TrueNAS
OPEN ENTERPRISE STORAGE

WHITE PAPER

TrueCommand 3.1

Contents

1 TrueCommand Manages the NAS Fleet

Every organization depends on data, the new oil of the 21st century. Data is more important than storage. Storage can be replaced, but data cannot. Embracing this truth, TrueNAS has been developed to provide True Data Freedom, allowing data to be moved between vendors and generations of NAS systems using the best of open source storage technologies, including OpenZFS.

Organizations need multiple copies of their data and many storage systems to process and back up that data. TrueNAS provides the tools to support many tiers of data to sync/migrate the data easily between systems. TrueCommand provides the management tools to simplify the tasks associated with managing multiple TrueNAS systems or clusters.

This white paper describes the role of TrueCommand in managing an organization's data and the associated fleet of TrueNAS systems.

2 Introduction

Managing data is a complex, time-consuming, and expensive task prone to human error, device failures, and acts of God. It is also one of the most critical tasks every organization has to address. The individuals that manage this data have complicated jobs with unrealistic budget constraints: data must be available everywhere, but costs must also decrease.

Each storage system must store, protect, and allow processing of that data as needed for the organization. However, a single storage system is never the entire solution. Data must flow through an organization, enabling analytics, backup, disaster recovery, compliance, and archive functions.

TrueNAS, with its ZFS storage layer, provides some of the industry's best tools for protecting and managing that data within a storage system. It also provides differential replication of data between systems, which is critical to the efficient movement of data. These are valuable tools for a more comprehensive approach to managing data across an organization.

Every NAS system can be compared to a member of a naval fleet. Just as there are battleships, aircraft carriers, and submarines within a fleet of ships, each NAS also has a different role in the protection and distribution of data. Each member of the fleet is configured and optimized for its specific role. Any one of the ships can sink, but the fleet must adapt and continue its mission.

The fleet can only achieve its mission under the command of a leader that makes good decisions. Circumstances change, storms roll in, and sometimes, enemies attack. The fleet commander must plan, assess the situation, and react. TrueCommand is the platform for the fleet commander to control the fleet and manage the organization's data.

The primary benefits of TrueCommand that organizations have reported are:

- Increased data and system security, including compliance
- Reduced staff time and costs to administer systems
- Simplification of TrueNAS SCALE cluster setup and operation
- Increased reliability with less downtime and better data management
- Managed NAS services can centralize skills and operations
- Team-based 24 × 365 operations of global infrastructure and its data

3 TrueCommand Overview

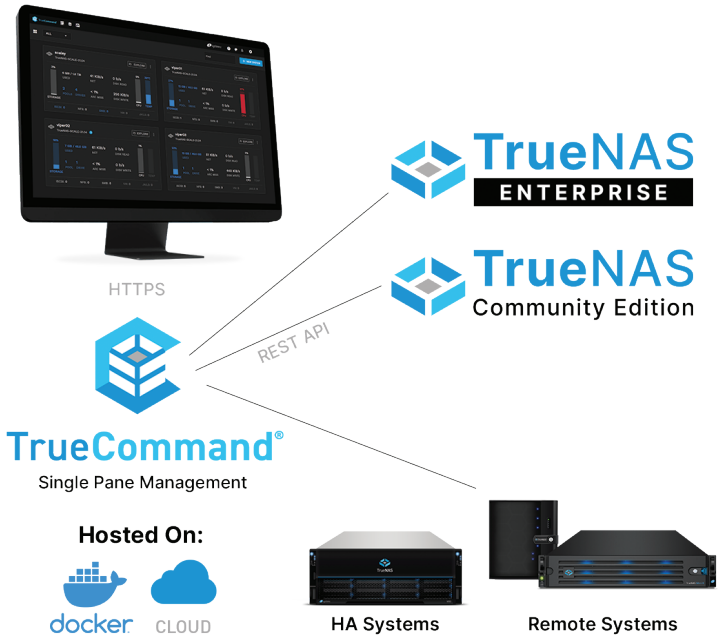
TrueCommand is the command station for the NAS fleet. It is a ZFS-aware and cluster-aware management platform that allows storage administrators to monitor, configure, control services, manage data, and report on all TrueNAS systems from a "single pane of glass" interface. The commander makes the decisions and TrueCommand provides the information and simplifies the execution.

Every TrueNAS system (Community Edition or Enterprise) includes a powerful RESTful API that operates on a bi-directional websocket connection between each TrueNAS and its TrueCommand instance. That IP-based connection is secure and can run either locally within a data center or globally across the Internet.

Each TrueNAS also provides reporting metrics to the TrueCommand system. These metrics are used for performance and fault diagnosis and are collected in real time with minimal impact on the NAS. TrueCommand connects to physical TrueNAS appliances or servers/VMs/Cloud instances running TrueNAS software.

The TrueCommand software is deployed as a Docker instance. It can run on Docker or Kubernetes and can also be packaged as a Linux VM to run on vSphere/ESXi or another hypervisor. It is recommended that TrueCommand does not run on a system that itself depends on a TrueNAS system.

A Software-as-a-Service (SaaS) version of TrueCommand is also provided by TrueNAS. TrueCommand Cloud instances run in a TrueNAS private cloud and are independent of the user infrastructure under management. It can manage infrastructure in many locations and uses VPN technology to ensure connectivity. This capability is particularly useful for Managed Service Providers (MSPs).



TrueCommand is available for free as a Docker instance that can manage up to 50 drives. Cloud instances are available starting at $6 per month. Larger instances are affordably priced based on the number of drives under management. There are no added costs for more users or systems.

Please contact TrueNAS for a proposal for your infrastructure. Self-service set-up of larger TrueNAS systems is also available via the TrueNAS Portal.

The following sections provide more detail, and complete technical information is available via the TrueCommand documentation.

4 TrueCommand Functions

TrueCommand provides a comprehensive set of functions that simplify and automate the tasks of the fleet commander (storage admins). As the fleet expands, the workload does not have to grow proportionally. Many users have reported that TrueCommand has more than halved their workload and ensured better teamwork between team members.

Many NAS and data management functions are simplified. The following list of functions is available in the TrueCommand 2.3 release that will be generally available in Q1 2023.

Consolidated Monitoring and Reporting
Admins can view the status of multiple systems simultaneously and drill down into the specifics for nearly any metric. Disk performance, network latency, CPU/memory/cache usage, and other system stats are shown at a glance so bottlenecks can be dealt with efficiently. Your organization can easily track everything from drives to services on your NAS systems.

Rapid Alerts and Diagnosis
TrueCommand proactively collects, prioritizes, and sends alerts to immediately highlight events. Alerts are customizable

and multivariable. Receive alerts directly in the web interface or by email for system problems, drive problems, service restarts, and more. Alerts are more quickly diagnosed with the help of context such as activity and performance occurring before and after the alert.

24×365 Operations
Teamwork is actively automated and encouraged with TrueCommand. The expectation is that a team of users can manage NAS systems on a 24×365 basis. Trouble tickets can be shared from one team member to another. Each team member can be assigned different roles and security privileges.

Single Sign-on Security with Web Proxy
TrueCommand authenticates users either locally, via LDAP, or by Active Directory. From TrueCommand, users can gain web access to any connected TrueNAS system without the need to enter a password or remember IP addresses. This simplifies security administration and increases operator efficiency. From the web interface of each TrueNAS, there is an ability to configure anything and gain access to real-time statistics and diagnostics. The web proxy eliminates the need for security "punch-holes" for admins to access each TrueNAS.

Customized Reports
Customized reports can be provided for single or multiple systems. These TrueCommand reports can include capacity, performance, and fault data. Once created, the reports can be generated as required and shared with other admins or users.

Integrated Audits for Compliance and Troubleshooting
Reports, alerts, and audits are simplified with a central database that can persist for up to two years. Audits include all configuration changes made via TrueCommand or during a web proxy session to a TrueNAS. Auditing is critical for security compliance and also assists with troubleshooting of NAS system issues.

Inventory Management
Systems inventories of both hardware components and software/support licenses are provided. These TrueCommand reports assist planning of future upgrades and identification of potential issues.

Role-Based Access Control
Users and NAS systems can be assigned into groups for simpler administration. Each user and group can be assigned different privileges for each NAS, such as read-only or read/write. This Role-Based Access Control (RBAC) can determine which users can control individual services directly from the TrueCommand web interface itself and have web-proxy access to each NAS. RBAC is critical for security compliance and reduces user errors in critical systems.

ZFS-Aware Pool Management
TrueCommand is ZFS-aware. Administrators can set custom alerts on statistics like ARC usage or pool capacity to help ensure storage uptime and future planning. TrueCommand identifies and pinpoints impaired drives or vdevs (RAID groups), saving valuable time to resolution.

Predictive Analytics
TrueCommand integrates intelligence into the TrueNAS infrastructure through predictive analysis. TrueCommand can predict when storage pools will reach capacity limits and when drives have problems. Performance analytics help admins diagnose problems and react quickly to meet operational targets and keep storage systems online.

Centralized Data Management
TrueCommand provides centralized control and monitoring of data management functions. Snapshot policies can be implemented for all organizations' TrueNAS systems via TrueCommand. These policies protect data from major failures and human error. A console-level view of existing replication tasks provides the necessary foundation for monitoring data management activities. Users are sent a failed replication alert in the event that a replication task is not functioning correctly. These functions are the basis for managing Backup and Disaster recovery of larger datasets.

Bulk Storage Automation
Many IT projects or applications require the creation of many datasets or LUNs to share with users and applications. TrueCommand removes the need to manually create each dataset with a dataset profile that allows automation of the dataset creation process. The result is fewer errors and this automation can save hours or days of administrative time.

Automated Software Updates and Configuration Restores
Each TrueNAS runs a specific software version and has a configuration file that documents the networking and sharing settings for each ZFS dataset. Software updates should be done carefully and include saving configuration files and

snapshotting the pools or important data. With TrueCommand, the processes are automated so that roll-backs are simpler and more reliable.

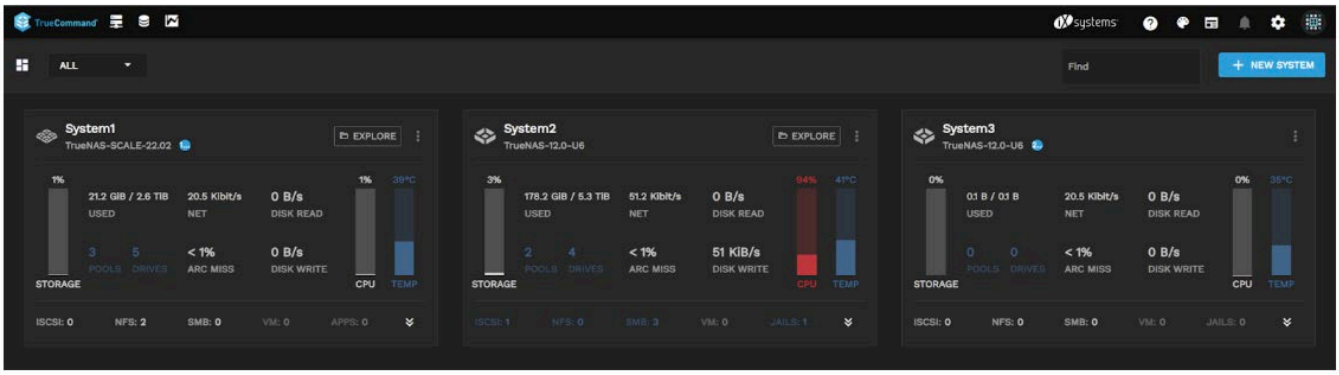
5 TrueCommand Operation and User Interface

The user interface of TrueCommand is a web-accessible graphical user interface based on a modern Angular framework. It is intended for storage admins and not end users. TrueCommand provides a set of dashboards that allow users to manage functions. It is simple to navigate between dashboards by clicking on the action bar or by scrolling down to systems.

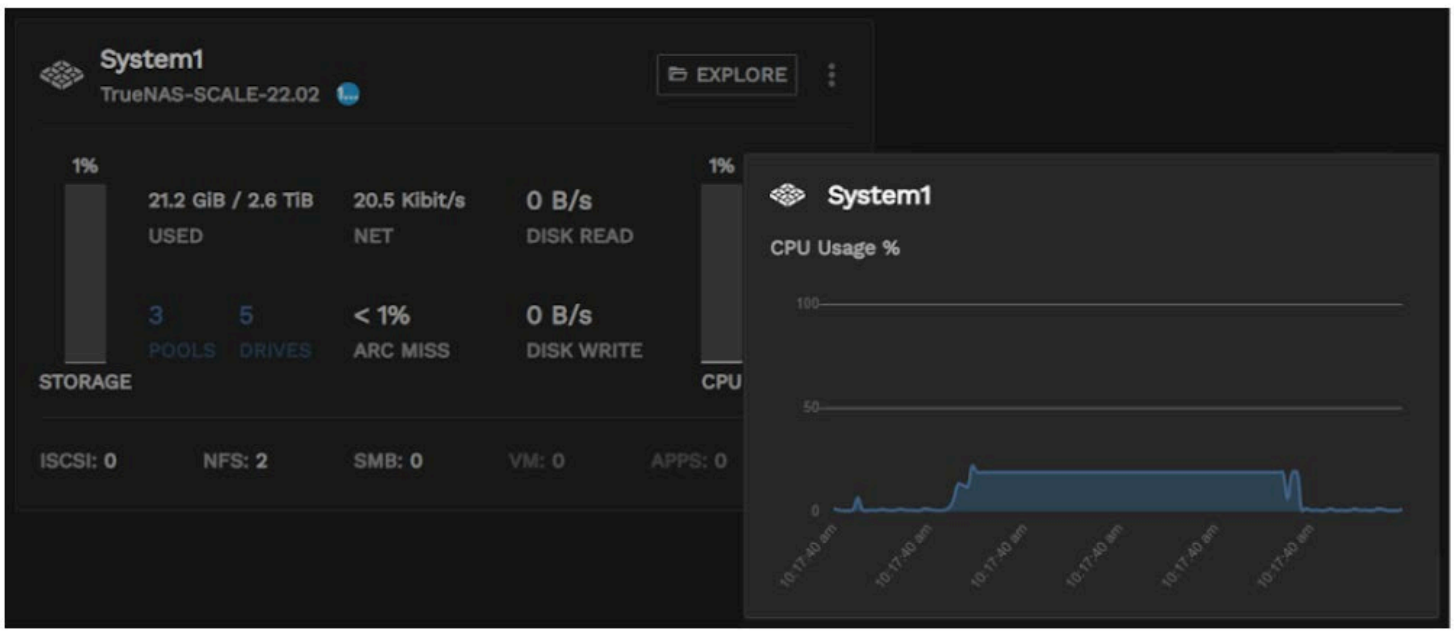
The design philosophy of TrueCommand allows the screen to be left visible in its dark mode at all times. In normal operation, the interface is subdued and there is little to distract the user, but when there are events, they are highlighted with brighter red or purple colors.

To simplify integration with enterprise environments, there is also a REST API that allows other management systems to perform automated functions through TrueCommand. New systems and users can be automatically added.

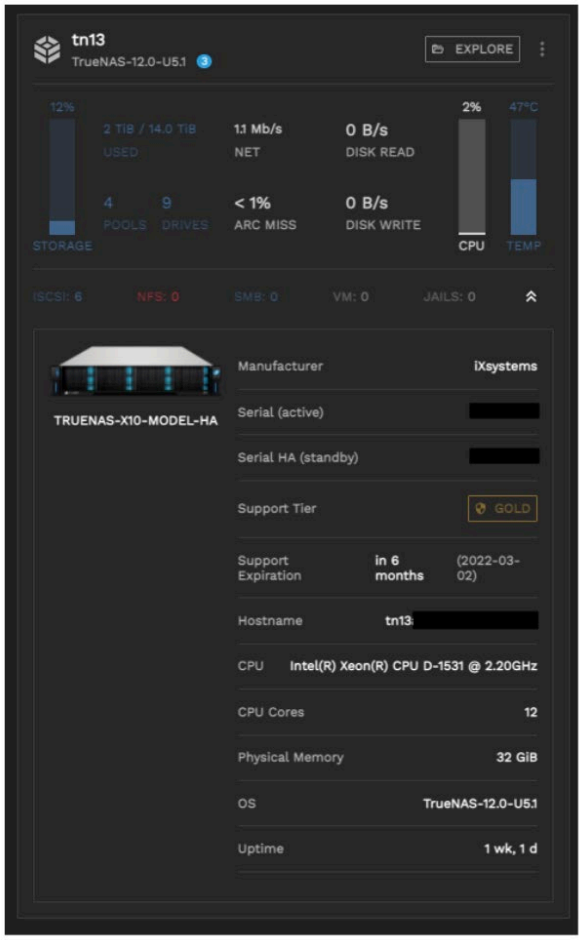
The multi-system dashboard is customized for each user/group to present only the NAS systems that the user has Monitoring privileges to. It allows that admin to quickly scan the systems and identify systems that have entered the red zone with respect to performance or capacity. The presence of any faults/alerts are also obvious.



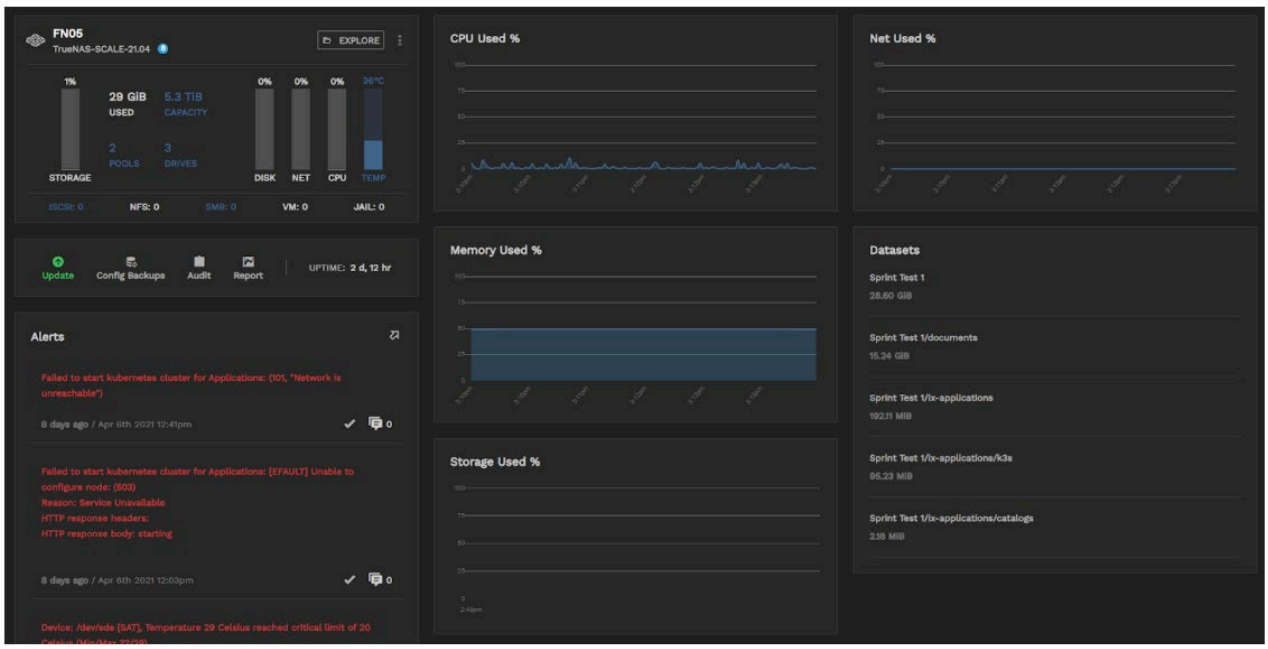
Each system card is designed to provide all the information for easy scanning. For example, if a system is updating or has a replication or scrub task ongoing, this is notified with simple icons. A simple click on a key element and a graph for that appears.



An expanded view of each system card includes very useful inventory management information.

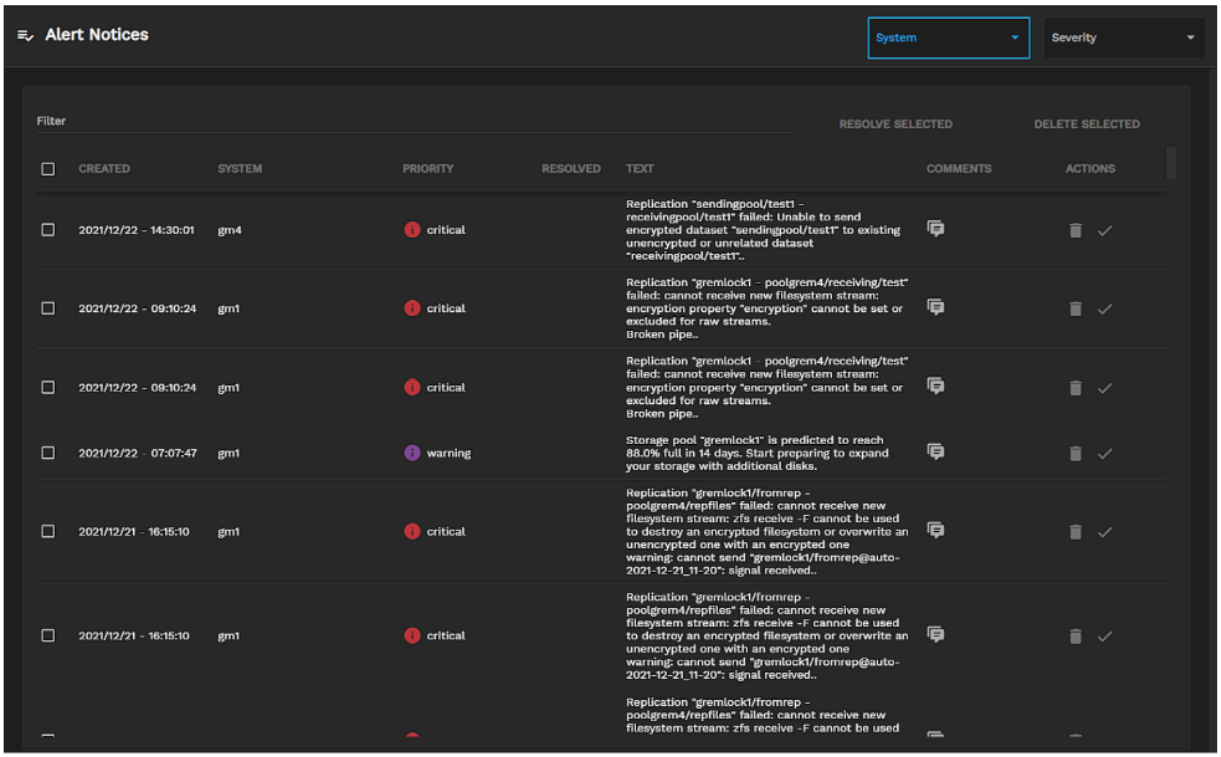


A comprehensive system view is available from the dashboard after a user clicks on a specific NAS system. The system view presents a consolidated report of resource utilization, alerts, performance, and allows a drill down to the datasets, their snapshots, and replication tasks.

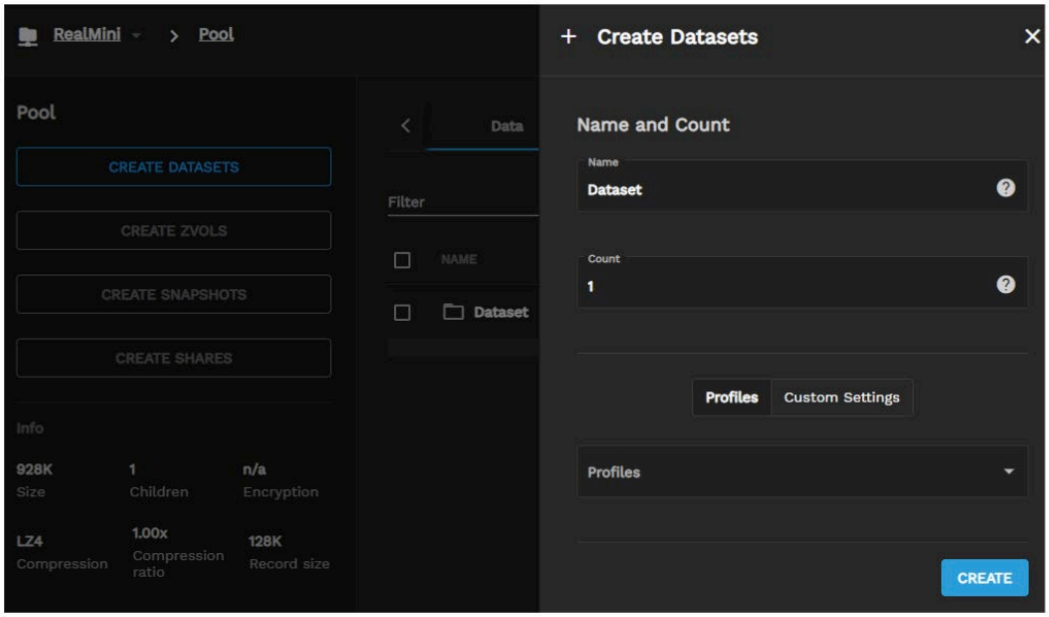


Custom reports can be created on a separate page. Once reports have been customized, they are available at any time to the select users. For example, the system admin could share specific reports to a storage system user. The reports can be metrics from multiple NAS systems or many individual metrics from a single NAS system. A wide range of charts are available.

Customized alerts can also be created via an alert management page. A standard set of alerts is automatically configured to identify unusual or undesirable behaviors or faults. All of these alerts can be edited or copied to create new alerts with goal-specific metrics. Alerts can be set at different levels including INFORMATIONAL, WARNING, and CRITICAL. New alerts can be created from scratch as required for the application environment. All alerts can then be monitored for all systems or individual systems.



Dataset creation and management wizards are launched from a system page. These provide a step-by-step automated flow to create datasets and share them with the required protocols.



6 TrueCommand Cloud Enables Managed Services

TrueCommand Cloud, (the SaaS version) includes VPN technology (WireGuard) to enable MSPs to manage hundreds of their clients' NAS systems from a single pane of glass. Each client can be assigned their own unique login keys and given access to monitor only their own systems. Meanwhile, the MSP can monitor and configure all NAS systems and maintain audit records of all changes.

Each NAS system is assigned an API key which connects it to the MSP's TrueCommand Cloud instance and enables full management of the TrueNAS remotely. The API key both enables TrueCommand cloud to use the API, but also to provide web proxy access to the TrueNAS system.

Central IT organizations can operate as MSPs for departments of their own organization, giving each department visibility into the status of their own systems while managing the systems for those departments. This approach centralizes the core competency for managing the technology while allowing each department to locate storage where it is needed for their specific applications.

TrueCommand Cloud is available via a self-service portal (portal.truenas.com) or through TrueNAS and its partners. Once it is provisioned, each user has a unique web address for their instance, unique VPN keys, and their own ability to administer and authenticate users.

7 TrueCommand Specifications

ZFS Features Monitored

- Pools, VDevs, RAID-Z
- Cache (ARC, L2ARC, SLOG)
- Resilvering, Scrubbing, Snapshots, Replication

Reporting

- System info (name, hostname/IP address, release, uptime, boot, device)
- CPU (number, utilization)
- Disks (status, throughput, IOPS, latency)
- Apps, Containers (number active)
- Memory (activity, cache usage)
- Network (throughput, packets, status)
- Services (enabled, ID, status)
- Storage Status (pools, vdevs, encryption)
- Virtual Machines (total, active)

Alerts
- Web interface, Email to users, PagerDuty
- Configurable, Multi-variable

Data Navigator
- Explore datasets and files on each NAS
- Manage snapshots and replication
- Bulk creation of LUNs and shares

Role-Based Access Control (RBAC)
- Single sign-on with Web Proxy to TrueNAS
- LDAP and Active Directory authentication
- Google Auth authentication
- Define teams and groups
- Audit device history and changes
- Read-only views for users

REST and Websocket APIs
- Real-time monitoring of TrueNAS systems
- Collect performance statistics
- Enable, disable, start, and stop services
- Configure and monitor TrueCommand

Compatible TrueNAS Versions
- TrueNAS Community Edition
- TrueNAS Enterprise

Web Interface
- Angular web interface
- HTML5 browsers: Chrome, Firefox, Edge, Safari

Recommended System Requirements
- Physical or virtual machine or Docker instance
- 4GB RAM, 80GB storage
- Network access to NAS systems

8 Integrating TrueCommand within the Enterprise

This white paper summarizes the features and significant benefits of TrueCommand. In a real enterprise environment, it is necessary for management systems to coexist with other systems that may already be in place. TrueCommand and TrueNAS have been architected to allow this coexistence and complement other systems. There are several types of systems that should be considered in a general deployment model.

Logging Systems
Logging events across all vendors, software, and equipment has proven to be very useful in complex infrastructures. Applications like Splunk and ELK (ElasticSearch) collect all the syslog data and other events and assist with identifying the root causes whether it's networking, storage, or computer related. TrueNAS can feed these logging systems while TrueCommand manages the detailed analysis of the TrueNAS storage systems.

Monitoring and Alert Systems
Monitoring and alert systems based on SNMP have been the staples for many infrastructures for decades. These systems collect performance data as well as traps and can provide alerts based on either. These systems can be used to monitor TrueNAS via SNMP and check availability and basic performance information. However, these tools cannot understand ZFS and the role of each drive in the system like TrueCommand does. TrueCommand provides additional intelligence and a more efficient stats collection system to collect more comprehensive data.

Orchestration Systems
There are several orchestration systems like vSphere and Openstack that can configure/provision storage, compute, and networking to orchestrate the infrastructure in support of applications. These tools require APIs in the storage systems. TrueNAS supports the VMware/vSphere APIs (vCenter plugin), Kubernetes CSI APIs, and Openstack Cinder APIs. TrueCommand can monitor and manage important attributes (ZFS pools, networking) of the TrueNAS systems while they are being orchestrated.

Custom Management Systems
Many larger applications require custom orchestration of all the storage, compute, networking, and application infrastructure via REST APIs and scriptable CLIs. Both TrueNAS and TrueCommand provide a programmable REST API for these custom systems to use.

TrueCommand
TrueCommand provides a ZFS-aware single pane of glass for TrueNAS systems. Unlike the systems above, it is focused on simplifying the management of pools and datasets. Through TrueCommand, enterprises can accelerate, protect, back-up, and migrate data.

For a large organization, many management systems will be deployed and used. TrueCommand adds significant new capabilities for managing TrueNAS systems and their data. However, existing systems add their own value and are normally retained.

9 Conclusion

Through TrueCommand, TrueNAS is delivering on our commitment to simplifying and reducing the costs of managing data. TrueCommand directly complements TrueNAS and enables its use in organizations with more complex operational needs and security compliance requirements.

TrueCommand Cloud (the SaaS version) addresses the needs of Managed Service Providers (MSPs). The VPN capabilities of the SaaS version provide the flexibility for the delivery of managed NAS services. VARs and MSPs can simplify NAS deployment and operation and reduce the customer skills needed to manage data and its storage.

The primary benefits of TrueCommand uniquely address the issues of many organizations:

- Increased data and system security, including compliance
- Reduced staff time and costs to administer TrueNAS systems
- Increased reliability with less downtime and better data management
- Managed NAS services can centralize skills and operations
- Team-based 24×365 operations of global infrastructure and its data

Please contact TrueNAS if there are any questions on TrueCommand or if there are any additional features required to automate or simplify your operation. There is significant flexibility within TrueCommand to add new features, independent of any TrueNAS software changes.

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