotag
Architecture:    freebsd:9:x86:64
Prefix:          /usr/local
Categories:      multimedia audio
Licenses:        GPLv2
Maintainer:      ports@FreeBSD.org
WWW:             https://github.com/Daenyth/audiotag
Comment:         Command-line tool for mass tagging/renaming of audio files
Options:
  DOCS:          on
  FLAC:          on
  ID3:           on
  MP4:           on
  VORBIS:        on
Annotations:
  repo_type:     binary
  repository:    FreeBSD
Flat size:       62.8KiB
Description:    Audiotag is a command-line tool for mass tagging/renaming of audio files
                it supports the vorbis comment, id3 tags, and MP4 tags.
WWW:            https://github.com/Daenyth/audiotag
```

To show what was installed by the package:

```
pkg info -l audiotag
audiotag-0.19_1:
/usr/local/bin/audiotag
/usr/local/share/doc/audiotag/COPYING
/usr/local/share/doc/audiotag/ChangeLog
/usr/local/share/doc/audiotag/README
/usr/local/share/licenses/audiotag-0.19_1/GPLv2
/usr/local/share/licenses/audiotag-0.19_1/LICENSE
/usr/local/share/licenses/audiotag-0.19_1/catalog.mk
```

In FreeBSD, third-party software is always stored in /usr/local to differentiate it from the software that came with the operating system. Binaries are almost always located in a subdirectory called bin or sbin and configuration files in a subdirectory called etc.

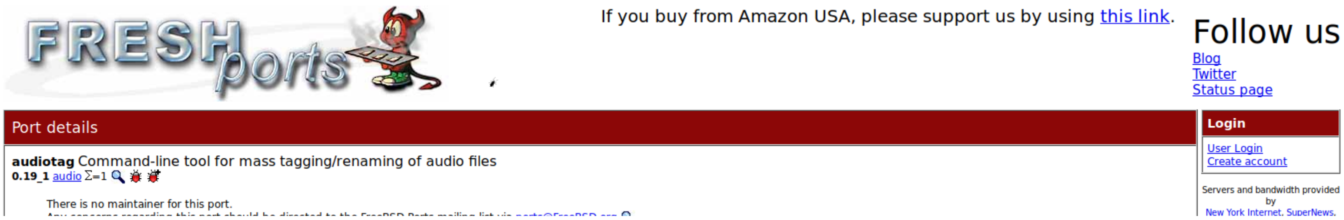
Compiling FreeBSD Ports

Compiling a port is another option. Compiling ports offer these advantages:

- Not every port has an available package. This is usually due to licensing restrictions or known, unaddressed security vulnerabilities.
- Sometimes the package is out-of-date and a feature is needed that only became available in the newer version.
- Some ports provide compile options that are not available in the pre-compiled package. These options are used to add or remove features or options.

Compiling a port has these disadvantages:

- It takes time. Depending upon the size of the application, the amount of dependencies, the speed of the CPU, the amount of RAM available, and the current load on the TrueNAS system, the time needed can range from a few minutes to a few hours or even to a few days.
- If the port does not provide any compile options, it saves time and preserves the TrueNAS system resources to use the `pkg install` command instead. The FreshPorts.org listing shows whether a port has any configurable compile options.



audiotag Command-line tool for mass tagging/renaming of audio files
0.19_1 audio Σ=1

There is no maintainer for this port.

Servers and bandwidth provided by New York Internet, SuperNews,

Any concerns regarding this port should be directed to the FreeBSD Ports mailing list via ports@FreeBSD.org
Port Added: 2008-04-15 13:43:37
Last Update: 2016-12-02 09:21:59
SVN Revision: 427548
Also Listed In: multimedia
License: GPLv2+

```
Audiotag is a command-line tool for mass tagging/renaming of audio files
it supports the vorbis comment, id3 tags, and MP4 tags.

WWW: https://github.com/Daenyth/audiotag
```

SVNWeb : Homepage : PortsMon
Pseudo-**pkg-plist** information, but much better, from `make generate-plist`
▼ Expand this list (4 items)

Dependency line: `audiotag>0:audio/audiotag`

To install the port: `cd /usr/ports/audio/audiotag/ && make install clean`
To add the package: `pkg install audiotag`

PKGNAME: audiotag

There is no flavor information for this port.

distinfo:

```
SHA256 (audiotag-0.19.tar.bz2) = 7b6a2de751058a95755f0842b83f2b1d8b94e5cd7634cbe71d67257208bf4646
SIZE (audiotag-0.19.tar.bz2) = 15016
```

NOTE: FreshPorts displays only information on required and default dependencies. Optional dependencies are not covered.

Runtime dependencies:
1. flac : audio/flac
2. id3tag : audio/id3lib
3. AtomicParsley : multimedia/atomicparsley
4. vorbiscomment : audio/vorbis-tools
5. perl5>=5.24<5.25 : lang/perl5.24

There are no ports dependent upon this port

Configuration Options

```
===> The following configuration options are available for audiotag-0.19_1:
     DOCS=on: Build and/or install documentation
     FLAC=on: FLAC lossless audio codec support
     ID3=on: ID3 tags support
     MP4=on: MP4 media format support
     VORBIS=on: Ogg Vorbis audio codec support
===> Use 'make config' to modify these settings
```

USES:

```
tar:bzip2 shebangfix perl5
```

Master Sites:
1. https://cloud.github.com/downloads/Daenyth/audiotag/

Number of commits found: 22

Commit History - (may be incomplete: see SVNWeb link above for full details)

Date	By	Description
02 Dec 2016 09:21:59 **0.19_1**	mat	http://github.com redirects to https://github.com, spare everyone a redirect. Sponsored by: Absolight
25 May 2016 15:43:34 **0.19_1**	mat	Remove useless WRKSRC definitions. While there, correct DEV_WARNINGS when they occur. Sponsored by: Absolight
01 Apr 2016 13:29:17 **0.19_1**	mat	Remove ${PORTSDIR}/ from dependencies, Mk and categories a, b, and c. With hat: portmgr Sponsored by: Absolight
12 Jan 2016 16:20:32 **0.19_1**	amdmi3	Convert LICENSE= "GPLxx # or later" to "GPLxx+" Approved by: portmgr blanket
18 Nov 2015 10:14:05 **0.19_1**	amdmi3	- Clarify LICENSE - Add LICENSE_FILE - Add NO_ARCH - Switch to options helpers
01 Jun 2014 13:03:14 **0.19_1**	ohauer	- USE_(BZIP2|XZ) -> USES= tar:(bzip2|xz)
24 Nov 2013 18:38:39 **0.19_1**	bapt	Remove cruft
24 Nov 2013 18:36:37	bapt	Support staging Use optiosn helpers
20 Sep 2013 14:36:37 **0.19_1**	bapt	Add NO_STAGE all over the place in preparation for the staging support (cat: audio)
03 Aug 2013 13:44:01 **0.19_1**	mat	- Convert to new perl framework - Remove MAKE_JOBS_SAFE=yes, it's the default.
06 May 2013 22:26:27 **0.19_1**	bapt	Use shebangfix
23 Mar 2013 19:36:24 **0.19_1**	bapt	Fix USE_GITHUB in combinaison with MASTER_SITE= GHC which breaks WRKSRC Drop maintainership
31 Dec 2012 11:31:44 **0.19_1**	bapt	- Trim headers - Switch to USE_GITHUB - Remove useless LICENSE_FILE license being plain GPLv2 - Various cleanup
29 May 2012 14:01:15 **0.19_1**	bapt	Convert to new options framework While here activate flac by default share descriptions of mp4, id3, flac and vorbis
19 Mar 2011 12:38:54 **0.19**	miwi	- Get Rid MD5 support
28 Jul 2010 17:31:01 **0.19**	bapt	Change maintainer address to my new @FreeBSD.org Approved by: jadawin@ (co-mentor)
19 Jul 2010 11:50:22 **0.19**	kwm	Correct the second LICENSE line, to fix the build. Submitted by: QAT Approved by: maintainer

and RootBSD

This site

What is FreshPorts?
About the authors
Issues
FAQ
How big is it?
The latest upgrade!
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Enter Keywords:
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Latest Vulnerabilities

powerdns	Mar 19
rubygem-actionview4	Mar 18
rubygem-actionview5	Mar 18
rubygem-actionview50	Mar 18
putty	Mar 17
putty-gtk2	Mar 17
putty-nogtk	Mar 17
py-notebook	Mar 16
ruby-gems	Mar 15
ntp	Mar 07
openssl*	Mar 07
openssl111	Mar 07
rssh	Mar 06
rt42	Mar 06
rt44	Mar 06

13 vulnerabilities affecting 42 ports have been reported in the past 14 days

* - modified, not new

All vulnerabilities

Last updated:
2019-03-19 14:51:44

Ports

Home
Categories
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Newsfeeds

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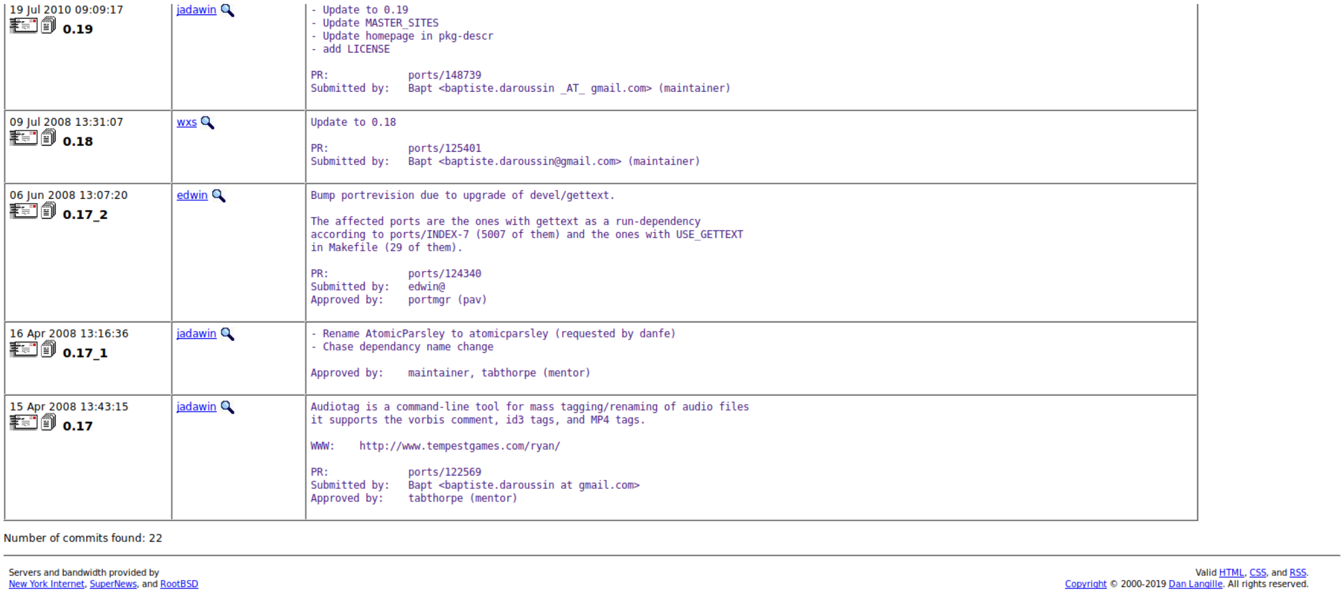
Graphs
NEW Graphs (Javascript)
Traffic

Calculated hourly:

Port count	36286
Broken	116
Deprecated	119
Ignore	337
Forbidden	5
Restricted	161
No CDROM	74
Vulnerable	37
Expired	6
Set to expire	93
Interactive	0
new 24 hours	4
new 48 hours	12
new 7 days	35
new fortnight	65
new month	138



19 Jul 2010 09:09:17 **0.19**	jadawin	- Update to 0.19 - Update MASTER_SITES - Update homepage in pkg-descr - add LICENSE PR: ports/148739 Submitted by: Bapt <baptiste.daroussin _AT_ gmail.com> (maintainer)
09 Jul 2008 13:31:07 **0.18**	wxs	Update to 0.18 PR: ports/125401 Submitted by: Bapt <baptiste.daroussin@gmail.com> (maintainer)
06 Jun 2008 13:07:20 **0.17_2**	edwin	Bump portrevision due to upgrade of devel/gettext. The affected ports are the ones with gettext as a run-dependency according to ports/INDEX-7 (5007 of them) and the ones with USE_GETTEXT in Makefile (29 of them). PR: ports/124340 Submitted by: edwin@ Approved by: portmgr (pav)
16 Apr 2008 13:16:36 **0.17_1**	jadawin	- Rename AtomicParsley to atomicparsley (requested by danfe) - Chase dependancy name change Approved by: maintainer, tabthorpe (mentor)
15 Apr 2008 13:43:15 **0.17**	jadawin	Audiotag is a command-line tool for mass tagging/renaming of audio files it supports the vorbis comment, id3 tags, and MP4 tags. WWW: http://www.tempestgames.com/ryan/ PR: ports/122569 Submitted by: Bapt <baptiste.daroussin at gmail.com> Approved by: tabthorpe (mentor)

Number of commits found: 22

Servers and bandwidth provided by
New York Internet, SuperNews, and RootBSD

Valid HTML, CSS, and RSS.
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Audiotag Port Information

Packages are built with default options. Ports let the user select options.

The FreeBSD Ports Collection must be installed in the jail before ports can be compiled. Inside the jail, use the `portsnap` utility. This command downloads the ports collection and extracts it to the /usr/ports/ directory of the jail:

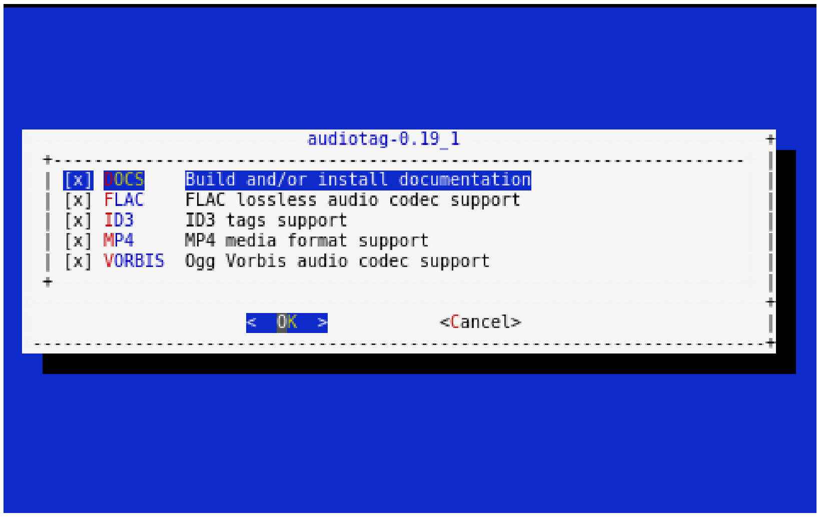
```
portsnap fetch extract
```

To install additional software at a later date, make sure the ports collection is updated with `portsnap fetch update`.

To compile a port, `cd` into a subdirectory of /usr/ports/. The entry for the port at FreshPorts provides the location to `cd` into and the `make` command to run. This example compiles and installs the *audiotag* port:

```
cd /usr/ports/audio/audiotag
make install clean
```

The first time this command is run, the configure screen shown.



```
                         audiotag-0.19_1
 [x] DOCS     Build and/or install documentation
 [x] FLAC     FLAC lossless audio codec support
 [x] ID3      ID3 tags support
 [x] MP4      MP4 media format support
 [x] VORBIS   Ogg Vorbis audio codec support

                 <  OK  >           <Cancel>
```

Audiotag Port Configuration Options

This port has several configurable options: *DOCS*, *FLAC*, *ID3*, *MP4*, and *VORBIS*. Selected options are shown with a `*`.

Use the arrow keys to select an option and press `spacebar` to toggle the value. Press `Enter` when satisfied with the options. The port begins to compile and install.

After options are set, the configuration screen is normally not shown again. Use `make config` to display the screen and change options before rebuilding the port with `make clean install clean`.

Many ports depend on other ports. Those other ports also have configuration screens that are shown before compiling begins. It is a good idea to watch the compile until it finishes and the command prompt returns.

Installed ports are registered in the same package database that manages packages. `pkg info` determines which ports were installed.

Starting Installed Software

After packages or ports are installed, they must be configured and started. Configuration files are usually in /usr/local/etc or a subdirectory of it. Many FreeBSD packages contain a sample configuration file as a reference. Take some time to read the software documentation to learn which configuration options are available and which configuration files require editing.

Most FreeBSD packages that contain a startable service include a startup script that is automatically installed to /usr/local/etc/rc.d/. After the configuration is complete, test starting the service by running the script with the *onestart* option. For example, when *openvpn* is installed in a jail, these commands verify that the service has started:

```
/usr/local/etc/rc.d/openvpn onestart
Starting openvpn.

/usr/local/etc/rc.d/openvpn onestatus
openvpn is running as pid 45560.

sockstat -4
USER COMMAND         PID     FD      PROTO   LOCAL ADDRESS   FOREIGN ADDRESS
root openvpn         48386   4       udp4    *:54789         *:*
```

If it produces an error:

```
/usr/local/etc/rc.d/openvpn onestart
Starting openvpn.
/usr/local/etc/rc.d/openvpn: WARNING: failed to start openvpn
```

Enter `tail /var/log/messages` to see any error messages if an issue is found. Most startup failures are related to a misconfiguration in a configuration file.

After verifying that the service starts and is working as intended, add a line to /etc/rc.conf to start the service automatically when the jail is started. The line to start a service always ends in `_enable=”YES”` and typically starts with the name of the software. For example, this is the entry for the *openvpn* service:

```
openvpn_enable="YES"
```

When in doubt, the startup script shows the line to put in /etc/rc.conf. This is the description in /usr/local/etc/rc.d/openvpn:

```
# To run additional instances link this script to something like
# % ln -s openvpn openvpn_foo

# and define additional openvpn_foo_* variables in one of
# /etc/rc.conf, /etc/rc.conf.local or /etc/rc.conf.d /openvpn_foo

#
# Below NAME should be substituted with the name of this script. By default
# it is openvpn, so read as openvpn_enable. If you linked the script to
# openvpn_foo, then read as openvpn_foo_enable etc.
#
# The following variables are supported (defaults are shown).
# You can place them in any of
# /etc/rc.conf, /etc/rc.conf.local or /etc/rc.conf.d/NAME
#
# NAME_enable="NO"
# set to YES to enable openvpn
```

The startup script also indicates if any additional parameters are available:

```
# NAME_if=
# driver(s) to load, set to "tun", "tap" or "tun tap"
#
# it is OK to specify the if_ prefix.
#
# # optional:
# NAME_flags=
# additional command line arguments
# NAME_configfile="/usr/local/etc/openvpn/NAME.conf"
# --config file
# NAME_dir="/usr/local/etc/openvpn"
# --cd directory
```

10.1.4 - Additional Storage

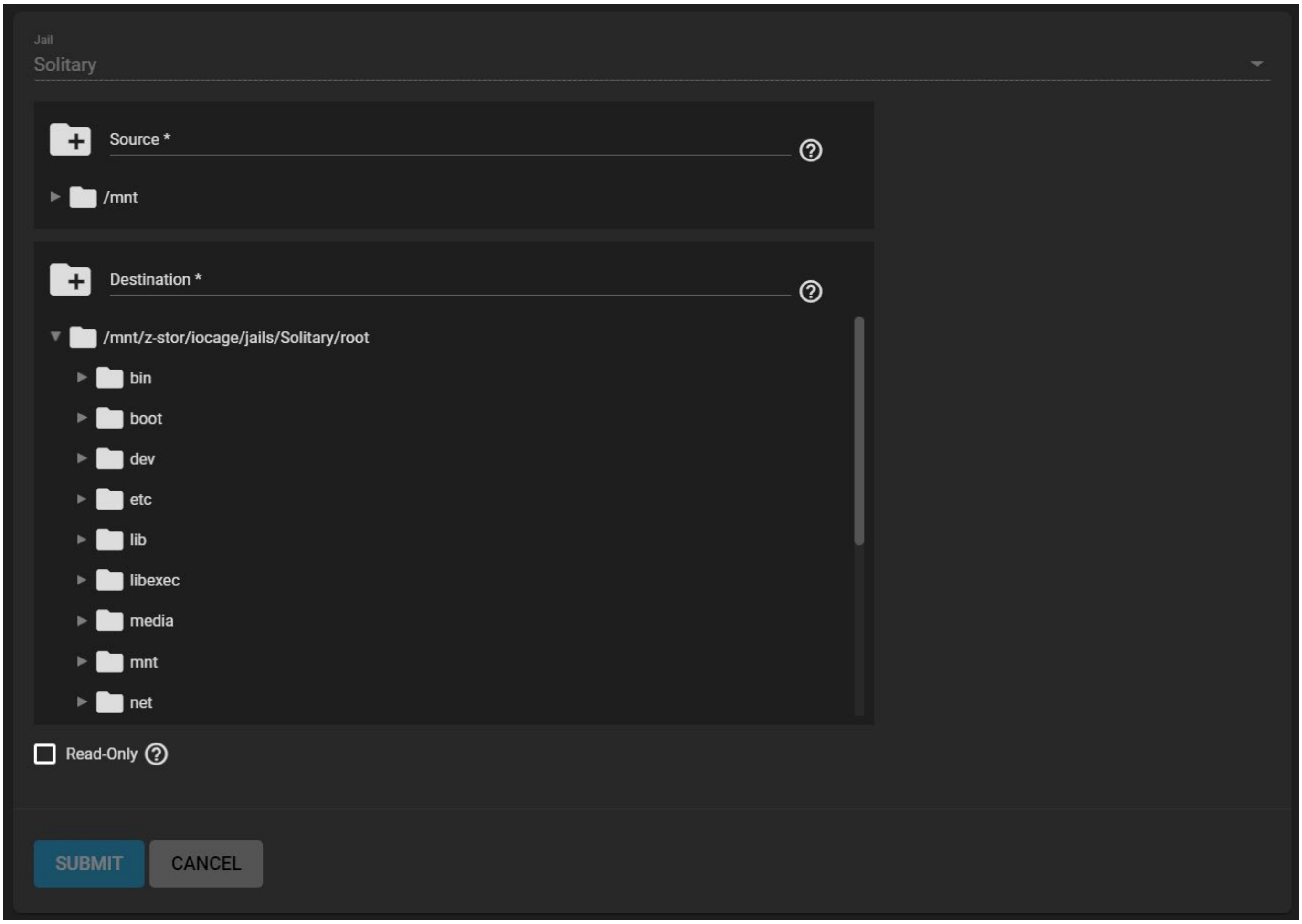
Jails can be given access to an area of storage outside of the jail that is configured on the TrueNAS system. It is possible to give a FreeBSD jail access to an area of storage on the TrueNAS system. This is useful for applications or plugins that store large amounts of data or if an application in a jail needs access to data stored on the TrueNAS system. For example, *Transmission* is a plugin that stores data using BitTorrent. The TrueNAS external storage is added using the mount_nullfs(8) mechanism, which links data that resides outside of the jail as a storage area within a jail.

chevron_right > **MOUNT POINTS** shows any added storage and allows adding more storage.

A jail must have a **STATE** of *down* before adding a new mount point. Click chevron_right and stop for a jail to change the jail STATE to down.

Storage can be added by clicking **Jails** > chevron_right > **MOUNT POINTS** for the desired jail. The **MOUNT POINT** section is a list of all of the currently defined mount points.

Go to **MOUNT POINTS > ACTIONS > Add Mount Point** to add storage to a jail.



Jail: Solitary

Browse to the *Source* and *Destination*, where:

- *Source* is the directory or dataset on the TrueNAS system that is accessed by the jail. TrueNAS creates the directory if it does not exist. This directory must reside outside of the pool or dataset being used by the jail. This is why it is recommended to create a separate dataset to store jails. The dataset holding the jails is always separate from any datasets used for storage on the TrueNAS system.
- *Destination* is an existing and empty directory within the jail to link to the *Source* storage area. Adding / and a name to the end of the path for TrueNAS creates a new directory. New directories

created must be **within** the jail directory structure. Example: /mnt/iocage/jails/samplejail/root/new-destination-directory.

Storage is typically added because the user and group account associated with an application installed inside of a jail needs to access data stored on the TrueNAS system. Before selecting the *Source*, it is important to ensure that the permissions of the selected directory or dataset grant permission to the user or group account inside the jail. This is not the default, as the users and groups created inside a jail are separate from the users and groups created on the TrueNAS system.

Here is the typical workflow for adding jail storage:

- Determine the name of the user and group account used by the application. For example, the installation of the *transmission* application automatically creates a user account named *transmission* and a group account also named *transmission*. When in doubt, check the files /etc/passwd (to find the user account) and /etc/group (to find the group account) inside the jail.

  Typically, the user and group names are similar to the application name. Also, the UID and GID are usually the same as the port number used by the service. A *media* user and group (GID 8675309) are part of the base system. Having applications run as this group or user makes it possible to share storage between multiple applications in a single jail, between multiple jails, or even between the host and jails.

- On the TrueNAS system, create a user account and group account that match the user and group names used by the jail application.

- Decide if the jail needs access to existing data or if a new storage area should be created.

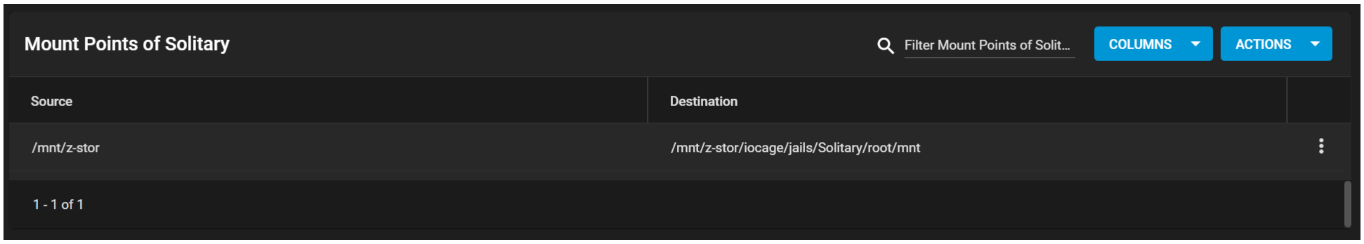
- If the jail needs to access existing data, edit the permissions of the pool or dataset so the user and group accounts have the desired read and write access. When multiple applications or jails need access to the same data, create a new group and add each new user account to that group.

- If a new storage area is being set aside for that jail or application, create a dataset. Edit the dataset permissions so the user and group account has the desired read and write access.

- Use jail chevron_right **> MOUNT POINTS > ACTIONS > Add Mount Point** to select the data *Source* and the jail mount *Destination*.

To prevent writes to the storage, click *Read-Only*.

After storage has been added or created, it appears in the `MOUNT POINTS` for that jail.



Mount Points of Solitary

Source	Destination
/mnt/z-stor	/mnt/z-stor/iocage/jails/Solitary/root/mnt

1 - 1 of 1

Storage is automatically mounted as it is created. Mounting a dataset does not automatically mount any child datasets inside it. Each dataset is a separate filesystem, so child datasets must each have separate mount points.

Click more_vert > **Delete** to delete the storage.

Remember that added storage is just a pointer to the selected storage directory on the TrueNAS system. It does not copy that data to the jail. Files that are deleted from the *Destination* directory in the jail are also deleted from the *Source* directory on the TrueNAS system. However, removing the jail storage entry only removes the pointer. This leaves the data intact but no longer accessible to the jail.

10.2 - Plugins

10.2.1 - Plugin Management

This feature is generally available in TrueNAS CORE and supported by the TrueNAS Community. iXsystems customers with TrueNAS Enterprise hardware and an iXsystems Support contract can contact Support about accessing these features.

Plugins allow extending the built-in NAS services by installing additional software. A plugin is a pre-packaged application that is installed into a FreeBSD Jail. The plugin jail is limited to installing and using only the plugin software.

Before getting started... expand □

- A data pool must be available for plugin storage.
- The system must be connected to the internet.
- Go to **Network > Interfaces**, edit the intended plugin interface, and set *Disable Hardware Offloading*.

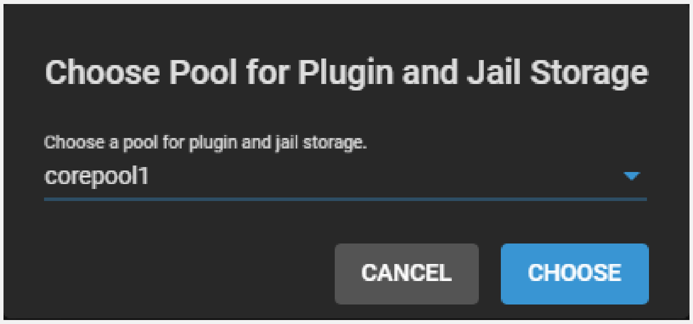
Plugin Installation

Catalog

To see the plugin catalog, go to the **Plugins** screen.

First time in this menu? expand □

Going to the **Jails** or **Plugins** screen for the first time prompts to select a location on the system for storing Jail related data.



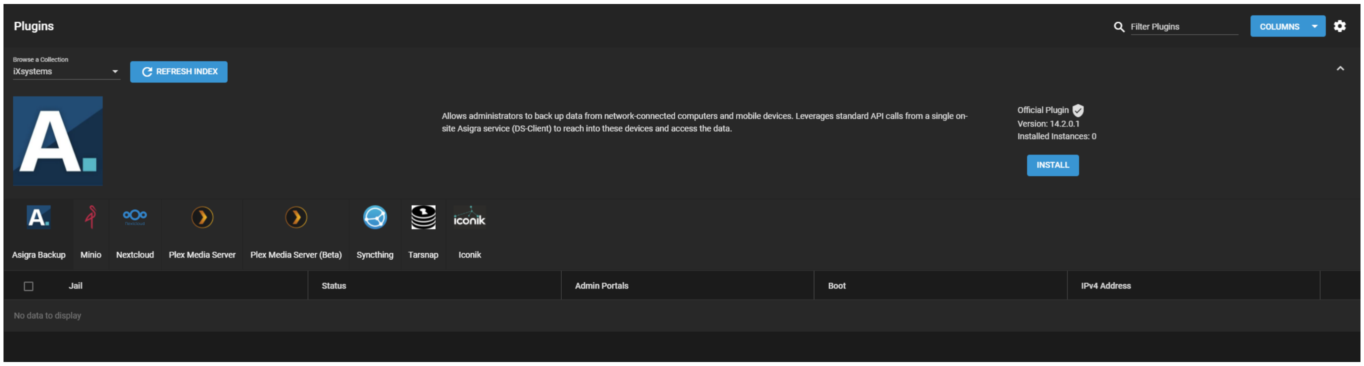
Choose Pool for Plugin and Jail Storage

Choose a pool for plugin and jail storage.
corepool1

By default, this location stores all data related to jails and plugins, including downloaded applications, data managed by the jail or plugin, and any jail snapshots.

Disconnecting or deleting the pool that stores jail data can result in **permanent data loss!** Make sure to back up any critical data or snapshots that are stored in a jail before changing the storage configuration.

To change the Jails and Plugins storage location, click □, select a new pool, and click *CHOOSE*.



Browse a Collection: iXsystems

Allows administrators to back up data from network-connected computers and mobile devices. Leverages standard API calls from a single on-site Asigra service (DS-Client) to reach into these devices and access the data.

Official Plugin
Version: 14.2.0.1
Installed Instances: 0

□ Jail	Status	Admin Portals	Boot	IPv4 Address

No data to display

I don't see anything? expand □

If the catalog doesn’t load:

- Go to **Network > Global Configuration** and confirm the **Default Gateway** and **DNS Servers** addresses are correct.
- Open the **Shell** and `ping` an Internet address. The output confirms the system is connected to the Internet.

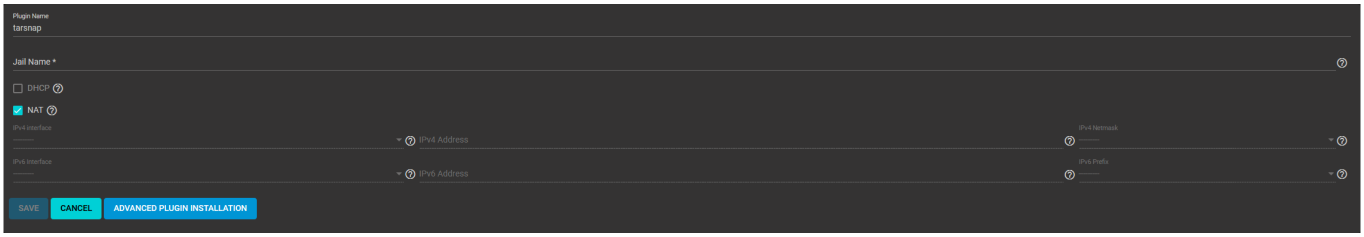
Plugins are organized into two **Collections**:

- iXsystems maintained plugins
- Open Source plugins created and maintained by the TrueNAS community.

By default, the iXsystems-supported plugins are shown. To view the community-supported plugins, open *Browse a Collection* and select *Community*.

Install Options

To install a plugin, click the plugin icon and *Install*. This example shows installing Tarsnap, a popular backup solution.



Plugin Name: tarsnap

Jail Name *

□ DHCP

☑ NAT

IPv4 interface: ——
IPv4 Address
IPv4 Netmask: ——

IPv6 Interface: ——
IPv6 Address
IPv6 Prefix: ——

Enter a *Jail Name* for the plugin and adjust the networking settings as needed. Most plugins default to using Network Address Translation (NAT) for their Internet connection, but you can choose to use a dynamically-generated address with *DHCP* or define static IP addresses for the plugin jail. Using *NAT* is recommended as it does not require manual configuration of multiple available IP addresses and prevents addressing conflicts on the network.

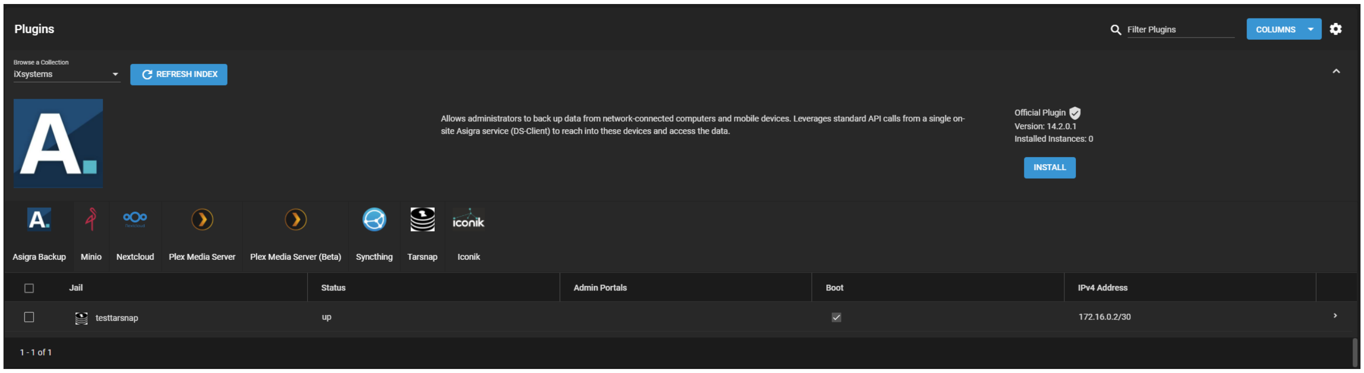
Some plugins default to *DHCP* as their management utility conflicts with NAT. Keep these plugins set to *DHCP* unless a manually configured IP address is preferred.

Plugins can take several minutes to download and install. A dialog confirms when the installation is complete and shows any post-install notes. You can view the post-install notes later by expanding the entry for the installed plugin in **Plugins** and clicking *Post Install Notes*.

Troubleshooting expand □
If a plugin download or update fails with an error about being unable to fetch an artifact or download a package, you might need to investigate your networking environment. Some home routers can have a security feature that prevent DHCP enabled plugins (or bridged devices with virtual MAC addresses) from resolving addresses. Also, sometimes additional DNS validation is required that is not supported by the router or the router has a caching resolver that is holding on to a stale record. A couple of possible solutions are to hard reset your router to clear any stale records or try using an alternate DNS server for the plugin.

Post-Install Configuration

After a plugin is installed, an entry is added to the **Plugins** screen.



Plugins

Browse a Collection: iXsystems

Allows administrators to back up data from network-connected computers and mobile devices. Leverages standard API calls from a single on-site Asigra service (DS-Client) to reach into these devices and access the data.

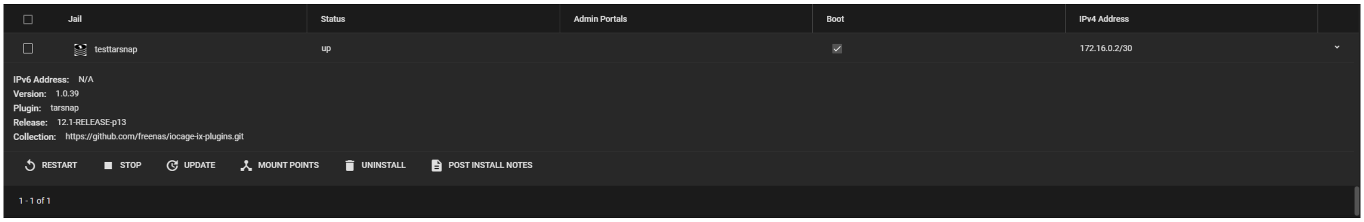
Official Plugin
Version: 14.2.0.1
Installed Instances: 0

□	Jail	Status	Admin Portals	Boot	IPv4 Address	
□	testtarsnap	up		✓	172.16.0.2/30	›

1 - 1 of 1

Click chevron_right to manage the plugin state, update the plugin application, configure the plugin jail mount points to storage datasets, and, when supported, open a link to the management portal for the plugin application.

Plugin jails are preconfigured and require very little tuning. However, jail properties are available in the event a setting needs to change. To update or reconfigure the plugin jail, go to the **Jails** screen and expand the entry for one of the plugin jails. You need to click □ and stop the jail before changing it.



□	Jail	Status	Admin Portals	Boot	IPv4 Address	
□	testtarsnap	up		✓	172.16.0.2/30	˅

IPv6 Address: N/A
Version: 1.0.39
Plugin: tarsnap
Release: 12.1-RELEASE-p13
Collection: https://github.com/freenas/iocage-ix-plugins.git

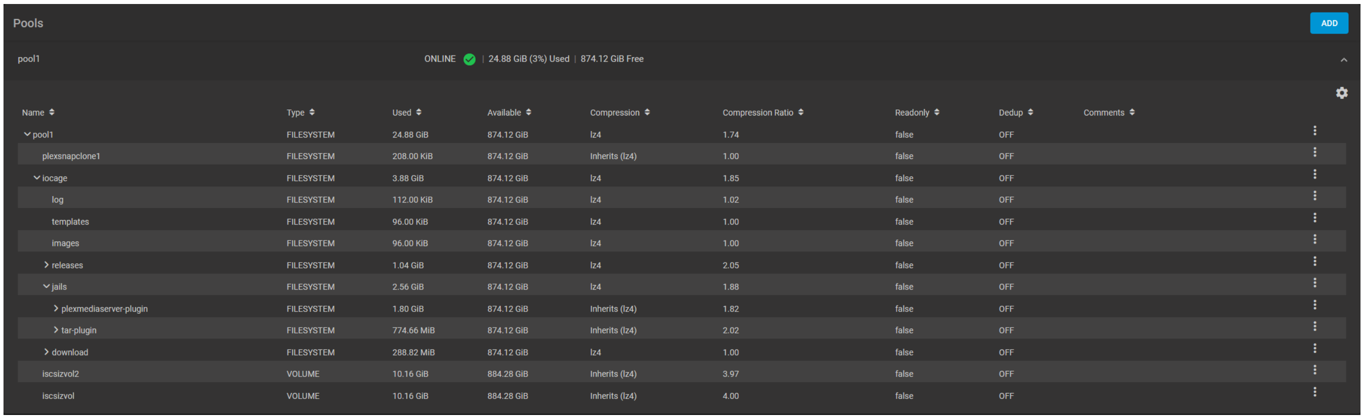
1 - 1 of 1

Removing a Plugin

Uninstalling a plugin **destroys** all datasets or snapshots that are associated with the plugin. Make sure to back up any important data stored in the plugin jail before deleting it!

Backing up Jail Data

To find a jail's stored data, go to **Storage > Pools** and expand the entry for the pool that was chosen to store plugin and jail data. Expand the `iocage` and `jails` datasets to find the plugin jail storage dataset.



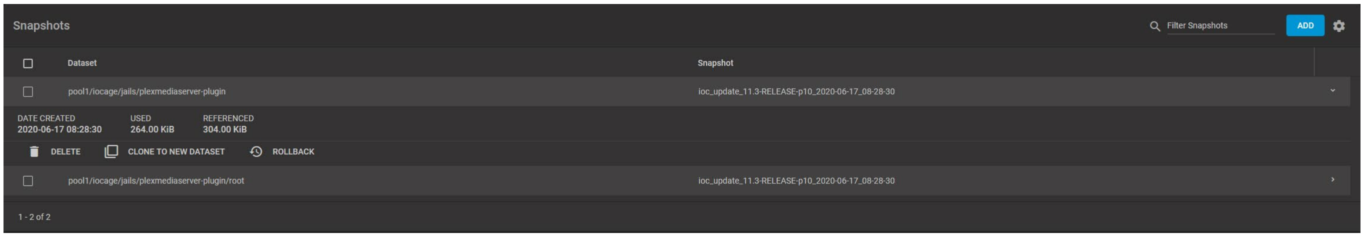
Pools

pool1 ONLINE | 24.88 GiB (3%) Used | 874.12 GiB Free

Name	Type	Used	Available	Compression	Compression Ratio	Readonly	Dedup	Comments
pool1	FILESYSTEM	24.88 GiB	874.12 GiB	lz4	1.74	false	OFF	
plexsnapclone1	FILESYSTEM	208.00 KiB	874.12 GiB	Inherits (lz4)	1.00	false	OFF	
iocage	FILESYSTEM	3.88 GiB	874.12 GiB	lz4	1.85	false	OFF	
log	FILESYSTEM	112.00 KiB	874.12 GiB	lz4	1.02	false	OFF	
templates	FILESYSTEM	96.00 KiB	874.12 GiB	lz4	1.00	false	OFF	
images	FILESYSTEM	96.00 KiB	874.12 GiB	lz4	1.00	false	OFF	
releases	FILESYSTEM	1.04 GiB	874.12 GiB	lz4	2.05	false	OFF	
jails	FILESYSTEM	2.56 GiB	874.12 GiB	lz4	1.88	false	OFF	
plexmediaserver-plugin	FILESYSTEM	1.80 GiB	874.12 GiB	Inherits (lz4)	1.82	false	OFF	
tar-plugin	FILESYSTEM	774.66 MiB	874.12 GiB	Inherits (lz4)	2.02	false	OFF	
download	FILESYSTEM	288.82 MiB	874.12 GiB	lz4	1.00	false	OFF	
iscsizvol2	VOLUME	10.16 GiB	884.28 GiB	Inherits (lz4)	3.97	false	OFF	
iscsizvol	VOLUME	10.16 GiB	884.28 GiB	Inherits (lz4)	4.00	false	OFF	

One option to back up this stored data is to create a local replication. The replication task can even be configured to run periodically and automatically back up new changes to the jail dataset.

To convert a jail snapshot into a new storage dataset, go to **Storage > Snapshots** and find a snapshot of the jail dataset.



Snapshots

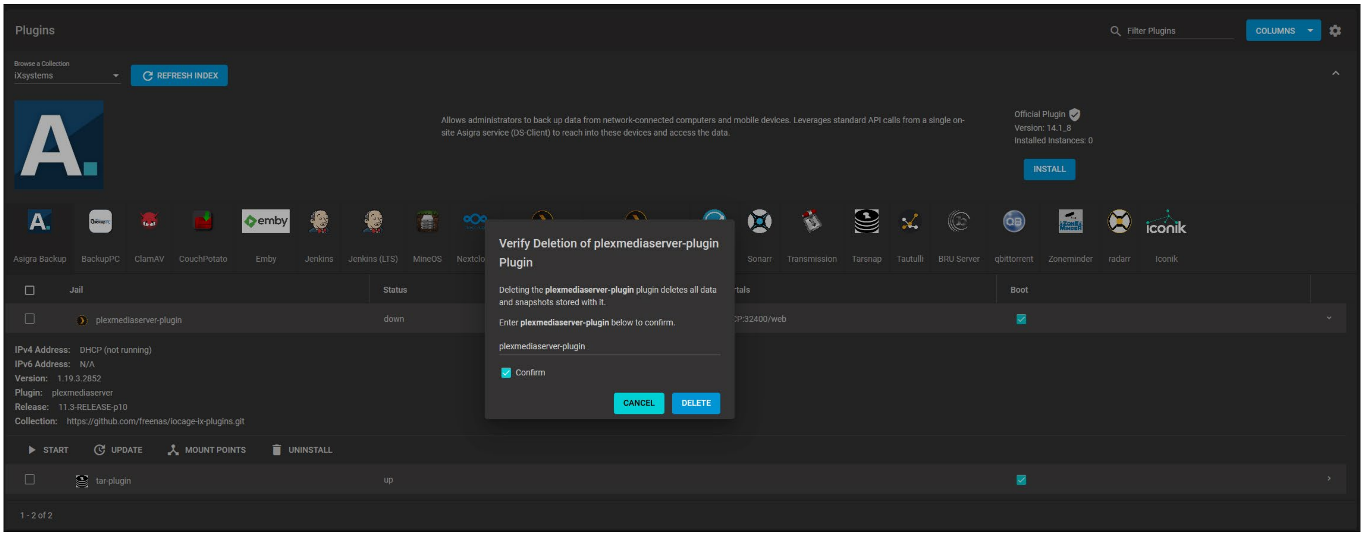
Dataset	Snapshot
pool1/iocage/jails/plexmediaserver-plugin	ioc_update_11.3-RELEASE-p10_2020-06-17_08-28-30
pool1/iocage/jails/plexmediaserver-plugin/root	ioc_update_11.3-RELEASE-p10_2020-06-17_08-28-30

DATE CREATED: 2020-06-17 08:28:30
USED: 264.00 KiB
REFERENCED: 304.00 KiB

Expand the snapshot entry, click filter_none, and define the path and name of the new dataset to create from the snapshot. Then go to **Storage > Pools**, open the more_vert for the new dataset, and click *Promote Dataset*.

Uninstalling a Plugin

To remove a plugin, go to **Plugins**, expand the installed plugin entry, and click delete. Confirm the plugin removal by typing in the name of the plugin jail and setting *Confirm*.



Allows administrators to back up data from network-connected computers and mobile devices. Leverages standard API calls from a single on-site Asigra service (DS-Client) to reach into these devices and access the data.

Official Plugin
Version: 14.1_8
Installed Instances: 0

Verify Deletion of plexmediaserver-plugin Plugin

Deleting the **plexmediaserver-plugin** plugin deletes all data and snapshots stored with it.

Enter **plexmediaserver-plugin** below to confirm.

plexmediaserver-plugin

☑ Confirm

Jail	Status	Boot
plexmediaserver-plugin	down	☑
tar-plugin	up	☑

IPv4 Address: DHCP (not running)
IPv6 Address: N/A
Version: 1.19.3.2852
Plugin: plexmediaserver
Release: 11.3-RELEASE-p10
Collection: https://github.com/freenas/iocage-ix-plugins.git

Uninstalling can take a few moments while the plugin deletes from both **Plugins** and **Jails**. The plugin dataset also deletes from {POOL}/iocage/jails/ and any jail snapshots from **Storage > Snapshots**.

10.2.2 - Custom Plugins

Plugins are a technology for easily and securely deploying 3rd party applications directly on TrueNAS storage systems. The web interface allows users to deploy, start, stop, and update applications, along with configuration tasks such as assigning storage to them. Plugins are popular for content, security, development, collaboration, and backup applications for home and business use.

This feature is generally available in TrueNAS CORE and supported by the TrueNAS Community. iXsystems customers with TrueNAS Enterprise hardware and an iXsystems Support contract can contact Support about accessing these features.

Plugin Technology expand □

Jails form the core of TrueNAS plugins. Jails are the FreeBSD container technology and are:

- resource efficient
- secure
- flexible with networking infrastructure

Additionally, TrueNAS integrates the iocage application for its jail container management framework.

Each of the most popular TrueNAS plugins such as Plex Media Server, NextCloud, and SyncThing begin as FreeBSD ports: multimedia/plexmediaserver/, deskutils/nextcloudclient/, and net/syncthing/ respectively. These install to a FreeBSD system using the `pkg` package manager. For example, FreeBSD uses `pkg install plexmediaserver` and then configures the application manually.

This tutorial guides you through creating a custom plugin using the SABnzbd newsreader plugin as an example. A plugin adds metadata that provides an installation source, reasonable defaults, and user interface elements such as an icon. The components for the *sabnzbd* plugin are:

- README.md: A popular convention for a file in markdown format for describing the project.
- sabnzbd.json: The JSON “Artifact” file containing various plugin properties including an inventory of all other metadata components which may be in the same or a remote repo.
- overlay/: An optional directory containing the files to be copied into the Jail.
- ui.json: A file containing the plugin management interface URL and port number.
- settings.json: An optional JSON file that contains variables used during plugin startup and for its configuration.
- sabnzbd.png: A .png image such as sabnzbd.png that will appear in the TrueNAS plugins Index. It is used as the icon.
- post_install.sh: A shell script ran after jail creation to perform necessary configuration steps. It runs only once.

Requirements

TrueNAS provides everything necessary for custom plugin development, but a FreeBSD system is also a good choice. The requirements are:

- A TrueNAS or FreeBSD system running `iocage`.
- An internet connection and at least *1 GiB* of available disk space.
- A publicly-accessible `git` repository, self-hosted or on a service like GitHub, Gitea or GitLab. GitLab can be run as its own plugin.
- A text editor such as *vi*, *ee*, or *nano*, all of which are available in TrueNAS.

Basic knowledge of FreeBSD and shell scripting.

Creating Each Component

`//` and `#` comments are not supported in JSON. Copy any examples from the files in the Git repo using “raw” mode.

⊙ Artifact File

sabnzbd.json (artifact file)

```
{
  "name": "sabnzbd",                //The name of the Plugin and resulting Jail
  "plugin_schema": "2",             //The Plugin schema version
  "release": "11.3-RELEASE",        //FreeBSD version (not significantly newer than host)
  "artifact": "https://github.com/ConorBeh/iocage-plugin-sabnzbd.git",      //The Git repo
containing the Plugin
  "properties": {                   //Jail properties that can be overridden by the user
    "nat": 1,
    "nat_forwards": "tcp(8080:8080)"
  },
  "pkgs": [                 //FreeBSD packages to be installed, one per line
    "sabnzbdplus",
  ],
  "packagesite": "https://pkg.FreeBSD.org/FreeBSD:11:amd64/latest",          //The package site,
latest, quarterly, or self-hosted
  "fingerprints": {
    "iocage-plugins": [
      {
        "function": "sha256",
        "fingerprint": "b0170035af3acc5f3f3ae1859dc717101b4e6c1d0a794ad554928ca0cbb2f438"
//The checksum of the FreeBSD port
      }
    ]
  },
  "revision": "0"       //Internal version number
}
```

Artifact File Properties

These are commonly-used properties specified in the artifact file. Any supported iocage property can be specified. Here are a few:

- `nat`: Enables Network Address Translation to utilize the host’s IP address.
- `nat_forwards`: Required when NAT is enabled. Syntax: `< protocol >` (`< jailport >:< hostport >`)
- `dhcp`: Enables DHCP on the jail to allow it to automatically obtain an IP address.
- `allow_tun`: Allows the creation of a tun network device inside the jail, required for VPN connections.
- `allow_raw_sockets`: Allows the jail to create raw sockets.

Artifact Repository Options

The official FreeBSD repository provides *latest* and *quarterly* branches. The *latest* branch contains binary packages that are updated immediately, while the *quarterly* branch binaries are only updated every quarter, and are the default for FreeBSD releases. The fingerprint remains the same for all official FreeBSD repositories. If custom port build options are required, the preferred solution is to set up a custom Poudriere build server.

○ overlay/

overlay/

The overlay/ is a directory of files copied into the jail after creation and before the execution of post_install.sh. The layout of these files follows the same paths as in the root jail filesystem. For example, a file placed in /overlay/usr/local/www/lighttpd/ inside the Git repo goes into /usr/local/www/lighttpd in the jail. This is very useful for providing pre-made configuration files, additional scripts, or even binaries that might not be available in the pkg repository.

○ ui.json

ui.json

This is a small JSON file containing the address of the WebUI and port. Use the variable `%%IP%%` to automatically display the correct IP address. Make sure to include any extra components in the URL following the domain name or IP address, for example /admin or /web/index.

○ **settings.json**

settings.json

A JSON file that is used when working with generated or user-specified data such as passwords or database names. These variables can be used in post_install.sh. In addition to these variables the `servicerestart` command must also be set. This command runs when a setting changes or the jail restarts, like a web server restart.

○ **sabnzbd.png (Icon File)**

sabnzbd.png (Icon File)

A link to a .png file to show in the TrueNAS Plugins Index. The image requires a transparent background and must be *128 pixel by 128 pixel square* in size to produce quality results when automatically resized.

○ **post_install.sh**

post_install.sh

A POSIX shell script that leverages all other files to automate plugin installation. Simple plugins typically only have a few lines in this file, to enable and start a few services. Note that iocage executes the file contents simultaneously, not line by line. Remember to make the file executable before uploading it to the Git repository.

To make post_install.sh executable, enter `chmod +x post_install.sh`.

Common post-installation steps include:

- Setting file and directory permissions
- Moving, copying, and editing configuration files
- Generating random passwords
- Adding a user and/or group
- Creating a database

○ **/root/PLUGIN_INFO**

/root/PLUGIN_INFO

A text file with easily accessible information which can be recalled again from the web interface by clicking *Post Install Notes*. Information can be entered into this file using `echo {information/notes} >> /root/PLUGIN_INFO` in post_install.sh, where *{information/notes}* is the relevant information about the plugin.

Git Repository Initialization

Create and initialize a Git repository and README for the plugin. Use this naming schema `iocage-plugin-{PLUGIN_NAME}`. For example, *iocage-plugin-sabnzbd* is the name of the Github repo in this example.

Put all the necessary files and directories in the newly created artifact repo. The necessary files are listed above. Next, open a pull request to the plugin hub index that adds the artifact file, icon, and entry into the `INDEX` file. Remember to put a link to your newly created artifact repo in the comments of the pull request. This way a moderator can fork your repo and it can be made available in the community list of plugins.

For guides on how to use Github, see Github Guides.

10.3 - Virtual Machines

10.3.1 - Basic Management

This feature is generally available in TrueNAS CORE and supported by the TrueNAS Community. iXsystems customers with TrueNAS Enterprise hardware and an iXsystems Support contract can contact Support about accessing these features.

A Virtual Machine (VM) is an environment on a host computer that can be used as if it were a separate physical computer. VMs can be used to run multiple operating systems simultaneously on a single computer. Operating systems running inside a VM see emulated virtual hardware rather than the actual hardware of the host computer. This provides more isolation than Jails, but a VM will consume more system resources.

What system resources do VMs require? expand □

A portion of system RAM and a new zvol is assigned to each VM. While a VM is running, these resources are not available to the host computer or other VMs.

TrueNAS VMs use the bhyve virtual machine software. This type of virtualization requires an Intel processor with Extended Page Tables (EPT) or an AMD processor with Rapid Virtualization Indexing (RVI) or Nested Page Tables (NPT). VMs cannot be created unless the host system supports these features.

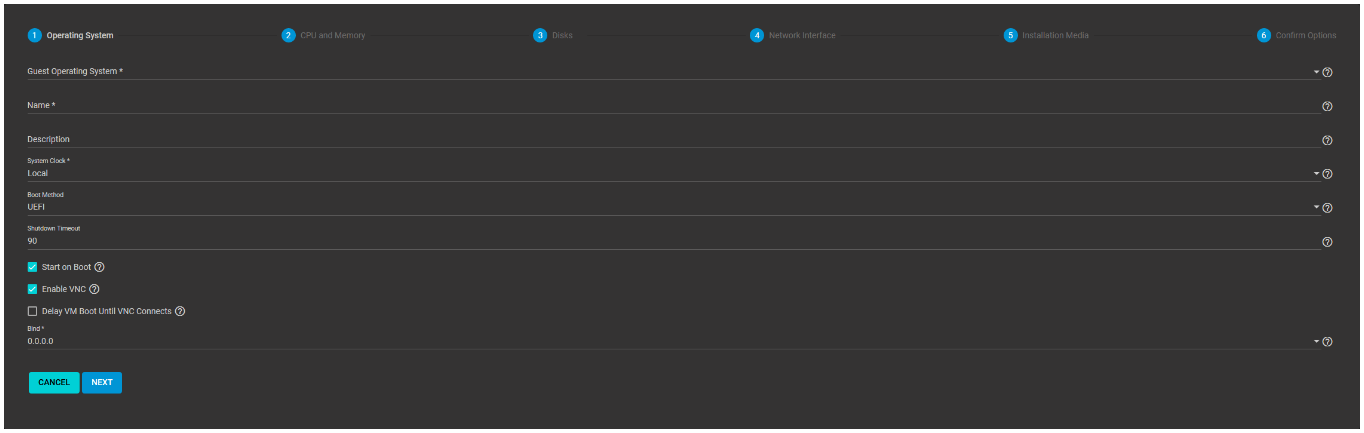
To verify that an Intel processor has the required features, open the **Shell** and run `grep VT-x /var/run/dmesg.boot`. If the EPT and UG features are shown, this processor can be used with bhyve.

To verify that an AMD processor has the required features, open the **Shell** and run `grep POPCNT /var/run/dmesg.boot`. If the output shows the POPCNT feature, this processor can be used with bhyve. Note that AMD K10 “Kuma” processors include POPCNT but do not support NRIS, which is required for use with bhyve. Production of these processors ceased in 2012-2013.

Creating a Virtual Machine

Before creating the virtual machine, you will need an installer .iso or image file for the operating system you intend to install and a storage pool available for both the virtual disk and operating system install file.

To create a new VM, go to **Virtual Machines** and click *Add*. Configure each category of the VM according to your specifications, starting with the **Operating System**.



Guest Operating System *

Name *

Description

System Clock *
Local

Boot Method
UEFI

Shutdown Timeout
90

☑ Start on Boot

☑ Enable VNC

☐ Delay VM Boot Until VNC Connects

Bind *
0.0.0.0

Specific Options expand □

Operating System

Name	Description
Guest Operating System	Choose the VM operating system type.
Name	Enter an alphanumeric name for the virtual machine.
Description	Description (optional).
System Clock *	VM system time. Default is Local.
Boot Method	Select UEFI for newer operating systems or UEFI-CSM (Compatibility Support Mode) for older operating systems that only support BIOS booting. Grub is not recommended but can be used when the other options do not work.
Shutdown Timeout	The time in seconds the system waits for the VM to cleanly shut down. During system shutdown, the system initiates poweroff for the VM after the shutdown timeout has expired.
Start on Boot	Set to start this VM when the system boots.
Enable VNC	Enable a VNC (Virtual Network Computing) remote connection. Requires UEFI booting.
Delay VM Boot Until VNC Connects	Wait to start VM until VNC client connects.
Bind	VNC network interface IP address. The primary interface IP address is the default. A different interface IP address can be chosen.

CPU and Memory

Name	Description
Virtual CPUs	Number of virtual CPUs to allocate to the virtual machine. The maximum is 16, or fewer if the host CPU limits the maximum. The VM operating system might also have operational or licensing restrictions on the number of CPUs.
Cores	Specify the number of cores per virtual CPU socket. The product of vCPUs, cores, and threads must not exceed 16.
Threads	Specify the number of threads per core. The product of vCPUs, cores, and threads must not exceed 16.

Memory Size	Allocate RAM for the VM. Minimum value is 256 MiB. This field accepts human-readable input (Ex. 50 GiB, 500M, 2 TB). If units are not specified, the value defaults to bytes.

Disks

Name	Description
Create new disk image	Select Create new disk image to create a new zvol on an existing dataset. This is used as a virtual hard drive for the VM. Select Use existing disk image to use an existing zvol or file for the VM.
Select Disk Type	Select desired disk type.
Zvol Location	Select a dataset for the new zvol.
Size	Allocate space for the new zvol. (Examples: 500 KiB, 500M, 2 TB) MiB. Units smaller than MiB are not allowed.

Network Interface

Name	Description
Adapter Type	Intel e82545 (e1000) emulates the same Intel Ethernet card. This provides compatibility with most operating systems. VirtIO provides better performance when the operating system installed in the VM supports VirtIO paravirtualized network drivers.
Mac Address	Enter the desired address into the field to override the randomized MAC address.
Attach NIC	Select the physical interface to associate with the VM.

Installation Media

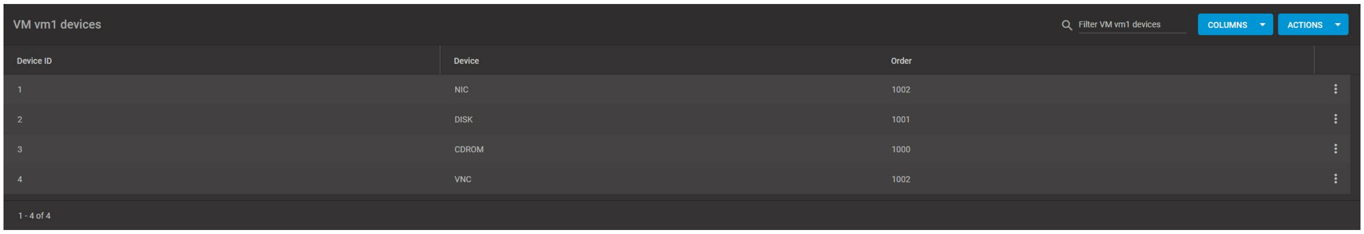
Name	Description
Choose Installation Media Image	Browse to the operating system installer image file.
Upload an Installer Image File	Set to display image upload options.

Additional notes:

- The *Grub Boot Method* is not supported by *Windows* guest operating systems.
- Compare the recommended specifications for your guest operating system with the available host system resources when allocating *Virtual CPUs*, *Cores*, *Threads*, and *Memory Size*.
- Avoid allocating too much memory to a VM. Activating a VM that has all available memory allocated to it can slow the host system or prevent other VMs from starting.
- *AHCI* is the recommended *Disk Type* for Windows VMs.
- The *VirtIO* **Network Interface** requires that the chosen guest operating system support VirtIO paravirtualized network drivers.

Adding and Removing Devices

After the VM is created, add and remove virtual devices by expanding the VM entry in **Virtual Machines** and clicking device_hub.



Device ID	Device	Order
1	NIC	1002
2	DISK	1001
3	CDROM	1000
4	VNC	1002

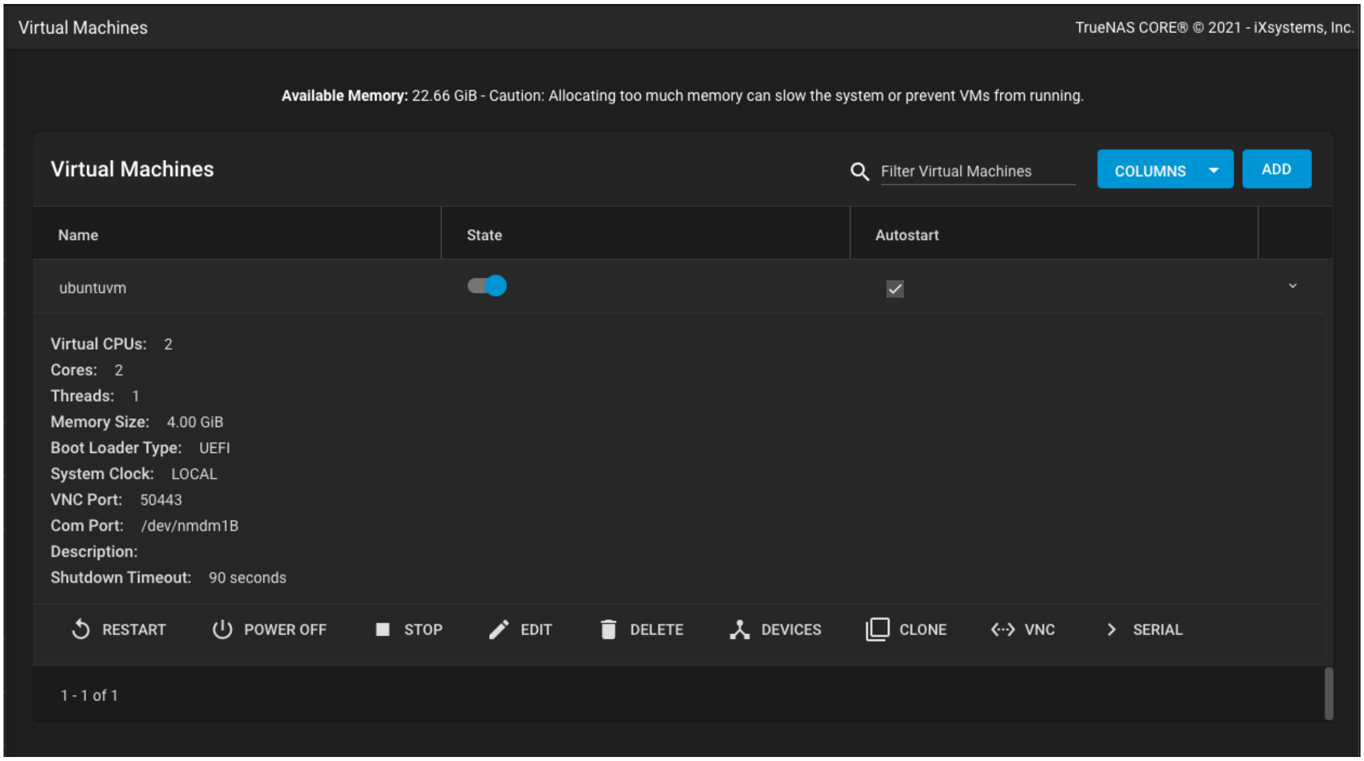
1 - 4 of 4

Device notes:

- The virtual machine attempts to boot from devices according to the *Device Order*, starting with *1000*, then ascending.
- *CD-ROM* devices allowing booting a VM from a CD-ROM image like an installation CD. The CD image must be available in the system storage.

Managing the Virtual Machine

After creating the VM and configuring any devices for it, manage the VM by expanding its entry in **Virtual Machines**.



Available Memory: 22.66 GiB - Caution: Allocating too much memory can slow the system or prevent VMs from running.

Name	State	Autostart
ubuntuvm	●	☑

Virtual CPUs: 2
Cores: 2
Threads: 1
Memory Size: 4.00 GiB
Boot Loader Type: UEFI
System Clock: LOCAL
VNC Port: 50443
Com Port: /dev/nmdm1B
Description:
Shutdown Timeout: 90 seconds

1 - 1 of 1

Options for settings_ethernet or keyboard_arrow_right connections are available after activating the VM. If the *VNC* connection screen appears garbled, try adjusting the VNC device resolution.

Using the *State* toggle or clicking stop follows a standard shut down procedure to cleanly shut down the running VM. Clicking power_settings_new immediately halts and deactivates the VM, similar to unplugging a computer.

> If the VM you created has no Guest OS installed, The VM **State** toggle and stop button might not function as expected. These buttons try to send an ACPI power down command to the VM operating system, but since no OS is installed, the commands time out. Use the *POWER OFF* button instead.

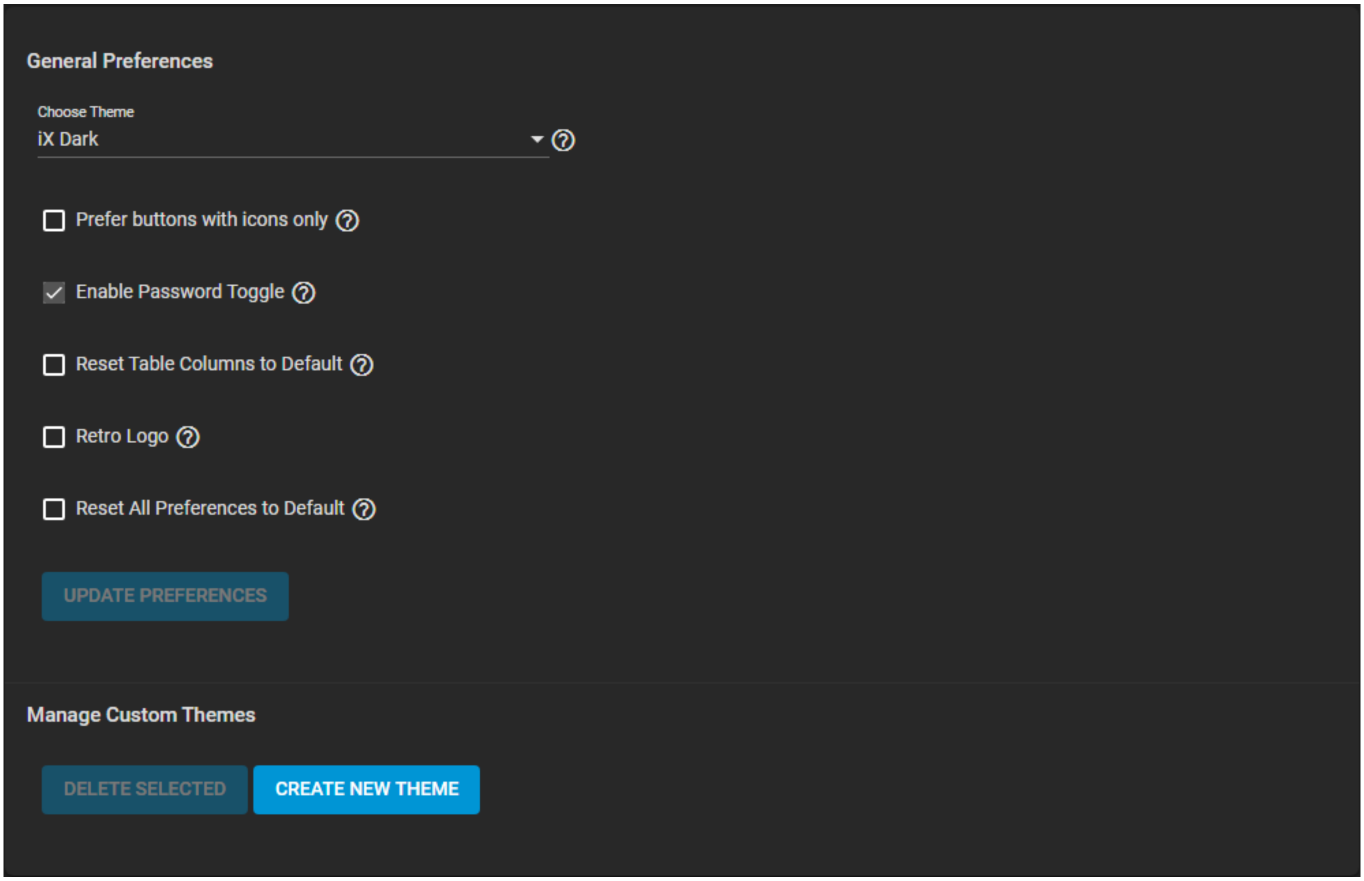
11 - Administration

11.1 - Interface Preferences

- - General Preferences
  - Custom Themes

There are a few adjustable interface preferences and a built-in theme editor for creating your own TrueNAS color schemes.

To access user preferences, click settings **> Preferences**. This page has options to adjust global settings in the web interface, manage custom themes, and create new themes.



General Preferences

Choose Theme
iX Dark

□ Prefer buttons with icons only

☑ Enable Password Toggle

□ Reset Table Columns to Default

□ Retro Logo

□ Reset All Preferences to Default

Manage Custom Themes

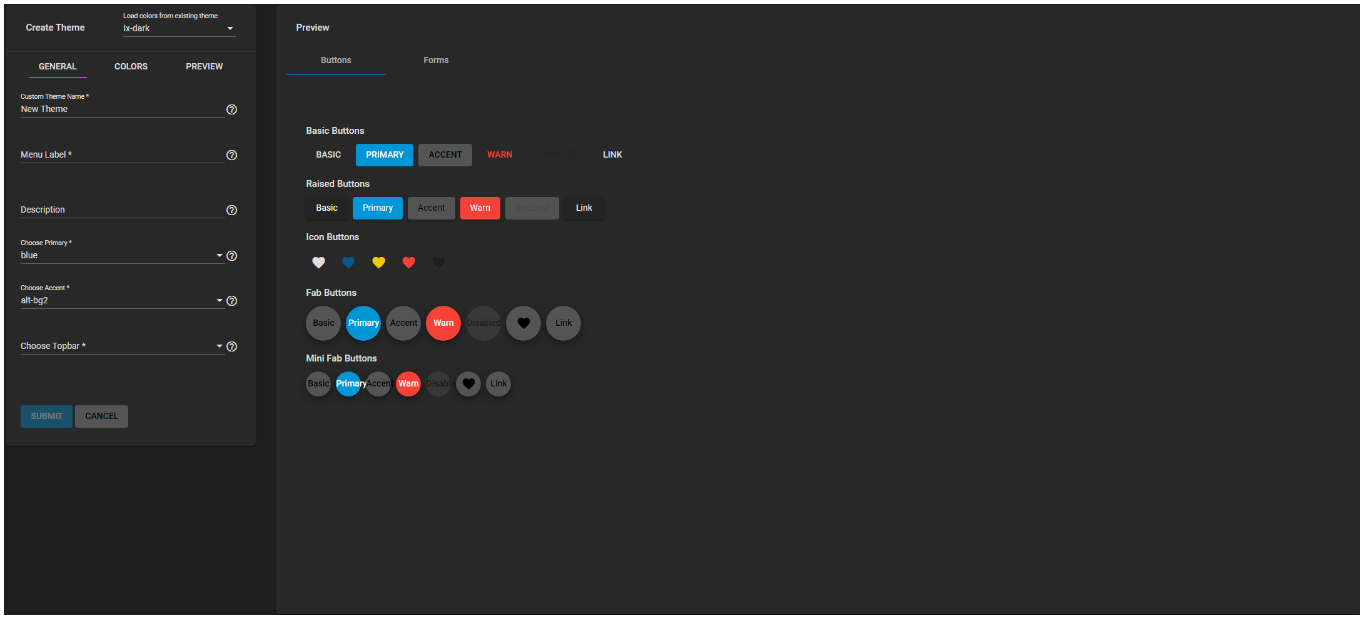
General Preferences

There are a few options for how things are displayed or behave in the web interface:

- To choose a different pre-built or saved custom color scheme for the web interface, select an option from the *Choose Theme* dropdown.
- If screen space is limited, set *Prefer buttons with icons only* to only display icons and tooltips without text labels.
- When *Enable Password Toggle* is set, visibility appears next to password fields. Clicking this button will show characters typed or saved in the field.
- To clear any custom display choices for interface tables, set *Reset Table Columns to Default*.
- To display the legacy FreeNAS branding, set **Retro Logo**.
- *Reset All Preferences to Default* changes all these options back to their factory default settings.

Custom Themes

If a included theme doesn't satisfy your preference, a fully custom theme can be created. To start creating a custom theme, click *CREATE NEW THEME*.



Create Theme

Load colors from existing theme: ix-dark

Custom Theme Name *: New Theme

Menu Label *

Description

Choose Primary *: blue

Choose Accent *: alt-bg2

Choose Topbar *

Colors from an existing theme can be used when creating a new custom theme. Select a theme from the *Load Colors from Theme* dropdown to use the colors from that theme for the new custom theme:

- *Custom Theme Name*: Enter a name to identify the new theme.
- *Menu Label*: Enter a short name to use in the TrueNAS web interface menus.
- *Description*: Enter a short description of the new theme.
- *Choose Primary*: Choose from either a generic color or import a specific color setting to use as the primary theme color. The primary color changes the color of many of the buttons.
- *Choose Accent*: Choose from either a generic color or import a specific color setting to use as the accent color for the theme. This color is used for many of the buttons and smaller elements in the web interface.
- *Choose Topbar*: Changes the color of the top menu bar in the web interface.

For even more fine tuning, click the *COLORS* tab. Here, colors can be changed using the slider or by entering hexadecimal values.

When complete, click **SUBMIT**. TrueNAS automatically switches to newly created theme and adds it to the **Choose Theme** dropdown.

11.2 - Task Manager

The task manager shows a list of tasks performed by the TrueNAS system starting with the most recent. Click a task name to display its start time, progress, finish time, and whether the task succeeded. If a task fails, the error status shows.

Tasks with log file output have a *View Logs* button to show the log files.

The task manager is opened by clicking assignment. Close the task manager by clicking *CLOSE*, clicking anywhere outside the task manager dialog, or by pressing `Esc`.

11.3 - Alert Notifications

The alert system provides a visual warning when system conditions require administrative attention. The alert icon in the upper right corner has a notification badge that displays the total number of unread alerts.

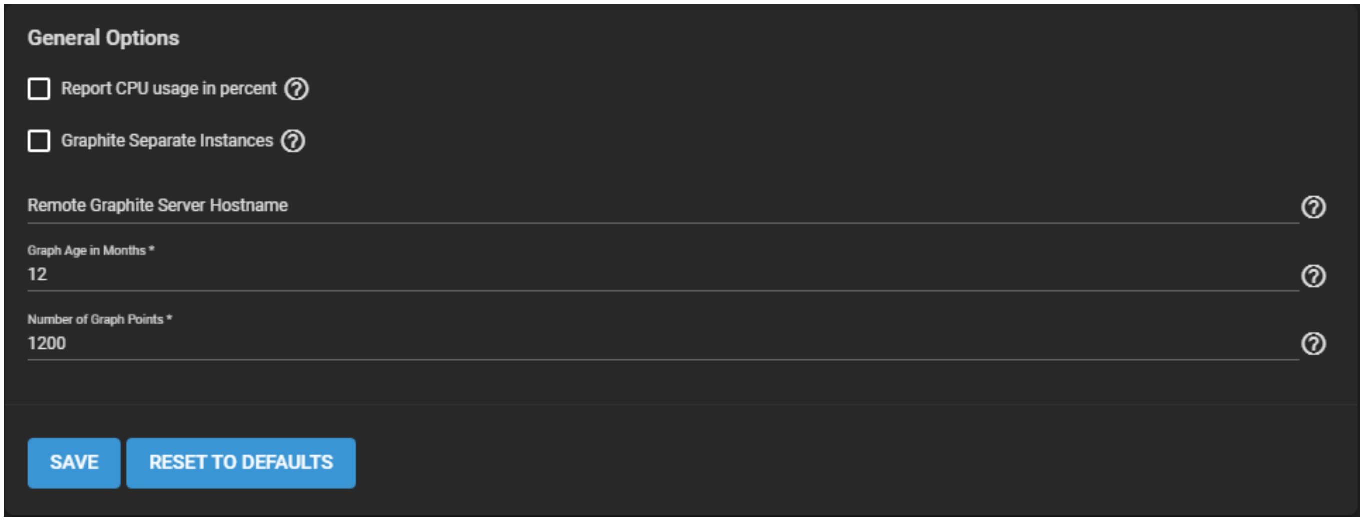
Alert icons indicate notification, warning, critical, and one-shot critical alerts. Critical messages are also emailed to the root account. One-shot critical alerts must be dismissed by the user.

Alert Level	Icon
Notification	□
Warning	□
Critical	□
One-shot Critical	□

11.4 - Statistics Reporting

Reporting General Settings

TrueNAS has a built in reporting engine that gives helpful graphs and information about the system. TrueNAS uses Graphite for metric gathering and visualizations. Some general settings can be found in **System > Reporting**.



General Options

☐ Report CPU usage in percent

☐ Graphite Separate Instances

Remote Graphite Server Hostname

Graph Age in Months *
12

Number of Graph Points *
1200

When *Report CPU usage in percent* is set, it simply reports the CPU usage in percent rather than units of kernel time. When *Graphite Separate Instances* is set, it sends the *plugin instance* and *type instance* to Graphite as separate path components: *host.cpu.0.cpu.idle*. When it is not set, the *plugin* and *plugin instance* as one path component and *type* and *type instance* as another component: *host.cpu-0.cpu-idle*.

A *Remote Graphite Server Hostname* can be typed in the respective field. The *Graph Age in Months* field is used to set the maximum number of months a graphis stored. The *Number of Graph points* field is used to set the number of points for each hourly, daily, weekly, monthly, or yearly graph.

Report history is cleared when CPU reporting, Graph Age, or Graph Points are changed.

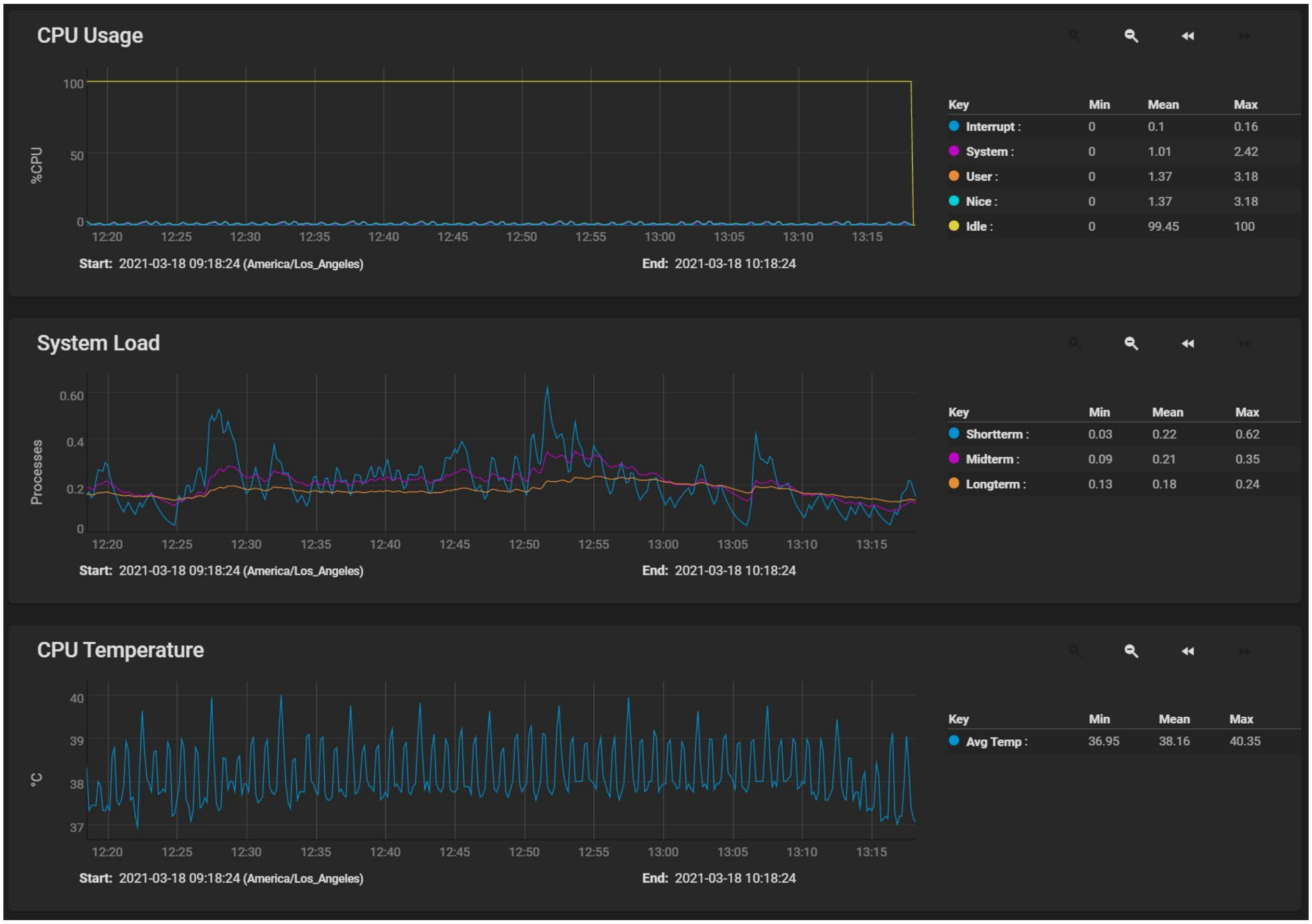
Graphs

TrueNAS uses collectd to provide reporting statistics. A comprehensive list of graphs and reporting are found in **Reporting**. Change the category of reporting by selecting an option of the drop-down. Graphs can be interacted with by clicking and dragging on a certain range, or by clicking □, □, □, □.

Below is a summary of what each page of graphs displays:

⊙ CPU

CPU shows the amount of time spent by the CPU in various states such as executing user code, executing system code, and being idle. Graphs of short-, mid-, and long-term load are shown, along with CPU temperature graphs.



CPU Usage

Key	Min	Mean	Max
● Interrupt :	0	0.1	0.16
● System :	0	1.01	2.42
● User :	0	1.37	3.18
● Nice :	0	1.37	3.18
● Idle :	0	99.45	100

Start: 2021-03-18 09:18:24 (America/Los_Angeles) **End:** 2021-03-18 10:18:24

System Load

Key	Min	Mean	Max
● Shortterm :	0.03	0.22	0.62
● Midterm :	0.09	0.21	0.35
● Longterm :	0.13	0.18	0.24

Start: 2021-03-18 09:18:24 (America/Los_Angeles) **End:** 2021-03-18 10:18:24

CPU Temperature

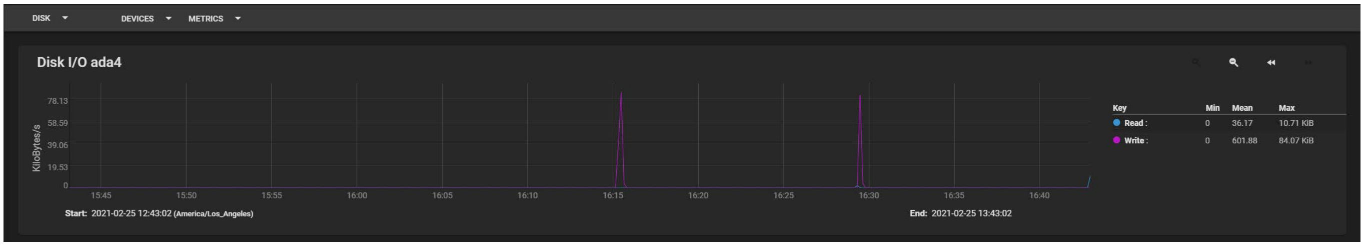
Key	Min	Mean	Max
● Avg Temp :	36.95	38.16	40.35

Start: 2021-03-18 09:18:24 (America/Los_Angeles) **End:** 2021-03-18 10:18:24

○ Disk

Disk shows read and write statistics on I/O, percent busy, latency, operations per second, pending I/O requests, and disk temperature. Choose the *DEVICES* and *METRICS* to view the selected metrics for the chosen devices.

> Temperature monitoring for the disk is disabled if *HDD Standby* is enabled on the disk.



Disk I/O ada4

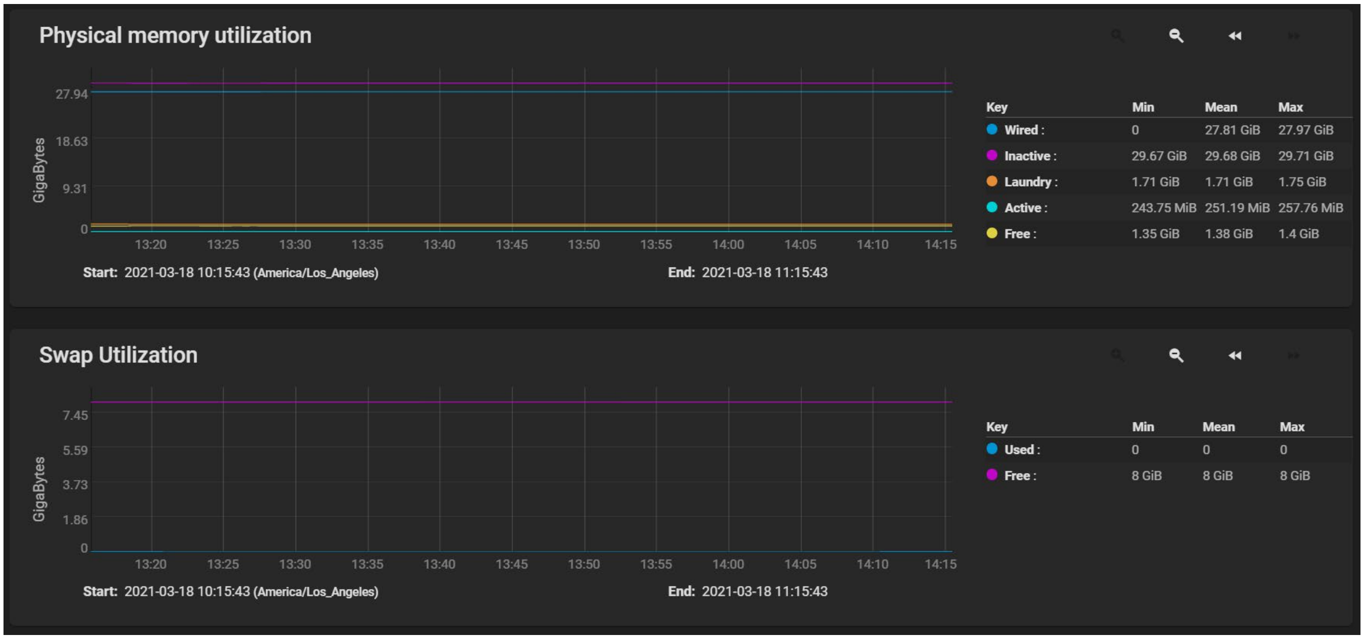
Key	Min	Mean	Max
● Read :	0	36.17	10.71 KiB
● Write :	0	601.88	84.07 KiB

Start: 2021-02-25 12:43:02 (America/Los_Angeles) **End:** 2021-02-25 13:43:02

The default view shows a temperature graph of the first disk. To see the temperature graphs of more disks, select them from the *DEVICES* drop-down. To view other metrics such as *Disk I/O* and *Disk Latency*, select them from the *METRICS* drop-down.

○ Memory

Memory displays memory usage. Swap displays the amount of free and used swap space.



Physical memory utilization

Key	Min	Mean	Max
● Wired :	0	27.81 GiB	27.97 GiB
● Inactive :	29.67 GiB	29.68 GiB	29.71 GiB
● Laundry :	1.71 GiB	1.71 GiB	1.75 GiB
● Active :	243.75 MiB	251.19 MiB	257.76 MiB
● Free :	1.35 GiB	1.38 GiB	1.4 GiB

Start: 2021-03-18 10:15:43 (America/Los_Angeles) **End:** 2021-03-18 11:15:43

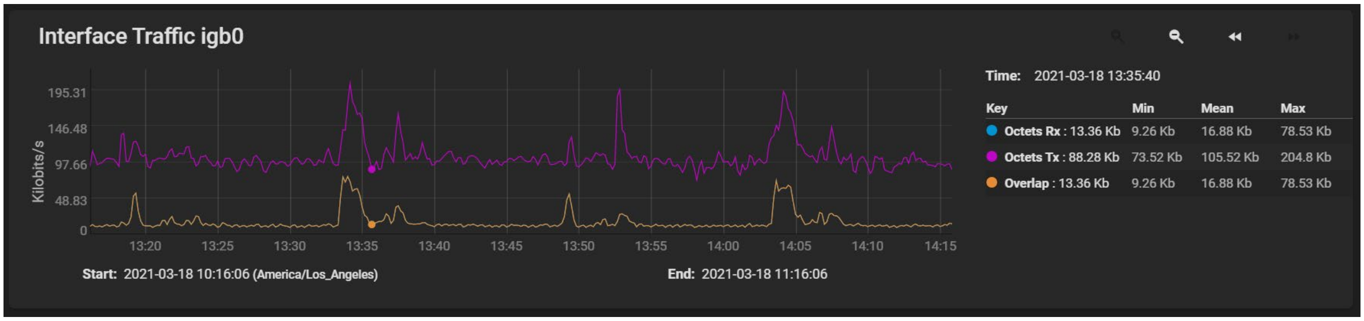
Swap Utilization

Key	Min	Mean	Max
● Used :	0	0	0
● Free :	8 GiB	8 GiB	8 GiB

Start: 2021-03-18 10:15:43 (America/Los_Angeles) **End:** 2021-03-18 11:15:43

○ Network

Network shows received and transmitted traffic in megabytes per second for each configured interface.



Interface Traffic igb0

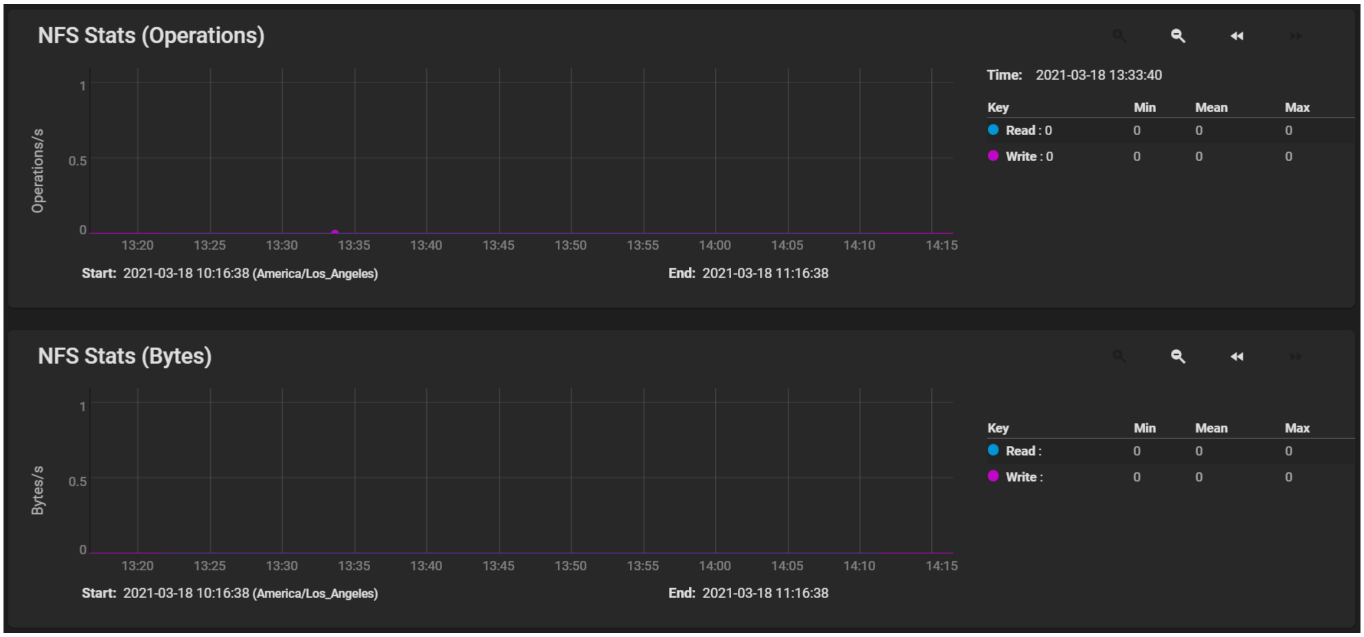
Time: 2021-03-18 13:35:40

Key	Min	Mean	Max
● Octets Rx : 13.36 Kb	9.26 Kb	16.88 Kb	78.53 Kb
● Octets Tx : 88.28 Kb	73.52 Kb	105.52 Kb	204.8 Kb
● Overlap : 13.36 Kb	9.26 Kb	16.88 Kb	78.53 Kb

Start: 2021-03-18 10:16:06 (America/Los_Angeles) **End:** 2021-03-18 11:16:06

○ NFS

NFS shows information about the number of procedure calls for each procedure and whether the system is a server or client.



NFS Stats (Operations)

Time: 2021-03-18 13:33:40

Key	Min	Mean	Max
● Read : 0	0	0	0
● Write : 0	0	0	0

Start: 2021-03-18 10:16:38 (America/Los_Angeles) **End:** 2021-03-18 11:16:38

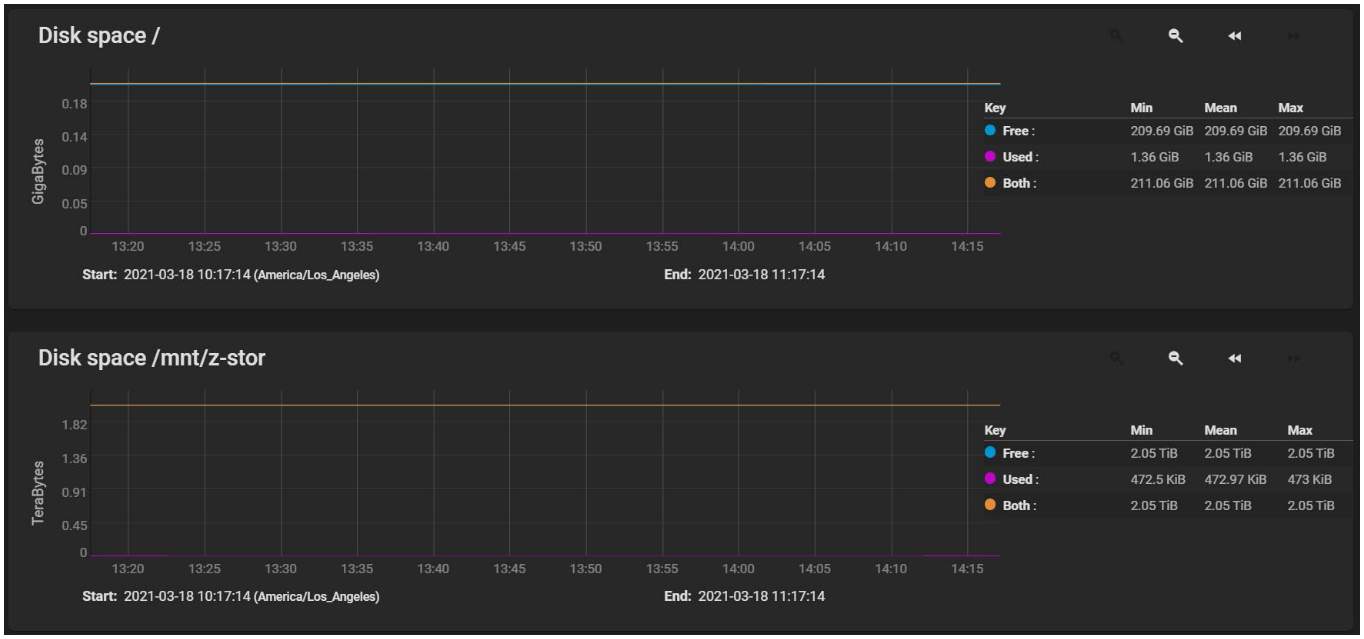
NFS Stats (Bytes)

Key	Min	Mean	Max
● Read :	0	0	0
● Write :	0	0	0

Start: 2021-03-18 10:16:38 (America/Los_Angeles) **End:** 2021-03-18 11:16:38

○ Partition

Partition displays free, used, and reserved space for each pool and dataset. However, the disk space used by an individual zvol is not displayed as it is a block device.



Key	Min	Mean	Max
● Free :	209.69 GiB	209.69 GiB	209.69 GiB
● Used :	1.36 GiB	1.36 GiB	1.36 GiB
● Both :	211.06 GiB	211.06 GiB	211.06 GiB

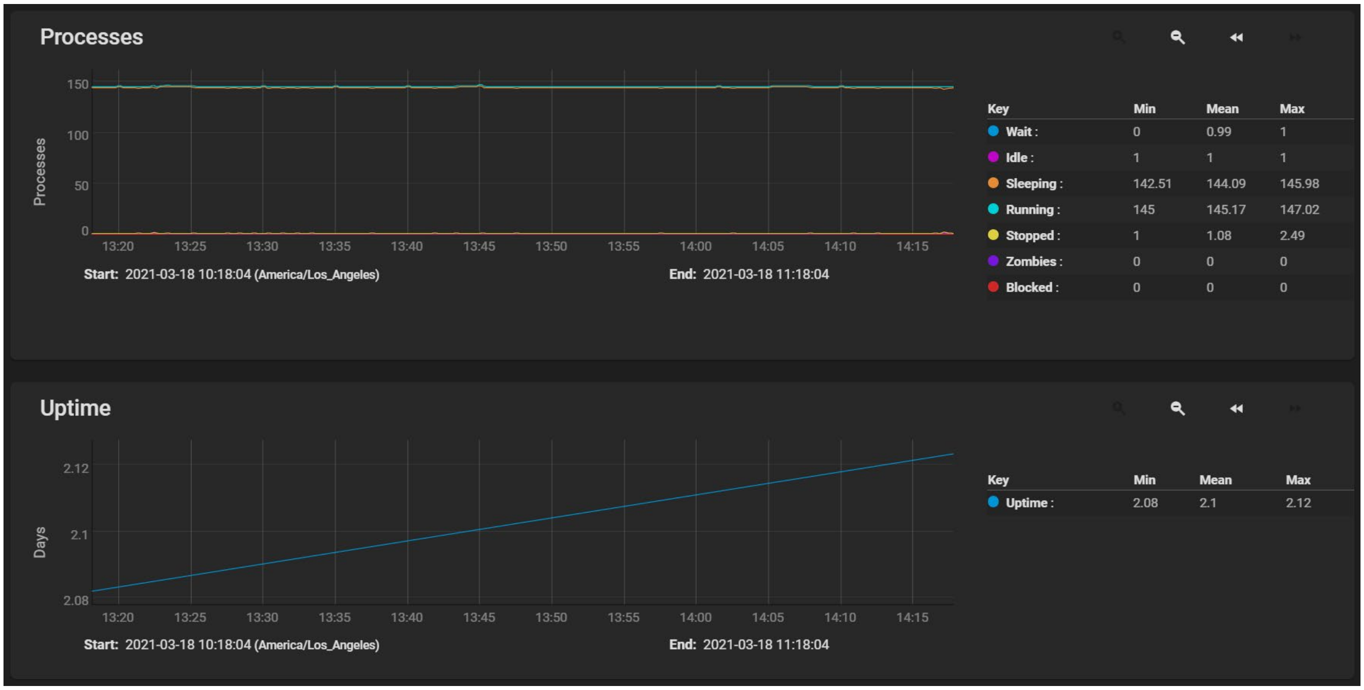
Start: 2021-03-18 10:17:14 (America/Los_Angeles) **End:** 2021-03-18 11:17:14

Key	Min	Mean	Max
● Free :	2.05 TiB	2.05 TiB	2.05 TiB
● Used :	472.5 KiB	472.97 KiB	473 KiB
● Both :	2.05 TiB	2.05 TiB	2.05 TiB

Start: 2021-03-18 10:17:14 (America/Los_Angeles) **End:** 2021-03-18 11:17:14

○ System

System displays the number of processes. It is grouped by state.



Key	Min	Mean	Max
● Wait :	0	0.99	1
● Idle :	1	1	1
● Sleeping :	142.51	144.09	145.98
● Running :	145	145.17	147.02
● Stopped :	1	1.08	2.49
● Zombies :	0	0	0
● Blocked :	0	0	0

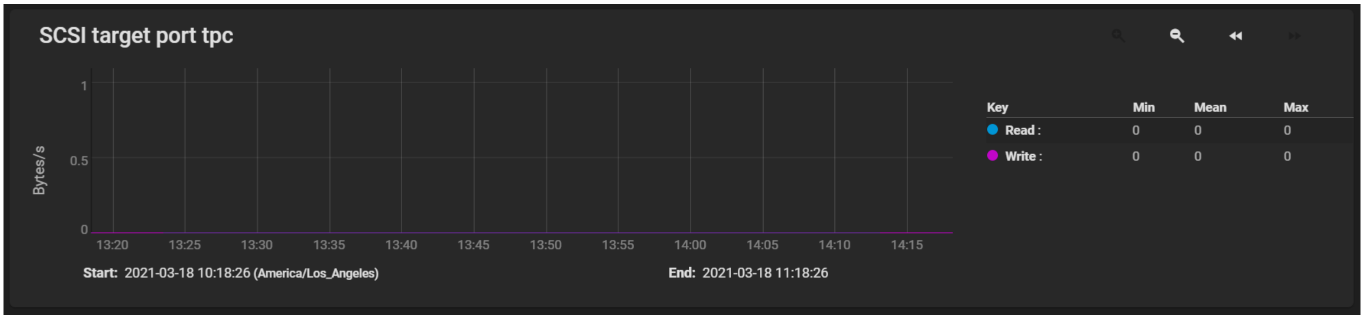
Start: 2021-03-18 10:18:04 (America/Los_Angeles) **End:** 2021-03-18 11:18:04

Key	Min	Mean	Max
● Uptime :	2.08	2.1	2.12

Start: 2021-03-18 10:18:04 (America/Los_Angeles) **End:** 2021-03-18 11:18:04

○ Target

Target shows bandwidth statistics for iSCSI ports.

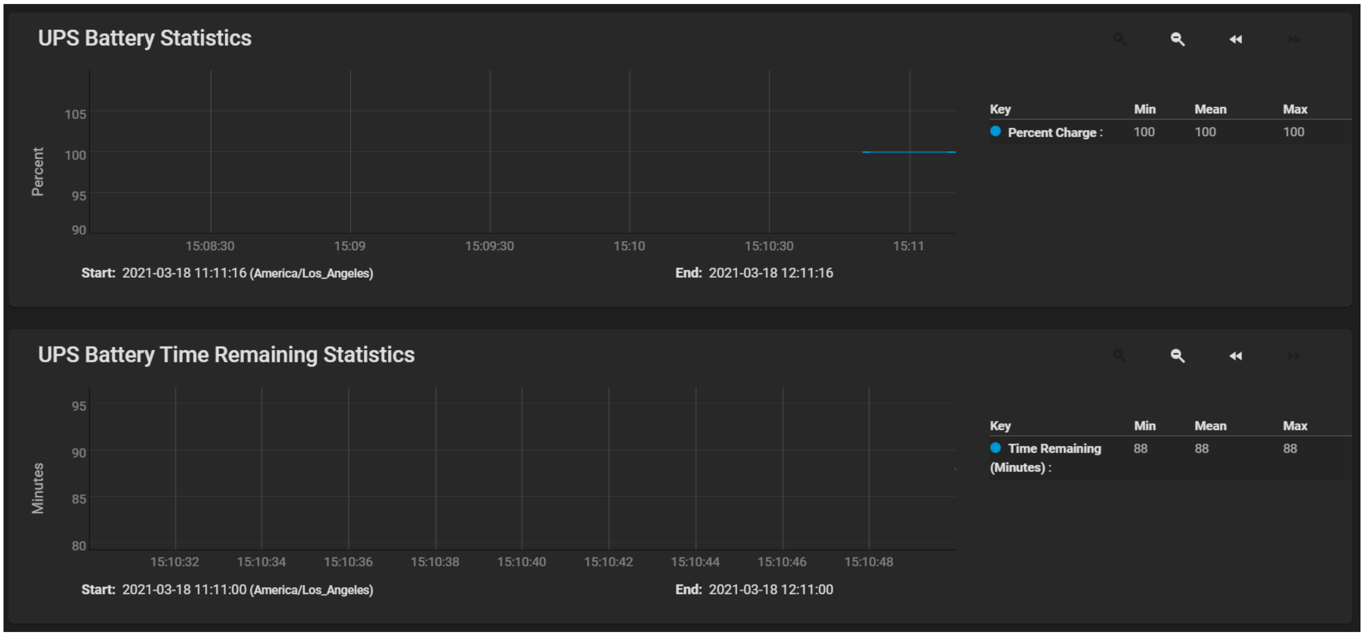


Key	Min	Mean	Max
● Read :	0	0	0
● Write :	0	0	0

Start: 2021-03-18 10:18:26 (America/Los_Angeles) **End:** 2021-03-18 11:18:26

UPS

UPS displays statistics about an uninterruptible power supply (UPS) using Network UPS tools. Statistics include voltages, currents, power, frequencies, load, and temperatures.



Key	Min	Mean	Max
● Percent Charge :	100	100	100

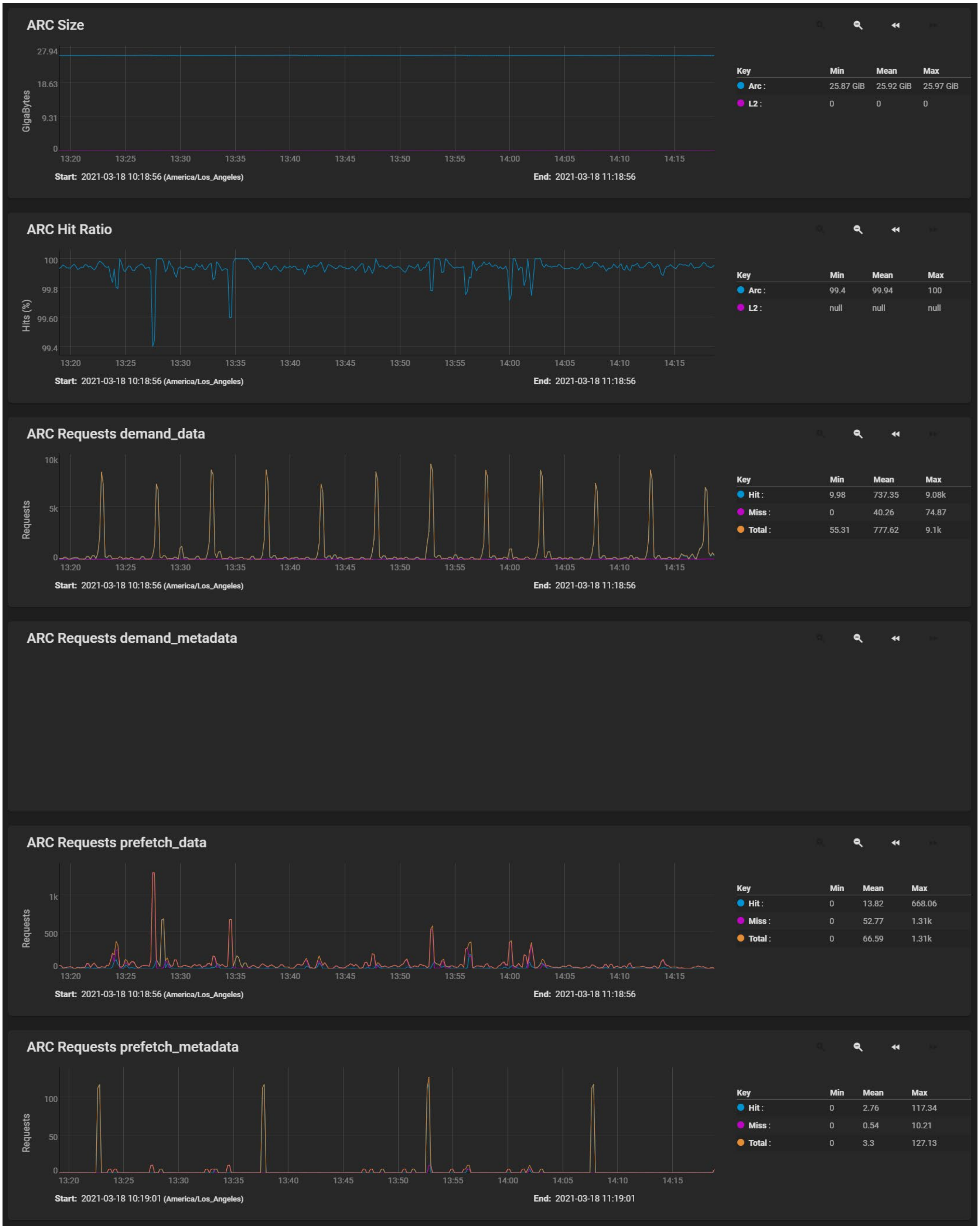
Start: 2021-03-18 11:11:16 (America/Los_Angeles) **End:** 2021-03-18 12:11:16

Key	Min	Mean	Max
● Time Remaining (Minutes) :	88	88	88

Start: 2021-03-18 11:11:00 (America/Los_Angeles) **End:** 2021-03-18 12:11:00

ZFS

ZFS shows compressed physical ARC size, hit ratio, demand data, demand metadata, and prefetch data.



ARC Size

Key	Min	Mean	Max
● Arc :	25.87 GiB	25.92 GiB	25.97 GiB
● L2 :	0	0	0

Start: 2021-03-18 10:18:56 (America/Los_Angeles) **End:** 2021-03-18 11:18:56

ARC Hit Ratio

Key	Min	Mean	Max
● Arc :	99.4	99.94	100
● L2 :	null	null	null

Start: 2021-03-18 10:18:56 (America/Los_Angeles) **End:** 2021-03-18 11:18:56

ARC Requests demand_data

Key	Min	Mean	Max
● Hit :	9.98	737.35	9.08k
● Miss :	0	40.26	74.87
● Total :	55.31	777.62	9.1k

Start: 2021-03-18 10:18:56 (America/Los_Angeles) **End:** 2021-03-18 11:18:56

ARC Requests demand_metadata

ARC Requests prefetch_data

Key	Min	Mean	Max
● Hit :	0	13.82	668.06
● Miss :	0	52.77	1.31k
● Total :	0	66.59	1.31k

Start: 2021-03-18 10:18:56 (America/Los_Angeles) **End:** 2021-03-18 11:18:56

ARC Requests prefetch_metadata

Key	Min	Mean	Max
● Hit :	0	2.76	117.34
● Miss :	0	0.54	10.21
● Total :	0	3.3	127.13

Start: 2021-03-18 10:19:01 (America/Los_Angeles) **End:** 2021-03-18 11:19:01

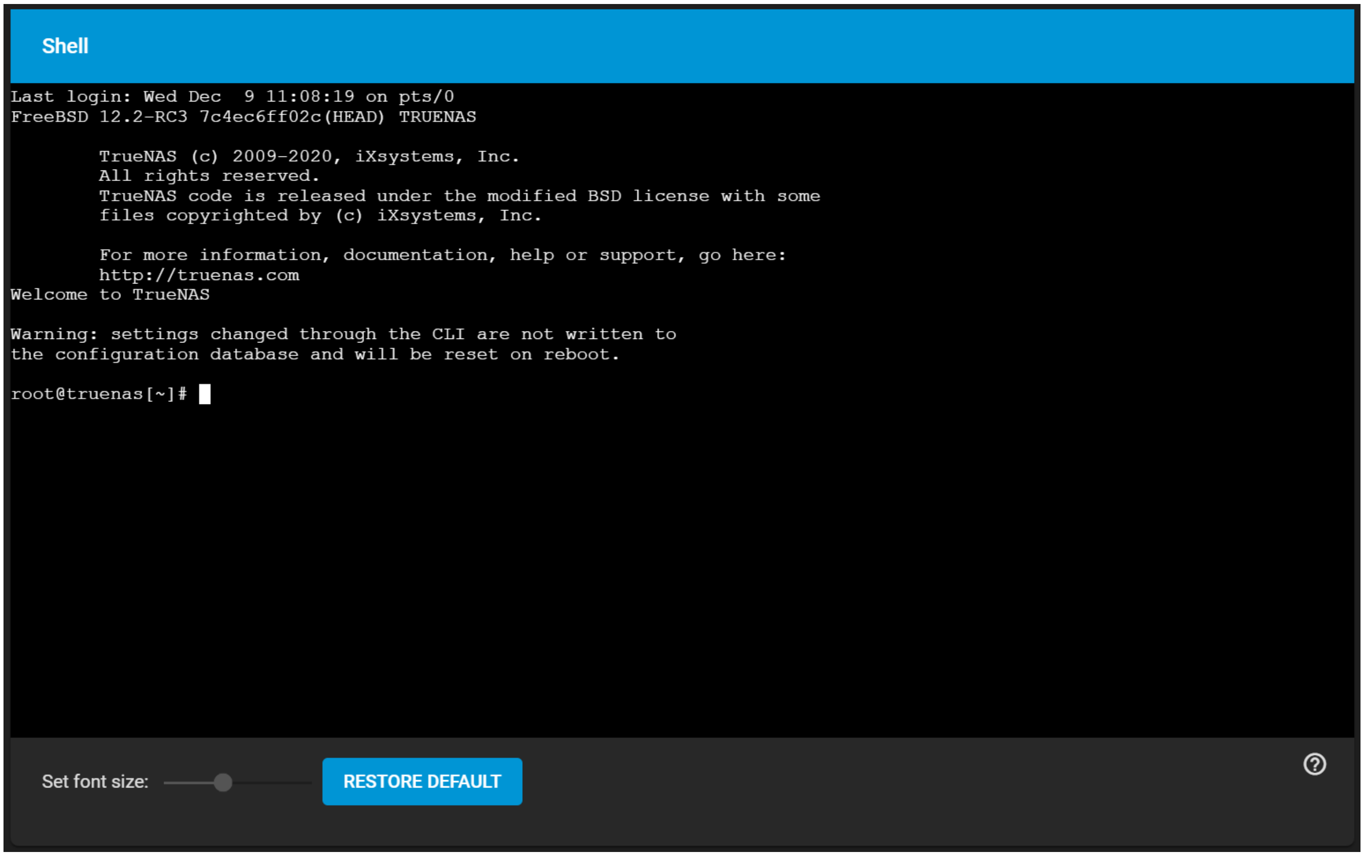
Reporting data is saved to permit viewing and monitoring usage trends over time. This data is preserved across system upgrades and restarts.

Data files are saved in /var/db/collectd/rrd/.

Reporting data is frequently written and should not be stored on the boot pool or operating system device.

11.5 - Shell

The web interface has a web shell that makes it convenient to run command line tools from the web browser as the root user.



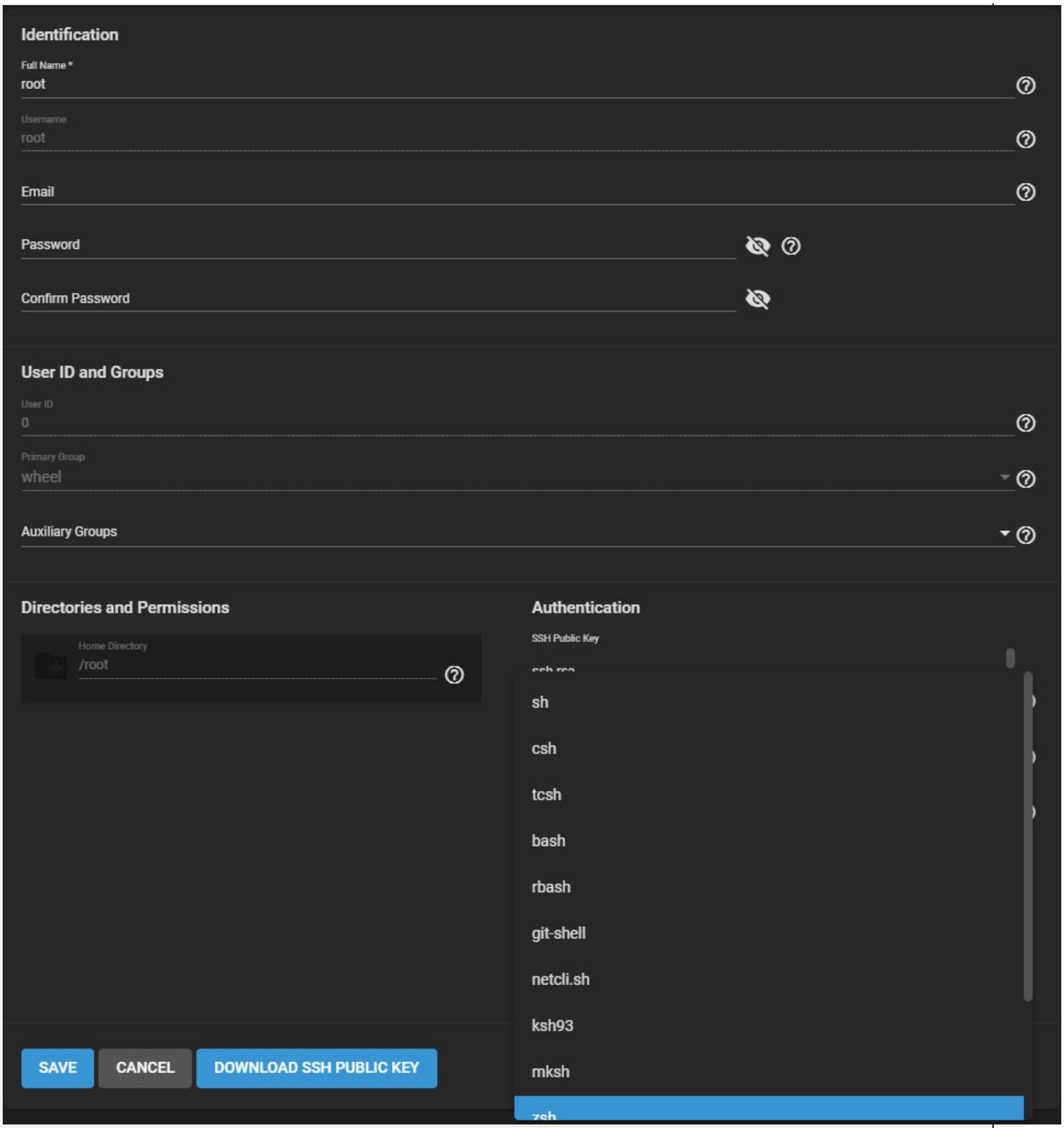
```
Last login: Wed Dec  9 11:08:19 on pts/0
FreeBSD 12.2-RC3 7c4ec6ff02c(HEAD) TRUENAS

        TrueNAS (c) 2009-2020, iXsystems, Inc.
        All rights reserved.
        TrueNAS code is released under the modified BSD license with some
        files copyrighted by (c) iXsystems, Inc.

        For more information, documentation, help or support, go here:
        http://truenas.com
Welcome to TrueNAS

Warning: settings changed through the CLI are not written to
the configuration database and will be reset on reboot.

root@truenas[~]# 
```

The prompt shows that the current user is `root`, the hostname is `freenas`, and the current working directory is `~`, the home directory of the logged-in user.

The default shell for a new installations is `zsh`.

How do I change the default shell? expand □

The default shell can be changed in **Accounts > Users**. Click more_vert and *Edit* for the root user.



Identification

Full Name * root

Username root

Email

Password

Confirm Password

User ID and Groups

User ID 0

Primary Group wheel

Auxiliary Groups

Directories and Permissions

Home Directory /root

Authentication

SSH Public Key ssh-rsa

Choose the desired shell from the *Shell* drop-down and click **SAVE**.

The *Set font size* slider adjusts the size of text displayed in the Shell. Click **RESTORE DEFAULT** to reset the shell font and size.

Shell command history is available for the current session. Use the `Up` and `Down` arrow keys to scroll through previously entered commands. Edit the command if desired, then press `Enter` to re-enter the command. Navigating away from the **Shell** screen clears the command history.

`Home`, `End`, and `Delete` keys are supported. Tab completion is also available. Type a few letters and press `Tab` to complete a command name or filename in the current directory. Right-clicking in the terminal window displays a reminder about using `Command+c` and `Command+v` or `Ctrl+Insert` and `Shift+Insert` for copy and paste operations in the shell.

Entering `exit` leaves the session. Click **Reconnect** to start a new session.

Clicking other web interface menus closes the shell session and stops commands running in the shell. `tmux` provides the ability to detach shell sessions and then reattach to them later. Commands continue to run in a detached session.

> Not all shell features render correctly in Chrome. Firefox is the recommended browser when using the shell.

Most FreeBSD command line utilities are available in the Shell, including additional troubleshooting applications for TrueNAS Core and Enterprise.
For TrueNAS SCALE, most Linux command line utilities are available in the shell.

12 - Solutions

This topic covers the various third party solutions that TrueNAS can integrate with or be optimized for.

Ready to get started? Choose a topic or article from the left-side Navigation pane. Click the **<** symbol to expand the menu to show the topics under this section.

12.1 - Optimizations

The optimizations topic has articles discussing how best to configure TrueNAS for various use cases or specific needs. This includes Disaster Recovery configurations, Media and Entertainment tuning, and Security best practices.

Ready to get started? Choose a topic or article from the left-side Navigation pane. Click the **<** symbol to expand the menu to show the topics under this section.

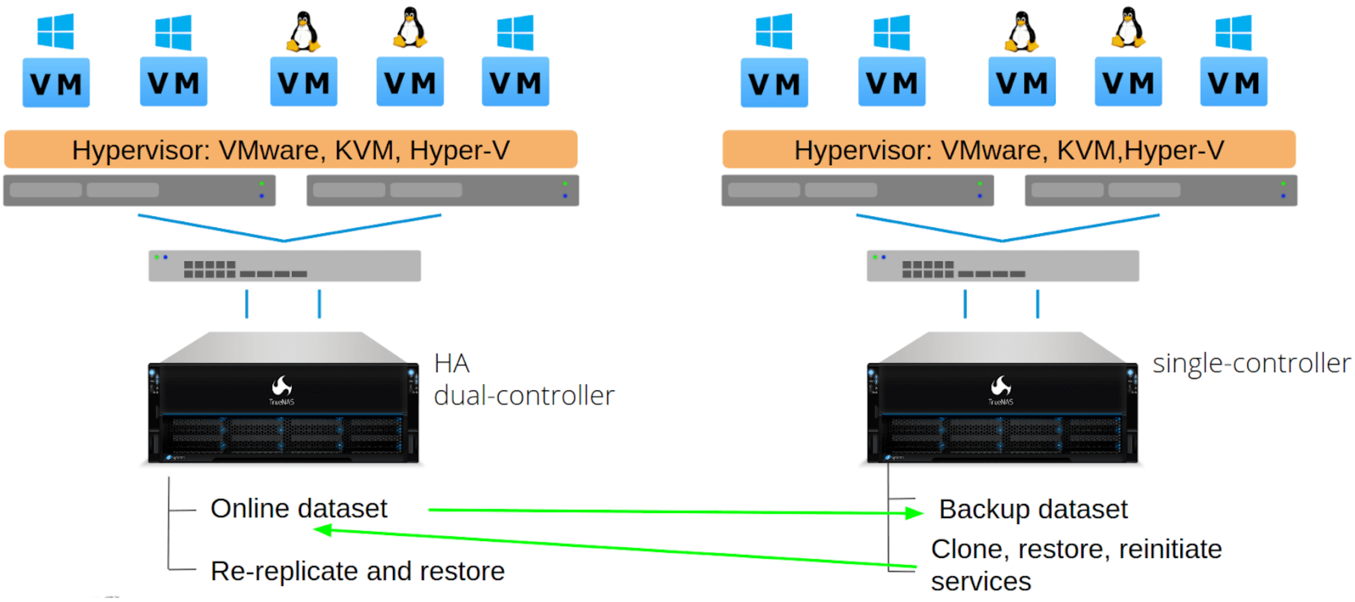
12.1.1 - Cross-Site Disaster Recovery

TrueNAS supports many different disaster recovery (DR) scenarios! Some of these scenarios with recovery processes are listed here.

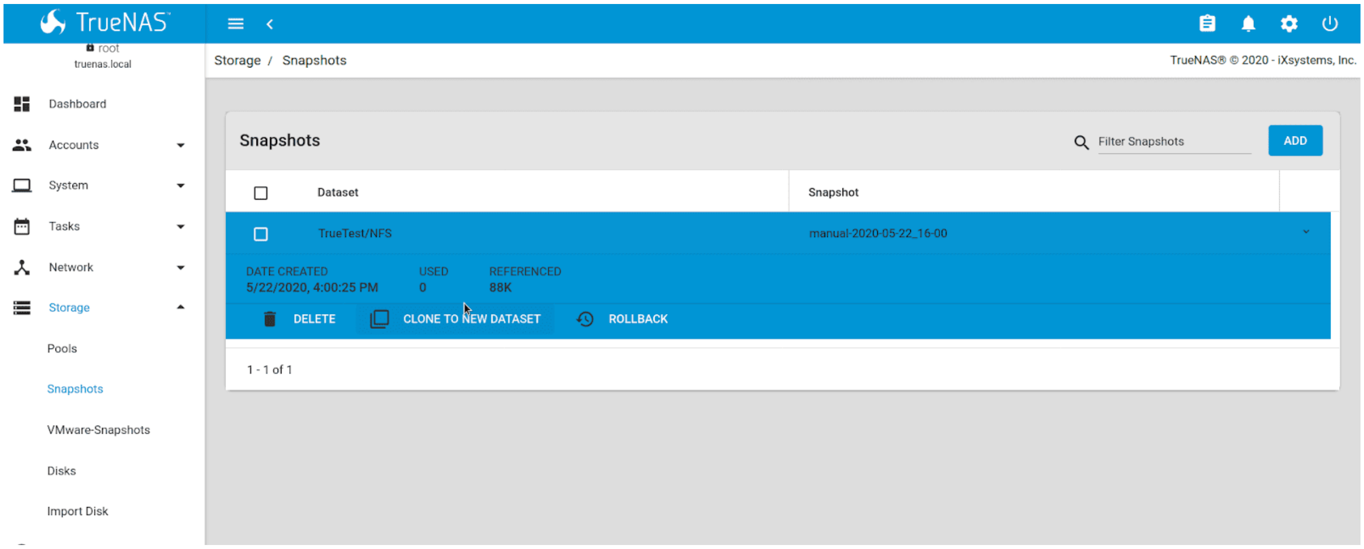
⊙ **Replication**

Point-in-Time Recovery – ZFS Replication

Of the native ways to replicate data, ZFS replication is the most efficient and reliable method for asynchronously replicating data from one TrueNAS system to another. Replication is based on snapshots of datasets or zvols and synchronizes the snapshots of the first system to the second system. There are numerous advantages to using ZFS replication. One of those is that a snapshot is a point-in-time, read-only copy of the data. This ensures that the contents of the snapshot cannot be altered.



ZFS replication is commonly used for disaster recovery. Should the first system or site go down, the remote system can be brought back by cloning the snapshot to a new dataset and restoring the share. This recovery does require some work on the side of the admin, but it's incredibly quick and ensures that whatever was transferred is retained. Snapshots and replications can be scheduled to run every few minutes.



Snapshots

□	Dataset	Snapshot
□	TrueTest/NFS	manual-2020-05-22_16-00

DATE CREATED	USED	REFERENCED
5/22/2020, 4:00:25 PM	0	88K

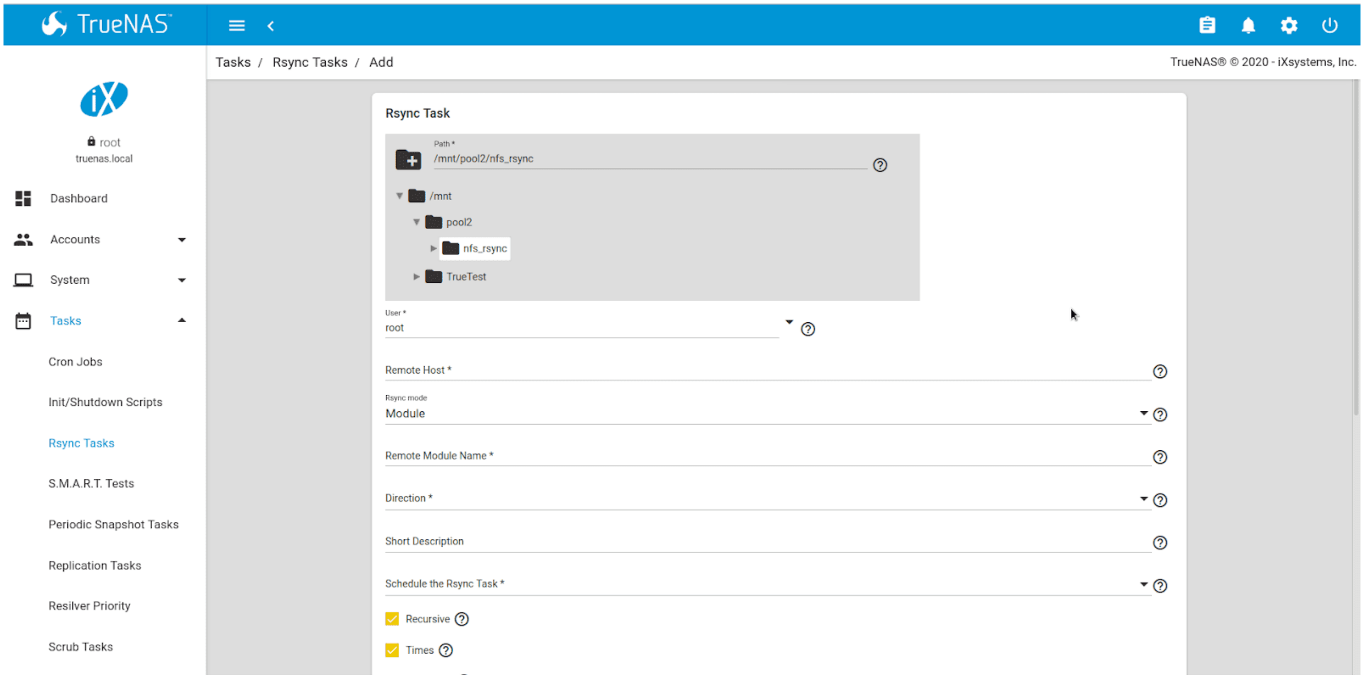
1 - 1 of 1

Another benefit of ZFS replication is the capability for the snapshots and referenced data to be stored on systems and pools of different specs or pool configuration. All-flash, high-performance pools can be backed up to lower performance pools with traditional drives and different RAID configurations. Smaller systems can also be backed up to larger central repositories. Companies such as FirstLink and others use this to help clone edge devices like the TrueNAS Mini systems to a central core TrueNAS in their data center. ZFS replication on TrueNAS ensures data protection regardless of system complexity, size, or location.

- ○ **Rsync**

File-based Recovery – Rsync

Rsync is a file-level migration that's the same as rsync in the Linux/FreeBSD command line. It's handy for semi-live sync of data if you need just the same files between sites each shared over a local share.



Tasks / Rsync Tasks / Add

TrueNAS® © 2020 - iXsystems, Inc.

Rsync Task

Path * /mnt/pool2/nfs_rsync

User * root

Remote Host *

Rsync mode Module

Remote Module Name *

Direction *

Short Description

Schedule the Rsync Task *

☑ Recursive

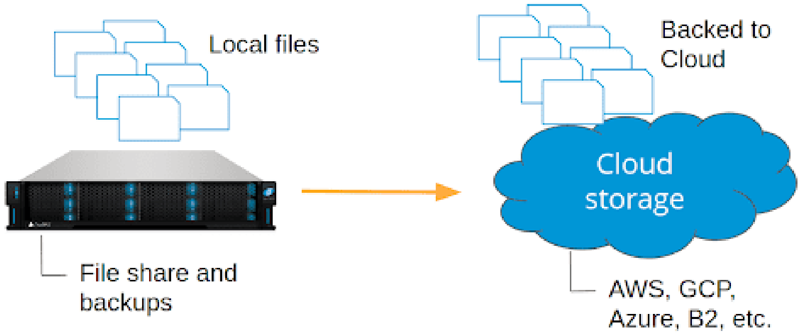
☑ Times

Rsync is useful for file transfer, but it's not recommended if files are being modified. For example, if an rsync task starts while 100 GB is being written and the data is changed before the file is written, it will cause issues with versioning and data integrity. Rsync should never be used to copy active VM data stores, block-level data (iSCSI or fibre channel shares), or other data that could constantly be in use. Rsync is slower than ZFS replication, particularly for large datasets, so it's recommended for convenience over data integrity. It can be used between TrueNAS and many other systems.

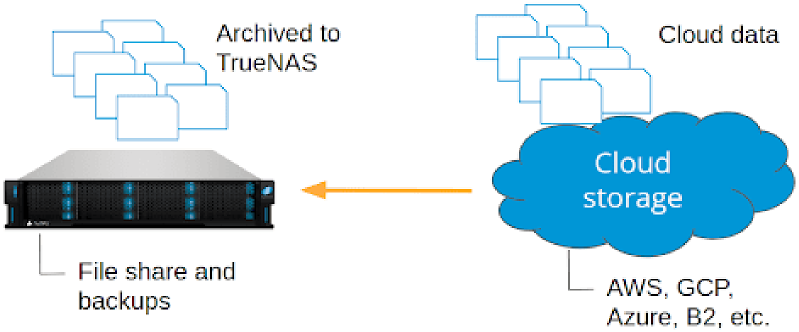
- ○ **Cloud Sync**

File Recovery To or From the Cloud – Cloud Sync

TrueNAS can copy, pull, and sync data to a variety of cloud-based data storage systems, including Amazon AWS, Microsoft Azure, Google GCP, Google Drive, Backblaze B2, Dropbox, Box, and more. By integrating rclone sync for file transfers, this feature can copy files on TrueNAS into a cloud repository of a user's choosing.



For larger datasets, TrueNAS systems are more cost-effective long term than cloud offerings, including Amazon AWS. For this reason, using TrueNAS as a backup target for protecting cloud-based data, e.g., from AWS, Dropbox, or Google Drive, is ideal because data stored in TrueNAS will get scrubbed, checked, and retained with an unlimited number of snapshots available.

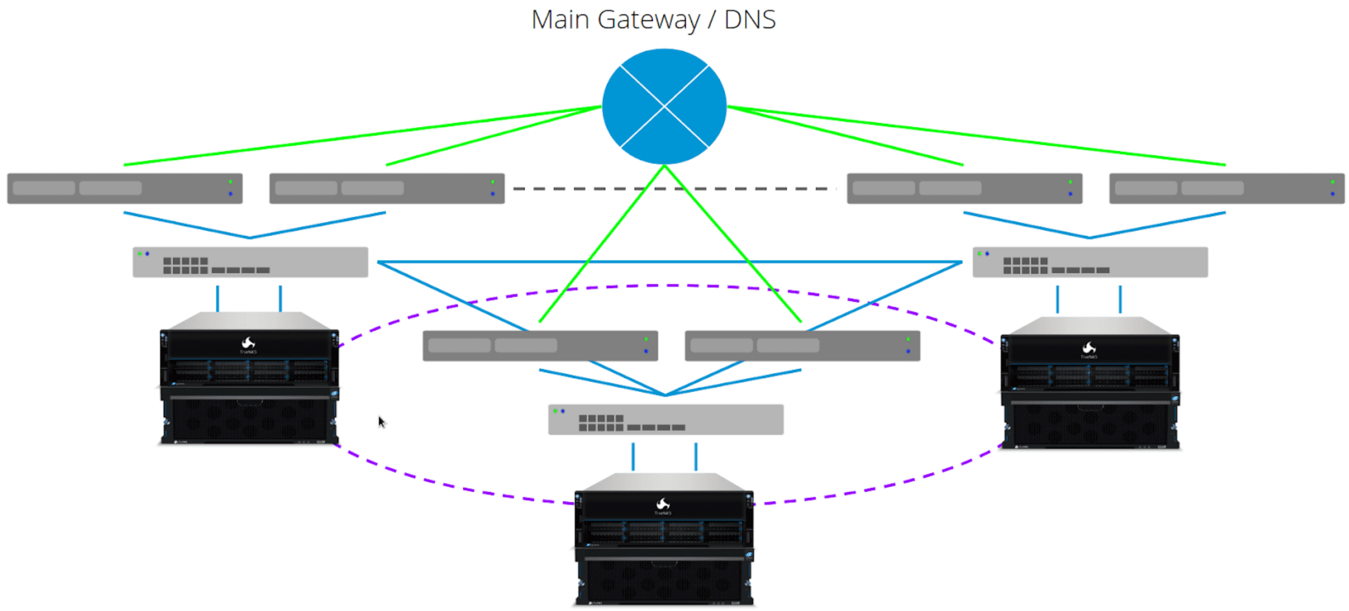


○ **Site-to-Site Failover**

Automatic Site-to-Site failover – DNS, Load-Balancing, Proprietary Tools

Automatic failover between sites is beyond the scope of TrueNAS systems alone. TrueNAS is a storage system, and while it handles data replication well in a variety of ways, automatic failover to a remote site requires knowledge of the services themselves. For environments with web or video streaming services, [DNS round-robinn(https://en.wikipedia.org/wiki/Round-robin_DNS) with failover might be feasible. Several web servers, like NGINX, also feature load-balancing services which could help mitigate service overload or downtime. TrueNAS systems provide a stable backend in this topology, with the option of also running ZFS replication for additional safety. Contact iXsystems if you need assistance with designing a storage system for your business.

An example design:



TrueNAS is a storage platform with powerful ways to ensure data integrity and consistency between local and remote sites. ZFS replication is the fastest and best way to ensure the data transferred is intact. Rsync is useful for file sync but cannot be used for live data or block-level data that could change during transfer. Cloud sync supports user workloads that archive to or from mainstream cloud providers. Beyond these tools, TrueNAS works with other systems, such as Asigra Backup and iconik smart media management, to provide an ultra-scalable backend with robust performance and a strong emphasis on data protection. The tools that TrueNAS provides combined with the flexibility to work with nearly any IT environment make it a robust system for cross-site and DR workloads.

12.1.2 - Media Workflows

Developing and delivering media content that reaches audiences whenever and wherever they are has increased in importance and complexity. In today's highly connected, entertainment-driven world, media and entertainment (M&E) companies need to stay competitive to succeed. These organizations need to produce information and entertainment in a variety of different formats to display on mobile devices, desktops, workstations, Blu-ray players, game consoles, set-top boxes, and TVs as well as in digital and analog movie theaters. Workflows grow in complexity daily and time-to-market windows continue to shrink. Where and how to store and archive all this content remains top-of-mind. M&E projects run on multiple heterogeneous environments, need an enterprise- grade storage array's features, and require multiple protocols.

Most M&E production houses purchase data storage based on capacity and performance dictated by the needs of existing applications. As a result, businesses often end up with multiple classes of application-specific storage or storage silos including SAN, NAS, all-flash arrays, and many forms of direct attached storage (DAS) from a multitude of vendors.

Creative organizations are often forced to over-provision and over-purchase capacity or performance, or use an all-flash array to meet their production needs. This reactive purchasing drives up the cost of media production. As media files grow, it becomes complex to manage and inefficient to increase the capacity or performance of DAS or consumer-grade NAS, so many turn to cloud storage. The security risk and expense of cloud storage are a top priority of IT and Media Managers. These factors and others put intense pressure on your budget and data storage infrastructure to keep up with the demand.

A TrueNAS storage system from iXsystems brings an enterprise-grade storage solution supporting multiple protocols to M&E production houses that is capable and affordable for many M&E applications. It is designed to enable M&E customers to address media capacity and performance requirements while reducing total cost of ownership (TCO), consolidating digital assets, accelerating media workflows, and providing the features needed to protect all media assets. Read more to learn how TrueNAS can be optimized for typical M&E production house usage.

> General tuning recommendations are changing constantly! Check back often to see what's changed or add your own recommendations!

General Optimizations

- Use SMB3 sharing on both the TrueNAS and any client systems.
- A typical recommendation is to use Mixed RAID (*2+1 RAIDZ*) in most cases with added *Read* and *Write* cache. The Write cache is optional if the system is only using SMB sharing.

  > **What about RAIDZ2 Configurations?** expand □
  > *6* or *7* disk wide *RAIDZ2* (Protection-X or Protection) is possible for tier2, nearline, or archival storage. It also works when the system has extensive data storage of a few hundred Terabytes or more.

- Setting jumbo frames (*MTU: 9000*) on the network, TrueNAS, and client side is important for large file streams.
- Do not store Media Cache Files and Media Cache Databases on a NAS. These files must stay local on clients. Ideally, client systems use SSDs and NVMe devices to store these files.
- With standard (non flash) systems, don't move or copy files or footage while editing. This causes choppy playback.

Software-specific Tuning

Beyond general optimization for Media and Entertainment workflows are tunings or TrueNAS usage recommendations for specific applications.

⊙ **Adobe Premier**

Adobe Premiere®

System size is a primary factor when tuning TrueNAS for Adobe Premiere workflows.

4K workflows typically want *20* disks or more. 8K can be all-flash demanding, but Premiere has the *proxies* feature to reduce the performance impact. Make sure your client systems or other applications support this feature too.

To get some performance improvement when scrubbing through long video files with audio tracks, de-select *play audio while scrubbing* under **Preferences > Audio**

Shared projects must enable *Project Locking* in Premiere.

12.1.3 - Security Recommendations

When using services on TrueNAS, especially services that allow outside connections, there are some best practices to follow to ensure your system is safe and secure. Several different system services are disscused in this article.

⊙ iSCSI

Follow the iSCSI creation wizard unless a specific configuration is required. To create an iSCSI share, go to **Sharing > Block Shares (iSCSI)** and click *WIZARD*. The iSCSI wizard has several additional security settings.

iSCSI Share Creation walks through share creation steps.

When creating a new **Portal**, consider adding a *Discovery Authentication Method*. This adds authentication between the initiator and the extent based on the chosen authentication method.

Entering a list of *Initiators* and *Authorized Networks* is also recommended. This allows defining which systems or networks can connect to the extent. When these options are empty, all initiators and all networks are allowed to connect to the extent.

○ NFS

Network File System (NFS) is a sharing protocol that allows outside users to connect and view or modify shared data.

To create a share, see NFS Share Creation.

NFS service settings are in **Services** after clicking the □. By default, all options are unset. Unless needed for a specific use case, keep the default NFS service settings.

During Share Creation, define which systems are authorized for share connections. Leaving the *Authorized Networks* or *Authorized Hosts and IP addresses* lists empty allows any system to connect to the NFS share. To define which systems can connect to the share, click the *Advanced Options* and enter all networks, hosts, and IP addresses to have share access. All other systems are denied access.

○ SMB

Using Server Message Block (SMB) to share data is a very common situation for TrueNAS users. However, it allows outside connections to the system and must be properly use to avoid security concerns.

To create a new SMB share, see SMB Share Creation.

SMB service settings are in **Services** after clicking the □.

Do not use SMB1.

Do not use *NTLMv1 Auth* with an untrusted network. This encryption option is insecure and vulnerable.

When using MacOS to connect to the SMB share, enable *Apple SMB2/3 Protocol Extensions*. This improves connection stability between the share and the Apple system.

If you need to add an *Administrators Group*, make sure the group members are correct. Members of the administration group have full permissions to modify or delete the share data.

During Share Creation, a *Purpose* can be selected. This changes the share configuration with one click. For example, when selecting *Private SMB Datasets and Shares* from the list, TrueNAS automatically tunes some settings so the share is set up for private use. To fully customize the share settings, select *No presets* for the *Purpose*. Unless a specific purpose for the share is required, it is recommended to select *Default share parameters* as the *Purpose*.

SMB Server Signing is recommended. To enable Server Signing, go to **Services > SMB > Edit > Auxiliary Parameters** and add this string to the *Auxilary Parameters* field:

```
server signing = mandatory
```

Then save, stop, and restart the SMB service.

○ SSH

Using Secure Shell (SSH) to connect to your TrueNAS is very helpful when issuing commands through the CLI. SSH settings are in **Services** after clicking the □.

To make sure users cannot connect to the system as `root` and potentially harm the system, leave *Log in as Root with Password* unset. It is off by default.

Unless it is required, do not set *Allow TCP Port Forwarding*.

Many SSH ciphers are outdated and vulnerable. It is not safe to enable any weak SSH ciphers. Block both the *CBC* and *Arcfour* ciphers by going to **Services > SSH > Edit > Advanced Options** and adding this line in the *Auxiliary Parameters*:

```
Ciphers chacha20-poly1305@openssh.com,aes128-ctr,aes192-ctr,aes256-ctr,aes128-gcm@openssh.com,aes256-gcm@openssh.com
```

12.2 - Integrations

Integrations discusses how TrueNAS can work with different third-party applications to create unique or efficient storage management environments.

Ready to get started? Choose a topic or article from the left-side Navigation pane. Click the **<** symbol to expand the menu to show the topics under this section.

12.2.1 - AWS Images

Process Summary

- Requirements
  - FreeBSD system
  - AWS Account
  - S3 Bucket
  - User with permissions for EC2
    - Download the user key to the local working directory and modify
  - Install bhyve and bsdec2-image-upload
  - Patch bsdec2-image-upload if needed
- Create TrueNAS image file
  - Download TrueNAS .iso
  - Create blank image file
  - Load virtualization module
  - Create tap and bridge interface
  - Load image and iso into bhyve
  - Install TrueNAS
- Upload image to EC2
  - Description and region name are required
- Launch EC2 instance
  - Select name created with image
  - t2.large is the recommended instance type
  - Add HDD/SSD volumes as needed
  - Step 6: add new rule
    - Type: `http`
  - Launch the instance
- Wait for AWS to finish status checks
- Paste Public DNS or Public IP link in browser to access TrueNAS web interface

Using Virtualized TrueNAS with Amazon Web Services (AWS)

These instructions demonstrate how to create a virtualized TrueNAS image on FreeBSD, configure it with Amazon Elastic Compute Cloud (EC2), and access the TrueNAS web interface. There are a few things that must be prepared before building the image. The FreeBSD system needs two applications to create, configure, and upload the virtual machine image: bhyve and bsdec2-image-upload. The most recent version (>=1.3.1) of *bsdec2-image-upload* is required, otherwise an SSL error occurs when attempting to upload the image. If not available on the ports tree, the utility can be downloaded from the GitHub repository.

Currently, *bsdec2-image-upload* fails on images that aren't 10GB. An issue has been created, but in the meantime a workaround is to edit main.c and replace:

```
"BlockDeviceMapping.1.Ebs.VolumeSize=10&"
```

with

```
"BlockDeviceMapping.1.Ebs.VolumeSize=16&"
```

To build, use a FreeBSD system with either *libressl-devel* or *openssl-devel*, as well as *ca_root_nss*, and run `make install`.

Create an AWS account with an S3 bucket. Record the region associated with the S3 bucket. Set the bucket lifetime policy to delete data after 1 day, as *bsdec2-image-upload* does not delete files from S3 and the files are no longer needed after the AMI is registered. A user with permissions to EC2 and S3 is must have these permissions:

```
s3:PutObject
s3:GetObject
ec2:RegisterImage
ec2:DescribeImages
s3:DeleteObject
ec2:ImportVolume
ec2:DescribeConverstionTasks
ec2:CreateSnapshot
ec2:DescribeSnapshots
ec2:DeleteVolume
ec2:DescribeRegions
ec2:CopyImage
ec2:ModifyImageAttribute
```

Alternatively, give full access to S3 and EC2.

After creating the IAM user, download an Access Key to the working directory on the FreeBSD system. The file has these lines:

```
Access key ID,Secret access key
{ACCESS_KEY},{SECRET}
```

Open a new file called KEY.pem and copy the information contained in the csv file:

```
ACCESS_KEY_ID={ACCESS_KEY}
ACCESS_KEY_SECRET={SECRET}
```

Create TrueNAS Image

When all the prerequisites are ready, download a TrueNAS 11.2 or later .iso file. Open a shell and go to your local working directory. Create an empty raw image file with `truncate -s 16G {TRUENAS}.img`. Replace *{TRUENAS}* with a image file name. This empty image is the installation target for the TrueNAS .iso.

Next, load the virtualization module and create a tap and bridge interface:

```
kldload -n vmm
ifconfig tap0 create
sysctl net.link.tap.up_on_open=1
ifconfig bridge0 create
ifconfig bridge0 addm re0 addm tap0
ifconfig bridge0 up
```

Use `bhyveload -m 4GB -d truenas.img vm0` to load the image into the hypervisor and create virtual machine *vm0* with four gigabytes of memory.

To install TrueNAS into the image, load both the image and TrueNAS .iso file into bhyve: `bhyve -c 2 -m 4G -H -A -P -g 0 -s 0,hostbridge -s 1,lpc -s 2,virtio-net,tap0 -s 3,virtio-blk,{TRUENAS}.img -s 31,ahci-cd,{TRUENAS-VERSION}.iso -l com1,stdio vm0`. Replace *{TRUENAS}* with the name of the image file and *{TRUENAS-VERSION}* with the TrueNAS .iso file name.

The commands failed? expand □

If these commands fail, for instance an error concerning boot.lua, then try this command which uses a combines the two previous commands in a shell script included in the bhyve installation.

```
sh /usr/share/examples/bhyve/vmrun.sh -c 2 -m 4GB -t tap0 -d {TRUENAS}.img -i -I {TRUENAS-VERSION}.iso vm0
```

When the TrueNAS installer opens, make sure *boot with BIOS* is chosen and start the installation. Power off the device when the installation is done.

Why can't I just reboot? expand □
Do not load the completed image into bhyve and boot after installation as TrueNAS will create invalid network settings. If network issues occur, boot the image and create a DHCP interface manually named `xn0`.

Upload TrueNAS Image to EC2

Now that the image is created and configured, upload it to EC2. Use `bsdec2-image-upload` with the image file: `bsdec2-image-upload --public {TRUENAS}.img TrueNAS {description} {region} {S3 bucket} KEY.pem`. Replace *{TRUENAS}* with the image file name, *{description}* with a unique identifier for the Amazon Machine Image (AMI), *{region}* with your [Amazon region](), and *{S3 bucket}* with your AWS image storage location. KEY.pem is the IAM user access key that was downloaded earlier. These elements are required for the upload to start.

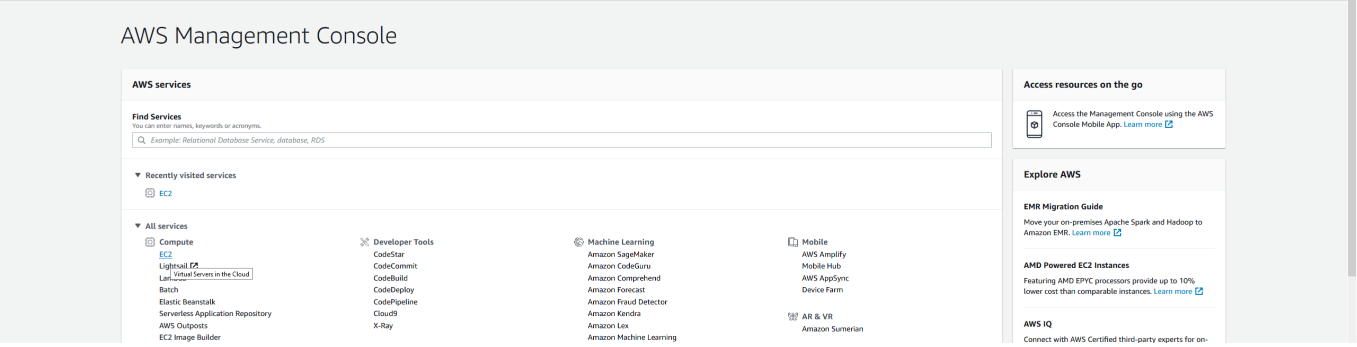
`bsdec2-image-upload` sends the image to the AWS bucket in *10 MiB* segments. The upload can take several hours, depending on connection speeds and other factors.

When the S3 bucket upload completes, the script creates a snapshot, registers the AMI, and copies the AMI to all regions for mirrors.

The upload command failed? expand □
The upload command can fail for various reasons. For example, entering a description that already exists. If this happens, fix the error and rerun the command. When successful, the upload simply finishes.

Accessing TrueNAS with the AMI

With the Amazon Machine Image (AMI) created and uploaded to AWS, an EC2 instance needs to be activated before the TrueNAS interface is accessible. Log in to your Amazon Web Services account and click the `EC2` Compute service.



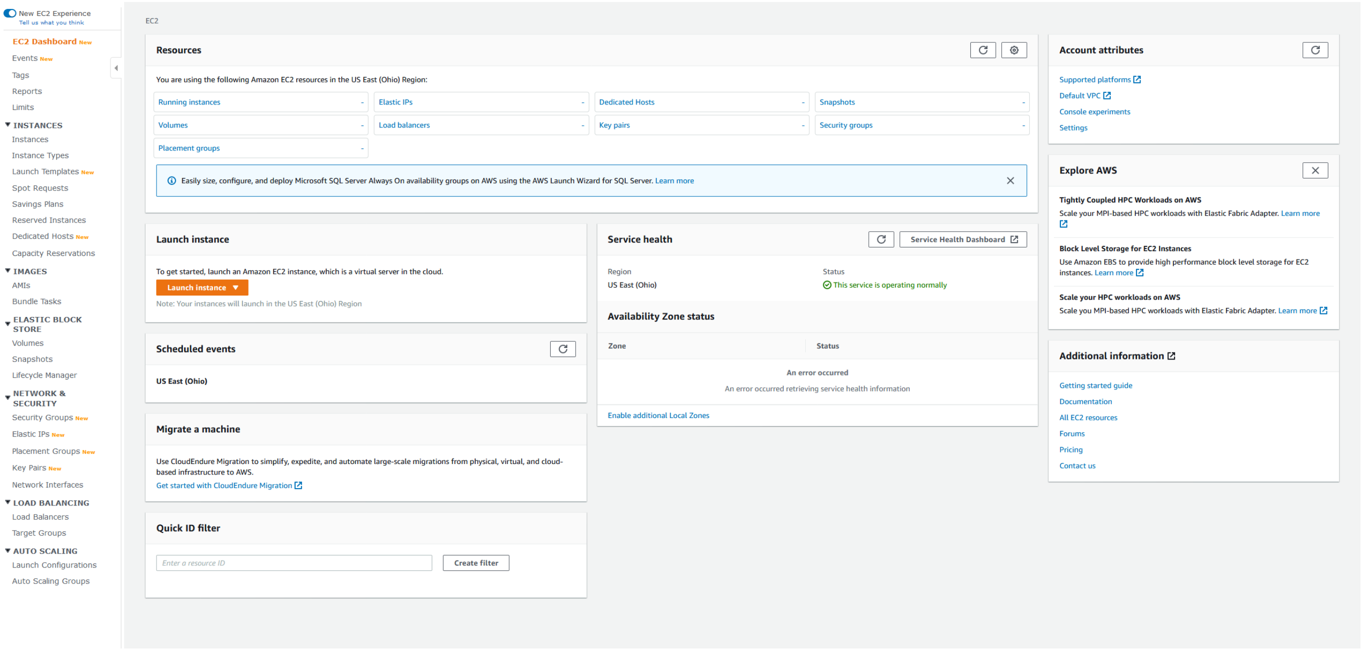
Access the Management Console using the AWS Console Mobile App. Learn more

Move your on-premises Apache Spark and Hadoop to Amazon EMR. Learn more

Featuring AMD EPYC processors provide up to 10% lower cost than comparable instances. Learn more

Connect with AWS Certified third-party experts for on-

Find the **Launch instance** section, open the *Launch instance* drop down, and click *Launch instance*.



You are using the following Amazon EC2 resources in the US East (Ohio) Region:

Easily size, configure, and deploy Microsoft SQL Server Always On availability groups on AWS using the AWS Launch Wizard for SQL Server. Learn more

To get started, launch an Amazon EC2 instance, which is a virtual server in the cloud.

Note: Your instances will launch in the US East (Ohio) Region

US East (Ohio)

Use CloudEndure Migration to simplify, expedite, and automate large-scale migrations from physical, virtual, and cloud-based infrastructure to AWS.

Region: US East (Ohio)

Status: This service is operating normally

An error occurred

An error occurred retrieving service health information

Scale your MPI-based HPC workloads with Elastic Fabric Adapter. Learn more

Use Amazon EBS to provide high performance block level storage for EC2 instances. Learn more

Scale you MPI-based HPC workloads with Elastic Fabric Adapter. Learn more

The instance launcher follows several steps:

1. Click *My AMIs* and select the name that was uploaded by `bsdec2-image-upload`.
2. Any instance will work, but *t2.large* is recommended for TrueNAS given an 8GB memory recommendation.
3. Skip this step.
4. Add EBS volumes according to your TrueNAS use case. At minimum, add a couple of cold HDD volumes for a storage pool. General purpose SSD volumes can be used as L2ARC or SLOG devices.
5. Skip this step.
6. Add a rule with *http*. This allows you to connect to the TrueNAS web interface.
7. Review your settings and press *Launch*.

The running instance is added to the EC2 dashboard or can be seen in the **Instances** menu. When the image has fully started, AWS performs two status checks. The first checks for AWS uptime, and the second verifies the instance is functional. After both checks pass, paste either the Public IP or Public DNS link in a new browser window to connect to the TrueNAS web interface.

TrueNAS Community AMI

Starting with 12.0-BETA, an AMI is provided for different TrueNAS releases and is available in the **Community AMI** section. When using this AMI, login with the default credentials:

Username: `root` Password: `abcd1234`

> To secure the system, change the password after the initial login.

12.2.2 - Asigra Plugin

Asigra provides a TrueNAS plugin to simplify cloud storage backups with their service. The Asigra plugin connects TrueNAS to a third party service and is subject to licensing. TrueNAS must have a public static IP address for Asigra services to function. Please read the Asigra Software License Agreement before using this plugin.

Follow the instructions in the Plugins section to install the Asigra Plugin. To begin using Asigra services after installing the plugin, expand the plugin options and click *Register*. A new browser tab opens to register a user with Asigra.

Refer to the Asigra documentation for details about using the Asigra platform:

- DS-Operator Management Guide: Using the DS-Operator interface to manage the plugin DS-System service. Click *Management* in the plugin options to open the DS-Operator interface.
- DS-Client Installation Guide: How to install the DS-Client system. DS-Client aggregates backup content from endpoints and transmits it to the DS-System service.
- DS-Client Management Guide: Managing the DS-Client system after it has been successfully installed at one or more locations.

12.2.3 - Containers

TrueNAS CORE & Enterprise can both be used as backing storage for container workloads.

The democratic-csi driver (available at https://github.com/democratic-csi/democratic-csi) allows users to integrate popular container solutions like Kubernetes, Nomad, Cloud Foundry, or Mesos into the TrueNAS CLI. The driver is sponsored by and offically supported by iXsystems for TrueNAS Enterprise Customers.

A CSI (Container Storage Interface) is an interface between container workloads and third-party storage that supports creating and configuring persistent storage external to the orchestrator, its input/output (I/O), and its advanced functionality such as snapshots and cloning.

The democratic-csi focuses on providing storage using iSCSI, NFS, and SMB protocols, and includes several ZFS features like snapshots, cloning, and resizing.

Features

- dynamically provisions/de-provision storage and shares it as appropriate for cluster usage
- online resize operations to dynamically expand volumes as needed
- snapshot support (using either `zfs send/receive` or `zfs snapshot`)
- cross-architecture (amd64, armv7, arm64)

Installation

There are 3 steps to integrating a container solution in TrueNAS:

1. Prepare TrueNAS.
2. Prepare the nodes (ie: your Kubernetes cluster nodes).
3. Deploy your container orchestrator.

Prepare TrueNAS for a Container Solution

We recommend using TrueNAS 12.0-U2.1+. However, the driver typically works with previous versions too, but is unsupported. Before you start, log in to TrueNAS, go to **Services**, and make sure *iSCSI*, *NFS*, and *SSH* are enabled.

Create Pools

Go to **Storage > Pools** and create the pools to include in your container.

Set up SSH

Now you need to ensure that a supported shell is used by the user account that your container solution can use to SSH to TrueNAS. Go to **Accounts > Users** and set the desired user's *Shell* to either *bash* or *sh*, then click *SAVE*.

To use a non-root user for the SSH operations, you can create a `csi` user and then run `visudo` directly from the console. Make sure the line for the `csi` user has `NOPASSWD` added (this can get reset by TrueNAS if you alter the user in the GUI later):

```
csi ALL=(ALL) NOPASSWD:ALL
```

With TrueNAS CORE version 12.0+, you can use an `apiKey` instead of the `root` password for the HTTP connection.

Set up NFS

1. Go to **Services** and click the □ next to *NFS* to edit its properties.
2. Make sure *Enable NFSv4*, *NFSv3 ownership model for NFSv4*, and *Allow non-root mount* are checked, then click *SAVE*.

Set up iSCSI

1. Go to **Sharing > Block Shares (iSCSI)**.
2. Use the default settings in the *Target Global Configuration* tab.
3. In the *Portals* tab, click *ADD*, then create a **Description*. Set the *IP Address* to *0.0.0.0* and the *Port* to *3260*, then click *SUBMIT*.
4. In the *Initiators Groups* tab, click *ADD*. For ease of use, check the *Allow ALL Initiators*, then click *SAVE*. You can make restrictions later using the *Allowed Initiators (IQN)* function.
5. Kubernetes will create Targets and Extents automatically.

When using the TrueNAS API concurrently, the `/etc/ctl.conf` file on the server can become invalid. There are sample scripts in the `contrib` directory to clean things up ie: copy the script to the server and directly and run - `./ctld-config-watchdog-db.sh | logger -t ctld-config-watchdog-db.sh &`. Please read the scripts and set the variables as appropriate for your server.

- Ensure you have preemptively created portals, initiator groups, and authorizations
    - Make note of the respective IDs (the true ID may not reflect what is visible in the UI)
    - You can make ID's visible by clicking the `Edit` link and finding the ID in the browser address bar
    - Alternately, use these commands to retrieve appropriate IDs:
        - `curl --header "Accept: application/json" --user root:<password> 'http(s)://<ip>/api/v2.0/iscsi/portal'`
        - `curl --header "Accept: application/json" --user root:<password> 'http(s)://<ip>/api/v2.0/iscsi/initiator'`
        - `curl --header "Accept: application/json" --user root:<password> 'http(s)://<ip>/api/v2.0/iscsi/auth'`

Prepare the Nodes

Install and configure the requirements for both NFS and iSCSI.

⊙ **NFS**

NFS

RHEL / CentOS

```
sudo yum install -y nfs-utils
```

Ubuntu / Debian

```
sudo apt-get install -y nfs-common
```

○ **iSCSI**

iSCSI

> Multipath is supported for the `iscsi`-based drivers. Configure multipath with multiple portals in the configuration as needed.
>
> If you are running Kubernetes with rancher/rke, please see https://github.com/rancher/rke/issues/1846.

RHEL / CentOS

Install these system packages:

```
sudo yum install -y lsscsi iscsi-initiator-utils sg3_utils device-mapper-multipath
```

Enable multipathing:

```
sudo mpathconf --enable --with_multipathd y
```

Ensure that `iscsid` and `multipathd` are running:

```
sudo systemctl enable iscsid multipathd
```

```
sudo systemctl start iscsid multipathd
```

Start and enable iSCSI:

```
sudo systemctl enable iscsi
```

```
sudo systemctl start iscsi
```

Ubuntu / Debian

Install these system packages:

```
sudo apt-get install -y open-iscsi lsscsi sg3-utils multipath-tools scsitools
```

Enable multipathing:

```
sudo tee /etc/multipath.conf <<-'EOF'
defaults {
    user_friendly_names yes
    find_multipaths yes
}
EOF
```

```
sudo systemctl enable multipath-tools.service
```

```
sudo service multipath-tools restart
```

Ensure that open-iscsi and multipath-tools are enabled and running:

```
sudo systemctl status multipath-tools
```

```
sudo systemctl enable open-iscsi.service
```

```
sudo service open-iscsi start
```

```
sudo systemctl status open-iscsi
```

○ **SMB**

SMB

When using Windows based machines, you might need to enable guest access, even if you are connecting with credentials.

```
Set-ItemProperty HKLM:\SYSTEM\CurrentControlSet\Services\LanmanWorkstation\Parameters
AllowInsecureGuestAuth -Value 1
Restart-Service LanmanWorkstation -Force
```

Deploy Your Orchestrator Into the Cluster

⊙ **Kubernetes**

Kubernetes

Kubernetes is “an open-source system for automating deployment, scaling, and management of containerized applications.”

Deploy the Driver (Helm Installation)

```
helm repo add democratic-csi https://democratic-csi.github.io/charts/
helm repo update

# helm v2
helm search democratic-csi/

# helm v3
helm search repo democratic-csi/

# copy proper values file from https://github.com/democratic-
csi/charts/tree/master/stable/democratic-csi/examples
# edit as appropriate
# examples are from helm v2, alter as appropriate for v3

# add --create-namespace for helm v3
helm upgrade \
--install \
--values freenas-iscsi.yaml \
--namespace democratic-csi \
zfs-iscsi democratic-csi/democratic-csi
helm upgrade \
--install \
--values freenas-nfs.yaml \
--namespace democratic-csi \
zfs-nfs democratic-csi/democratic-csi
```

Non-standard Kubelet Paths expand □

When using a distribution with a non-standard kubelet path (such as `minikube` and `microk8s`), a new kubelet host path is required. Example:

```
microk8s helm upgrade \
  --install \
  --values freenas-nfs.yaml \
  --set node.kubeletHostPath="/var/snap/microk8s/common/var/lib/kubelet"  \
  --namespace democratic-csi \
  zfs-nfs democratic-csi/democratic-csi
```

Multiple Deployments

You can install multiple deployments of each or any driver. You will need:

- a new helm release name for each deployment
- a unique `csiDriver.name` in the values file
- a unique name for each storage class (per cluster)
- a unique parent dataset (don’t try to use the same parent across deployments or clusters)

Snapshot Support

Install beta (v1.17+) CRDs (once per cluster):

- https://github.com/kubernetes-csi/external-snapshotter/tree/master/client/config/crd

```
kubectl apply -f snapshot.storage.k8s.io_volumesnapshotclasses.yaml
kubectl apply -f snapshot.storage.k8s.io_volumesnapshotcontents.yaml
kubectl apply -f snapshot.storage.k8s.io_volumesnapshots.yaml
```

Install snapshot controller (once per cluster):

- https://github.com/kubernetes-csi/external-snapshotter/tree/master/deploy/kubernetes/snapshot-controller

```
# replace namespace references to your liking
kubectl apply -f rbac-snapshot-controller.yaml
kubectl apply -f setup-snapshot-controller.yaml
```

Install `democratic-csi` as usual with `volumeSnapshotClasses` defined as appropriate.

- https://kubernetes.io/docs/concepts/storage/volume-snapshots/
- https://github.com/kubernetes-csi/external-snapshotter#usage

Openshift expand □

Openshift is another addon to Kubernetes and generally works fine with the `democratic-csi`. You will need to set special parameters with helm (support added in chart version `0.6.1`):

```
# for sure required
--set node.rbac.openshift.privileged=true
--set node.driver.localtimeHostPath=false
```

unlikely, but in special circumstances may be required

```
-set controller.rbac.openshift.privileged=true
```

- You can run the `kubectl get pods -n democratic-csi -o wide` command to make sure all the democratic-csi pods are running.
- You can also run the `kubectl get sc` command to make sure your storage classes are present and set a default class.
- Visit the Kubectl Cheat Sheet or this Kubernetes CSI guide for more Kubernetes deployment and configuration information.

○ **Nomad**

Nomad

Nomad is a “simple and flexible workload orchestrator to deploy and manage containers and non-containerized applications across on-prem and clouds at scale.”

The democratic-csi works in Nomad with limited functionality and has to be deployed as a set of jobs. The controller job runs as a single instance, and the node job runs on every node and manages mounting the volume.

Read the Nomad Support page in the democratic-csi GitHub for detailed setup instructions. Visit the Nomad Storage Plugins page to learn how Nomad manages dynamic storage plugins.

○ **Mesos**

Mesos

Mesos is an open source cluster manager that abstracts CPU, memory, storage, and other compute resources away from machines (physical or virtual), enabling fault-tolerant and elastic distributed systems to easily be built and run effectively.

○ **Cloud Foundry**

Cloud Foundry

Cloud Foundry is an open source cloud platform as a service (PaaS) on which developers can build, deploy, run and scale applications.

As always, we welcome and encourage contributions from the community!

Additional Resources

- https://github.com/democratic-csi/democratic-csi/blob/master/README.md
- https://github.com/democratic-csi/democratic-csi/blob/master/docs/nomad.md
- https://jonathangazeley.com/2021/01/05/using-truenas-to-provide-persistent-storage-for-kubernetes/

12.2.4 - Nextcloud

Nextcloud Plugin

The Nextcloud plugin is a suite of client-server software for creating and using file hosting services.

Plugins Catalog

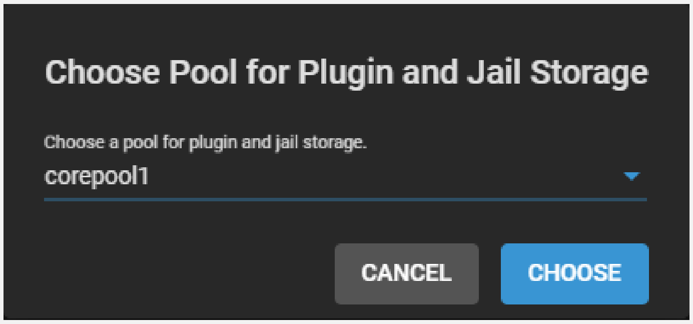
Before getting started... expand □

- You must have a data pool available for plugin storage.
- You must connect the system to the internet. Go to **Network > Interfaces**, edit the intended plugin interface, and set **Disable Hardware Offloading**.

To see the plugin catalog, go to the **Plugins** screen.

First time in this menu? expand □

Going to the **Jails** or **Plugins** screen for the first time prompts to select a location on the system for storing Jail related data.



Choose Pool for Plugin and Jail Storage

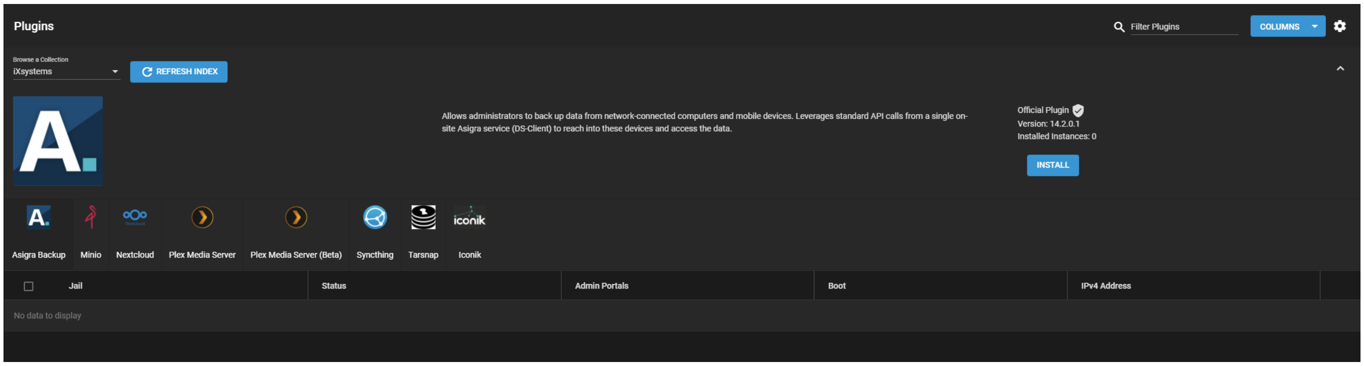
Choose a pool for plugin and jail storage.

corepool1

By default, this location stores all data related to jails and plugins, including downloaded applications, data managed by the jail or plugin, and any jail snapshots.

Disconnecting or deleting the pool that stores jail data can result in **permanent data loss!** Make sure to back up any critical data or snapshots that are stored in a jail before changing the storage configuration.

To change the Jails and Plugins storage location, click □, select a new pool, and click *CHOOSE*.



Plugins

Browse a Collection: iXsystems

Allows administrators to back up data from network-connected computers and mobile devices. Leverages standard API calls from a single on-site Asigra service (DS-Client) to reach into these devices and access the data.

Official Plugin
Version: 14.2.0.1
Installed Instances: 0

□ Jail	Status	Admin Portals	Boot	IPv4 Address
No data to display				

I don't see anything! expand □

If the catalog doesn’t load:

- Go to **Network > Global Configuration** and confirm the **Default Gateway** and **DNS Servers** addresses are correct.
- Open the **Shell** and `ping` an Internet address. The output confirms the system is connected to the Internet.

TrueNAS organizes plugins into two **Collections**:

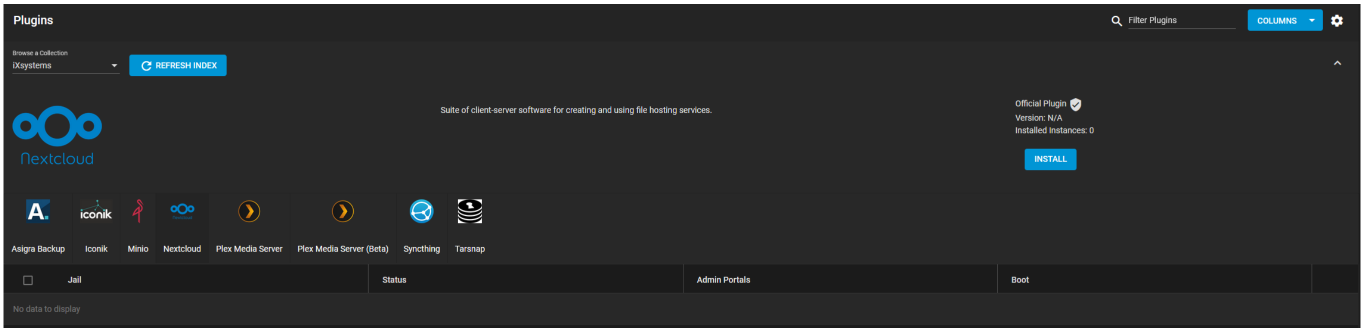
- iXsystems maintained plugins
- Open source plugins created and maintained by TrueNAS users.

By default, TrueNAS shows the iXsystems-supported plugins. To see the community plugins, open **Browse a Collection** and select **Community**.

Installation

○ Basic Install

Go to **Plugins** and select **Nextcloud**, then click **INSTALL**.



Browse a Collection: iXsystems

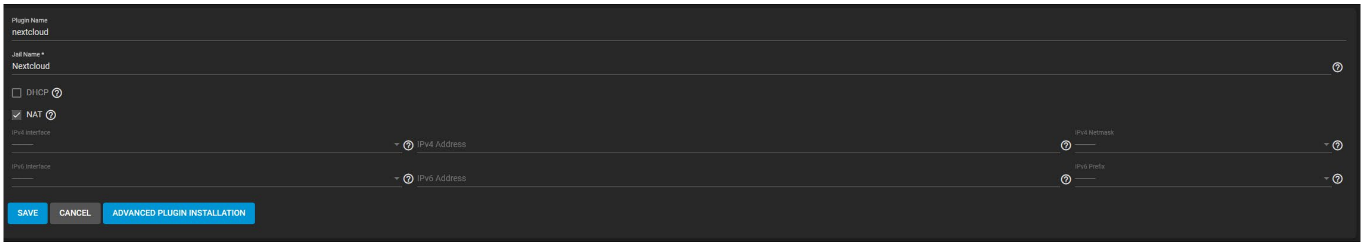
Suite of client-server software for creating and using file hosting services.

Official Plugin
Version: N/A
Installed Instances: 0

□	Jail	Status	Admin Portals	Boot

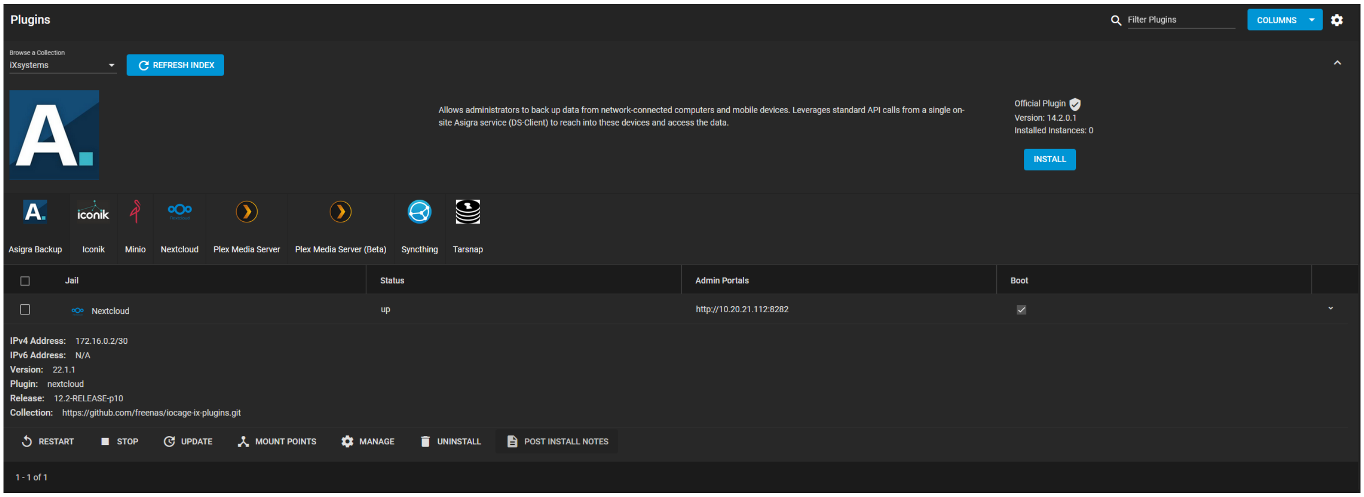
No data to display

Type a **Jail Name** and click **SAVE**.



Plugin Name: nextcloud
Jail Name *: Nextcloud
□ DHCP
☑ NAT
IPv4 Interface
IPv4 Address
IPv4 Netmask
IPv6 Interface
IPv6 Address
IPv6 Prefix

After Nextcloud installs successfully, you can manage your instance of the plugin.



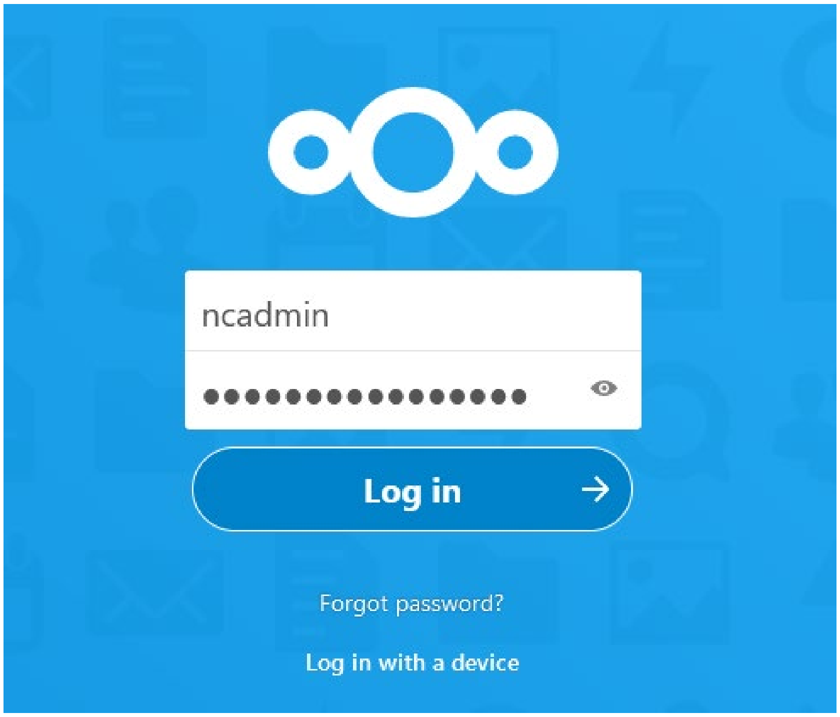
Allows administrators to back up data from network-connected computers and mobile devices. Leverages standard API calls from a single on-site Asigra service (DS-Client) to reach into these devices and access the data.

Official Plugin
Version: 14.2.0.1
Installed Instances: 0

□	Jail	Status	Admin Portals	Boot
□	Nextcloud	up	http://10.20.21.112:8282	☑

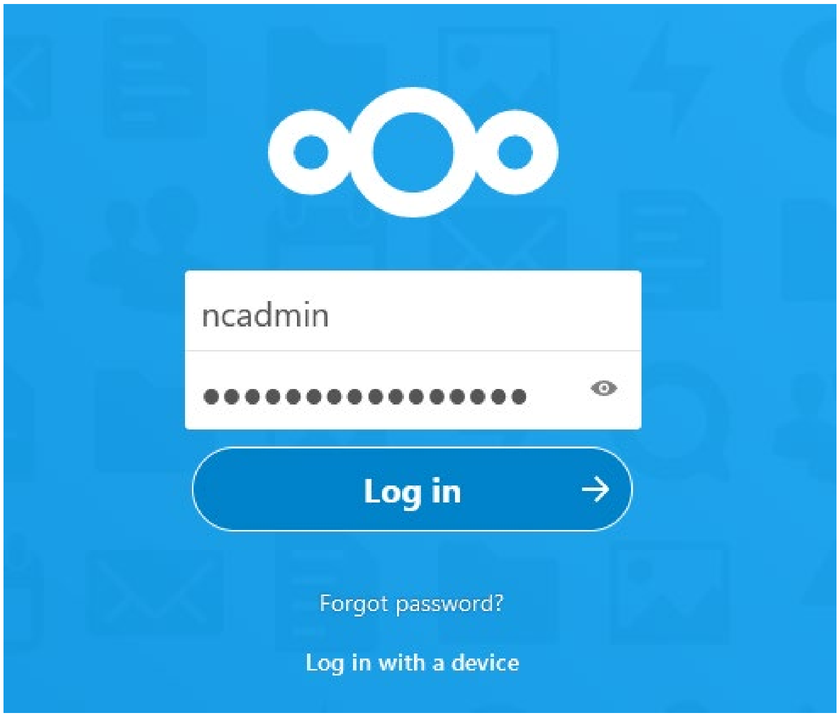
IPv4 Address: 172.16.0.2/30
IPv6 Address: N/A
Version: 22.1.1
Plugin: nextcloud
Release: 12.2-RELEASE-p10
Collection: https://github.com/freenas/iocage-ix-plugins.git

Click **POST INSTALL NOTES** to obtain your Nextcloud admin user and Nextcloud admin password information. Click **MANAGE** to access the Nextcloud login page within your browser.



ncadmin
●●●●●●●●●●●●●●●●

Enter the credentials from **POST INSTALL NOTES** and click **Log in** to access the Nextcloud Hub.

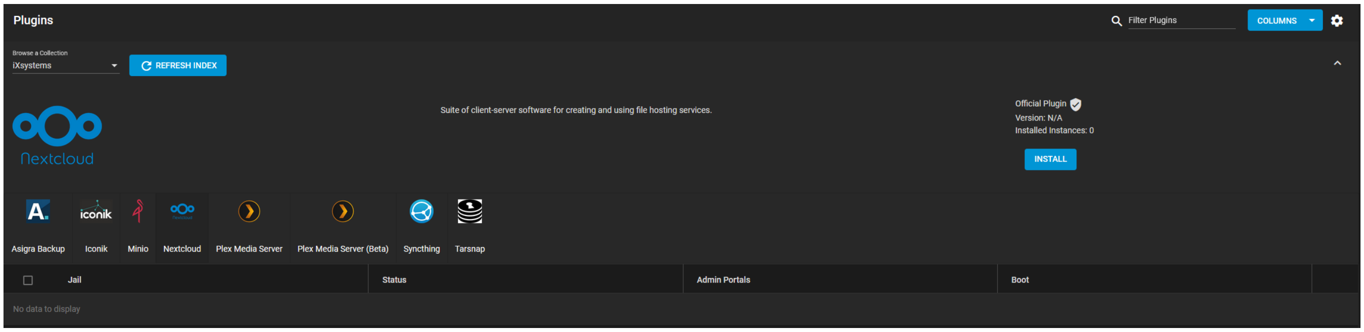


ncadmin

●●●●●●●●●●●●●●●●●

○ Static IP Install

Go to **Plugins** and select **Nextcloud**, then click **INSTALL**.



Plugins

Browse a Collection: iXsystems

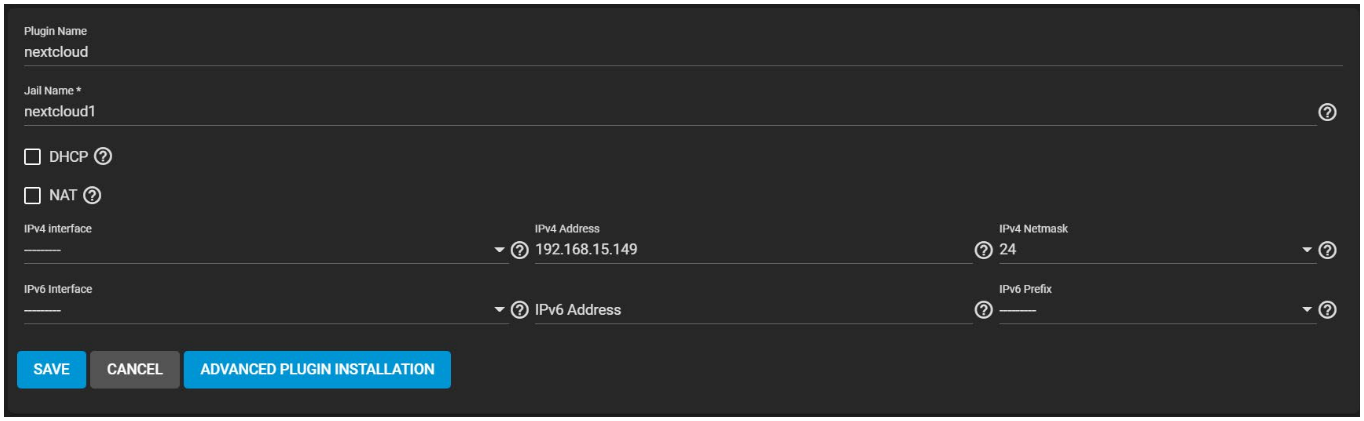
Suite of client-server software for creating and using file hosting services.

Official Plugin
Version: N/A
Installed Instances: 0

□ Jail	Status	Admin Portals	Boot

No data to display

Type a **Jail Name**, then disable the **NAT** checkbox and enter an available IP in the **IPv4 Address** field. Select an **IPv4 Netmask** (iX recommends 24), then click **SAVE**.



Plugin Name: nextcloud

Jail Name *: nextcloud1

□ DHCP

□ NAT

IPv4 interface: ———
IPv4 Address: 192.168.15.149
IPv4 Netmask: 24

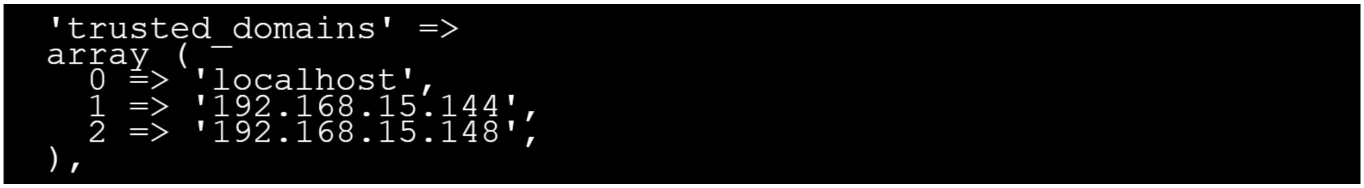
IPv6 Interface: ———
IPv6 Address
IPv6 Prefix: ———

After Nextcloud installs, you must add your Nextcloud IP to your Nextcloud jail trusted domains.

Go to **Jails** and expand your Nextcloud jail, then click **> SHELL**.

Enter `ee /usr/local/www/nextcloud/config/config.php` to edit your Nextcloud config file.

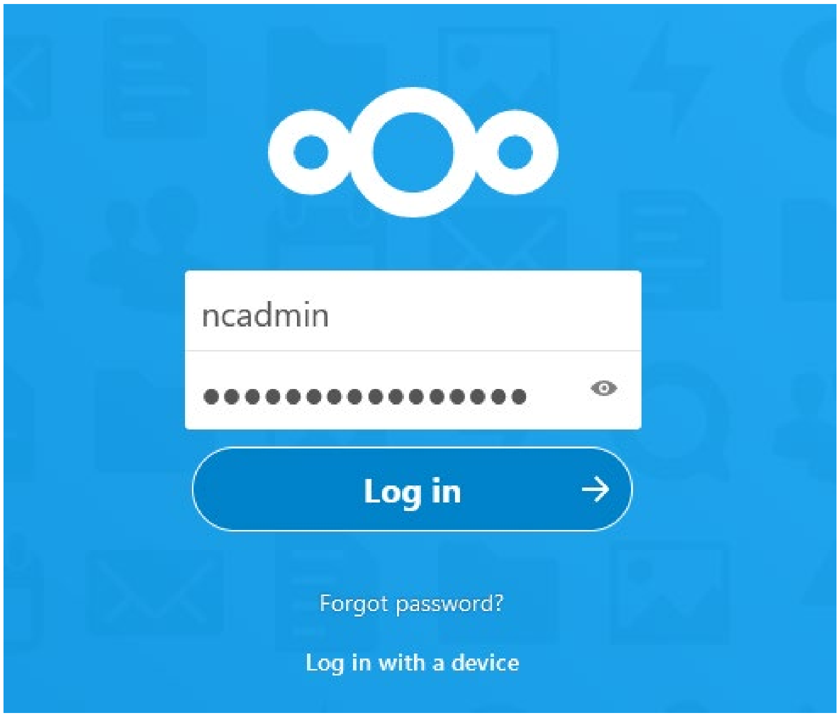
Scroll to the `trusted_domains` section and type your Nextcloud IP as a new line item. Use the image below for reference.



```
'trusted_domains' =>
array (
  0 => 'localhost',
  1 => '192.168.15.144',
  2 => '192.168.15.148',
),
```

Type CTRL+C to close the editor, then type **exit** to close the config file.

Go back to **Plugins** and expand your Nextcloud instance. Click **POST INSTALL NOTES** to obtain your Nextcloud admin user and Nextcloud admin password information. Click **MANAGE** to access the Nextcloud login page within your browser.



ncadmin

Enter the credentials from **POST INSTALL NOTES** and click **Log in**. You are directed to the Nextcloud Hub.

Refer to the Nextcloud documentation for details about using the Nextcloud platform:

- Administrators Manual
- Users Manual
- Nextcloud Developer Documentation

12.2.5 - OpenStack

12.2.5.1 - Cinder Driver

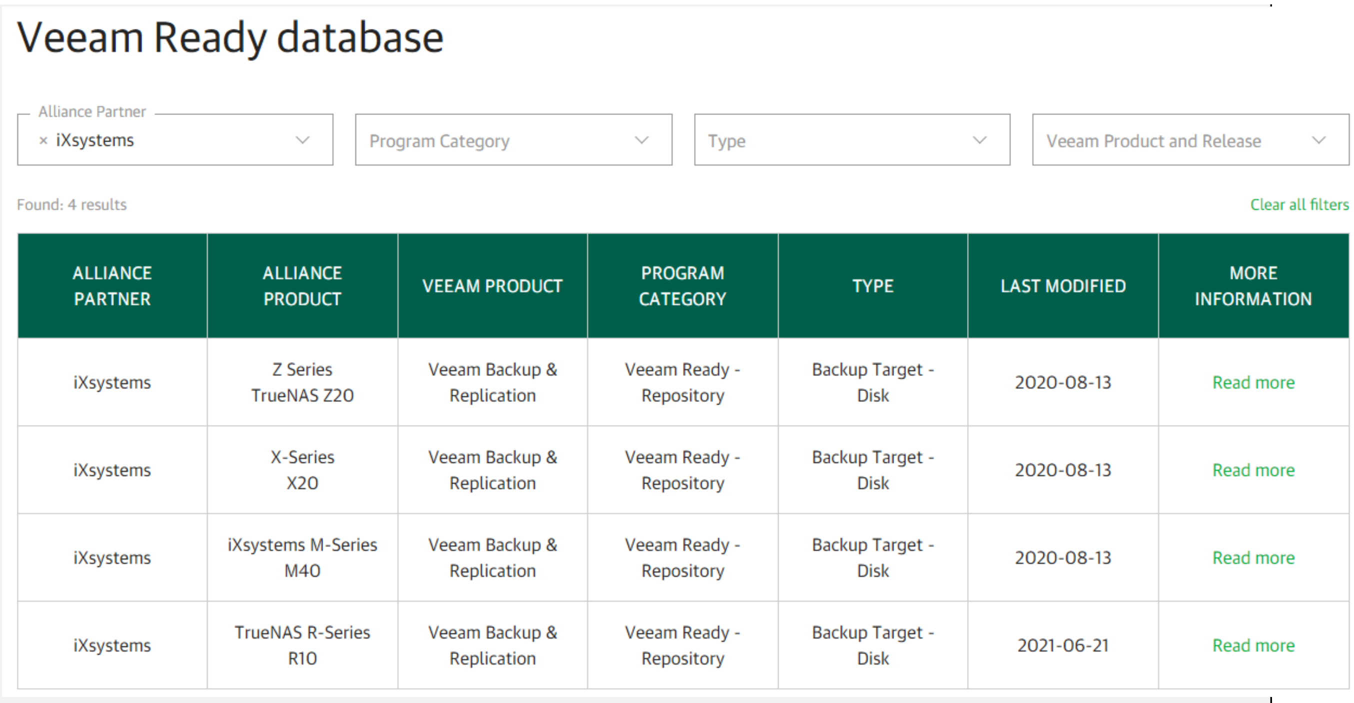
There is a community-supported, open source driver for Cinder available for TrueNAS, available at https://github.com/iXsystems/cinder. This is a simple driver that uses several scripts to allow block/iSCSI interactions between OpenStack Cinder and TrueNAS systems. To review the driver documentation, including minimum hardware requirements, install instructions, and basic usage, see https://github.com/iXsystems/cinder/blob/master/README.md.

12.2.6 - Veeam

TrueNAS Unified Storage appliances are certified Veeam Ready and can be used to handle demanding backup requirements for file and VM backup. These certification tests measure the speed and effectiveness of the data storage repository using a testing methodology defined by Veeam for Full Backups, Full Restores, Synthetic Full Backups, and Instant VM Recovery from within the Veeam Backup & Replication environment. With the ability to seamlessly scale to petabytes of raw capacity, high-performance networking and cache, and all-flash options, TrueNAS appliances are the ideal choice for Veeam Backup & Replication repositories large and small.

Certified Hardware expand □

These TrueNAS products are certified by Veeam:



Veeam Ready database

Alliance Partner: × iXsystems | Program Category | Type | Veeam Product and Release

Found: 4 results

Clear all filters

ALLIANCE PARTNER	ALLIANCE PRODUCT	VEEAM PRODUCT	PROGRAM CATEGORY	TYPE	LAST MODIFIED	MORE INFORMATION
iXsystems	Z Series TrueNAS Z20	Veeam Backup & Replication	Veeam Ready - Repository	Backup Target - Disk	2020-08-13	Read more
iXsystems	X-Series X20	Veeam Backup & Replication	Veeam Ready - Repository	Backup Target - Disk	2020-08-13	Read more
iXsystems	iXsystems M-Series M40	Veeam Backup & Replication	Veeam Ready - Repository	Backup Target - Disk	2020-08-13	Read more
iXsystems	TrueNAS R-Series R10	Veeam Backup & Replication	Veeam Ready - Repository	Backup Target - Disk	2021-06-21	Read more

This article discusses some of the best practices when deploying TrueNAS with Veeam, specific considerations users must be aware of, and some tips to help with performance. The focus will be on capabilities native to TrueNAS, and users are encouraged to also review relevant Veeam documentation, such as their help center and best practices for more information about using and optimizing Veeam.

What is Needed?

When deploying TrueNAS with Veeam users should prepare the following:

- Veeam Backup & Replication dedicated server - either physical or VM
- Windows Server and Microsoft SQL for Veeam
- TrueNAS appliance with users pre-configured as determined by the admin
- Networking - 1/10/40/100GbE infrastructure and cables
- Veeam connected to the Hypervisor or other clients to pull the data to TrueNAS
- All appropriate licenses
- Backup proxies as defined by Veeam - they can be virtual machines or physical machines or the backup server itself for low workloads

Update the TrueNAS systems to the latest version before beginning deployment. This ensures the appliance has the latest bug fixes, security updates and software enhancements to ensure maximum performance and security. If deploying on a closed network (LAN) without access to the Internet, users can also obtain and apply an update manually. For assistance, please contact TrueNAS support.

Contacting iXsystems Support expand □

Customers who purchase iXystems hardware or that want additional support must have a support contract to use iXystems Support Services. The TrueNAS Community forums provides free support for users without an iXsystems Support contract.

Contact Method	Contact Options
Web	https://support.ixsystems.com
Email	support@ixsystems.com
Telephone	Monday - Friday, 6:00AM to 6:00PM Pacific Standard Time:

	US-only toll-free: 1-855-473-7449 option 2 Local and international: 1-408-943-4100 option 2
Telephone	After Hours (24x7 Gold Level Support only): US-only toll-free: 1-855-499-5131 International: 1-408-878-3140 (international calling rates apply)

Sizing Considerations

TrueNAS storage appliances range from entry-level to high-end, and the user's current usage scenario and backup demands must be considered.

⊙ Define Your Storage Usage

While this guide focuses on Veeam, the unified design of TrueNAS allows it to multitask. If TrueNAS will be handling more than backup jobs, other usage needs should be taken into account. For example, if the storage appliance has one LUN (dataset or zvol) set as a VMware datastore for hosting VMs, and another LUN set to be used for backups, both capacities must be considered.

○ Estimate Capacity

The first step when estimating required capacity is to understand how much capacity is currently used by existing VMs and by files that users need to back up. Veeam and the TrueNAS appliance will both apply data compression, though different file types and the structure of the data in those files will affect the achieved compression levels. Some tools for capacity estimation are listed at the end of this section, but it is always good to err on the side of caution and 3x the current storage used is not unreasonable. ZFS performs best with utilization below 80%. Snapshots, full backups, and incremental backups will all require more storage than primary storage being used today.

○ Estimate Network Bandwidth

Bandwidth is harder to estimate and must take into account backup timeframes, backup sizes, and available network resources. Typically, backups run during off-hours when IT equipment is under a lighter load. This timeframe can be set, but if each backup is several terabytes in size, a longer amount of time and greater bandwidth is required. iXsystems tests its Veeam backups using a 10 GbE mixed network with the datastore storage, hypervisor hosts, and backup repository (the TrueNAS) on the same network. However, shorter backup windows, heavy network usage, and dozens of VMs being backed up at the same time may require 40 or 100 GbE networking and multiple Veeam Backup Proxies used in tandem.

For example, consider a scenario of backing up 1000 VMs (each 100 GB in size) with a backup window of 8 hours. This requires around 5 virtual Proxy servers with 8 vCores (16 GB memory each) and around 3.7 GB/s of throughput. In such a scenario, iXsystems would recommend 100 GbE interconnect and TrueNAS appliances with over 100+ hard drives. However, bandwidth can be greatly reduced if users can accept incremental and staggered backups. For example, run an incremental backup on all VMs each day, and a full backup on 100 VMs per night, rotating a different 100 VMs each night. This strategy provides a 5X increase to the maximum number of VMs and reduces costs by 75%.

○ Choose a TrueNAS model

TrueNAS systems are excellent for backup and archiving, but must be sized correctly. Recommended sizing:

Model	Backup Only?	Number of VMs Backed Up	Network Max	Usable Capacity
TrueNAS X10	Yes	6800	10 GbE	340 TB
TrueNAS X20	Yes	13600	10 GbE	680 TB
TrueNAS M40	No	29400	40 GbE	1.47 PB
TrueNAS M50	No	151800	100 GbE	7.59 PB
TrueNAS M60	No	303600	100 GbE	15.8 PB

- `Backup Only?` assumes that the storage is being used only as a backup repository. This can be understood as a recommendation, not a rule. The number of VMs is based upon conservative throughput estimates with an average VM size set as 100GB and a backup window of 8 hours running full backups. All other requirements for the number of Veeam Backup Proxies, and networking dependencies also apply.
- `Number of VMs Backed Up`: Numbers are based on max capacity and estimating 100GB per VM and a 2:1 optimal compression ratio. Compression and Deduplication settings can radically change the estimates, and Veeam allows for fine tuning.

○ **Configure the Pools, Datasets, and Zvols**

For high-capacity deployments, iXsystems recommends 9+2+1 RAID groups (called “Virtual Devices” or “vdevs” by ZFS terminology). This configuration consists of a RAIDZ2 (similar to RAID 6 with 2 drive parity so 2 drives can fail without data loss) with one to two global hot-spares added to the pool. Pools can include several of these groups, so the capacity can be expanded as needed. For example, 390 TB of usable space with 12 TB drives requires four groups and 48 drives. Detailed configurations can be discussed with iXsystems sales representatives and engineers.

○ **Storage Lifecycle Planning**

TrueNAS storage pools can be expanded online to the maximum size supported by a particular TrueNAS system. Storage pools can be expanded one vdev (RAID group) at a time so long as each vdev shares the same type. When deploying an iSCSI share requiring a zvol (LUN), users should consider thin provisioning using the sparse option during setup.

In addition to the above considerations, there are many tools, forums, and other discussion groups to help verify the amount of storage needed for Veeam backup. In many sites, Veeam compression or deduplication is around 1.5x to 2x, but this is more a reference than a rule. Backup types, applications, and the diversity of VMs can all factor into the true amount of storage needed. Capacity must also be considered alongside desired performance, as a smaller quantity of large drives often will not yield the same performance as a larger number of small drives. For rough calculations, additional resources are listed below.

- Estimate Veeam space - Veeam Knowledge Space
- Sizing from Veeam Best Practices
- 3rd Party Disk Space Calculator
- 3rd Party Bandwidth Calculator

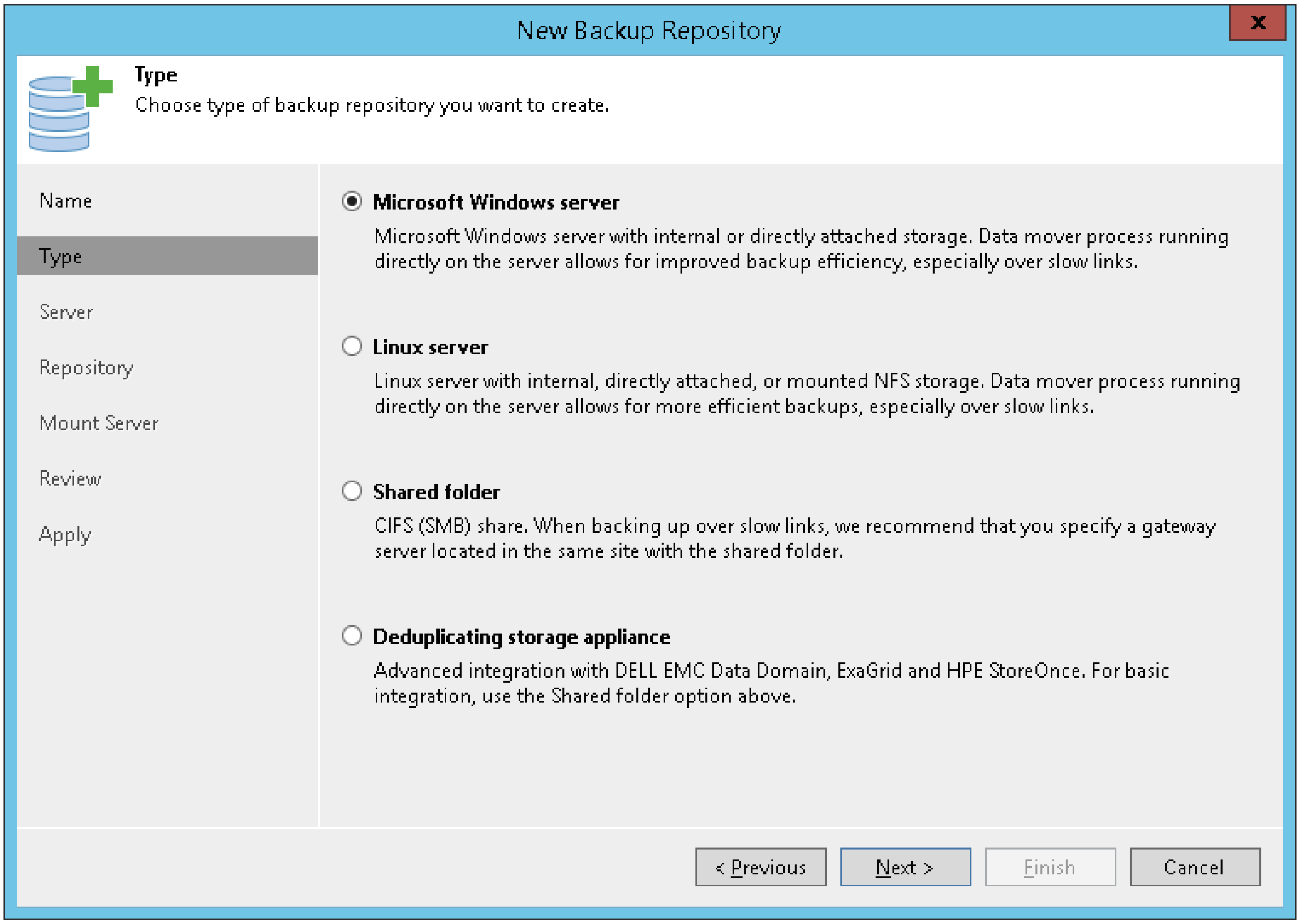
Advantages

TrueNAS is a robust, unified storage system well-suited for nearly any environment. For backups, the platform takes advantage of the data integrity offered by ZFS that includes features such as copy-on-write, snapshots, and checksums that prevent bit-rot. TrueNAS appliances can also be expanded at any time simply by adding more drives so datasets can grow to keep pace with your data. Here are additional key features that are offered out-of-the-box at no extra cost to the user:

- **Self-healing file system**: ZFS places data integrity first with data scrubs and checksums to ensure files are saved correctly and preserved.
- **Native replication to TrueNAS systems**: perfect for disaster recovery and compliance.
- **High-availability (HA) architecture with 99.999% availability**: Ensure the system is always ready to receive the latest backups.
- **Triple-parity**: RAID groups (vdevs) can be configured with mirror, single-parity (RAIDZ), dual-parity (RAIDZ2), or triple-parity (RAIDZ3) levels, while copy-on-write, checksums, and data scrubbing help protect long-term data integrity.
- **Certified with VMware® and Citrix® XenServer®**: TrueNAS can be both a hypervisor datastore and a backup repository with data on different datasets and even pools. Just be mindful of the scale of the workloads being run.
- **Unrivaled scalability in a single dataset**: Scale the backup repository from terabytes to petabytes of usable capacity. No LUN limits, clustering or licenses needed.

Setting Up TrueNAS as a Veeam Repository

Veeam Backup & Replication runs on a Windows operating system, typically Windows Server 2012 or newer, and can connect to a variety of storage systems. iXsystems recommends using iSCSI with a Veeam scale-out repository architecture. Users can also use SMB to mount the volume to the backup server directly. With support for SMB/CIFS, NFS, AFP, iSCSI, and FC, TrueNAS offers many ways to connect to Veeam backup servers.



New Backup Repository

Type

Choose type of backup repository you want to create.

● **Microsoft Windows server**

Microsoft Windows server with internal or directly attached storage. Data mover process running directly on the server allows for improved backup efficiency, especially over slow links.

○ **Linux server**

Linux server with internal, directly attached, or mounted NFS storage. Data mover process running directly on the server allows for more efficient backups, especially over slow links.

○ **Shared folder**

CIFS (SMB) share. When backing up over slow links, we recommend that you specify a gateway server located in the same site with the shared folder.

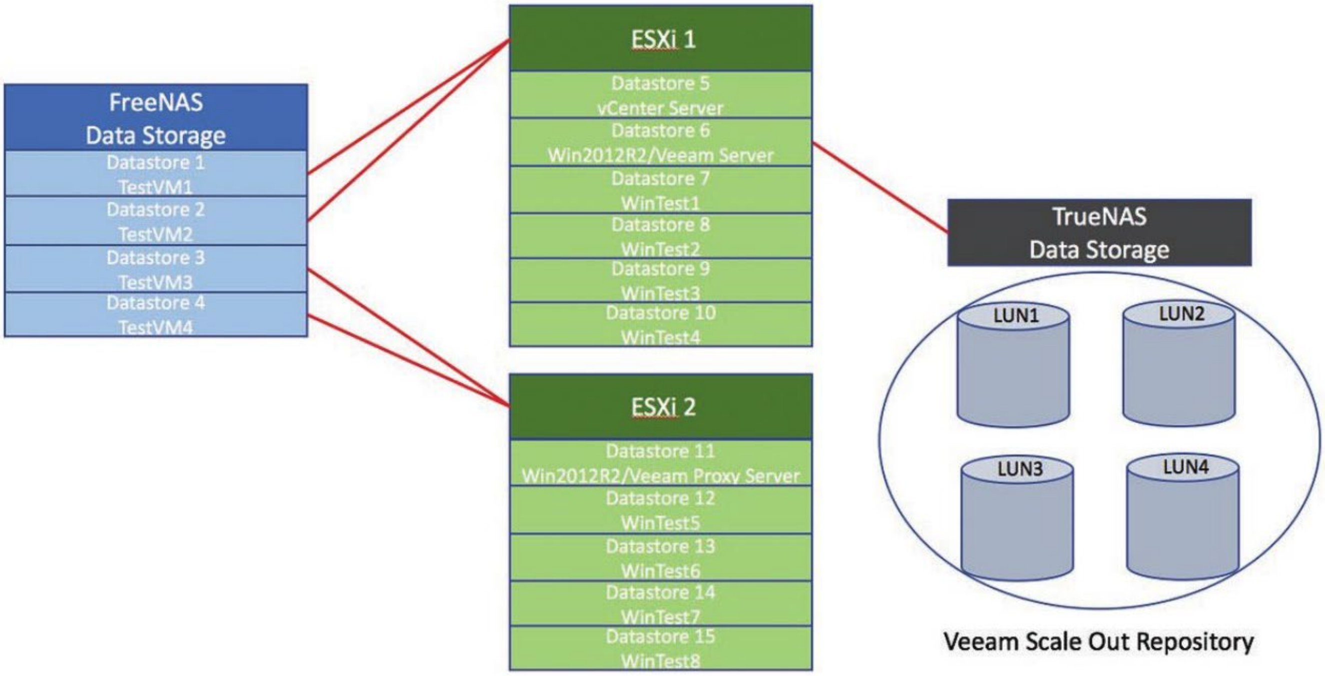
○ **Deduplicating storage appliance**

Advanced integration with DELL EMC Data Domain, ExaGrid and HPE StoreOnce. For basic integration, use the Shared folder option above.

Performance Tuning for Veeam Backup & Replication

Test environment:

- A 2TB datastore must be configured on TrueNAS System 1 utilizing the iSCSI wizard using default values. This will be the backup source.
- A 2TB datastore must be configured on TrueNAS System 2 utilizing the iSCSI wizard using default values. This will be the backup target.
- Connect the source datastore to the Hypervisor.
- Ensure the NFS ISO datastore is mounted.
- A 64-bit Microsoft Windows Server 2019 Standard VM should be constructed for Veaam Backup & Replication Server.
- Install VMware guest additions.
- Configure STATIC IP for Windows Server 2019 VM.
- Connect storage to the Veeam VM
- Install Veeam software on Veeam Backup & Replication Server.



Using a Scale-out Backup Repository, users can link multiple backup repositories (Extents) together to help with performance and load balancing across the various repositories. In the topology above, the TrueNAS is broken across four LUNs to act as the scale-out extents. Both the FreeNAS datastore and the TrueNAS backup only used one 10GbE link when connecting to the VMware server pool.

Scale-out Backup Repository is only available in Veeam Backup & Replication 9.5 Enterprise and Enterprise Plus editions.

Results

Testing in this configuration with a backup server and backup proxy, Windows Server 2019 Standard VMs, yielded excellent results with the TrueNAS R-Series platform. iXsystems reference numbers can be seen below. These were achieved with just a single Veeam Backup Server and a Veeam Backup Proxy Server. For more demanding workloads, results can be scaled by adding more VMs to act as the Veeam Backup Proxy.

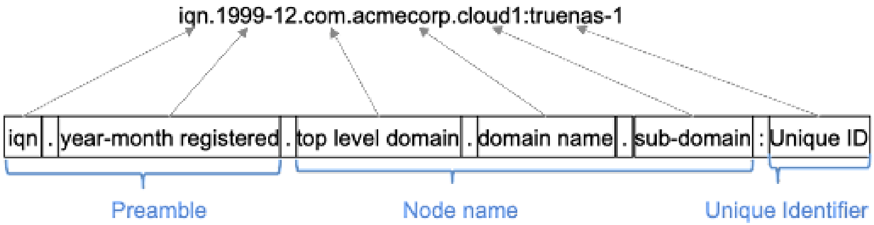
Test	Time Limit	TrueNAS Time
Full Backup	30:00 Minutes	27:41 Minutes
Full Restore	25:00 Minutes	16:48 Minutes
Synthetic Full Backup	50:00 Minutes	37:18 Minutes

12.2.7 - VMware

There are several configuration recommendations and troubleshooting tips when using TrueNAS with a VMware hypervisor.

⊙ IQN

iSCSI IQN is an acronym that stands for “iSCSI Qualified Name”. It is comprised of the following naming schema with a preamble, node name and unique identifier:



VMware requires using an IQN in their software iSCSI implementation.

○ Failover

A VMware datastore backed by iSCSI-based storage will consist of at least three distinct pieces: the storage host, the switching infrastructure, and the VMware host itself. In order to maximize service availability, each of these elements needs to be able to tolerate some level of failure without significantly disrupting iSCSI traffic.

TrueNAS systems support high-availability (HA) through dual-controllers running in active/standby mode. A properly-configured HA TrueNAS system can offer up to 5x 9’s of system availability. TrueNAS also fully supports asymmetric logical unit access (ALUA) on iSCSI to significantly reduce failover time.

Network switching infrastructure can be made redundant and fault-tolerant through a number of methods, but multipathing is recommended as the best practice for iSCSI networks.

VMware’s official documentation details several ways the virtualization host(s) can be made redundant, so that is not covered here.

○ Discovery, Authentication, and Access Control

For a VMware ESXi host to communicate with an iSCSI capable storage array, the iSCSI protocol must be configured to provide: Discovery, Authentication, and Access Control (DAAC).

Discovery

iSCSI offers two methods of target discovery: dynamic and static. Dynamic discovery lets the storage array respond automatically to the host initiator’s “SendTargets” request. Static discovery requires an administrator to manually add a list of the iSCSI targets to the initiator. Either method of discovery is fine, but dynamic discovery can make the iSCSI setup process easier.

Authentication

iSCSI authentication is handled via the Challenge Handshake Authentication Protocol, or CHAP. CHAP uses a shared secret between targets and initiators to let them validate each other’s authenticity. By default, no CHAP-based authentication is performed by the VMware iSCSI initiator. If you do decide to use

CHAP, authentication can either be unidirectional (where only the target authenticates the initiator) or bidirectional (where both the iSCSI initiator and the iSCSI target are required to authenticate to each other prior to transmitting iSCSI data).

VMware iSCSI initiators operating with unidirectional CHAP can be configured in two behavior modes. In "Required" mode, an iSCSI adapter will give precedence to non-CHAP connections, but if the iSCSI target requires it, the connection will use CHAP instead. Required mode is only supported by Software iSCSI and Dependent Hardware iSCSI adapters. Alternatively, initiators can run in "Prohibited" mode, where an iSCSI adapter will give precedence to CHAP connections, but if the iSCSI target does not support CHAP, the initiator can still connect.

Bidirectional CHAP (called "mutual CHAP" in TrueNAS) offers greater security by ensuring that both sides of the iSCSI connection authenticate against each other. Unidirectional CHAP does not let the iSCSI initiator authenticate the target, and running without CHAP obviously disables all authentication. For this reason, bidirectional CHAP is usually recommended but requires additional configuration and comes with greater administrative overhead when troubleshooting iSCSI connections.

Access Control

Access control policies are set up within a storage array to ensure only certain initiators can connect to the target (even if they possess the correct CHAP password). Access control can be performed using the initiator's name (IQN), its IP address, or its CHAP username.

VMware and TrueNAS iSCSI Setup

The setup of vCenter iSCSI to TrueNAS requires that ESXi hosts be set up as initiators and TrueNAS storage arrays are set up as targets. To configure ESXi hosts with vCenter, see the VMware vCenter 6.7 documentation.

To configure TrueNAS Enterprise storage arrays with vCenter, iXsystems has developed a vCenter plugin. The plugin uses TrueNAS REST APIs to automate LUN creation and assignment. When an VMFS (iSCSI) datastore is created using the plugin, the TrueNAS systems automatically activate their iSCSI system services.

Hosting VMware Storage with TrueNAS

When using TrueNAS as a VMware datastore:

- Make sure guest VMs have the latest version of `vmware-tools` installed. VMware provides instructions to install VMware Tools on different guest operating systems.
- Increase the VM disk timeouts to better survive long reboots or other delayed disk operations. Set the timeout to a minimum of *300 seconds*. VMware provides instructions for setting disk timeouts on some specific guest operating systems:
  - Windows guest operating system: https://docs.vmware.com/en/VMware-vSphere/6.7/com.vmware.vsphere.storage.doc/GUID-EA1E1AAD-7130-457F-8894-70A63BD0623A.html
  - Linux guests running kernel version 2.6: https://kb.vmware.com/s/article/1009465

  NOTE: Reboots or failovers will typically complete much faster than 300 seconds and Disk IO will resume automatically when finished.

VMware Snapshots on TrueNAS

When TrueNAS is used as a VMware datastore, you can coordinate creating and using ZFS and VMware snapshots. See VMware-Snapshots for details.

vStorage APIs for Array Integration (VAAI) for iSCSI

VMware's VAAI allows storage tasks such as large data moves to be offloaded from the virtualization hardware to the storage array. These operations are performed locally on the NAS without transferring bulk data over the network.

VAAI for iSCSI supports these operations:

⊙ **Atomic Test and Set (ATS)**
Allows multiple initiators to synchronize LUN access in a fine-grained manner rather than locking the whole LUN and preventing other hosts from accessing the same LUN simultaneously.

○ **Clone Blocks (XCOPY)**
Copies disk blocks on the NAS. Copies occur locally rather than over the network. This operation is similar to Microsoft ODX.

○ **LUN Reporting**
Allows a hypervisor to query the NAS to determine whether a LUN is using thin provisioning.

○ **Stun**
Pauses virtual machines when a pool runs out of space. The space issue can be fixed and the virtual machines continue instead of reporting write errors.

○ **Threshold Warning**
The system reports a warning when a configurable capacity is reached. In TrueNAS, this threshold is configured at the storage pool level when using zvols or at the extent level for both file and device based extents. Typically, the warning is set at the pool level, unless file extents are used, in which case it must be set at the extent level.

○ **Unmap**
Informs TrueNAS that the space occupied by deleted files should be freed. Without unmap, the NAS is unaware of freed space created when the initiator deletes files. For this feature to work, the initiator must support the `unmap` command.

○ **Zero Blocks or Write Same**
Zeros out disk regions. When allocating virtual machines with thick provisioning, the zero write is done locally, rather than over the network. This makes virtual machine creation and any other zeroing of disk regions much quicker.

12.2.7.1 - TrueNAS vCenter Plugin

vCenter Server provides a web interface to manage physical and virtual machines. vCenter uses plugins to integrate server management into the vCenter application. The iXsystems TrueNAS vCenter Plugin activates management options for TrueNAS hardware attached to vCenter Server. This enables some management of TrueNAS systems from a single interface.

> The current release version of the TrueNAS vCenter Plugin is **3.4.0**. This version is only compatible with VMware vCenter Server version **6.7.0**.

Getting and Deploying the Plugin

Currently, the plugin is only available to TrueNAS Enterprise customers. iXsystems Support staff are available to assist with deploying the TrueNAS vCenter Plugin. Please contact iXsystems Support to learn more and schedule a time to deploy the plugin.

Contacting iXsystems Support expand □

Customers who purchase iXystems hardware or that want additional support must have a support contract to use iXystems Support Services. The TrueNAS Community forums provides free support for users without an iXsystems Support contract.

Contact Method	Contact Options
Web	https://support.ixsystems.com
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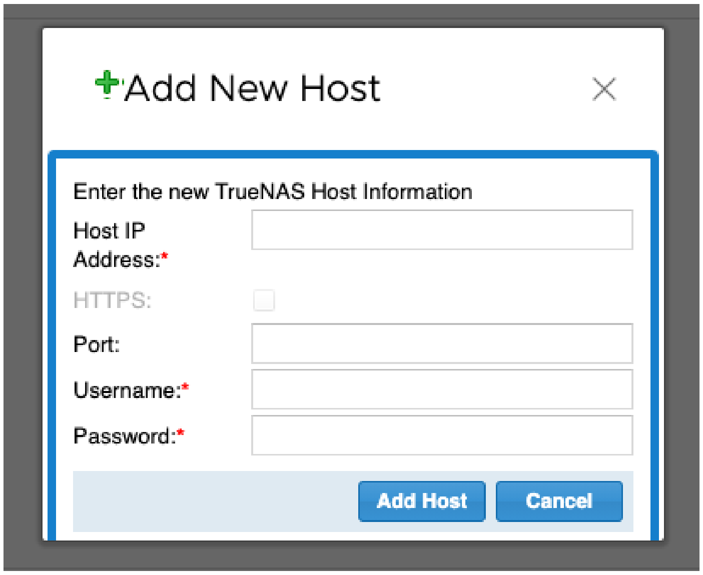
Telephone	Monday - Friday, 6:00AM to 6:00PM Pacific Standard Time: US-only toll-free: 1-855-473-7449 option 2 Local and international: 1-408-943-4100 option 2
Telephone	After Hours (24x7 Gold Level Support only): US-only toll-free: 1-855-499-5131 International: 1-408-878-3140 (international calling rates apply)

Using the Plugin

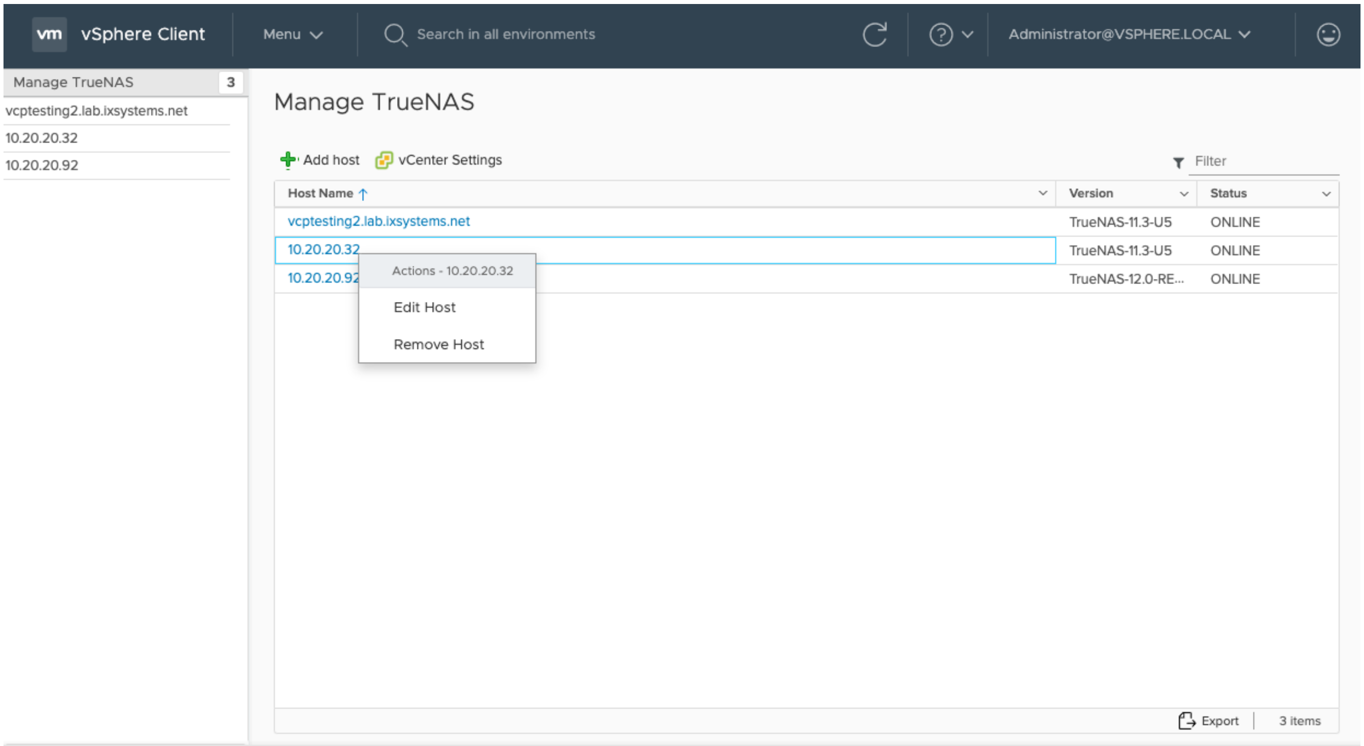
After being assisted with deploying the plugin, using the plugin follows a simple process of connecting TrueNAS hosts and configuring the various features to your use case. The interface suspends after several minutes of inactivity and displays a warning that the interface is suspended and must be refreshed.

Connecting TrueNAS Hosts

In a browser, go to your vCenter Server web interface, log in, and click **Menu > Global Inventory Lists > Manage TrueNAS > + Add host** to add TrueNAS hosts to vCenter.



Fill in the required information. A hostname or IP address can be used for the TrueNAS system. For High Availability systems, use the VIP address or hostname to ensure the plugin remains connected in the event of a system failover. Click *Add Host* and the TrueNAS hostname or IP address appears in the list of connected systems.



Host Name	Version	Status
vcptesting2.lab.ixsystems.net	TrueNAS-11.3-U5	ONLINE
10.20.20.32	TrueNAS-11.3-U5	ONLINE
10.20.20.92	TrueNAS-12.0-RE...	ONLINE

Right-click a list entry to see options to edit the host user credentials or remove that host from vCenter. Click a hostname to see the system management options. Clicking a system entry opens the management interface.

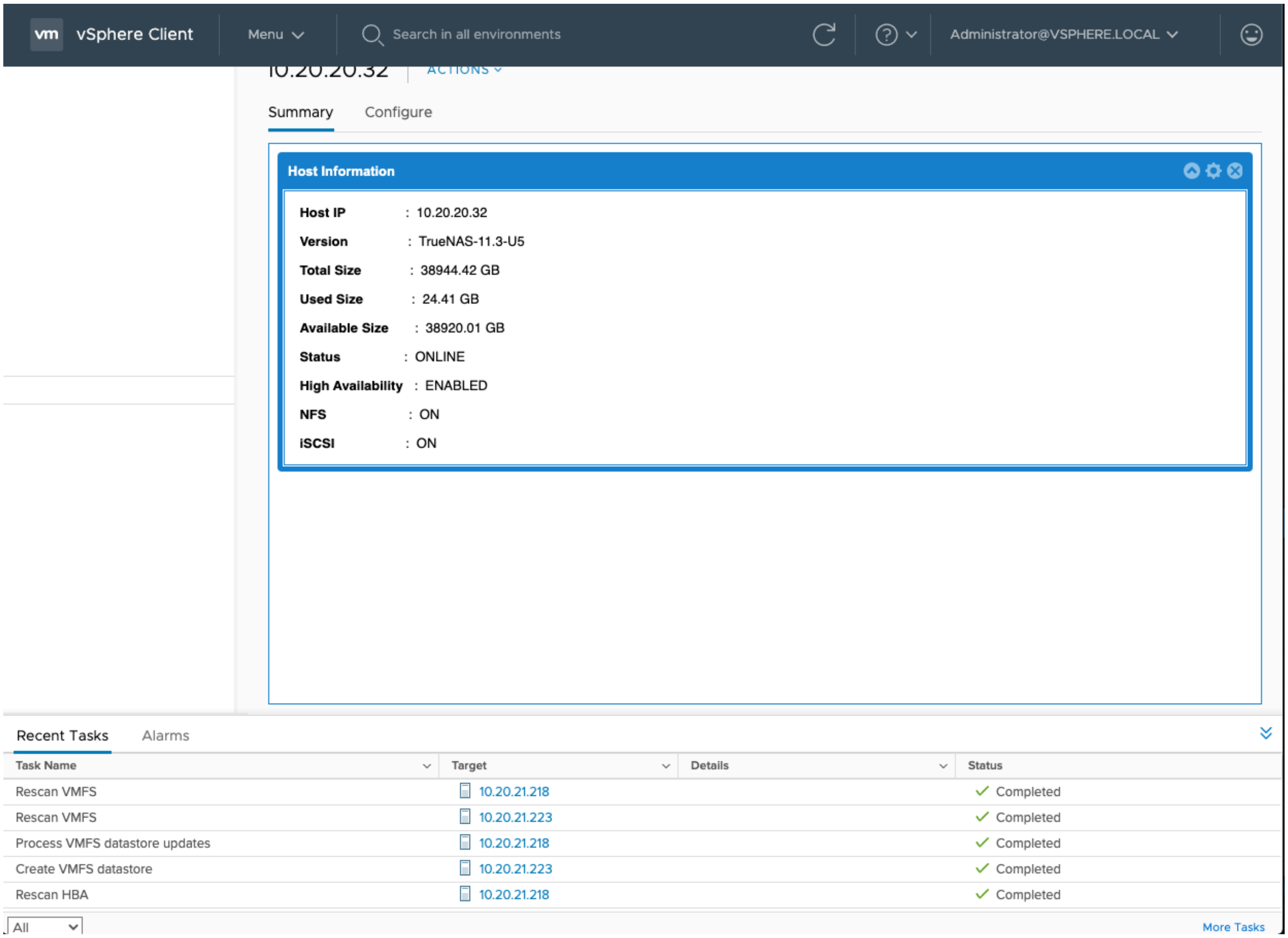
System Management

The system management screen shows a summary and options to modify the system.

To modify the TrueNAS system, click *Configure*. Each submenu has a row of buttons to add or make changes to any items in the list. vCenter works in the background when resolving change requests. *Refresh* updates the list to see any items that might have finished being created or modified. Tasks in progress display in the collapsible **Recent Tasks** area across the bottom of the screen. Naming objects in the plugin follow a standard convention. Names can contain spaces, alphanumeric, `-`, and `.` characters.

⊙ System Summary

Click *Summary* to view basic information about this system. The IP address, installed version of TrueNAS, storage availability, and system service status are shown.



Host IP : 10.20.20.32
Version : TrueNAS-11.3-U5
Total Size : 38944.42 GB
Used Size : 24.41 GB
Available Size : 38920.01 GB
Status : ONLINE
High Availability : ENABLED
NFS : ON
iSCSI : ON

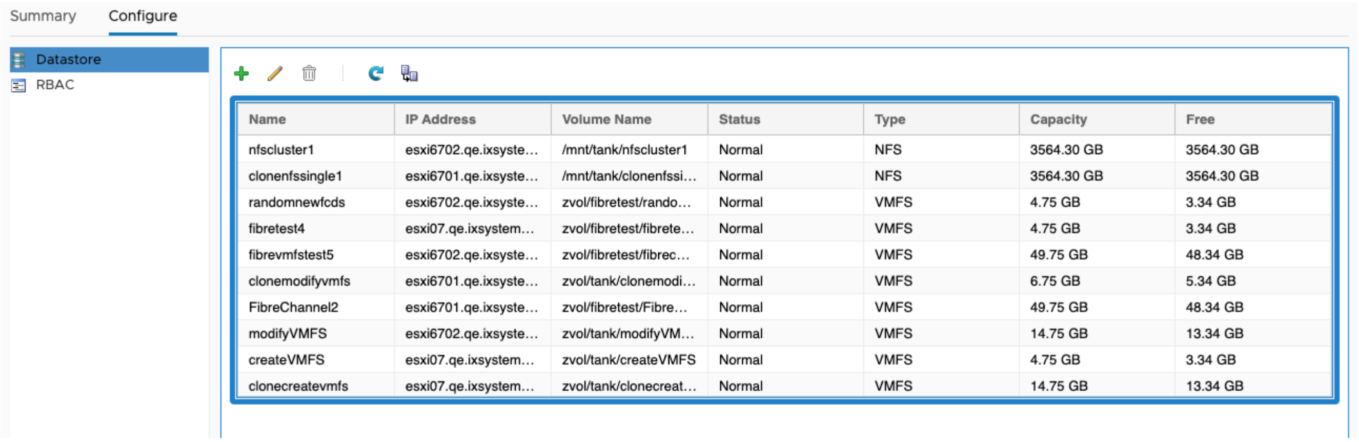
Task Name	Target	Details	Status
Rescan VMFS	10.20.21.218		✓ Completed
Rescan VMFS	10.20.21.223		✓ Completed
Process VMFS datastore updates	10.20.21.218		✓ Completed
Create VMFS datastore	10.20.21.223		✓ Completed
Rescan HBA	10.20.21.218		✓ Completed

○ Datastores

The vCenter plugin can create two different kinds of datastores on a TrueNAS host:

- Virtual Machine File System (VMFS) for iSCSI block-level access
- Network File System (NFS) for file-level access

List



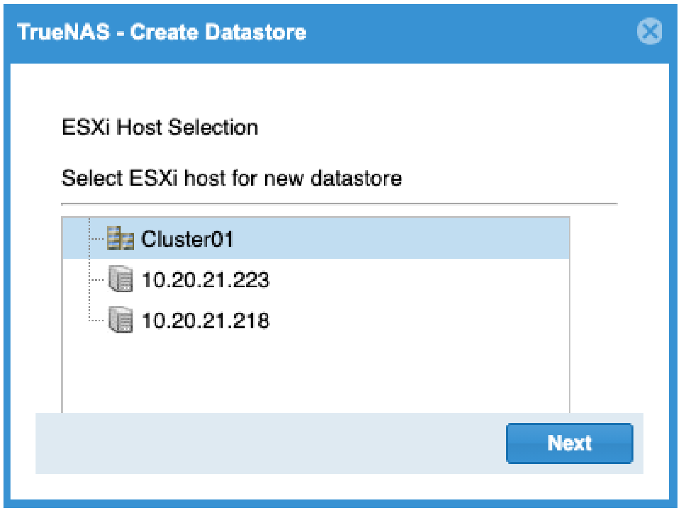
Name	IP Address	Volume Name	Status	Type	Capacity	Free
nfscluster1	esxi6702.qe.ixsyste…	/mnt/tank/nfscluster1	Normal	NFS	3564.30 GB	3564.30 GB
clonenfssingle1	esxi6701.qe.ixsyste…	/mnt/tank/clonenfssi…	Normal	NFS	3564.30 GB	3564.30 GB
randomnewfcds	esxi6702.qe.ixsyste…	zvol/fibretest/rando…	Normal	VMFS	4.75 GB	3.34 GB
fibretest4	esxi07.qe.ixsystem…	zvol/fibretest/fibrete…	Normal	VMFS	4.75 GB	3.34 GB
fibrevmfstest5	esxi6702.qe.ixsyste…	zvol/fibretest/fibrec…	Normal	VMFS	49.75 GB	48.34 GB
clonemodifyvmfs	esxi6701.qe.ixsyste…	zvol/tank/clonemodi…	Normal	VMFS	6.75 GB	5.34 GB
FibreChannel2	esxi6701.qe.ixsyste…	zvol/fibretest/Fibre…	Normal	VMFS	49.75 GB	48.34 GB
modifyVMFS	esxi6702.qe.ixsyste…	zvol/tank/modifyVM…	Normal	VMFS	14.75 GB	13.34 GB
createVMFS	esxi07.qe.ixsystem…	zvol/tank/createVMFS	Normal	VMFS	4.75 GB	3.34 GB
clonecreatevmfs	esxi07.qe.ixsystem…	zvol/tank/clonecreat…	Normal	VMFS	14.75 GB	13.34 GB

vCenter has a default limit of *eight NFS datastores per ESX host*. See this VMware article about maximum supported volumes for more details.

The list shows Datastores that have been created and are managed by the plugin. The list does not display other types of shares created and managed through the TrueNAS web interface.

Add Datastore

Click + (Add) to create a new datastore.

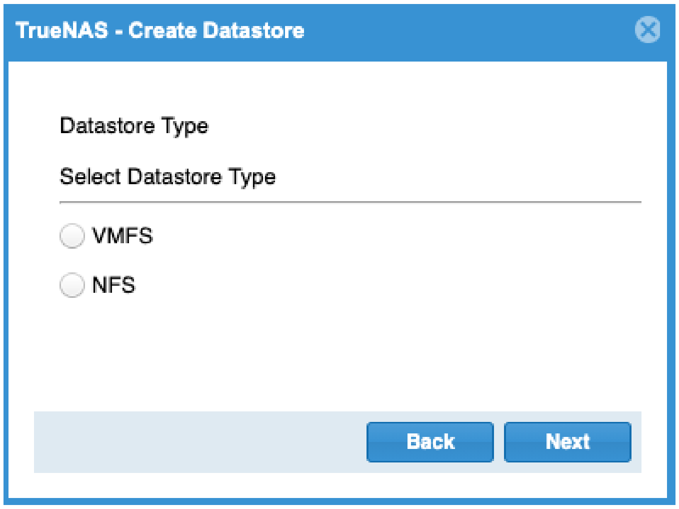


TrueNAS - Create Datastore

ESXi Host Selection

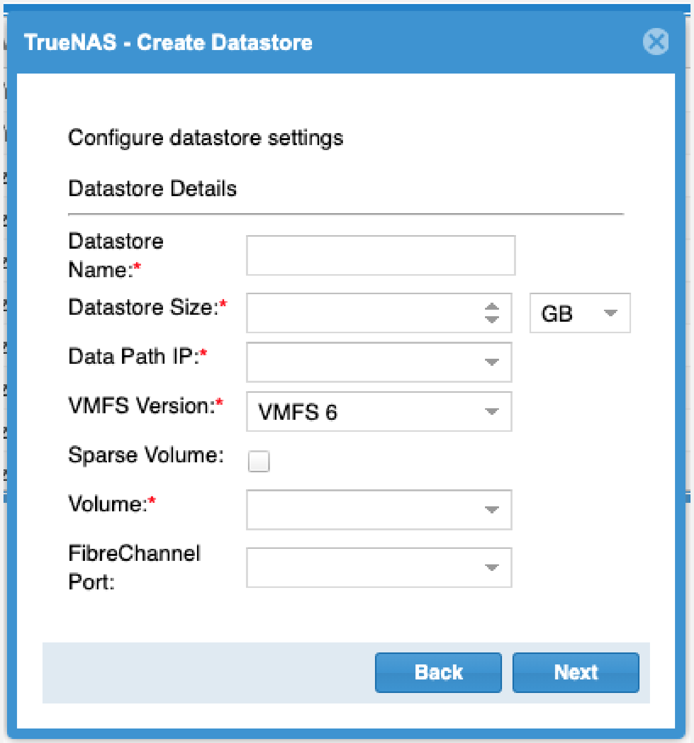
Select ESXi host for new datastore

Choose an ESXi host for the datastore or an ESXi cluster to spread the reserved space across multiple systems. Clusters can be used as long as a single member of the cluster supports the datastore features. Click *Next*.



Choose the datastore type. *VMFS* datastores provide block-level (iSCSI) storage for virtual machines. *NFS* datastores provide file-level storage access. Click **Next** to view specific options for each datastore type

VMFS Datastore Configuration expand ☐



Datastore Size:* GB

VMFS Version:* VMFS 6

Enter a name for the new datastore. Enter a value and choose a unit for the *Datastore Size*. The size must be smaller than the chosen *Volume*. The minimum size for a VMFS datastore is *2GB*.

The *Data Path IP* shows the TrueNAS system's IP address. Users can select other connected TrueNAS systems with the drop-down menu.

Select the datastore *VMFS Version* from the drop-down menu. Choose between the modern version *6* or the legacy versions *3* and *5*. See the VMware VMFS documentation for detailed comparisons.

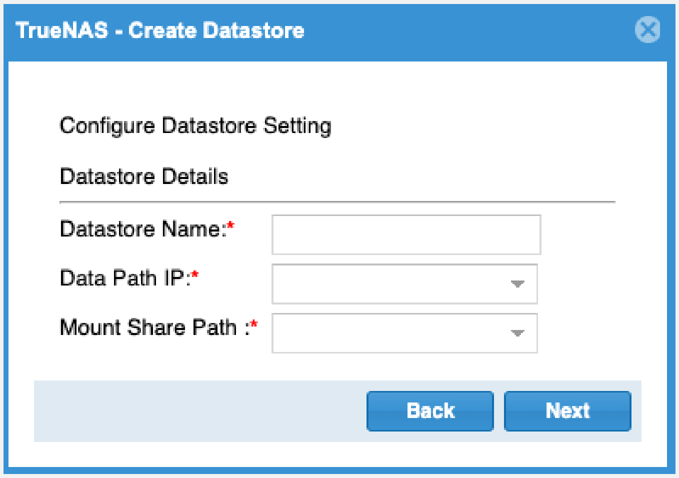
Enabling *Sparse Volume* reserves less than the total available size and metadata storage space, but it can cause writing to fail if the volume has little space remaining. See zfs(8) for more details.

Select the TrueNAS pool to hold the datastore. The *Volume* must be large enough to contain the chosen *Datastore Size*.

If you have a high availability NAS with a Fibre Channel license and a network configured to form a Fibre Channel fabric with the NAS and ESXi, you will also be able to select a *Fibre Channel port* for the datastore.

Selecting a *Fibre Channel port* enables that port with the datastore's target on the NAS and creates a datastore with a corresponding Fibre Channel HBA on the ESXi.

NFS Datastore Configuration expand □



TrueNAS - Create Datastore

Configure Datastore Setting

Datastore Details

Datastore Name:*

Data Path IP:*

Mount Share Path :*

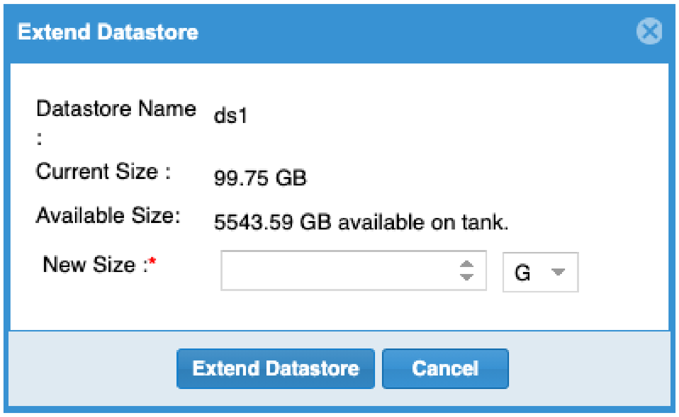
Enter a *Name* for the new datastore. The *Data Path IP* shows the TrueNAS system's IP address. Users can select other TrueNAS systems added to vCenter Server with the drop-down menu. Select the path to the TrueNAS NFS share from the *Mount Share Path* drop-down menu. Click *Next*.

Review Datastore Configuration

After configuring the VMFS or NFS datastore, vCenter will show a summary of the new datastore. To begin creating the datastore, review the settings and click *Finish*. The interface shows a warning when the datastore contains more than *80%* of the available space. Click *Refresh* to see the new datastore after creating it.

Extending a Datastore

Users needing additional space can increase the total size of a VMFS datastore. Highlight a VMFS datastore from the list and click *Edit* to extend it.



Extend Datastore

Datastore Name : ds1

Current Size : 99.75 GB

Available Size: 5543.59 GB available on tank.

New Size :* G

The new size must be larger than the current size and less than the total available capacity. For best performance, we recommend using less than *80%* of the total available size. Using decimal notation will round down the size to the nearest 1024 bytes (or whatever the volume's configured default block size is).

Click *Extend Datastore*. Datastores reserve some available space for internal use and set the available capacity to slightly less than the chosen amount.

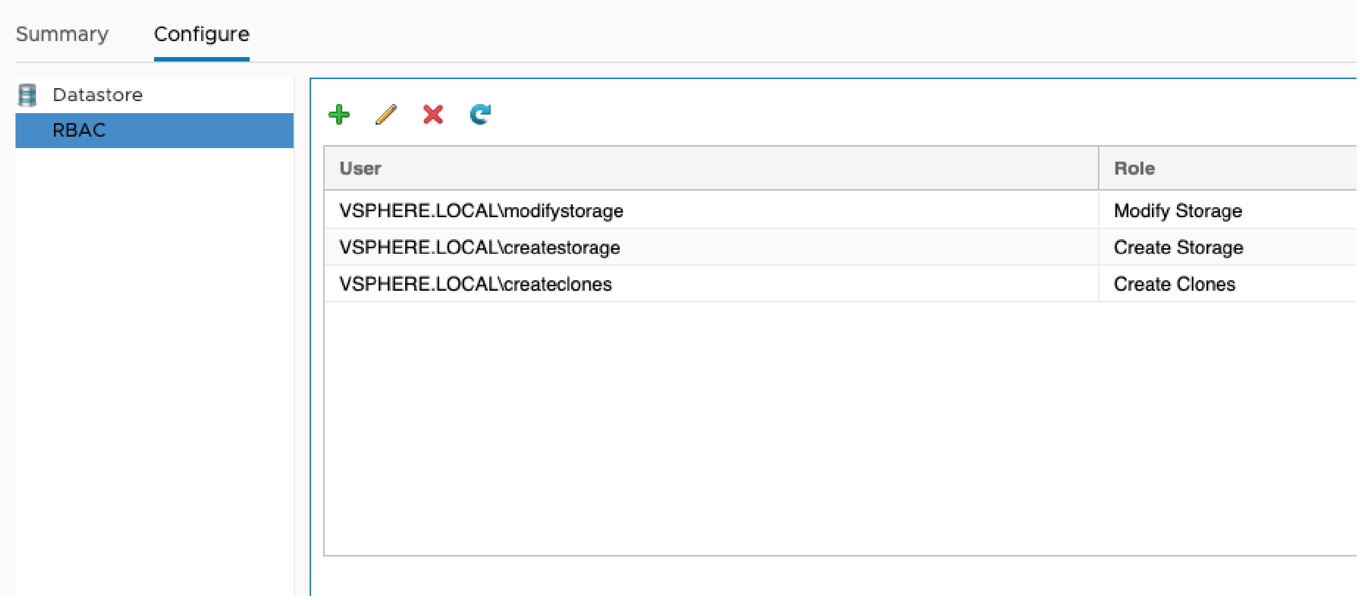
Cloning Datastores

Cloning an NFS or VMFS datastore duplicates that datastore. Select a datastore from the list and click *Clone*. Choose an ESXi host to store the new datastore and click *Next*. Enter a name for the clone and click *Clone Datastore*.

vCenter starts the cloning process and continues the task in the background. Click *Refresh* after some time to see the cloned datastore.

○ RBAC

An administrator can grant vCenter users specific role-based access to the TrueNAS systems managed by this plugin.



User	Role
VSPHERE.LOCAL\modifystorage	Modify Storage
VSPHERE.LOCAL\createstorage	Create Storage
VSPHERE.LOCAL\createclones	Create Clones

Role Name	User is allowed to:
Discover	Add TrueNAS systems to vCenter
Create Clones	Copy existing datastores
Create Storage	Create new datastores
Modify Storage	Edit existing datastores
Destroy Storage	Delete datastores

Each role gives the user the ability to perform the functions in that role and all of the roles that precede it in the list. For example, a user with a *Create Storage* role can create a new datastore and clone existing datastores. The vCenter administrator account always has all permissions.

> New vCenter users must be created in **Menu > Administration > Single Sign On > Users and Groups**.

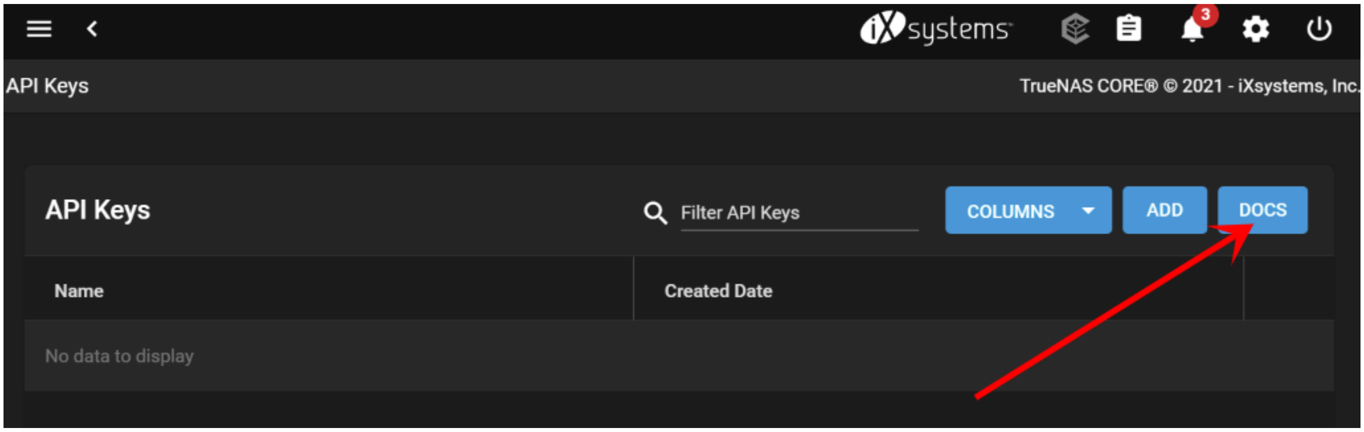
Add a Role to an Existing vCenter User

Click + to open the **Add Role Based Access Control** window. Type a user name in the form `DOMAIN.NAME\username`, where `DOMAIN.NAME` is the user Domain found in the **vCenter Menu > Administration > Single Sign On > Users and Groups** page. Open the *Assign Role* drop-down menu and choose a role for the user. Click *Add* to add the role.

If the entry does not appear in the list immediately, click *Refresh*.

13 - API

TrueNAS CORE API documentation is available from the web interface by clicking settings **> API Keys > DOCS**.



Alternately, append `/api/docs/` to your TrueNAS hostname or IP address in a browser to go directly to the API documentation.

For convenience, static builds of the current 2.0 API documentation stored on the Docs Hub:

- Websocket Protocol
- RESTful

14 - User Agreements

14.1 - TrueNAS CORE EULA

TrueNAS CORE End User License Agreement

Important - Please Read This EULA Carefully

PLEASE CAREFULLY READ THIS END USER LICENSE AGREEMENT (EULA) BEFORE CLICKING THE AGREE BUTTON. THIS AGREEMENT SERVES AS A LEGALLY BINDING DOCUMENT BETWEEN YOU AND IXSYSTEMS, INC. BY CLICKING THE AGREE BUTTON, DOWNLOADING, INSTALLING, OR OTHERWISE USING TRUENAS CORE SOFTWARE, YOU AGREE TO BE BOUND BY THE TERMS AND CONDITIONS OF THIS AGREEMENT). IF YOU DO NOT AGREE TO THE TERMS AND CONDITIONS IN THIS AGREEMENT, DO NOT USE OR INSTALL TRUENAS CORE SOFTWARE.

This agreement is provided in accordance with the Commercial Arbitration Rules of the American Arbitration Association (the “AAA Rules”) under confidential binding arbitration held in Santa Clara County, California. To the fullest extent permitted by applicable law, no arbitration under this EULA will be joined to an arbitration involving any other party subject to this EULA, whether through class arbitration proceedings or otherwise. Any litigation relating to this EULA shall be subject to the jurisdiction of the Federal Courts of the Northern District of California and the state courts of the State of California, with venue lying in Santa Clara County, California. All matters arising out of or relating to this agreement shall be governed by and construed in accordance with the internal laws of the State of California without giving effect to any choice or conflict of law provision or rule.

1.0 Definitions

1.1 “Company”, “iXsystems” and “iX” means iXsystems, Inc., on behalf of themselves, subsidiaries, and affiliates under common control.

1.2 “TrueNAS CORE Software” means the TrueNAS CORE storage management software.

1.3 “TrueNAS Device” means the TrueNAS storage appliances and peripheral equipment provided by iXsystems or a third party.

1.4 “Product” means, individually and collectively, the TrueNAS CORE Software and the TrueNAS Device provided by iXsystems.

1.5 “Open Source Software” means various open source software components licensed under the terms of applicable open source license agreements, each of which has its own copyright and its own applicable license terms.

1.6 “Licensee”, “You” and “Your” refers to the person, organization, or entity that has agreed to be bound by this EULA including any employees, affiliates, and third party contractors that provide services to You.

1.7 “Agreement” refers to this document, the TrueNAS End User License Agreement.

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1.7 “Agreement” refers to this document, the TrueNAS End User License Agreement.

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4.0 General

4.1 Entire Agreement - This Agreement, together with any associated purchase order, service level agreement, and all other documents and policies referenced herein, constitutes the entire and only agreement between You and iXsystems for use of the TrueNAS Software and all other prior negotiations, representations, agreements, and understandings are superseded hereby. No agreements altering or supplementing the terms hereof may be made except by means of a written document signed by Your duly authorized representatives and those of iXsystems.

4.2 Waiver and Modification - No failure of either party to exercise or enforce any of its rights under this EULA will act as a waiver of those rights. This EULA may only be modified, or any rights under it waived, by a written document executed by the party against which it is asserted.

4.3 Severability - If any provision of this EULA is found illegal or unenforceable, it will be enforced to the maximum extent permissible, and the legality and enforceability of the other provisions of this EULA will not be affected.

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4.8 Maintenance and Support - You may be entitled to support services from iXsystems after purchasing a TrueNAS Device or a support contract. iXsystems will provide these support services based on the length of time of the purchased support contract. This maintenance and support is only valid for the length of time that You have purchased with Your TrueNAS Device. iXsystems may from time to time and at their sole discretion vary the terms and conditions of the maintenance and support agreement based on different business environmental and personnel factors. Any variations will be notified via email and the support portal. For more information on our Maintenance and Support contract, refer to https://www.ixsystems.com/support/.

4.9 Force Majeure - iXsystems will not be deemed to be in default of any of the provisions of this Agreement or be liable for any delay or failure in performance due to Force Majeure, which shall include without limitation acts of God, earthquake, weather conditions, labor disputes, changes in law, regulation or government policy, riots, war, fire, epidemics, acts or omissions of vendors or suppliers, equipment failures, transportation difficulties, malicious or criminal acts of third parties, or other occurrences which are beyond iXsystems' reasonable control.

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TrueNAS Software will not collect sensitive User information including email addresses, names of systems, pools, datasets, folders, files, credentials.

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15 - Notices

15.1 - TrueNAS Data Collection Statement

TrueNAS collects non-sensitive system data and relays the data to a collector managed by iXsystems. This system data collection is enabled by default and can be disabled in the web interface under **System > General > Usage collection**. When disabled, no information about system configuration and usage is collected. The system capacity and software version is still collected.

The protocol for system data collection uses the same TCP ports as HTTPS (*443*) and passes through most firewalls as an outgoing web connection. If a firewall blocks the data collection or the data collection is disabled, there is no adverse impact to the TrueNAS system.

Non-sensitive system data is used to identify the quality and operational trends in the fleet of TrueNAS systems used by the entire community. The collected data helps iXsystems identify issues, plan for new features, and determine where to invest resources for future software enhancements.

The non-sensitive system data collected is clearly differentiated from sensitive user data that is explicitly not collected by TrueNAS. This table describes the differences:

Data Type	Sensitive User Data (NOT COLLECTED)	Non-Sensitive System Data (Optionally Collected)
Description	Any data that includes user identity or business information	Data that only includes information about the TrueNAS system and its operation
Frequency	NEVER	Daily
Examples	Usernames, passwords, email addresses	Anonymous hardware inventory, faults, statistics, Pool configuration
	User-created System and dataset names	Software versions, firmware versions
	Directory, files names, user data	Services and features enabled, Usage and Performance statistics

15.2 - Software Development Life Cycle

-
    - SDLC Application
    - TrueNAS Quality Lifecycle

The TrueNAS (and FreeNAS) Software Development Life Cycle (SDLC) is the process of planning, creating, testing, deploying, and maintaining TrueNAS releases.

There are five stages to the TrueNAS SDLC: requirement analysis, design and development, testing and evaluation, documentation, and maintenance.

⊙ **Requirement Analysis**
Determine the objectives, nature, and scope of future versions of the software. Requirement Analysis involves gathering feedback and interpreting customer needs and requirements, diagnosing existing problems, and weighing the pros and cons of potential solutions. The end result is a list of recommended improvements to be integrated into future versions of TrueNAS.
○ **Design and Development**
Required and planned changes are investigated in detail and development steps are determined. Proposed alterations are reviewed by peers for completeness, correctness, and proper coding style. TrueNAS developers then begin altering the software to include new features, resolve software bugs, or implement security improvements.
○ **Testing and Evaluation**
Code is integrated into the existing TrueNAS source tree, then built and tested by the Release Engineering (RE) department. RE verifies that all requirements and objectives are properly met and the updated software is reliable and fault-tolerant according to the determined requirements. If issues are found, code is reworked to meet the development requirements. Simultaneously, a security evaluation of the TrueNAS code is completed, with any discovered issues sent to the engineering team for resolution.
○ **Documentation**
The Validation and Documentation Team audits all development changes to the software and resolves any inconsistencies with the current software documentation. This is to verify that end user documentation is as accurate as possible. Any security notices, errata, or best practices are also drafted for inclusion on the TrueNAS Security website.
○ **Maintenance**
The new release of TrueNAS is evaluated to determine further feature development, bug fixes, or security vulnerability patches. During this stage, security patches and software erratum are corrected, updated versions of existing branches are pushed, and feedback is solicited for future versions of the software.

SDLC Application

The TrueNAS SDLC applies to the latest two release branches. As new releases are created for TrueNAS, the oldest TrueNAS release branch is dropped out of the SDLC and labeled as End of Life (EoL). For example, TrueNAS/FreeNAS 11.3 and TrueNAS 12.0 were in active development under the SDLC in August 2020. In early 2021, TrueNAS Core/Enterprise 12.0 and 12.1 branches were in active development under the SDLC. These versions of the software are in active development and maintenance. We encourage users to actively keep their software updated to an active development version to continue to receive security patches and other software improvements.

TrueNAS Quality Lifecycle

TrueNAS releases follow a general adoption guideline for their lifetime. Starting with the NIGHTLY builds, each stage of a major release incorporates more testing cycles and bug fixes that represent a maturation of the release. With each version release stage, users are encouraged to install, upgrade, or otherwise begin using the major version, depending on the specific TrueNAS deployment and use case:

Release Stage	Completed QA Cycles	Typical Use-case	Description

NIGHTLY	0	Developers	Incomplete
ALPHA	1	Testers	Not much field testing
BETA	2	Enthusiasts	Major Feature Complete, but expect some bugs
RC	3	Home Users	Suitable for non-critical deployments
RELEASE	4	General Use	Suitable for less complex deployments
U1	5	Business Use	Suitable for more complex deployments
U2+	6+	Mission Critical	Suitable for critical uptime deployments

15.3 - SMB1 Security Advisory

Do not use SBM1

SMB1, also known as SMBv1, is an early version of the Windows SMB file-sharing protocol. Microsoft has deprecated the SMB1 protocol for security reasons and strongly recommends removing SMB1. SMB1 is disabled by default in FreeNAS and TrueNAS. Current SMB networking clients use later versions of the SMB protocol.

Microsoft maintains a list of older products that still require SMB1.

Windows Explorer (File Explorer) does not need SMB1, or a separate protocol called NetBIOS (sometimes called “NetBIOS over TCP/IP”), to discover and list SMB shares from a TrueNAS server. All modern versions of Windows use a newer protocol called WS-Discovery, which is more reliable and faster. TrueNAS automatically enables WS-Discovery to allow discovery of SMB shares by client devices.

Do not enable SMB1 on FreeNAS or TrueNAS without understanding the security implications and taking measures to protect the network from those risks. Contact the vendor of older products for upgrades to support newer, more secure versions of SMB, or replace older products with ones that do not require the security risks of SMB1.

Do not enable SMB1 unless it is absolutely required for essential equipment that cannot be upgraded or replaced, the security implications are understood, and steps have been taken to protect the network from those security risks.

16 - Core Security Reports

See the TrueNAS Security Hub to get the latest information that you need to maintain the security, integrity, and availability of your data.

17 - User Recommendations

Because TrueNAS is both Open Source and complicated, the massive user community often creates recommendations for specific hardware or environments. User-created recommendations can be added in this location, but be aware these are provided “as-is” and are not officially supported by iXsystems, Inc.

17.1 - /etc/hosts IP Persistence

Description

Domain Name resolution, the process of mapping host or domain names, such as `mytruenas` or `truenas1.mycompany.com`, to their associated IP addresses can be achieved through a variety of methods. The quickest method is to read entries in the hosts file, which is a local text file containing a list of IP addresses mapped to domain/host names. Every operating system (OS) that communicates through the TCP/IP protocol has a hosts file.

The hosts file can be used to speed up name resolution if a DNS server is not available on the local network. A DNS server runs networking software that allows it to join the Domain Name System, which is the standard service used on the Internet for name resolution. When adding entries to the hosts file of a TrueNAS system, use the TrueNAS web interface to save the entries directly to the configuration database. Do *not* edit the hosts file directly, as it will be overwritten by the configuration database during reboot.

Errors

I’m trying to use NFS, SSH, and FTP, but I keep receiving “reverse DNS” or timeout errors.
expand □

The fastest domain name resolution method is for the operating system to read the hosts file, but if there are no matching entries in the hosts file, a DNS server is queried instead. This is a slower process as the OS has to find the DNS server, send it a query, and wait for an answer. Timeout errors are common for some network protocols, such as SSH, FTP and NFS, as their connection requests can time out before a DNS server replies. To speed up name resolution, add entries for commonly used hosts to the hosts file.

Fix

To add an entry to the hosts file, log in to the TrueNAS web interface using a browser, and follow these steps:

1. Go to **Network > Global Configuration**.
2. Scroll down to the *Host name database* field and add an entry for the TrueNAS system in the format *IP_address space hostname*.
3. Click *Save*.

17.2 - Legacy Engine (11.3) Replication

This article only applies to FreeNAS or TrueNAS version 11.3. The “Legacy” replication option in this version provides compatibility with the replication engine used in FreeNAS/TrueNAS 11.2 and earlier.

Creating a legacy replication requires creating an SSH connection to the remote system and snapshots generated by a periodic snapshot task.

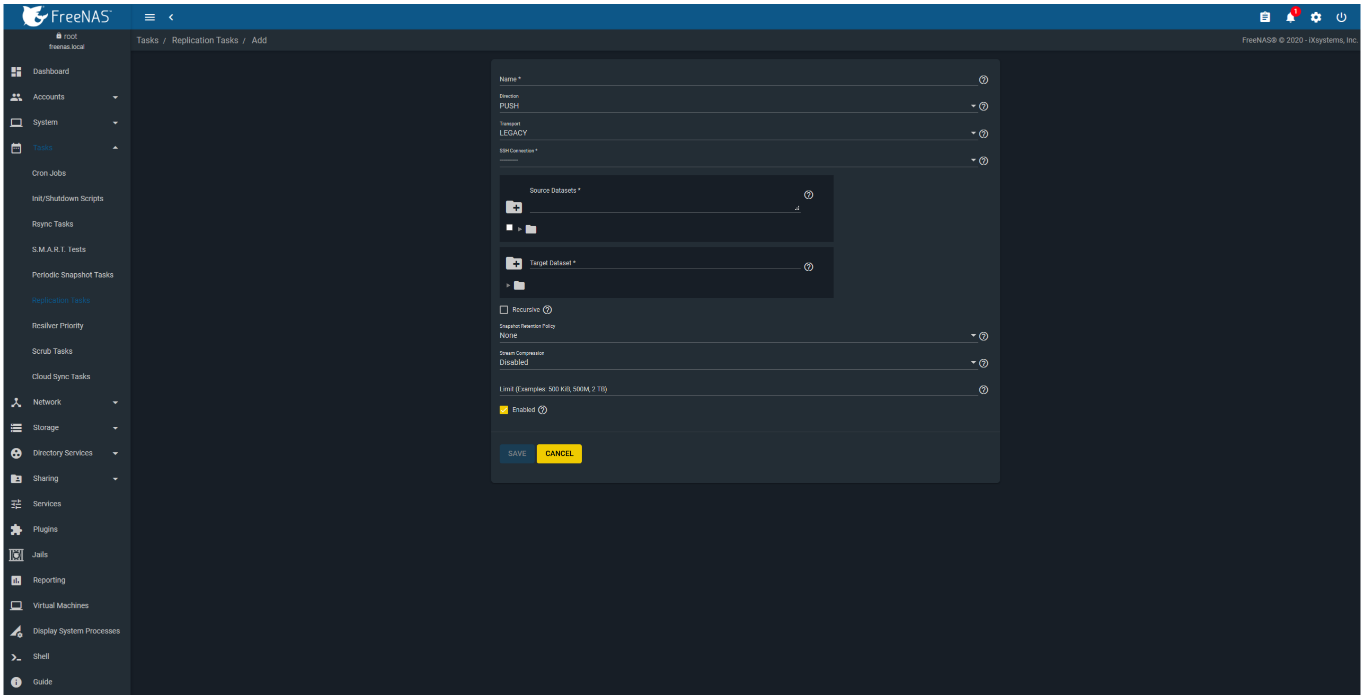
Process Summary

- Create SSH connection to remote system in **System > SSH Connections**
- Create a periodic snapshot task of the source datasets in **Tasks > Periodic Snapshot Tasks**
- Go to **Tasks > Replication Tasks** and open the advanced creation screen.
  - Set **Transport** to **LEGACY**
  - Select SSH connection to remote system
  - Choose source datasets related to the periodic snapshot task
  - Set a target location on the remote system

Creating a Legacy Engine Replication

Go to **Tasks > Replication Tasks** and click *ADD*. Select *Advanced Replication*.

Set the replication *Transport* method to *LEGACY* to reorganize the screen for only the relevant options.



Name *

Direction
PUSH

Transport
LEGACY

SSH Connection *

Source Datasets *

Target Dataset *

□ Recursive

Snapshot Retention Policy
None

Stream Compression
Disabled

Limit (Examples: 500 KiB, 500M, 2 TB)

☑ Enabled

Choose the SSH connection to a remote system that stores replicated snapshots.

Select the source datasets on the local system using the file browser or manually enter the dataset paths into the field. To also replicate snapshots of child datasets, set *Recursive*.

To choose the replication target, open the file browser and select the dataset to store snapshots. Entering a path to a new dataset creates that target dataset in the defined file path.

The remaining options allow defining how long to keep replicated snapshots, compressing data before replication, and setting a bandwidth limit on the transfer.

17.3 - Configuring a 3rd Party VPN service on TrueNAS

TrueNAS includes the ability to run OpenVPN. This is a short tutorial to configure the OpenVPN client on TrueNAS 12.0.

> Many VPN services are provided by 3rd parties that are unaffiliated with iXsystems. Please verify compatibility and pricing with your provider before integrating with TrueNAS.

Prerequisite: An OpenVPN server running with a similar configuration to these configuration file settings:

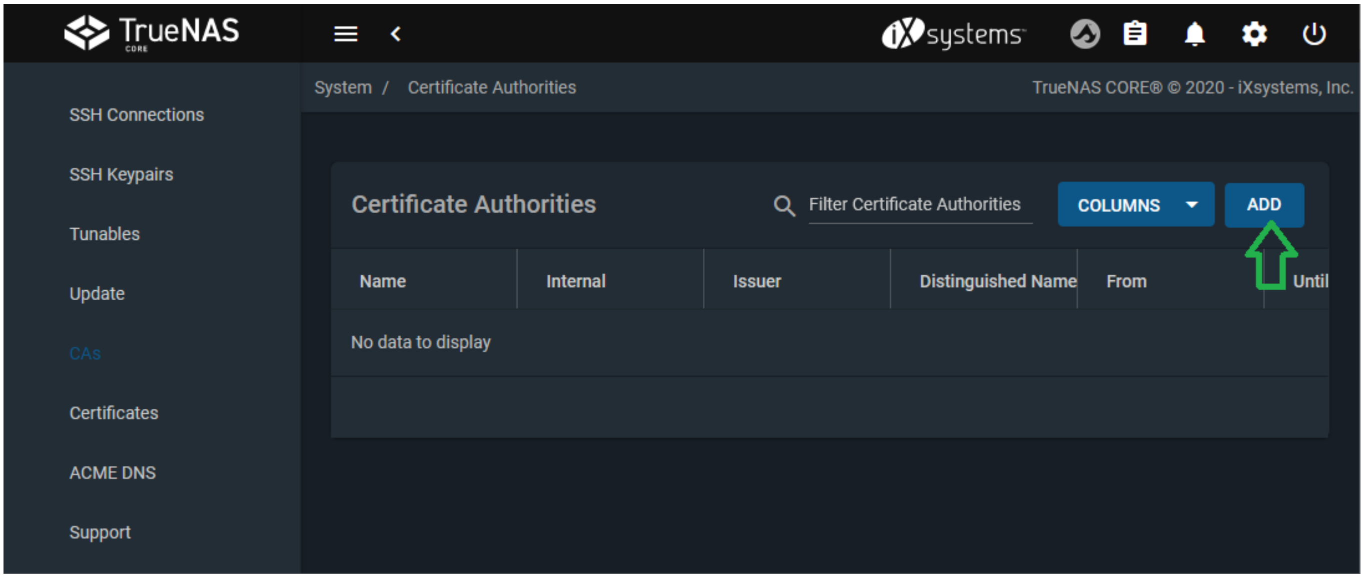
Example OpenVPN Configuration File expand □

```
dev tun
persist-tun
persist-key
cipher AES-128-CBC
auth SHA512
tls-client
client
resolv-retry infinite
remote vpn.domain.org 1194 udp
lport 0
verify-x509-name "vpn.domain.org " name
auth-user-pass
remote-cert-tls server
comp-lzo adaptive

<ca>
-----BEGIN CERTIFICATE-----
MIIFgNGGD2bjNiJRSeJfugreDJkqhgh57w0BER8GFADBrMtMwEQYJYRRDEwuPcGVu
UW+LBmf6rq+7zqi4UH+f+zB566FOpEwwSjEGA1UETMBEAxMKT3BlblZQTi1DQTEL
...
9Iw5MNx9phXRlZjwMX0L3pteGKNUNJlmgQZSjI1ZNw7K3CZsIB47QFwalqkGFqGr
L0nObyspUxbcdqZVO/vbo3hFjNqVPjqkO4bP94G7D6w+W0ZHF6TXPmScvo2c9XVs
qnpyhawELAHtDy3keG1Hf/A+D6nTGMUb5+7E9Lw9WS+M1B6jrE
-----END CERTIFICATE-----
</ca>
<cert>
-----BEGIN CERTIFICATE-----
MIIGGTCCBAGgIBgAwIBABqhkiG9TANBgkw0BABKJZMQsFADwEQYDIEAZEwcGpPVy
iSFcYvI0l24r3zcIF836KryNpb1FKFaYzFszG3bCVSIp9LwVDrz1irMahq/W43Zb
...
D3kash6QiMfbVoxts2TEGMw18tz3ptf5R9QuGAILlfdZbVC9i0hj2wZvIMXZ+MDu
zwjY8zVQnfyxT9gc2rYwZTx057ldXZRqds7H2znKzIDZC9iu+UrQzCmq+s/YXUjy
KyLQVgOUIT6n2vyGuikiOvUczf1S8E8MBZtrvhM=
-----END CERTIFICATE-----
</cert>
<key>
-----BEGIN PRIVATE KEY-----
MIIJQgkqhkiG9IBADANBgw0BAASCQEFACSwgkoAwggEAAQCAoIC71VfhS9wOaSNJ
DCBpBfPtUc6iMzeezb0Dld1TGNmbujIAqOdmcnikE87lnQXA+w1ZIwKouFx2b7zr
...
6IEehZNciHpOU8zGE1RSNH1mqQKT6t0pK7hjGhlbZRsHmE8tGy7aBQi9z38pkunR
M7Dird0Be9Ua6r90+lDczcggzwzHTZ==
-----END PRIVATE KEY-----
</key>
key-direction 1
<tls-auth>
#
# 2048 bit OpenVPN static key
#
-----BEGIN OpenVPN Static key V1-----
31201c2093539a034a3549b8f109f7a0
...
c0224e25d9ed3d2b562e94bed507fcac
-----END OpenVPN Static key V1-----
</tls-auth>
```

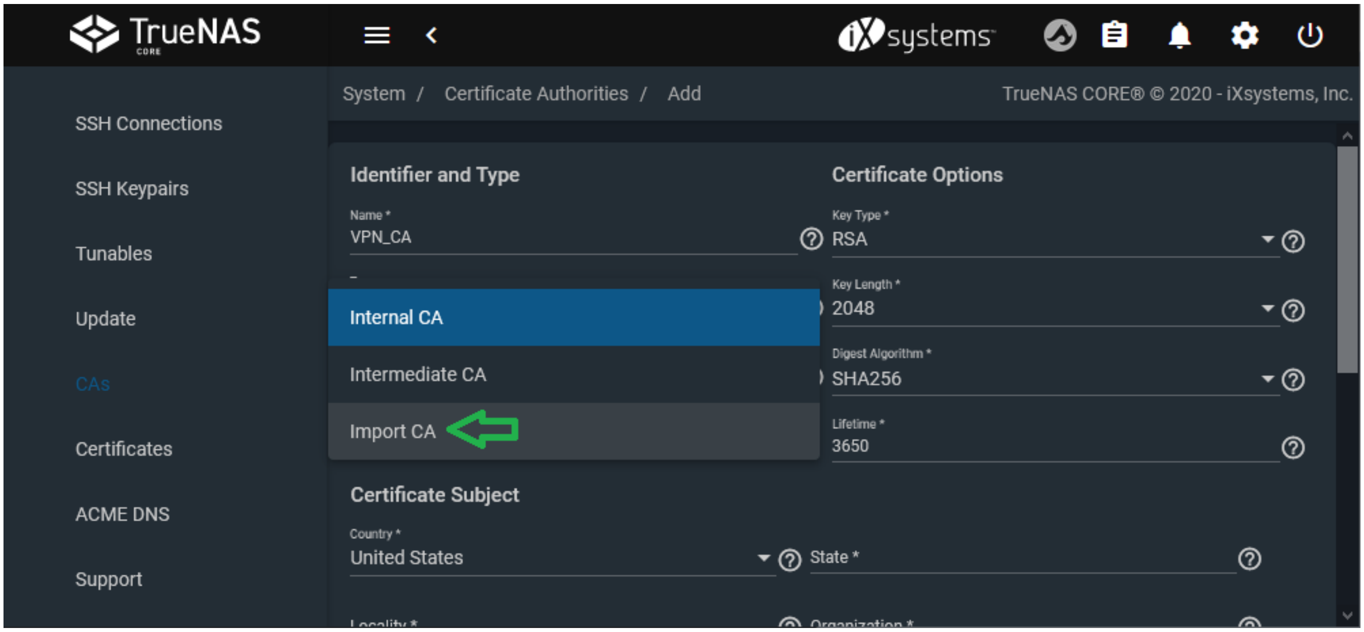
Installing the CA

Open **System > CA**.

Add a new certificate.



Give it a name (here VPN_CA) and select “Import CA” as type.



Identifier and Type

Name * VPN_CA

Certificate Options

Key Type * RSA

Key Length * 2048

Digest Algorithm * SHA256

Lifetime * 3650

Certificate Subject

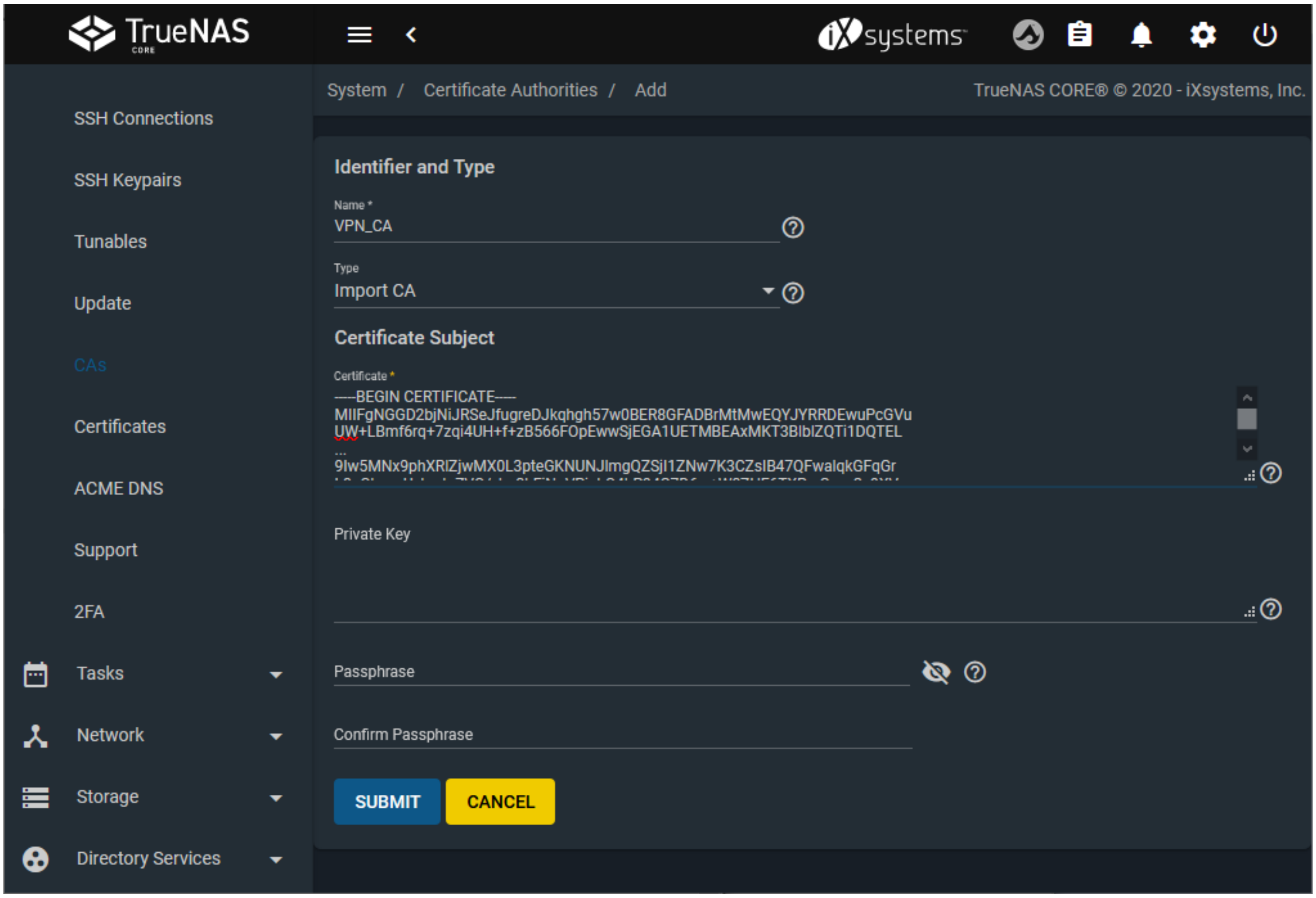
Country * United States

State *

Locality *

Organization *

Copy/paste the certificate from the configuration file. The certificate can be found between the tags `<ca>` and `</ca>` of the OpenVPN config file.



Identifier and Type

Name * VPN_CA

Type Import CA

Certificate Subject

Certificate *

```
-----BEGIN CERTIFICATE-----
MIIFgNGGD2bjNiJRSeJfugreDJkqhgh57w0BER8GFADBrMtMwEQYJYRRDEwuPcGVu
UW+LBmf6rq+7zqi4UH+f+zB566FOpEwwSjEGA1UETMBEAxMKT3BlblZQTi1DQTEL
...
9Iw5MNx9phXRlZjwMX0L3pteGKNUNJlmgQZSjI1ZNw7K3CZsIB47QFwalqkGFqGr
```

Private Key

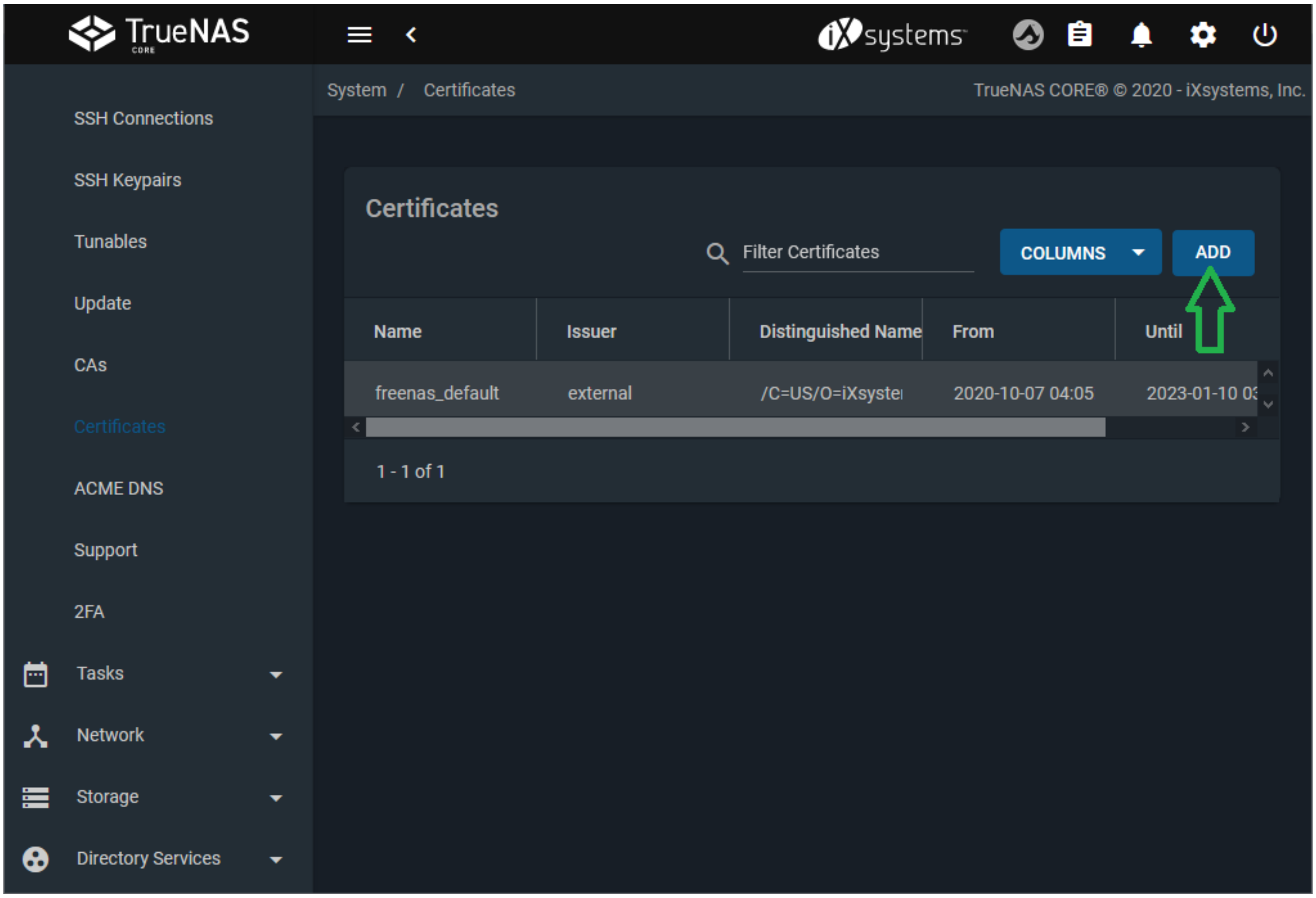
Passphrase

Confirm Passphrase

Installing the Certificate

Open **System > Certificate**.

Add a certificate.

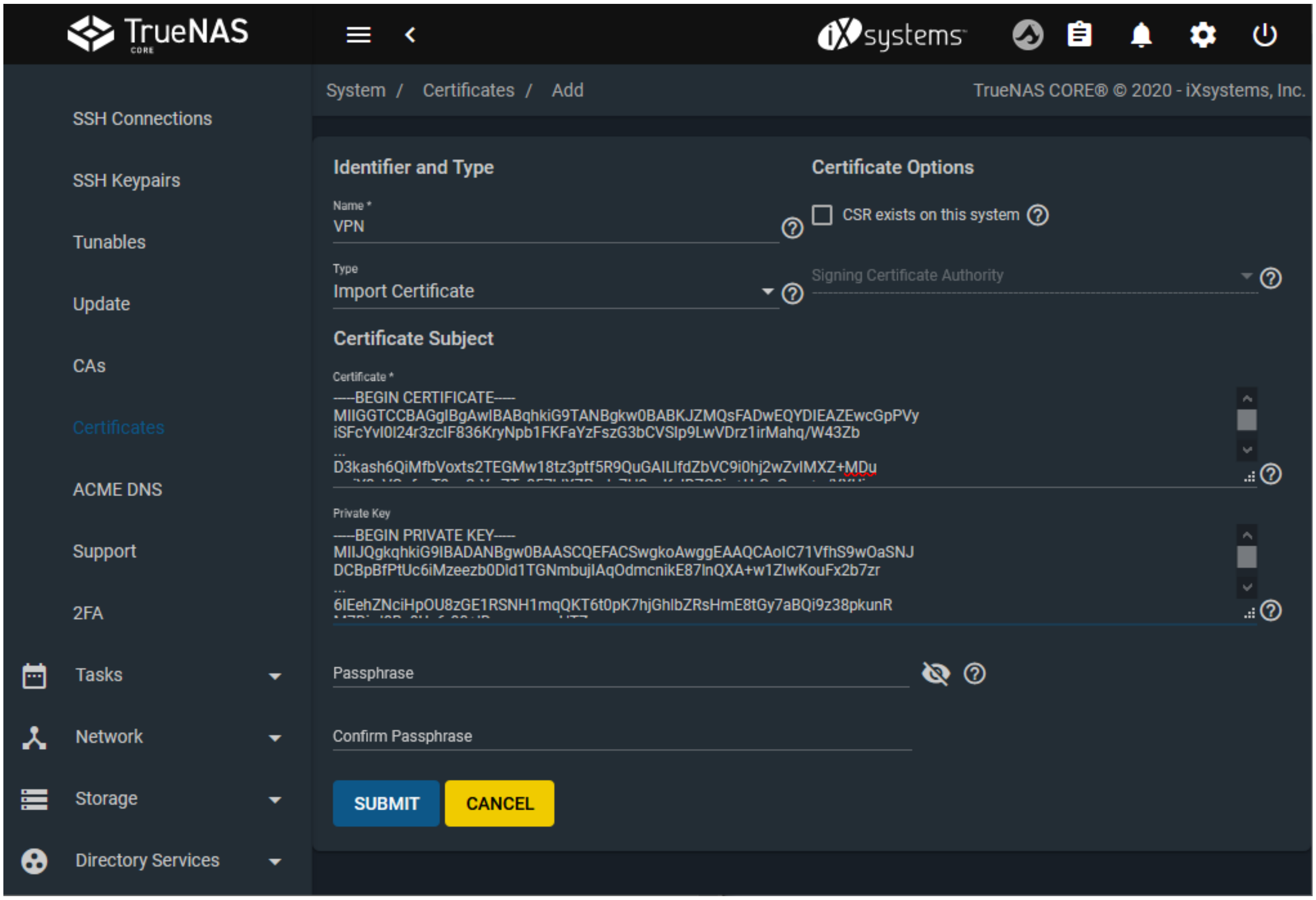


Certificates

Name	Issuer	Distinguished Name	From	Until
freenas_default	external	/C=US/O=iXsyste	2020-10-07 04:05	2023-01-10 0

1 - 1 of 1

Give it a name (here VPN) and select “Import Certificate” as type. Copy and paste the certificate, it can be found in the OpenVPN config file between the tags `<cert>` and `</cert>`. Copy and paste the key between the tags `<key>` and `</key>` from the configuration file.



Identifier and Type

Name * VPN

Type Import Certificate

Certificate Options

□ CSR exists on this system

Signing Certificate Authority

Certificate Subject

Certificate *

```
-----BEGIN CERTIFICATE-----
MIIGGTCCBAGgIBgAwIBABqhkiG9TANBgkw0BABKJZMQsFADwEQYDIEAZEwcGpPVy
iSFcYvl0I24r3zcIF836KryNpb1FKFaYzFszG3bCVSlp9LwVDrz1irMahq/W43Zb
...
D3kash6QiMfbVoxts2TEGMw18tz3ptf5R9QuGAILIfdZbVC9i0hj2wZvIMXZ+MDu
```

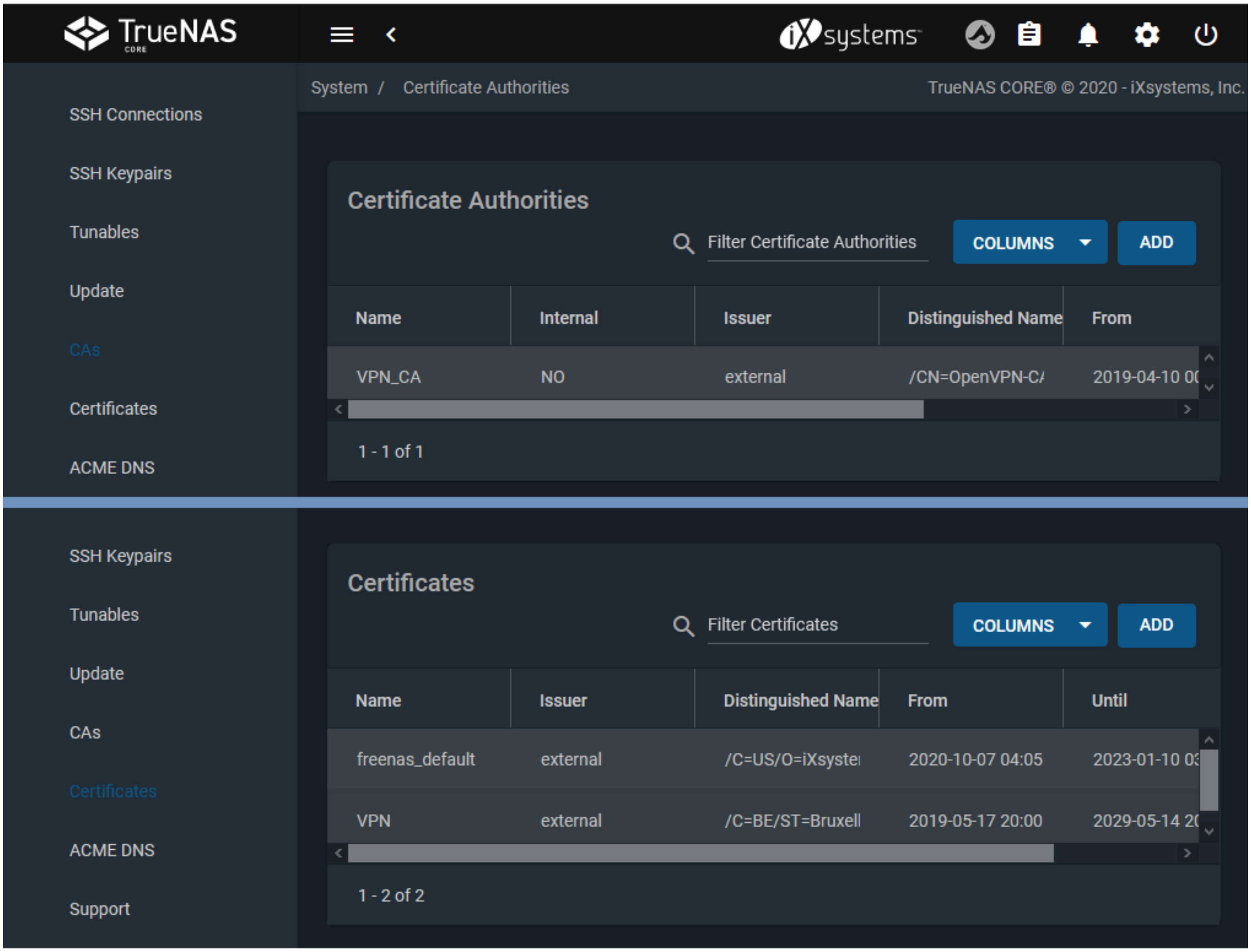
Private Key

```
-----BEGIN PRIVATE KEY-----
MIIJQgkqhkiG9IBADANBgw0BAASCQEFACSwgkoAwggEAAQCAoIC71VfhS9wOaSNJ
DCBpBfPtUc6iMzeezb0DId1TGNmbujIAqOdmcnikE87InQXA+w1ZIwKouFx2b7zr
...
6IEehZNciHpOU8zGE1RSNH1mqQKT6t0pK7hjGhlbZRsHmE8tGy7aBQi9z38pkunR
```

Passphrase

Confirm Passphrase

So now we have a CA and a certificate for the VPN connexion as below:



Certificate Authorities

Name	Internal	Issuer	Distinguished Name	From
VPN_CA	NO	external	/CN=OpenVPN-C/	2019-04-10 0(

1 - 1 of 1

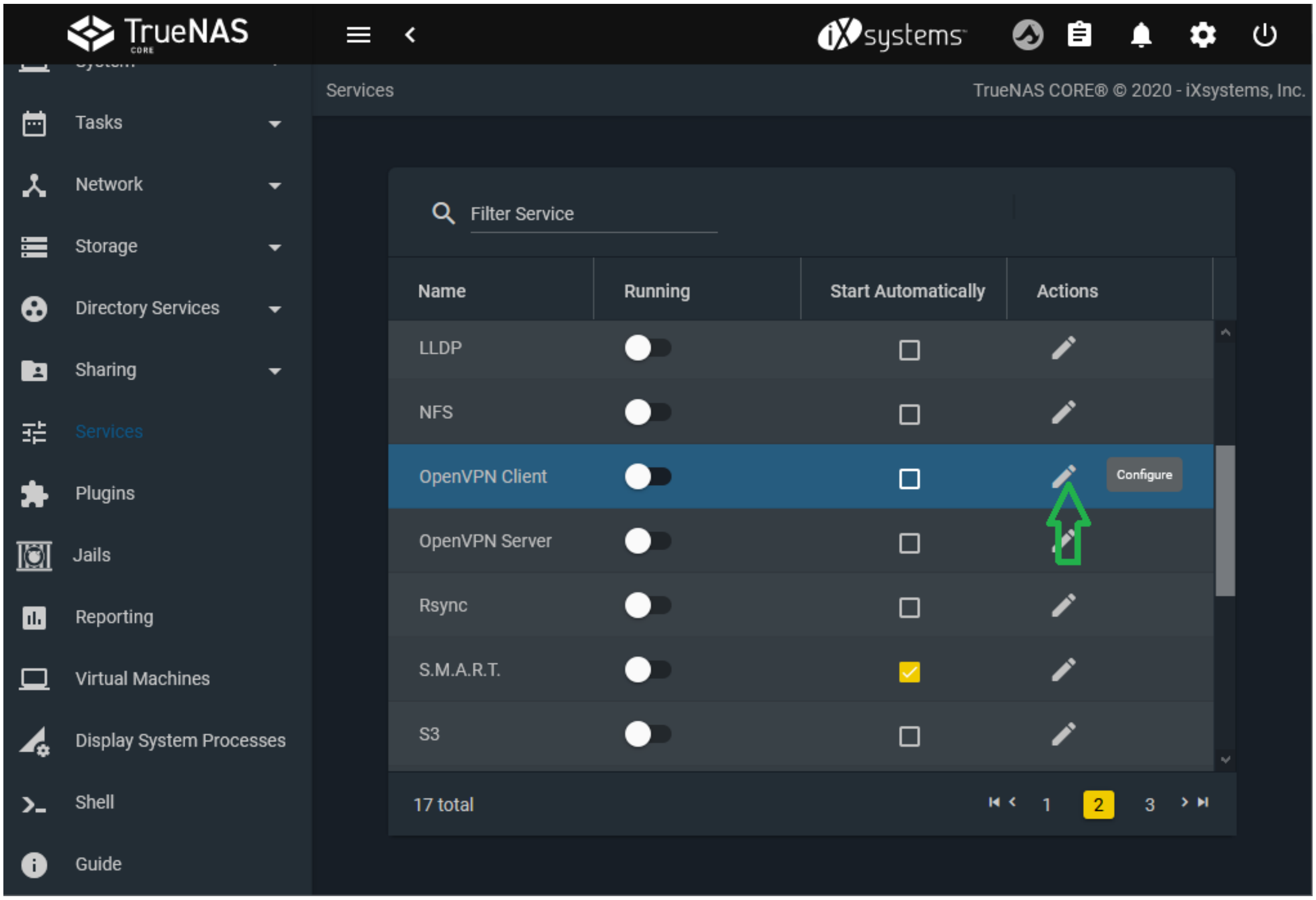
Certificates

Name	Issuer	Distinguished Name	From	Until
freenas_default	external	/C=US/O=iXsyste|	2020-10-07 04:05	2023-01-10 0:
VPN	external	/C=BE/ST=Bruxell	2019-05-17 20:00	2029-05-14 2(

1 - 2 of 2

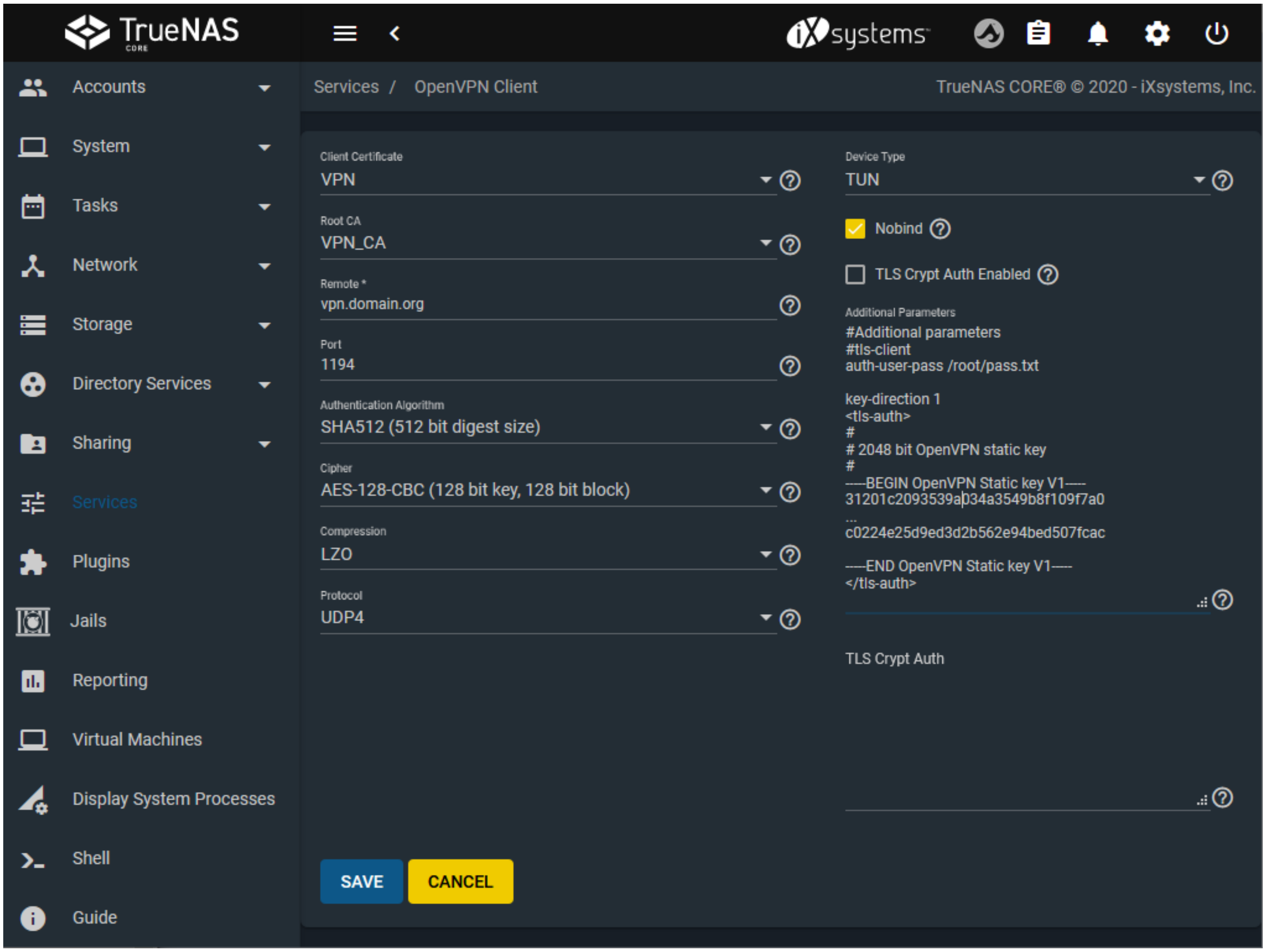
Configure OpenVPN Service

Go to the **Services** page and find the **OpenVPN Client** entry. Click the □ to configure the service.



Name	Running	Start Automatically	Actions
LLDP	○	□	✎
NFS	○	□	✎
OpenVPN Client	○	□	✎
OpenVPN Server	○	□	✎
Rsync	○	□	✎
S.M.A.R.T.	○	☑	✎
S3	○	□	✎

Choose the certificate and Root CA we previously installed. The rest of the parameters are found in the OpenVPN configuration file. In “Additional parameters” you can add options that are in the configuration files, like the TLS key for authentication or user login/password.



Client Certificate: VPN

Root CA: VPN_CA

Remote *: vpn.domain.org

Port: 1194

Authentication Algorithm: SHA512 (512 bit digest size)

Cipher: AES-128-CBC (128 bit key, 128 bit block)

Compression: LZO

Protocol: UDP4

Device Type: TUN

☑ Nobind

☐ TLS Crypt Auth Enabled

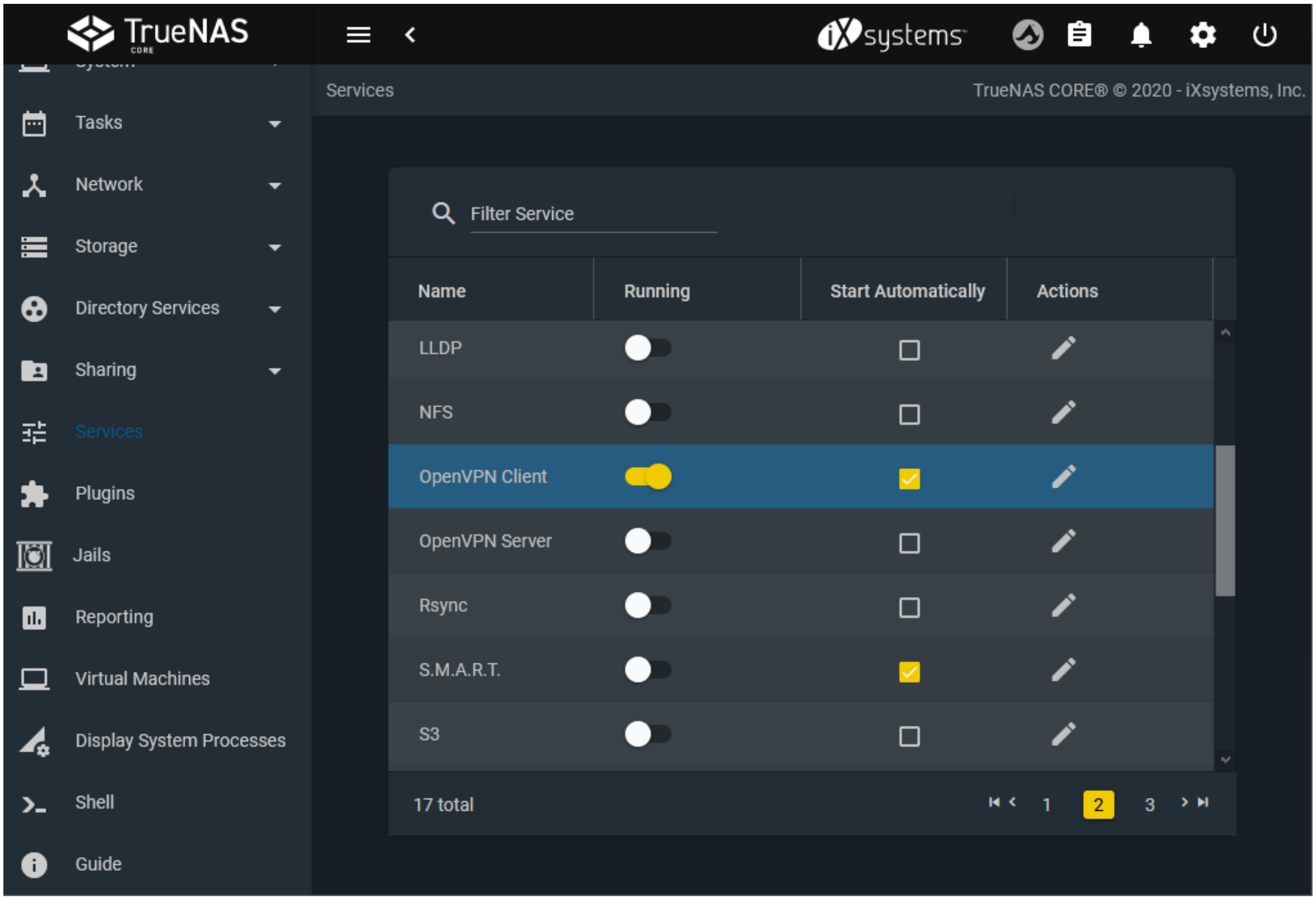
Additional Parameters

```
#Additional parameters
#tls-client
auth-user-pass /root/pass.txt

key-direction 1
<tls-auth>
#
# 2048 bit OpenVPN static key
#
-----BEGIN OpenVPN Static key V1-----
31201c2093539a034a3549b8f109f7a0
...
c0224e25d9ed3d2b562e94bed507fcac

-----END OpenVPN Static key V1-----
</tls-auth>
```

TLS Crypt Auth

Start the service

Start the service (check automatically if needed).



Name	Running	Start Automatically	Actions
LLDP	○	□	✎
NFS	○	□	✎
OpenVPN Client	●	☑	✎
OpenVPN Server	○	□	✎
Rsync	○	□	✎
S.M.A.R.T.	○	☑	✎
S3	○	□	✎

17 total

Test if the connection is working using `curl ifconfig.me` in a terminal for example. It should give you the IP from the VPN connection and not from your “local” connection, turn the OpenVPN client service on and off to see the difference.

Logs of the OpenVPN client can be found in /var/log/messages and /var/log/daemon.

17.4 - Setting ACL Permissions for Jailed Applications

Various Jail Plugins will require permissions to be set on datasets so that they can access them.

Unless otherwise modified, dataset will be owned by the user `root` and group `wheel`.
Jailed processes like Plex run as their own user. As a result Plex will not be able to read or write to the any datasets and thus not be able to access media files stored in those datasets.

To create an ACL for dataset for an application you need to obtain the Application user ID. Plex's ID is `972`.

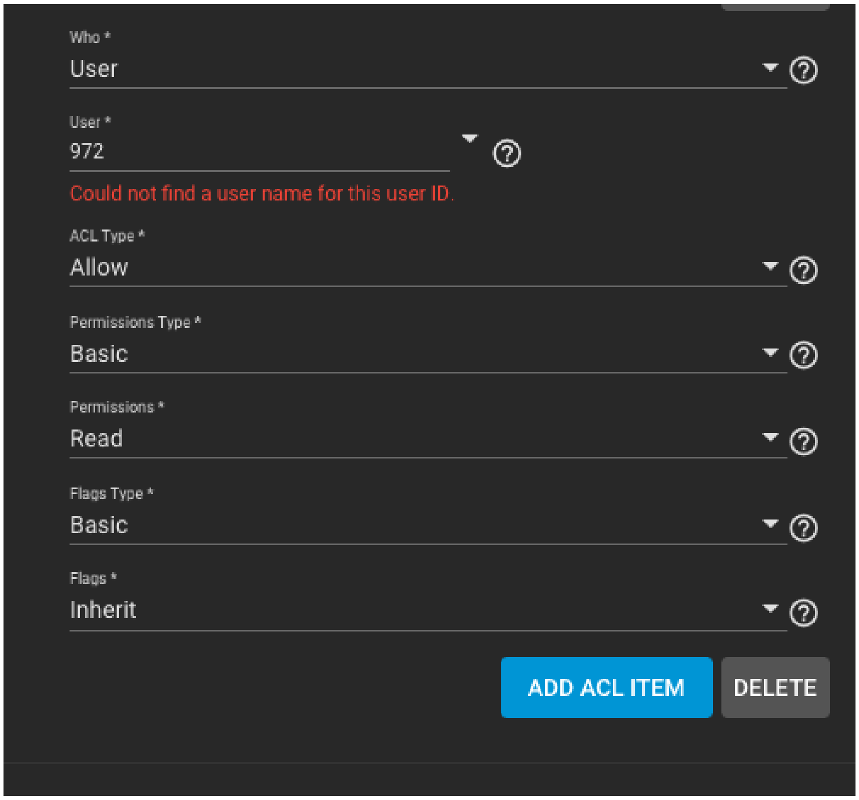
Other popular Plugin user IDs include:

- Radarr = 352
- Sonarr = 351
- Transmission = 921
- Sabnzbd = 350

To create an ACL for dataset, open **Storage > Pools**.
Click the three dot icon more_vert and select **Edit Permissions**. Click the **Add ACL Item** button to create a new entry.
The new entry will appear at the bottom of the list of existing ACL items.

Continuing with Plex as our example we would enter the following:

```
Who: User
User: 972 (Don't worry if it says "Could not find a username for this ID")
ACL Type: Allow
Permissions Type:
Basic Permissions: Read
Flags Type: Basic
Flags: Inherit
```



Who *
User

User *
972

Could not find a user name for this user ID.

ACL Type *
Allow

Permissions Type *
Basic

Permissions *
Read

Flags Type *
Basic

Flags *
Inherit

If files already exist in the dataset, click the **Apply permissions recursively** checkbox and click **Save**.

17.5 - Setting SMB ACLs on Legacy FreeNAS systems

This article only applies to versions of FreeNAS or TrueNAS released before 12.0

TrueNAS uses Samba to share pools using the Microsoft SMB protocol. SMB is built into the Windows and macOS operating systems and most Linux and BSD systems pre-install an SMB client to provide support for the SMB protocol.

The SMB protocol supports many different types of configuration scenarios, ranging from simple to complex. The complexity of the scenario depends on several factors:

- Client operating system types and versions connecting to the share.
- When the network has an active Windows server.
- Active Directory is in use.

Depending on the specific authentication requirements, it can be necessary to create or import user and group accounts into FreeNAS/TrueNAS.

The videos at https://www.youtube.com/watch?v=RxggaE935PM and https://www.youtube.com/watch?v=QhwOyLtArw0 clarify setting up permissions on SMB shares on legacy (pre-TrueNAS 12.0) versions of FreeNAS: