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Global Leader in Software-Defined Storage.

NexentaStor Adds NAS Capabilities to Hyper-converged or Block Storage Systems

By Michael Richtberg, Nexenta Advisory Board Member

Introduction

Nexenta's pioneering innovations has led to our leading Open Software-Defined Storage (OpenSDS) software solutions for on-premises, hybrid and multi cloud enterprise environments with the Nexenta AnyCloud vision. This has resulted in thousands of customers and more than 2,000 petabytes of storage capacity under management. Nexenta uniquely integrates its hardware-agnostic software-only enterprise innovation with market leading partners to enable complete, yet flexible, storage solutions that span today's terrestrial and cloud based enterprise infrastructure options. Nexenta enables a wide variety of workloads including existing enterprise applications to next-generation cloud-native apps using any protocol and any hardware infrastructure to power the largest and most cost/performant data centers globally.

Nexenta's solution portfolio is 100% software-based for both on and off premise settings. As companies adopt new enterprise architecture options that include block-only storage and hyper-converged infrastructure to improve performance and simplify deployments but over time there is a need to expand the workloads but run into challenges due to not having file based storage services. You will gain valuable insight on how Nexenta enables these modern architectures to flourish with simplicity to help you grow your business by providing complementary NAS and hybrid public cloud capabilities

Alternative Storage Architecture Options Spurring Growth

Two of the fastest growing segments of the on-premises storage market include hyper-converged infrastructure (HCI) and all-flash arrays (AFAs) with software-defined pulling many of these together for a total of $16.2B of IT spending by 2021[1]. The HCI segment accounts for a significant portion with the highest compound annual growth rate. All flash options from Pure, Dell (XtremeIO), HPe (3PAR), and NetApp continue to grow as the cost per gigabyte of SSDs (solid-state drives) has declined over the past five years. This makes AFA options more affordable, more power and space efficient, and appealing for tier 1 applications that need the performance of SSDs. An increasingly common combination using SSDs in HCI provides excellent choices for customers looking for either a hyper-converged option (HCI) or the separate external shared storage (AFAs).

Block storage systems using hard disk drives (HDDs) or hybrid HDD/SSD combinations in storage area networks (SANs) or hyper-converged remain very attractive for storage capacity where cost per gigabyte is the key buying criteria. This segment has slower growth, but there is a tremendous install base.

[1] Source: IDC, 2017

Missing File Services

Servicing workloads that use the block storage protocols (e.g., iSCSI, FC, InfiniBand) works great for applications designed to use raw storage volumes. Its versatility makes it very attractive for many use cases. File storage systems created from block storage are frequently needed to present users with file shares. Most of the HCI and SAN storage systems do an excellent job focusing on raw block storage but do not have file services. The workaround often comes from attaching a general-purpose operating system to create file systems like NFS and SMB/CIFS. Alternatively, you can purchase a dedicated NAS hardware appliance.

Add NAS Capabilities and Extend Your Investment

VMware VSAN and other hyper-converged platforms, public cloud platforms like AWS, and standard servers connected to SANs are all excellent options for hosting virtual machines (VMs). Most of these are forms of software-defined storage enabling commodity servers and SSD/HDD media to perform advanced storage functions, but they are not built to deliver file services. Adding file services can increase the versatility of these storage systems to address user directories, virtual desktops, and back-up applications.

Fortunately there's a way to add file services to the HCI or SAN options using another form of software-defined storage via Nexenta's award winning fifth generation storage software, NexentaStor. This highly efficient, hardware independent, option runs as a VM on an existing HCI node (figure 1) or on a VMware enabled server to form a "Virtual Storage Appliance" and attaching to the SAN storage (figure 2). By using the capacity presented to NexentaStor as a VMDK (Virtual Machine Disk), we can create a full featured NAS for delivering NFS or SMB/CIFS shares and even iSCSI LUNs.

Using NexentaStor provides an extremely efficient means of getting both the block storage already available from the HCI or SAN systems and the NAS features by simply adding another virtual machine. A VM hosting NexentaStor provides all of the NAS capabilities while consuming very little overhead from the server/node.

The combination of existing servers, storage, and NexentaStor provides a versatile NAS and SAN/HCI solution without incremental hardware enabling these systems to broaden the use cases available via file services. The NexentaStor option integrates cleanly with VMware's vCenter console for a simplified and unified management experience without *any changes to the existing SAN/HCI systems*.

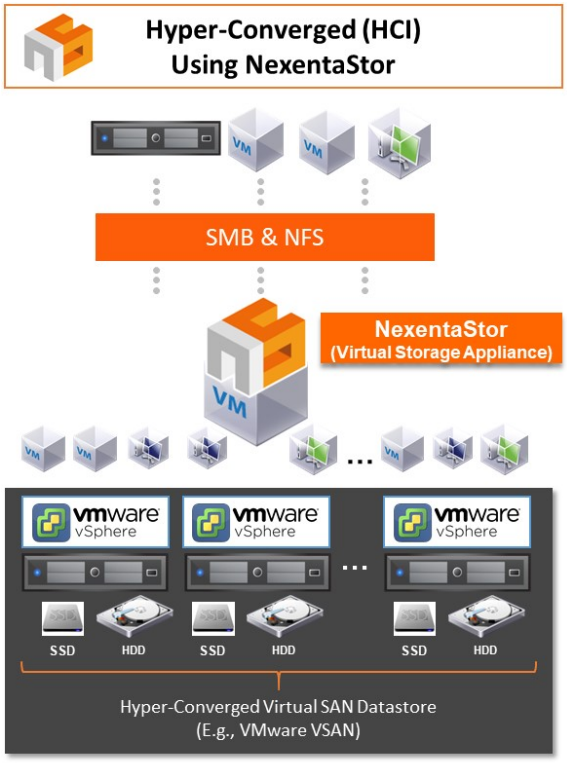


Figure 1

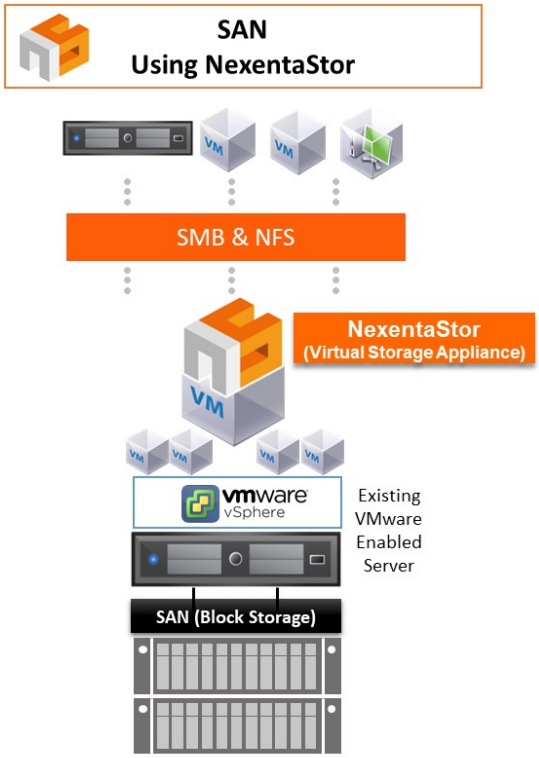


Figure 2

The NexentaStor software utilizes the existing storage contained in the HCI or SAN systems by leveraging the physical elements that connect the disk media together. VMware provides the hosting mechanism for running various virtual machine (VM) workloads and NexentaStor operates in one of those VMs. Using variable capacities presented through VMware's VMDK interface, NexentaStor can create any mixture of NFS, SMB or iSCSI storage targets (figure 3).

For HCI deployments, Windows or Linux workloads requiring an SMB or NFS share, respectively, may run external to the HCI cluster or service VMs running on the HCI cluster. The NexentaStor virtual storage appliance simply shows the NFS or SMB shares as available capacity to the workloads without changing the application or requiring any special HCI system changes, so long as they use a VMware hypervisor.

SAN deployments work in a similar way. NexentaStor occupies a VM on an existing server and connects to the capacity presented to VMware as a VMDK. The SMB or NFS shares appear as available capacities to any VMs running on the network.

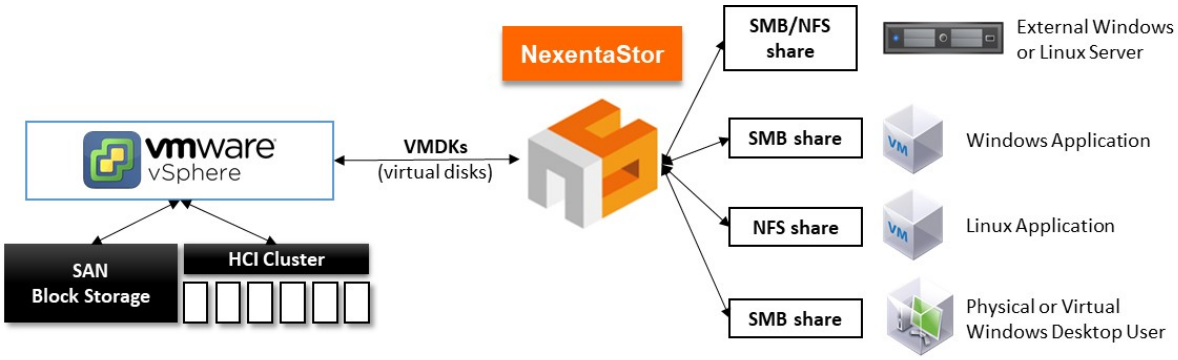


Figure 3

NexentaStor provides the key value of providing a full enterprise NAS without requiring any incremental hardware and eliminates the need to purchase a separate dedicated NAS storage system. NexentaStor provides the same capability by simply creating virtual NAS using the NexentaStor software-defined storage.

Get Full-Feature Enterprise File Services without Extra Cost or Complexity

If you need file services, adding a dedicated NAS appliance certainly provides a way to address the need. This adds another cost for setting up your full service storage needs, plus it's another item to maintain which adds even more cost.

An alternative "do-it-yourself" option is to add a Linux or Windows server as a VM to present the SMB or NFS shares. While it addresses the protocol requirement, it does not completely address enterprise class storage needs and it introduces new complexities. Using a Linux or Windows OS provides a broad range of general purpose capabilities - most of them don't have anything to do with storage. Dealing with lifecycle issues like maintaining patches unrelated to storage adds unnecessary maintenance efforts. Linux or Windows does not offer a full set of enterprise storage features (e.g., user management, lack of NFS/SMB access controls, full enterprise data services).

Why take a well-engineered hyper-converged or SAN storage solution designed to optimize your infrastructure and then add on these non-optimized options to get file services?

NexentaStor provides an extremely efficient fit-for-purpose storage solution that includes a kernel that has one focused function: providing optimized storage services. Getting full service enterprise storage goes well beyond simply providing a protocol. NexentaStor includes all of the NAS capabilities that you'd expect from an enterprise-class physical NAS appliance. These include features like advanced caching algorithms for higher performance, lifecycle management (cloning, provisioning, snapshotting), full ACL and AD user management, data efficiency services (inline data reduction), and data resiliency (software based RAID, replication, copy-on-write file system, & 256 bit checksum on all data). All combined, the NexentaStor capabilities do much more than what you get from a general-purpose operating system for providing file services.

NexentaStor Offers "No-Compromise" Enterprise Features

Using NexentaStor, you get all of the enterprise capabilities that help with lifecycle management, data efficiency, integration with your access control systems, and protocol compatibility for your application operating systems. Moving to a virtual storage appliance model doesn't mean leaving all of those features behind. With NexentaStor, you get all of these advanced storage system benefits:

- Enterprise-grade data integrity, scale and performance scaling to hundreds of Terabytes
  - Copy on Write file system
  - 256 bit checksum on all data
- Unlimited file system sizes
- Unified File and Block data services
  - File: NFSv3, NFSv4, SMB 1.0, SMB 2.1, SMB 3
  - Block: iSCSI
- Multiple media options
  - HDD, SSD or combinations
- Client OS support
  - VMware ESXi, Microsoft Windows
  - CentOS, RHEL, Ubuntu
- Ecosystem integration
  - VMware vCenter plug-in
  - SMB 3 ODX for Microsoft Hyper-V
  - OpenStack Cinder & Manila
  - Docker Volume plug-in
  - Kubernetes Persistent Volume
- Inline data reduction for additional storage cost savings
- Software-based RAID options for tuning capacity, performance and protection options
  - For best performance we recommend stripping the pools
- Access control
  - NexentaStor ACLs are compatible with both NFS and SMB, so that the ACL you create for a file system applies to clients using either protocol
- Flexible management services
  - VMware vCenter Plug-in
  - Self-documenting REST API, CLI, SNMP
  - NexentaFusion (HTML 5 based)
- Flexible capacity based licensing

- Advanced high performance caching architecture
  - The filesystem was specifically designed to deliver optimal performance and availability from the extensive list of hardware found on the VMware hardware compatibility list. Excellent hybrid pool performance capabilities and use of isolated caching for read and write operations provides optimal speed for each individually. Leveraging local system memory, the filesystem adds an even faster layer of cache for all data.
- Unlimited space optimized snapshots and clones
  - Leverages the copy on write benefits for unlimited snapshotting
  - Capacity optimized – only consuming incremental block changes
  - Configurable frequency for optimizing recovery points
- High availability
  - Utilizes VMware HA for ESX host failover. The VSA auto-restarts on an alternative active host. Downtime commensurate with ESX load levels & server performance.
  - Optional NexentaStor HA plug-in provides instant seamless auto-restart failovers between VSA nodes for rapid VM host transition.
- Periodic or continuous asynchronous long distance replication
- Simplified setup
  - Installs quickly and easily on an existing HCI node VM or on an external server connected to your SAN.

NAS File Storage Use Cases

Block storage provides an excellent option for VMs running many application workloads, but file services becomes a necessity when servicing many end user needs. Some excellent examples for optimizing the combination of NexentaStor and SAN/HCI include:

- **User Directories & Profiles** – User file directories to centralize physical or virtual desktops using SMB shares makes a lot of sense, particularly as more and more users are now mobile. File storage for user profiles typically goes along with user files when deploying virtual desktops and they need a file storage solution as well. If you're considering options like HCI or a SAN to replace a NAS, adding NexentaStor enables you keep those NAS capabilities while simplifying your architecture. Adding the NexentaStor software-defined storage to one of the VMs provides a pragmatic solution without adding more hardware.

- **Branch Office Consolidation** – Simplifying branch office locations with easily maintained HCI options helps bring local proximity of user files while using a centralized private or public cloud storage system for consolidation for a great hybrid combination. NexentaStor running at the branch offices using scheduled replication to a central office or public cloud hosted repository provides an excellent combination of local user file access and centralized protection.

- **Back-up** – Many back-up applications use a file protocol. Adding NexentaStor to your SAN or HCI configuration enables our customers to consolidate functionality by providing the NAS interface needed for back-up applications (e.g., Veeam).

- **Line of Business Applications** – Linux or Windows applications designed for NFS or SMB, respectively, can leverage the NexentaStor NAS interface with SAN or HCI deployments when our customers choose these enterprise architecture options.

Integrated vCenter Management

To simplify daily administration tasks, the ESXi certified NexentaStor offering provides a fully integrated vCenter plugin (figure 4). Leveraging the same tool set for your VM management, NexentaStor seamlessly integrates all of the administrative tasks in the vCenter console and provides full multi-tenant control.

NexentaStor leverages VMware's VVOLs (Virtual Volumes) capabilities to enable performance optimized NFS shares as well. Using QoS capabilities in NexentaStor, we ensure VMs using SMB/NFS shares to not create "noisy neighbor" problems for other VMs.

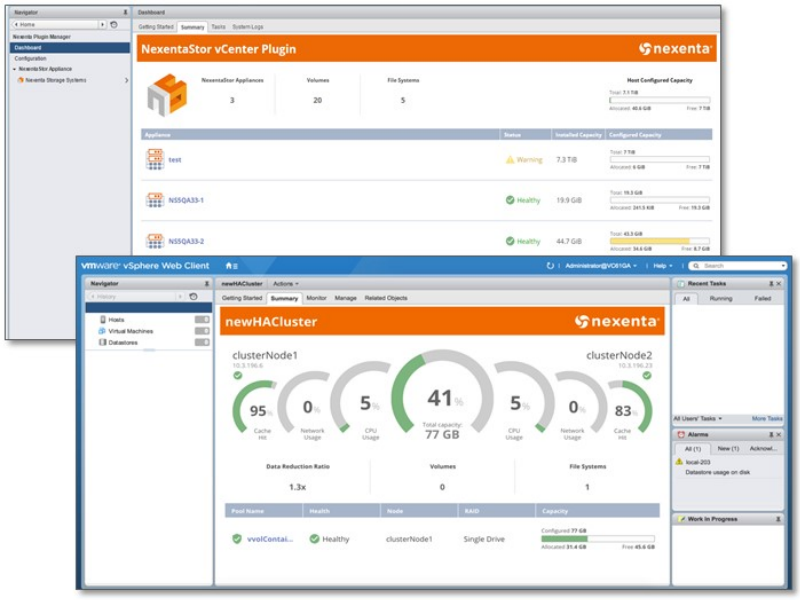


Figure 4

NexentaFusion

For greater visibility and orchestration capabilities, NexentaFusion provides a unified storage management and analytics system for customers using a combination of Nexenta products, including hybrid cloud deployments, branch office consolidation, or deployments using multiple virtual storage appliances. NexentaFusion provides a single pane of glass to simplify your administration and visibility with extensive analytics to help optimize your data management (figure 5). Get a true sense of your data systems by looking at historical activity. Improve your load accommodations. Even troubleshoot problems or prevent problems from occurring in the first place.

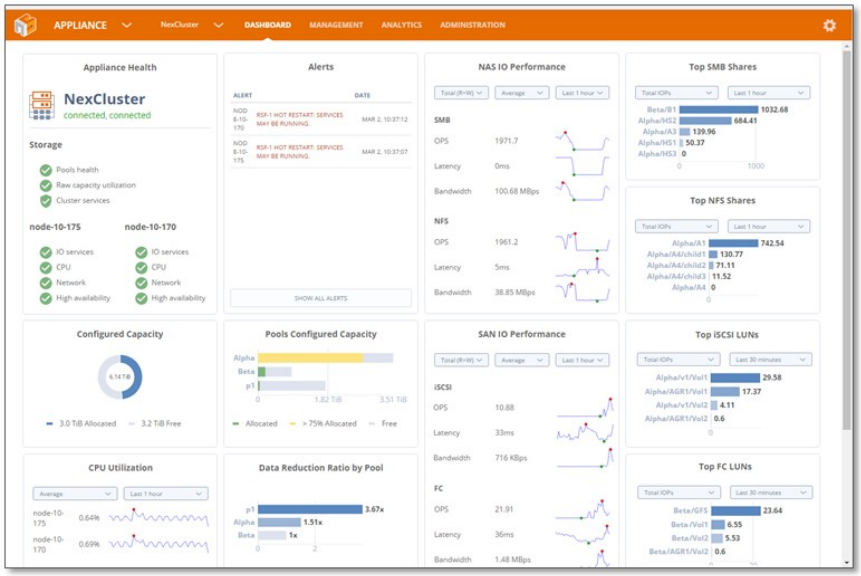


Figure 5

NexentaFusion provides the perfect multi-system dashboard to keep track of the status and health of all Nexenta instances (figure 6). Easily administer all provisioning and configuration options that includes:

- Hardware / components configurations
- Pool configurations
- File systems, volumes
- Shares, LUNs
- Data protection
- Replication

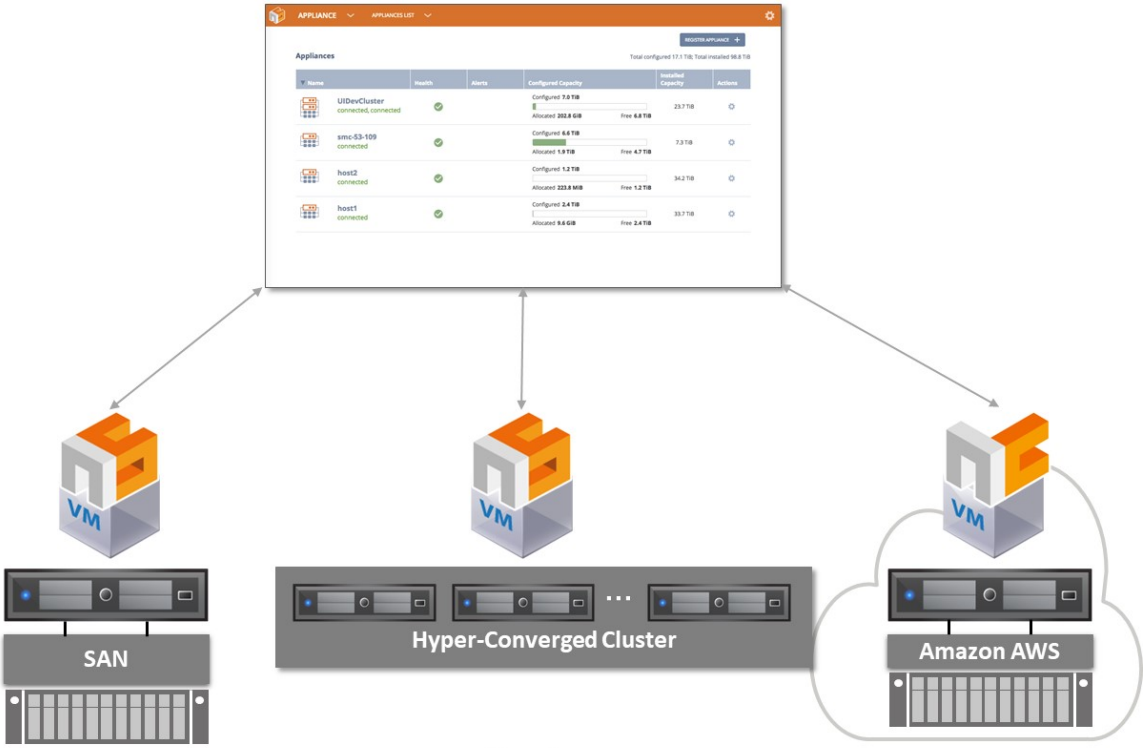


Figure 6

Configuration Options

Depending on the use cases, we find our customers prefer options for the type of storage media. For cost effectiveness, hard disk drives (HDDs) provides the best option. Workloads requiring high performance choose all-flash arrays (AFAs) or hybrid flash/HDD configurations. NexentaStor provides the flexibility to utilize any of these combinations. Simply pick the configuration of your HCI or SAN that best meets your needs and the software-only addition of NexentaStor consumes the capacities presented as VMDKs.

Our customers may use a combination of media types in different HCI clusters or a mixture of SAN configurations. We support these mixed environments as well. This enables provisioning shares with different performance characteristics that best suit the needs of your workload.

Virtual Machine Resource Recommendations for NexentaStor

Depending on the workload, the media type, and the storage capacity needed, the virtual machine resources needed to host NexentaStor varies. The table below provides a starting point guide for allocating the proper combination of compute, memory, disk, and networking. NexentaStor goes well beyond the 128 TB example.

Media protection inherently built in the SAN or HCI configurations simplifies the configuration options in NexentaStor. While we provide the ability to choose different RAID options, we simply recommend using stripping for optimizing performance. The underlying physical and SAN/HCI infrastructure provides drive level redundancy management.

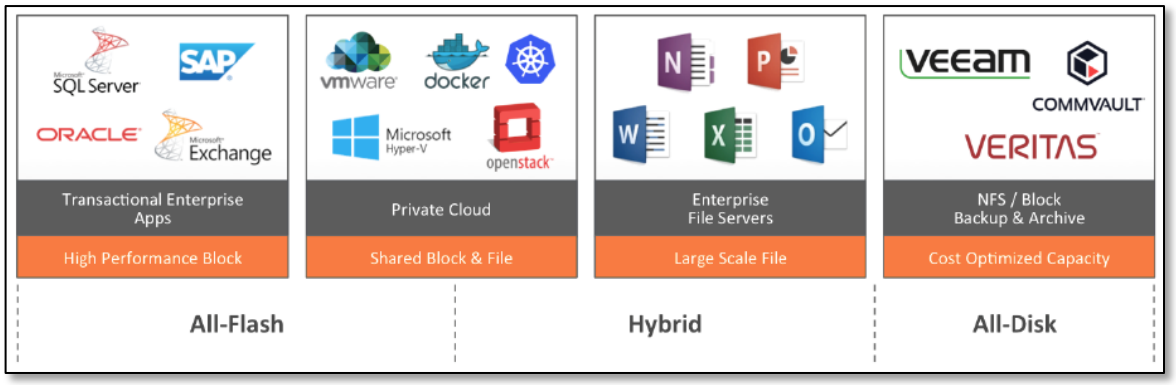
	Small (up to 4 TB)	Medium (up to 32 TB)	Large (up to 128 TB)
Virtual Machine Sizing:			
vCPU	1	2	2
Memory[1]	8 GB	24 GB	32 GB
vNIC (VMXNet3)[2]	1-2	2-4	2-4
VMDK Disk Recommendations[3]			
Quantity	8	16	32
Size	1 TB	2 TB	4 TB
Redundancy[4]	Leverages the underlying storage. Set NexentaStor to use striping for performance.	Leverages the underlying storage. Set NexentaStor to use striping for performance.	Leverages the underlying storage. Set NexentaStor to use striping for performance.

Notes:
1. Used for high performance advanced caching algorithms
2. Varies for items like isolating management from I/O traffic, or turning on various NexentaStor features (e.g., replication)
3. Example configurations – other options also available
4. Block storage systems and HCI clusters already provide media fault protection

Nexenta Solution Summary

Adding NexentaStor to your SAN or HCI systems provides a cost effective, software-only solution that adds all of the enterprise class NAS features you need without adding additional stand-alone systems. NexentaStor provides all of the enterprise features you expect using an extremely efficient virtual storage appliance that simply occupies a virtual machine on existing systems.

At Nexenta, our mission is to provide the greatest flexibility and simplified implementation through software-defined storage to help you optimize your data management. Taking advantage of different media and storage possibilities, Nexenta provides excellent options to help meet all of your needs.



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See more information on the NexentaStor offering https://nexenta.com/products/nexentastor

Additional resources:

- NexentaStor Datasheet
- NexentaStor Product Documentation

See more about the Nexenta products at https://nexenta.com/products

About Nexenta

Nexenta is the market creator and leader in Open Software-Defined Storage (OpenSDS) software solutions for Hybrid and Multi Cloud enterprise environments via Nexenta AnyCloud vision; with thousands of customers, 300 partners, 50 patents, and more than 2,000 petabytes of storage capacity under management; disrupting and democratizing one of the largest and most oligopolistic IT market segments nearing $100B in size by 2020. Nexenta uniquely integrates its hardware-agnostic software-only enterprise OpenSDS innovation with deep "open source" collaboration via some of the most active communities with 45,000+ members. Nexenta enables a wide variety of workloads from legacy enterprise to next-gen cloud-native apps, on any cloud platform, any protocol and any hardware infrastructure to power the largest and most cost/performant data centers globally. Nexenta OpenSDS solution portfolio is 100% software-based for both on and off premise settings. Nexenta provides organizations with Total Freedom protecting them against punitive legacy storage hardware vendor practices including, long term "vendor-lock-in", "vendor-bait-n-switch", and "vendor-rip-n-replace." Beyond its industry-leading software innovation and multi-channel distribution, Nexenta also provides comprehensive enterprise-class support and services 24x7, globally.