OSNEXUS QuantaStor Feature Analysis - 2023

QuantaStor Key Features

Feature	Value
Distributed Management Architecture (Grid Technology enables mangement of systems and storage clusters across sites, ideal for hybrid and private cloud)	Yes
Grid Configuration Analytics - identifies potential network and system configuration issues and can be configured to send as a health report via email	Yes [1]
REST API (100% API coverage)	Yes [2]
Python Client Library (100% API coverage)	Yes
Scriptable CLI (99% API coverage with XML, JSON, CSV output)	Yes [5]
PowerShell module	Yes
Client OS Support	Linux, Windows, MacOS, Solaris, AIX, HPUX, VMware, XenServer
Upgrade Management (Web, CLI, API accessible)	Yes
Ansible Modules (File & Block Storage)	Yes [16]
Base Platform OS Options	Ubuntu LTS (default), RHEL, AlmaLinux, RockyLinux
Web Management / WUI (Native JS/HTML5)	Yes [18]
Web Management - Real-time Stats	Yes [19]
Web Management - Grid/Global Dashboard	Yes [20]
Web Management - Internationalization & Localization	Yes (Japanese, Korean, French, Spanish, German, Chinese, Russian)
Distributed Management Control Plane (Storage Grid Technology enables WUI access and API access from all systems simultaneously)	Yes [21]
Alert Management (over 200 call-home alert types covering system, storage, and networking related issues and maintenance items)	SNMP, Email, Pagerduty, Slack, Splunk On-Call, ServiceNow, DynaTrace, Squadcast, Lightstep, etc
Health Reporting (HTML & CSV)	Yes
Capacity Usage Reporting (HTML & CSV)	Yes
Zero-touch Maintenance System (automatic repair/heal on replacement of bad media)	Yes
Data scrubbing Schedule Management (bit-rot correction) for both scale-up and scale-out solutions.	Yes [27]
Composable Infrastructure Management - NVMeoF JBOFs and correlation of pool device to enclosure view	Yes, OpenFlex Data24
Hardware Monitoring & Management - Servers	Yes (Dell, HPE, Supermicro, Cisco, Lenovo, WD, Seagate)

QuantaStor Protocol Specific Features

Object Storage

Feature	Scale-out
S3 Compatible	Yes
S3 User and Tenant Management	Yes
S3 Bucket Management	Yes
Bucket Object Locking (Governance/Compliance)	Yes
Data Compression	Yes [6]
Data De-duplication	No
Thin Provisioning/Over Provisioning	Yes [11]
Write Log (SSD acceleration)	Yes
Read Caching (SSD acceleration)	Yes [17]
Meta-data Offload (SSD acceleration)	Yes
Async Replication	2023
SMB bucket access	Yes (via Cloud Containers)
Scale-out NFS bucket access	Yes
S3 Bucket Management	Yes
Erasure-coding (any K+M)	Yes [22]
Replicas (r=2, 3, 4)	Yes
Multi-site Clusters	Yes
Multiple Clusters per Storage Grid (Multi-cluster / Zone Management)	Yes
Bi-directional bucket replication	Yes
Quotas (Tenant, User & Bucket)	Yes [28]
Multi-tenant (Group users by tenant)	Yes
Hierarchical Fault-tolerance (Rack / Site / Building)	Yes

File Storage

Feature	Scale-out	Scale-up
NFS v3/v4	Yes	Yes
SMB v2/v3	Yes	Yes
Native scale-out client	Yes	N/A
Sync Replication / Multi-site strech clusters	Yes	N/A
Data Compression	Yes [7]	Yes [8]
Data De-duplication	No	Yes (inline)
Thin Provisioning/Over Provisioning	Yes [12]	Yes [13]
Write Log (SSD acceleration)	Yes	Yes
Read Caching (SSD acceleration)	Yes	Yes
Meta-data Offload (SSD acceleration)	Yes	Yes
Async Replication	2023	Yes
N-way & Cascading Replication	Yes	Yes
Snapshot Shares	Yes	Yes
Snapshots of Snapshots	No	Yes
Clone Shares	Yes	Yes
Quotas	Yes [23]	Yes [24]
Multiple Clusters per Storage Grid (Multi-cluster / Zone Management)	Yes	Yes
AD Integration for SMB users	Yes	Yes
Host level QoS controls	2023	2023
Supported Media	All *3	SAS, NL-SAS, Dual-port NVMe
Hybrid storage optimized HDD+SSD	Yes	Yes
Encryption-at-rest (AES256)	Yes [31]	Yes [32]

Block Storage

Feature	Scale-out	Scale-up
FC 8Gb/16Gb/32Gb	Yes	Yes
iSCSI 10/25/50/100GbE	Yes	Yes
NVMeoF TCP	Yes [3]	Yes [4]
Native scale-out block client (RBD map)	Yes	N/A
Data Compression	Yes [9]	Yes [10]
Data De-duplication	No	Yes (inline)
Thin Provisioning/Over Provisioning	Yes [14]	Yes [15]
Write Log (SSD acceleration)	Yes	Yes
Read Caching (SSD acceleration)	Yes	Yes
Meta-data Offload (SSD acceleration)	Yes	Yes
Sync Replication / Multi-site strech clusters	Yes	N/A
Async Replication	Yes	Yes
N-way & Cascading Replication	Yes	Yes
Snapshot Volumes	Yes	Yes
Snapshots of Snapshots	No	Yes
Clone Volumes	Yes	Yes
Multiple Clusters per Storage Grid (Multi-cluster / Zone Management)	Yes	Yes
QoS controls (throughput)	Yes [25]	Yes [26]
Supported Media	All *3	SAS, FC, NL-SAS, Dual-port NVMe
Hybrid storage optimized HDD+SSD	Yes	Yes
Encryption-at-rest (AES256)	Yes [29]	Yes [30]
Clustered High Availability Interface Management	Yes [33]	Yes [34]

Feature	Value
Hardware Monitoring & Management - Controllers, Enclosures and correlation of pool device to enclosure view	Yes (Dell, HPE, Supermicro, Cisco, Lenovo, WD, Seagate) [35]
Deploy as Virtual Storage Appliance	Yes (VMware, HyperV, VirtualBox) [38]
Out-of-box experience - QuantaStor has a Getting Started configuration workflow manager built-in to the web management interface that makes it easy to configure new systems through a set of steps.	Yes [41]
Branded all-in-one QuantaStor OS platform media packaged as ISO for bare-metal or VM installation	Yes
Heterogeneous Storage Grids - Bare metal deployment on hardware from multiple vendors and generations of hardware	Yes [48]
Scale-out Cluster Management (Full management and monitoring of all services including monitors, RGWs, MDS, file/block/object pools, EC policies, Clusters, OSD, WAL, MDB, and associated protocol services)	Yes
Block Storage Copy Engine	FC, iSCSI, NVMeOF, Cloud
Block Storage Pass-thru	FC, iSCSI, NVMeOF
Block Storage Software Adapter for using 3rd party SAN storage back-end	iSCSI & NVMeOF
File Storage Backup Engine	NFS, SMB, S3
NAS Gateway to Cloud	Yes
Intelligent Pool Provisioning with Automatic Enclosure Redundancy	Yes [59]
Multi-tenant Resource Groups	Yes
Multi-tenant Tagging	Yes
Multi-tenant Provisioning Quotas	Yes
Automatic Multipath Device Management	Yes
Network - Port Bonding, VLANs and VIF management	Yes
Network - FIrewall Management (System & Port level)	Yes
Network - DNS, NTP Management	Yes
Security - FIPS-140-2 L1 Certification	Yes
Security - Key Management - KMIP Integration	Yes
Security - SED Opal/Ruby Hardware Encryption	Yes
Security - Multi-factor Authentication	Yes (Cisco Duo)
Security - Single-sign-on AD/LDAP with automatic grid user creation based on AD/LDAP group settings	Yes
Security - Role Based Access Controls (security management system does authentication and authorization checks for every API call)	Yes
Security - RBAC + Multi-tenancy	Yes (patented) [69]
Security - NIST 800-53 Compliance	Yes [70]
Security - Audit Logging	Yes [71]
Security - Data-shredding (DoD, Army, random)	Yes [72]
Security - GDPR compliant Log Send System	Yes
Security - CJIS Compliance	Yes
Security - HIPAA Compliance	Yes

Feature	Value
Supported Media	All *3
Hybrid storage optimized HDD+SSD	Yes
Snapshot Rollback	Yes [42]
Encryption-at-rest (AES256)	Yes [47]
S3 Reverse Proxy	Yes [49]
Multi-site / Multi-cluster Management	Yes
Clustered High Availability Interface Management	Yes [55]
Multiple S3 Gateways per system	Yes
S3 Gateway optimization for NVMeOF	Yes
Built-in Load Balancing	Yes
Open Data Storage Technology	Ceph RGW
Multi-tenant Charge-back	Yes [60]

Feature		
Clustered High Availability Interface Management	Yes [36]	Yes [37]
Snapshot Schedules (instant)	Yes [39]	Yes [40]
Snapshot Rollback	Yes [43]	Instant [44]
Async Replication Schedules (block level incremental)	2023	Yes
Multi-site / Multi-cluster Management	Yes	Yes
Share aliases & sub-share Mangement	Yes	Yes
Grid Network Share Namespaces (NFS v4 referrals & SMB DFS)	Yes [56]	Yes [57]
Open Data Storage Technology	CephFS [58]	OpenZFS
NFS & SMB Protocol Containerization for Multi-tenancy / Resource Groups	2023	2023
Multi-tenant FTP	2023	Yes
Multi-tenant Resilio	2023	Yes
Write-Once-Read-Many (WORM) Support	2023	Yes
NAS to Cloud Storage Tiering	Yes [61]	Yes [62]
NAS to Cloud Storage Gateway	Yes [63]	Yes [64]
Backup to/from NAS	Yes [65]	Yes [66]
Backup to/from Object Storage	Yes [67]	Yes [68]

Feature		
Multi-site / Multi-cluster Management	Yes	Yes
Snapshot Schedules (instant)	Yes	Yes
Snapshot Rollback	Yes [45]	Instant [46]
Async Replication Schedules (block level incremental)	Yes	Yes
Host & Host Initiator Group Management (iSCSI, FC, NVMeoF)	Yes [50]	Yes [51]
iSCSI CHAP Authentication (Volume, User, & Tenant scope) [52]	Yes [53]	Yes [54]
Performance Optimization Policies	Yes	Yes
Open Data Storage Technology	Ceph RBD	OpenZFS
Multi-tenant iSCSI	Yes	Yes

Licensing System (capacity per system, subscription based, cloud native for service providers)	Yes
Cluster Management System for HA VIFs	Yes
OEM Branding System	Yes
VMware Certification	iSCSI, FC [73]
Veeam Ready Certified	Yes
Docker Volume Driver	Yes
Openstack Cinder Driver	Yes [74]
Kubernetes CSI Integrated	Yes (scale-out)
Weka IO Certified	Yes

Notes:

1* Backup Policy feature provides a mechansim for replication but its file level replication doesn't have the efficiency of block-level incremental replication. True async-replication is a feature that's under investigation for a future version of CephFS.

2* See information on Ceph deduplicaton plans here: https://docs.ceph.com/en/latest/dev/deduplication/

3* All storage media types include NVMe direct, NVMeoF RDMA & TCP, SAS, NL-SAS, Enterprise SATA, PMEM

[1] With Advanced Storage Analytics, users can visualize file, block, and object storage utilization in graphs, charts, and real-time dashboards to better understand their storage needs and simplify capacity planning. The QuantaStor web-based grid management interface also includes real-time visual presentation of block storage performance, network utilization, CPU and memory utilization, object storage utilization, and network health diagnostics. The Configuration Analyzer enables one-click analysis of network, security, and performance settings across all QuantaStor appliances in a given storage grid, making it easy to validate a storage configuration before production deployment.

[2] QuantaStor's REST API support enables automated provisioning and management operations. Every feature of QuantaStor is accessible via REST APIs, CLI and the web user interface so that all aspects of deployment and provisioning can be automated via scripting.

[3] QuantaStor supports the use of NVMe with all storage types including SAN, NAS and object storage. Support for highy-available NVMe storage pools, using persistent-reservation device locking on dual-ported NVMe devices is available. Please see supported list of NVMe drives on our HCL (https://wiki.osnexus.com/index.php?title=Hardware_Compatibility_List_(HCL))

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[5] QuantaStor's remote management CLI allows storage management scripting and automation. The CLI is available on Windows and Linux (RHEL & Debian/Ubuntu) and includes an XML (--xml) output mode for easy parsing and integration with custom applications and provisioning tools.

[6] Storage Pools have compression enabled by default which both increases usable capacity and increases performance by reducing the amount of data written to disk. Virtualization deployments typically have compressible data and gain an additional 30 percent or more usable storage space due to compression.

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[11] Allocate volumes without having to dedicate the storage until it is needed. With thin-provisioning make the volume (LUN)s as large as needed (up to 2x the size of the storage pool).

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[16] The Ansible module enables users to quickly and easily set up playbooks to automate the provisioning of file, block and object storage within QuantaStor storage grids, which is ideal for highly dynamic environments like software development, testing, continuous integration, and analytics.

[17] For S3/SWIFT object and other scale-out configurations QuantaStor integrates with SSD read/write cache management features of the LSI and Adaptec RAID controllers as well as with software SSD journalling features such as those found in Ceph.

[18] QuantaStor's web-based user interface provides a rich experience which enables users to manage all their appliances as a homogeneous storage grid. The web management interface is accessible from all QuantaStor appliances and is pure native HTML5 + JS with full support for all major web browsers.

[19] The QuantaStor web management interface provides real-time stats on a variety of important metrics including memory, CPU, I/O wait, network RX/TX throughput and more. Third party monitoring systems can also be installed into QuantaStor appliances including CopperEgg, Librato Metrics, Nagios, Splunk, Zabbix, and others. For more information on how to setup and integrate with 3rd party monitoring systems please see the guides on the OSNEXUS wiki: https://wiki.osnexus.com/index.php?title=OSNEXUS_QuantaStor_Documentation

[20] Web User Interface dashboard views are customizable allowing users to turn on and off storage management section and web interface tab views. The Storage Grid Dashboard is a tile-based view of all appliances within a storage grid, their health, and a summary of storage utilization statistics.

[21] Provision up to 64x storage appliances and over 64PB of storage in a single grid with support for all major server vendors (HP, Dell, Cisco, IBM/Lenovo and SuperMicro). QuantaStor's unique Storage Grid technology enables organizations to manage all appliances as a homogeneous grid which spans sites with a heterogeneous mix of hardware.

[22] Erasure coding is supported on all scale-out S3/SWIFT object configurations and scale-out NAS configurations. This provides maximum usable capacity along with high-availability and fault-tolerance by using Reed-Solomon algorithms, spreading data across appliances so that environments can scale from 100TB to 100PB.

[23] Set storage quota limits on the maximum amount of storage that can be thin-provisioned or the maximum amount of storage that can be physically utilized and the maximum number of volumes that can be provisioned. Storage quotas are associated with storage clouds to create one per cloud and cover all users within that cloud storage pool. Users can also be members of more than one storage cloud.

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[25] QuantaStor offers storage read and write bandwidth limiting, referred to as Quality of Service (QoS) controls, to ensure reliable and predictable service quality for all applications and users of a given appliance. In a shared or multi-tenancy environment, QuantaStor QoS controls are enabled for storage volumes via policy management.

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[27] QuantaStor support Bit-rot detection and protection on all storage types through ZFS technology for SAN/NAS deployments and Ceph technology on scale-out S3/SWIFT object storage deployments.

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[29] QuantaStor supports "one-click" full drive encryption with AES-256 as well as hardware based encryption on systems with LSI RAID with SafeStore enabled. Software encryption and decryption performance is accelerated by much as 8x through the use of Intel's AES-NI technology found on Intel Xeon® processors. Hardware encryption is FIPS 140-2 certified and requires special FDE/SED enterprise SAS drives available from a variety of vendors listed in the LSI SafeStore HCL.

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[33] High-Availability is a must have requirement for almost all use cases and is available on SAN/NAS and S3/SWIFT object configurations. SAN/NAS configurations require 2x servers with HBA or SAN connectivity to back-end storage while scale-out S3/SWIFT configurations use RAID controllers and cluster technology to replicate data across nodes to ensure high-availability while providing an additional layer of fault-tolerance. QuantaStor's SAN/NAS based HA failover is one of the fastest in the industry which is made possible by our highly parallelized HA failover system and IO fencing system that ensures quick failover of our ZFS based Storage Pools whether they're large (100s of disks per pool) or small (less than 50 disks per pool). NVMe high-availability is supported. Please see supported list of NVMe drives on our HCL (https://wiki.osnexus.com/index.php?title=Hardware_Compatibility_List_(HCL))

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[35] QuantaStor hardware module plug-in framework for integrates with third-party hardware including HBAs, RAID controllers, and SANs enabling the use of advanced enterprise hardware and RAID capabilities from variety of vendors to be integrated into QuantaStor appliances and storage grids. Management integration includes enclosure and device identification, and management operation integration so that administrators can provision hardware RAID using, handle hot-spare management, disk identification and other management task completely within the QuantaStor web management interface and REST APIs.

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[38] QuantaStor Virtual Storage Appliances (VSAs) are cloud-hosted virtual SAN/NAS Linux storage appliances that support all major protocols including iSCSI/FC and NFS/CIFS/SMB for file, block and object storage.

[39] Create automatic snapshot schedules of storage volumes and network shares in just a few clicks to ensure easy recovery of deleted files and instant roll-back capabilities. This allows for instant recovery back to a previous point in time to recover lost files or other data. Snapshots are also a powerful tool in the fight against ransom-ware since snapshot roll-back can be used to rewind to a point-in-time before a given attack took place.

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[41] The Configuration Workflow Manager guides users through basic QuantaStor appliance set up, block storage provisioning, file storage provisioning and storage grid set up.

[42] Accidental file deletion and data recovery is enabled through volume and network shares snapshots that can be created automatically on a schedule. Windows users accessing Network Shares via SMB can access and recover files by right-clicking on the share and viewing 'Previous Versions..' which greatly simplifies the file recovery process for IT organizations.

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[47] QuantaStor supports "one-click" full drive encryption with AES-256 as well as hardware based encryption on systems with LSI RAID with SafeStore enabled. Software encryption and decryption performance is accelerated by much as 8x through the use of Intel's AES-NI technology found on Intel Xeon® processors. Hardware encryption is FIPS 140-2 certified and requires special FDE/SED enterprise SAS drives available from a variety of vendors listed in the LSI SafeStore HCL.

[48] QuantaStor works with all major standard server hardware to meet IOPS and bandwidth requirements using a hardware vendor of your choice. For more information on our reference configurations for Dell, HPE, SuperMicro, Cisco, and Lenovo hardware please see our Reference Configurations page here.

[49] Designed specifically for IBM COS, this feature enables IBM customers to set up a highly-available S3 reverse proxy so that hybrid cloud users can access COS object storage data from IBM Cloud, IBM private cloud datacenters, as well as on-premise data seamlessly.

[50] Hosts are often combined into clusters or pools for use with Microsoft MSCS, Hyper-V, VMWare, and XenServer. The Host Group object is a grid wide object which allows administrators to easily assign Storage Volumes to a cluster of hosts in just a couple of clicks. Traditional storage systems require that Host Initiator entries and Host Initiator Groups be setup per appliance simultaneously as a group rather than assign a volumes to each host individually.

[52] QuantaStor supports per target/volume CHAP (Challenge-Handshake Authentication Protocol) settings, as well as default CHAP settings at a User level and at the Resource Group level for multi-tenant environments. This ensures that as storage volumes (LUNs) are provisioned within a resource group they're automatically protected as per its CHAP policy settings. This also enables CHAP settings to be changed in one place and instantly applied to all volumes in a given resource group simplifying management and security policy enforcement.

[53] QuantaStor allows you to associate a default password to each user account (and storage cloud) so that users can easily change the CHAP password for all their devices all at once without having to update each volume one by one.

[55] High-Availability is a must have requirement for almost all use cases and is available on SAN/NAS and S3/SWIFT object configurations. SAN/NAS configurations require 2x servers with HBA or SAN connectivity to back-end storage while scale-out S3/SWIFT configurations use RAID controllers and cluster technology to replicate data across nodes to ensure high-availability while providing an additional layer of fault-tolerance. QuantaStor's SAN/NAS based HA failover is one of the fastest in the industry which is made possible by our highly parallelized HA failover system and IO fencing system that ensures quick failover of our ZFS based Storage Pools whether they're large (100s of disks per pool) or small (less than 50 disks per pool). NVMe high-availability is supported. Please see supported list of NVMe drives on our HCL (https://wiki.osnexus.com/index.php?title=Hardware_Compatibility_List_(HCL))

[56] As an environment grows and additional appliances are deployed it becomes increasingly difficult for users and to track and manage their storage across a disparate set of NAS filers. QuantaStor solves this problem with global namespaces (aka Network Share Namespaces) which presents visibility to any/all Network Shares from any/all appliances in a given grid. When deployed with highly-available storage pools users get the ease of access found with scale-out NAS with the high-performance that comes with our ZFS based storage pools. QuantaStor's global namespace present storage over over SMB using the Microsoft DFS protocol and via NFS using NFSv4 referral technology. Namespaces can also span sites and the grid of appliances encompassing up to 64x appliances and over 64PB of storage.

[58] QuantaStor fully integrates Ceph technology into the platform so that scale-out NAS and S3/SWIFT configurations can be deployed with ease completely through the QuantaStor grid wide web management interface or in an automated fashion via REST APIs or QS CLI. Simply put, there is no easier way to deploy and maintain Ceph based storage environments than with QuantaStor.

[59] In case of a failed drive, QuantaStor SDS' global hot spare management system dynamically provisions disk hot spares, failover proceses and storage pools to maintain continuous uptime with intelligent disk eclosure, capacity and disk type awareness.

[60] Via API, CLI and WUI the object storage usage information is available indicating the number of buckets allocated and the total usage by bucket, user, and tenant in bytes. This supports automated charge-back accounting systems.

[61] With QuantaStor automated storage tiering your old files can automatically archived to the cloud (Seagate Lyve Cloud, Amazon AWS S3, Microsoft Azure, Backblaze, Wasabi, etc) or to other NAS storage and 3rd party filers. Tiering to the cloud leaves behind a file stub/link so that users can still access the content from your QuantaStor storage system even after it has been migrated to the cloud. Cloud tiering is ideal for use cases like media asset management and can be configured withing QuantaStor via the Backup Policy feature.

[65] Backup policies make it easy to backup any server, desktop or NAS filer via NFS and/or SMB directly to QuantaStor. Backup policies may be configured in

to move or copy mode to backup to files to or from 3rd party NAS filers and cloud object storage.

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[69] Create custom roles or modify existing roles to better match the needs of your organization. QuantaStor goes far beyond basic role-based-access-controls (RBAC) by grouping authorization of actions/operations into roles which are separate from resource groups which indicate what subset of resources a given user can use. Powerful security tools enable multi-tenancy and scoping of permissions to just the user's resources, or to all resources in the user's associated resource group(s), or to the entire storage grid.

[70] QuantaStor is compliant with the security controls and associated assessment procedures defined in NIST publication 800-53 and the protection of controlled unclassified information (CUI) resident in nonfederal systems and organizations in publication 800-171.

[71] QuantaStor appliances automatically maintain audit logs of all operations with time-stamps, user ID, task/operation, client IP, and description so that systems meet regulatory security compliance requirements set forth by CJIS, HIPAA, and other standards.

[72] Devices and storage pools can be easily shredded using industry standard data scrubbing options including 4-pass DoD 5220 22-M section 8-306 procedure, 4-pass NNSA Policy Letter NAP-14.1-C procedure and the US Army AR380-19 method.

[73] QuantaStor is certified for use via NFS, iSCSI and FC on VMware v5 & v6. QuantaStor is certified for use with VMware VAAI for iSCSI/FC block storage based DataStores on both VMware v5 & v6.

[74] QuantaStor object storage integrates with OpenStack by adding it as an OpenStack Swift end-point to the Keystone OpenStack Identity Service so that OpenStack services can use the object storage to store image data and metadata.