Titan T6000

Scale-out NAS made simple

Titan T6000 is an ideal active archive storage solution that combines high performance, near-primary accessibility, value, and ease of use. Titan T6000 provides between 240 TB to 1.2 PB per chassis and scales to 60 PB in a single cluster. Titan T6000 includes inline compression and deduplication capabilities.

Key benefits

- **Deep archives**
  Large-scale, archiving data storage that offers unmatched efficiency to lower costs
- **Disaster recovery**
  Disaster recovery target for organizations requiring an economical, large-capacity storage solution
- **File archives**
  Economical storage and fast access to reference data to meet business, regulatory and legal requirements

It's not just data, it's your business

The software defined architecture of the Operating System OneFS gives you simplicity at scale, intelligent insights and the ability to have any data anywhere it needs to be – at the edge, core or cloud. Whether it is hosting file shares or home directories or delivering high performance data access for applications like analytics, video rendering and life sciences, Titan T6000 can seamlessly scale performance, capacity, and efficiency to handle any unstructured data workload.

Unlock intelligent insights within your data

A large portion of your data is unstructured data and that dataset is growing exponentially – not just in the data center but at the enterprise edge and in the cloud. Titan T6000 scale-out storage solutions are designed for organizations that want to manage all their data, not their storage. Our storage systems are powerful yet simple to install, manage and scale to virtually any size. And, unlike traditional enterprise storage, these solutions stay simple no matter how much storage capacity is added or how business needs change in the future.

Highly scalable

In a world where unstructured data is growing rapidly and taking over the data center, organizations are looking for ways to get more out of their data. Whether it is driving innovation, getting to market faster or creating differentiation, they want the data to start creating value. Instead of thinking of destinations for your data, you think about what the data is going to be used for, who will be using it and how the data will help you solve for their business needs. When you have a data first mindset, the goal is to get any data to where it needs to be for business needs. With OneFS powered clusters consisting of Titan T6000 nodes, you can eliminate storage silos, consolidate all your unstructured data, store petabytes of file data and analyze them in a data first world. With up to 252 nodes in a cluster, you can scale both capacity and performance in a few minutes to meet your specific business needs – all without any additional IT burden.

Key advantages include:

- **Simplicity at any scale:** Unlock the potential within your unstructured data using a solution that provides a single file system, single volume namespace that scales to PBs of capacity
- **Any data, anywhere:** Support a wide range of data types and diverse workloads with built-in multi-protocol capabilities including NFS, SMB, HDFS, S3, HTTP and FTP protocols. Store data anywhere – at the edge, in the data center or in the cloud

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- **Optimized data placement:** Optimize resources with policy-based, automated storage tiering to move data automatically to lower cost tiers, including public and private cloud storage with a choice of cloud providers
- **Efficiency:** SmartDedupe data deduplication which can reduce storage requirements. Inline data reduction and compression.
- **Enterprise data protection:** OneFS powered storage platforms are highly resilient with up to N+4 redundancy and offer proven enterprise-grade back-up and disaster recovery options
- **Robust security options:** RBAC, Access Zones, SEC 17a-4 WORM compliance, File System Auditing, File blocking, SMB3 encryption, Data At Rest Encryption (DARE) with SEDs, STIG hardening, Multi-factor authentication, HDFS transparent data encryption and FIPS 140-2 validation
- **Powerful big data analytics:** Maximize data capital with in-place analytics that seamlessly integrate with leading vendors like Pivotal, Cloudera, Hortonworks and Splunk to drive workloads in Artificial Intelligence, Machine Learning or Deep Learning

Titan T6000 Specifications

Nodes per chassis	4
Capacity per node	60 TB
Storage media per node	15x SATA drives
Storage media per chassis	60x 3.5" 4 TB SATA drives
Storage media capacity options (only upon request)	2, 4,8, 12 or 16 TB SATA drives
ECC memory per node	96 GB
OneFS version	OneFS 9 and above
Cache (per node)	1x 1.6 TB SSD
Storage (as configured)	240 TB (60x 4 TB SATA)
Cache (as configured)	6.4 TB
Front end networking (per node including transceivers)	2 x 25 GbE (SFP28)
Infrastructure networking (per node)	2x 25 Gbe (SFP28)
Max power consumption @ 200~240v (per chassis)[1]	1120 Watts (@25°C)
Typical thermal rating	3800 BTU/hr
Dimensions (H x W x D)	17.8 cm x 44.8 cm x 95.5 cm
Weight (with drives)	114.4 kg

[1] Values at <25° C are reflective of more steady state maximum values during normal operation

Cluster Attributes

Number of Nodes	4 to 252
Cluster capacity	240 TB to 60 PB
Rack units	4 to 252

All systems are available in individual configurations (drives, network connectivity, support options).
Contact us now for your customized offer.

Titan6000 Software Features

Simplify storage and data management for unstructured data

Essentials

- **Automated policy-driven tiered storage to optimize resources**
- **Seamless public cloud integration to lower costs**
- **Resilient data protection for a highly available environment**
- **Robust security and compliance options**
- **Optimize storage consumption with flexible quotas**
- **Seamless load balancing of client connections for maximum availability**
- **Storage efficiency, deduplication and compression to reduce costs**

The power of the OneFS operating system

PowerScale OneFS is the operating system powering the industry's leading scale-out NAS platform. Apart from unlocking the potential within your unstructured data, OneFS enables you to store, manage, protect, secure and analyze your data while running a wide variety of applications. OneFS provides a scalable, high-performance, modular storage architecture that enables you to innovate with your data. With built-in interoperability, OneFS solutions are simple to manage at any scale and capacity can be provisioned in minutes to your cluster. A single volume, single filesystem, single namespace enables you to consolidate your data and eliminate storage silos. Regardless of the number of nodes in your cluster, a OneFS powered solution allows you to store and manage many petabytes of data with a single admin. With support for protocols like NFS, SMB, S3 and HDFS, you can simultaneously run applications that require file and object protocols on the same dataset which helps you maximize the value of your data in this Data First world.

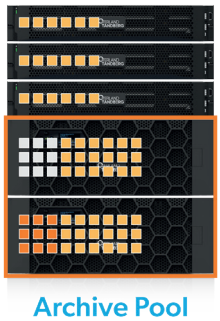
OneFS software features

OneFS provides software modules that simplify storage and data management at scale. Storage management features and functionality like autobalance, snapshots, data protection, backup, replication and disaster recovery help to simply and automate management for OneFS powered clusters. Data management capabilities like quotas and deduplication enable administrators and data owners to maximize the investments from the data.

OneFS comprises a single file system single namespace that spans all the nodes of a cluster. SmartPools allows multiple storage tiers to exist within a single file system to aggregate and consolidate applications within a single storage pool. This gives you workflow isolation, higher utilization and independent scalability—from a single point of management.

PowerScale SmartPools

SmartPools allows you to define the value of the data within your workflows based on policies and automatically aligns the data to the appropriate price/performance tier over time. With file-level granularity and control with automatic policies, you can tune performance and data layout, storage tier alignment and protection settings—all with no impact to your end-users. SmartPools allows for unprecedented flexibility, granularity and ease of management. SmartPools aligns the business value of data with optimal storage performance and cost by optimized data placement including flash, hybrid, archive and cloud storage. Policy triggers that determine optimized data placement include criteria like file age, size, type, owner, location or date fields. By default, the SmartPools jobs run nightly to apply new policies to the selected data and seamlessly tiers the files to the appropriate location based on your requirements.



Archive Pool

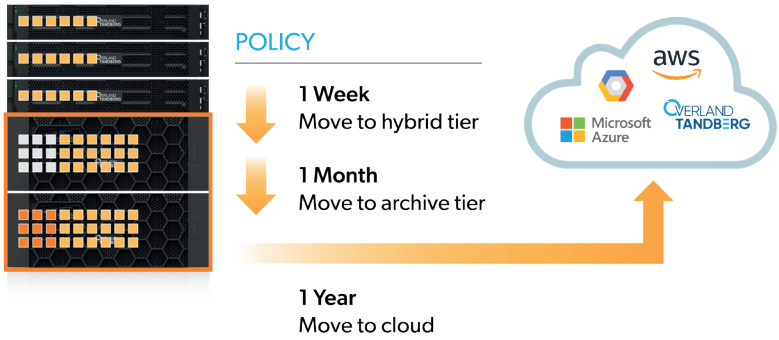
POLICY

1 Week
move to hybrid tier

1 Month
move to archive tier

PowerScale CloudPools

CloudPools software provides policy-based automated tiering that lets you seamlessly integrate with the cloud as an additional storage tier for the cluster. This allows you to address rapid data growth, reduce storage costs and optimize data center storage resources by using the cloud for frozen data. In this way, your more valuable storage may be used for more active data and applications, while frozen data may be retained at minimum cost for compliance, historical or other business reasons.



With CloudPools, you have a flexible choice of tiering data to public, private or hybrid cloud options. You can select from Amazon Web Services (AWS) S3, Google Cloud Platform (GCP), Alibaba Aliyun, Federal C2S clouds, Microsoft Azure or ECS.

CloudPools is simple to setup, deploy and manage because it uses the same flexible and powerful policy engine that PowerScale SmartPools uses. You can use SmartPools and CloudPools together to optimally place data within your cluster or the cloud. For example, SmartPools may be used to tier "warm" data to an archive tier in your cluster while CloudPools may be used to tier “frozen” data to the cloud. The use of CloudPools is transparent to end users and applications.

With CloudPools and SmartPools, you may define policies that identify the data to be tiered, the criteria for tiering and the choice of the public or private cloud target. The policies are dynamic, flexible and scalable which provides you with granular control of the data placement. A policy can be based on any combination of file metadata attributes such as timestamps, file name or type or file size.

When a file is tiered, the file is replaced by a SmartLink that contains the maps to the contents in the cloud. Users access the data the same way as before without changes to policies and procedures—you don’t have to do anything different to access the data. If you access a tiered file, only the relevant blocks are retrieved without the need to retrieve the entire file from the cloud. When you modify a tiered file, only the relevant portions of the file are rewritten to the cloud, thereby optimizing the bandwidth. CloudPools allows you to encrypt or compress data that is transmitted.

PowerScale SmartQuotas

SmartQuotas allow you to control and limit storage usage by assigning quotas at the cluster, directory, subdirectory, user and group levels. SmartQuotas span across the entire cluster thus enabling you to easily administer storage from a single interface. With its thin provisioning capability, SmartQuotas allow you to present more storage capacity to applications and users than is physically installed. In this way, you can limit their actual physical storage resources to what is only needed today and automatically add storage resources on demand to meet changing business requirements in the future. Storage capacity can be automatically increased with minimal administrative overhead, so that you can purchase less storage capacity up front, defer capacity

	Directory	User	Group
Advisory Quota	✓	✓	✓
Soft Quota	✓	✓	✓
Hard Quota	✓	✓	✓
EXAMPLE			
	Apps 4 T Each	Employees 10 GB Each	Executives 25 GB Each

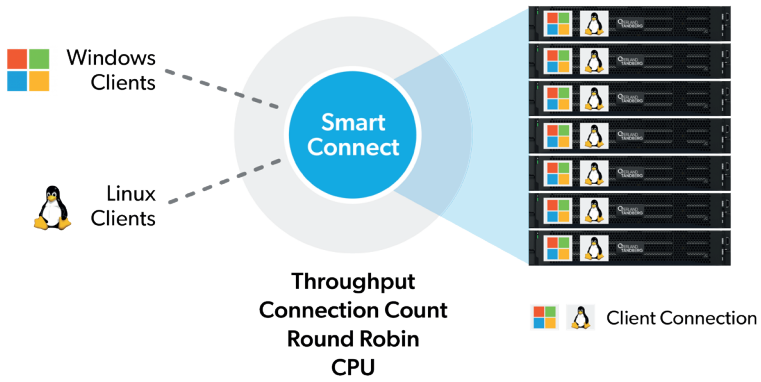
upgrades to match actual business usage and save on power and cooling costs associated with keeping unused disk capacity spinning.

When actual capacity begins to approach its designated threshold, nodes can be added to the cluster quickly and easily - typically in minutes. The result is unprecedented grow-as-you-go flexibility and value if you are looking to minimize costs while keeping pace with data growth.

SmartQuotas can be used to establish hard, soft and advisory storage capacity limits that can be set across your organization for specific users and groups, as well as across the various directory structures. Setting up advisory and soft quotas as a percentage of the hard quota provides improved convenience, flexibility and usability. You can also use SmartQuotas to configure alerts and send email notifications to end users, letting them know that quota limits are approaching, enforcing hard stops on writes, or providing a grace period of several days before maintaining thresholds.

PowerScale SmartConnect

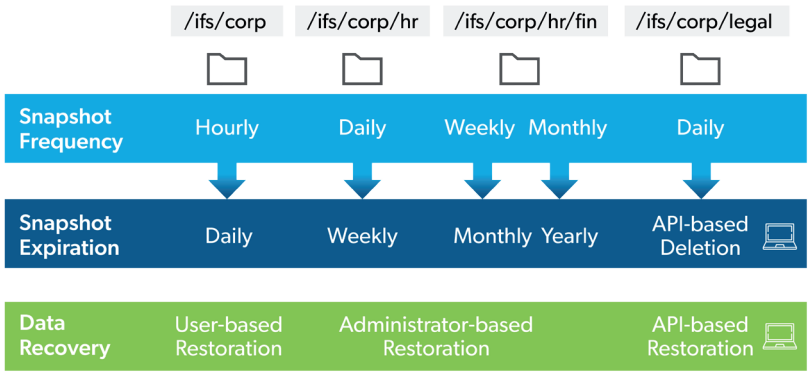
SmartConnect delivers intelligent, automatic client connection load balancing and failover capabilities to optimize storage performance and data availability. Through a single host name, SmartConnect enables client connection load balancing and dynamic NFS protocol failover and failback of client connections across nodes to provide optimal utilization of the cluster. Without the need to install client-side drivers, you can easily manage a number of clients even in the face of system failures. SmartConnect balances client connections across nodes based on policies that help ensure optimal usage of your cluster resources. By leveraging your existing network infrastructure, SmartConnect provides a layer of intelligence that allows all client and user resources to point to a single host name, enabling easy management of a large and growing numbers of clients. Based on user configurable policies, SmartConnect applies intelligent algorithms (e.g., CPU utilization, aggregate throughput, connection count, or round robin) and distributes clients across the cluster to optimize client performance and end-user experience.



SmartConnect uses a virtual IP failover scheme that does not require any client-side drivers. The cluster shares a "pool" of virtual IPs that is distributed across all nodes of the cluster. The cluster distributes an IP address across NFS (Linux and UNIX) clients based on the policy. If a node within a cluster is brought down for any reason including a failure, the cluster automatically distributes the IPs of that node to the remaining nodes and the clients can keep using the same IP of the failed node. The virtual IPs on the client connection will seamlessly failover to another node in the cluster. This ensures that when a node failure occurs, all in-flight reads and writes are handed off to another node in the cluster to finish its operation without any user or application interruption.

PowerScale SnapshotIQ

SnapshotIQ software provides simple point-in-time data protection and recovery by making frequent, user-recoverable backups of files. SnapshotIQ backups data automatically and as frequently as required to meet your RPO regardless of the size of the file system or directory.



SnapshotIQ also offers an extremely fast snapshot capability—typically less than one second to create. When needed, near-immediate data restoration is available to easily meet your RTO. Snapshots can be taken at a granular level and you can take up to 1024 snapshots per directory. Because SnapshotIQ is globally coherent and spans across all nodes regardless of the cluster size, you can administer snapshots from a single point of view. With SnapshotIQ, you no longer need to worry about managing snapshot capacity and performance. With the flexibility of your cluster, storage capacity and performance can be added on-the-fly, quickly and transparently, without having to replicate or delete snapshots. Since snapshots are an integral part of the OneFS file system there is no need to pre-allocate dedicated snapshot reserve space. Once your baseline snapshot has been established, only changes to blocks that make up a file are reflected in updates to the current version of snapshots.

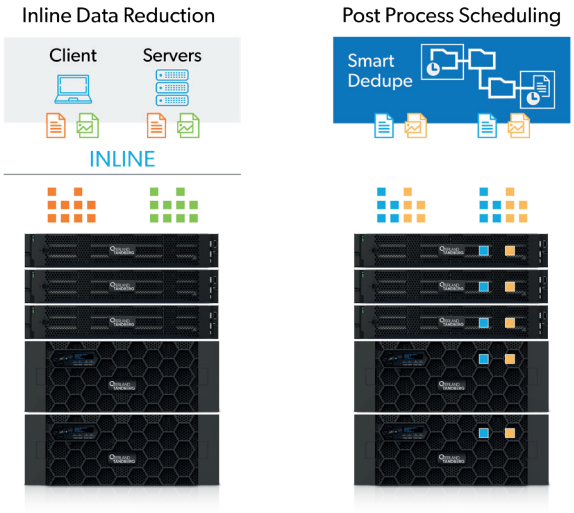
The automated SnapRevert functionality of SnapshotIQ also makes restoration to a specific recovery point extremely easy. One of the largest IT costs associated with backup and restore is the sheer number of help desk calls from end-users who accidentally delete a file or directory. To reduce these costs, SnapshotIQ can be used to empower end-users by enabling them to easily find and restore their own accidentally deleted files or folders—without any IT intervention.

PowerScale SmartDedupe

SmartDedupe maximizes the storage efficiency of a cluster by decreasing the amount of physical storage by scanning the on-disk data for identical blocks and then eliminating the duplicates. This approach is commonly referred to as post-process or asynchronous deduplication. After duplicate blocks are discovered, SmartDedupe moves a single copy of those blocks to a special set of files known as shadow stores. During this process, duplicate blocks are removed from the actual files and replaced with pointers to the shadow stores.

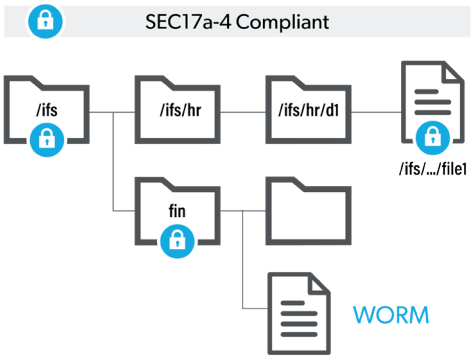
With post-process deduplication, new data is first stored on the storage device and then a subsequent process analyzes the data looking for commonality. This means that the initial file-write or modify performance is not impacted since no additional computation is required in the write path. The process of sampling, fingerprinting and matching the data is used to create an index that helps with the matching of duplicate blocks.

SmartDedupe can be configured all the way from a volume to a directory level granularity. You can schedule when and how frequently the SmartDedupe job runs. You can monitor and report on the status and progress of the SmartDedupe job. An assessment job can be run in estimation mode to predict the potential space savings of the dedupe process. The efficiency is dependent on the type of data scanned and the potential compressibility of that data. Hardware models like F810, H5600, H700, H7000, F200, F600 and F900 provide the capability of inline compression and deduplication.



PowerScale SmartLock

Protecting critical data from alteration is a key business imperative for most organizations. SmartLock helps you protect your critical data against accidental, premature or malicious alteration or deletion. Because SmartLock is a software-based approach to Write Once Read Many (WORM), you can store SmartLock-protected data alongside other data types in your cluster with no effect on performance or availability and without the added cost of purchasing and maintaining specialty WORM-capable hardware.



SmartLock operates in either one of two modes—in an Enterprise mode or in a Compliance mode. You must choose the desired mode of operation during the initial cluster configuration. In Compliance mode, login by the root user is disabled, providing the extra level of protection to meet regulatory requirements. With Compliance mode, SmartLock can help you to meet regulatory compliance requirements to provide absolute retention and protection of data—including the most stringent SEC 17a-4 requirements. Data protected with SmartLock cannot be altered by anyone. In Enterprise mode, this data can be deleted by an authorized administrator. Retention times set under SmartLock are absolute, elapsed time and thereby preclude the impact of potential time zones changes, leap years or other time and calendar-related events which might occur during the retention period.

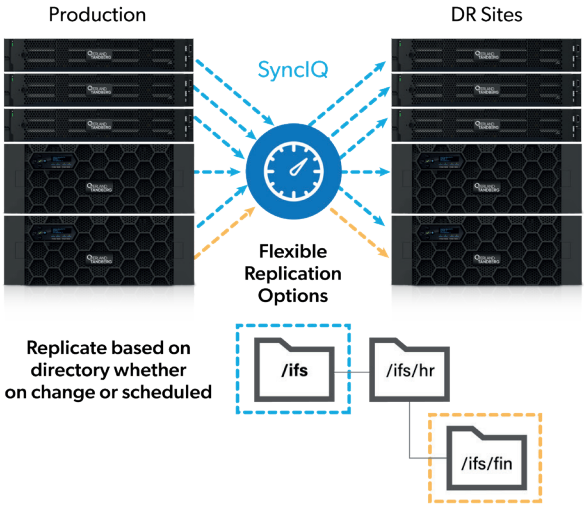
With SmartLock, you can protect your data at the directory-level and thereby eliminate the wasted space and complexity of managing WORM protections across multiple devices or volumes. You can set customized retention times for specific files. SmartLock is tightly integrated with OneFS and provides efficient storage for your WORM data.

PowerScale SyncIQ

SyncIQ offers powerful, flexible and easy to manage the secure replication of data for disaster recovery, business continuance, disk-to-disk backup and remote disk archive. SyncIQ delivers replication performance because every node can send and receive data. Replication gets faster the larger your data store grows since SyncIQ can take advantage of any available network bandwidth. By default, replication between nodes is encrypted.

A simple and intuitive web-based UI allows you to easily organize SyncIQ replication job rates and priorities to match business continuance priorities. You can configure a directory, file system or even specific files for replication based on the business criticality. You can also create remote archive copies of data that needs to be retained so you can reclaim valuable capacity in your production system. SyncIQ can support end-to-end encryption of data along with seamless integration with third-party applications like Superna EyeGlass.

Performance of SyncIQ include incremental transfer where only changed blocks are replicated, snapshot integration, bandwidth metering, monitoring, throttling and flexible scheduling. For availability, SyncIQ jobs can be configured for alerting and logging along with failure and recovery.



PowerScale SmartSync

OneFS 9.4 introduces a new data movement and replication engine to move data quickly and efficiently between systems. Designed from the ground up, SmartSync replication – like SyncIQ - moves or replicates file data between PowerScale systems. SmartSync cloud copy is optimized to move data between file and object repositories like ECS, Microsoft Azure or Amazon AWS. SmartSync can enable push or pull replication so that it can optimize the load on a system without over-burdening it. The ability to embed this engine across platforms provide a flexible way to move data between disparate systems.