nimblestorage

Accelerate Performance and Optimize Capacity

Nimble Storage arrays efficiently store and serve up data fast enough to satisfy even the most demanding applications, from Microsoft SQL Server to VDI. Using flash SSDs to dynamically cache hot data to accelerate reads and leveraging a write-optimized data layout to speed up data written to storage, Nimble delivers more IOPS than traditional storage at proven sub-millisecond latencies (measured across Nimble's installed base).

CASL uses multiple mechanisms to optimize disk utilization, allowing more data to be stored in the same capacity. These include inline data compression that reduces the data footprint by 30 to 75 percent; instant redirect-on-write snapshots; zero-copy cloning based on snapshots; and thin provisioning that allocates blocks of data on demand.

Nimble Storage easily scales to fit IT and business needs, enabling customers to boost performance, capacity, or both flexibly and non-disruptively for full investment protection. Customers can scale up performance with more compute power for higher throughput and IOPS and with more cache to accommodate more active data. To scale capacity, simply add additional storage disk shelves to an existing array. Demanding environments can even linearly scale both performance and capacity beyond the physical limitations of a single array, and out to a cluster using any combination of Nimble Storage CS-Series arrays, preserving storage investments and avoiding forklift upgrades.

For extremely demanding environments, or for the purpose of eliminating multiple storage silos to increase operational efficiency, customers can seamlessly combine any Nimble Storage arrays to form a scale-out cluster. Nimble's scale-out architecture features dynamic load balancing,which eliminates performance hot-spots and greatly simplifies operations. It also performs multi-array data striping, which enables any application to fully leverage the collective hardware resources of the scale-out cluster. The process of grouping arrays and reconfiguring nodes, pools, and volumes within the cluster as workloads shift is seamless and incredibly simple, with no disruption to running applications. Ultimately, all hardware resources can be managed as a single storage entity.

Benefits of CASL

Cache Accelerated Sequential Layout (CASL™) is the foundation for Nimble Storage's high performance and capacity savings, integrated data protection, and easy lifecycle management.

CASL features include:

Flash-Based Dynamic Cache
Accelerate read access to application data by holding a copy of active "hot" data in flash; customers benefit from high read throughput and low latency.

Write-Optimized Data Layout
Data written by a host is first aggregated or coalesced, then written sequentially as a full stripe to a pool of disk; CASL's sweeping process also consolidates freed up disk space for future writes. Customers benefit from fast sub-millisecond writes and very efficient disk utilization.

Inline Universal Compression
30 to 75 percent with no added latency; customers gain much more usable disk capacity with zero performance impact.

Accelerate Performance and Optimize Capacity

- Get sub-millisecond latencies on random IO
- Reduce data footprint by 30-75 percent
- Scale to fit capacity and performance requirements

Instant Backups and Restores

- Take months of easy-to-restore backups on same array
- Backup windows virtually eliminated
- Efficiently replicate for affordable disaster recovery

Empower IT

- Simplify storage lifecycle management
- All-inclusive features and functionality
- Application profiles make provisioning a snap
- Secure remote support and non-disruptive upgrades

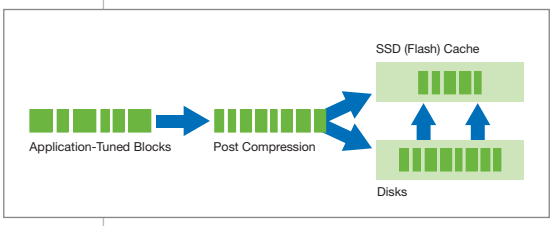

Figure 1: CASL Architecture
Data is compressed inline and stored to disk as a full stripe, and, if applicable, cached in SSD.

Instantaneous Point-in-Time Snapshots
Fast restores without copying data; customers benefit from a single, simple storage solution for primary and secondary data, frequent and instant backups, and significant capacity savings.

Efficient Integrated Replication
Only copy compressed, changed data to a secondary site at a pre-set schedule; customers benefit from affordable disaster recovery.

Zero-Copy Clones
Created instantly, customers get great space efficiency and performance on cloned volumes, making them ideal for virtualization, virtual desktop infrastructure (VDI) and test and development environments.

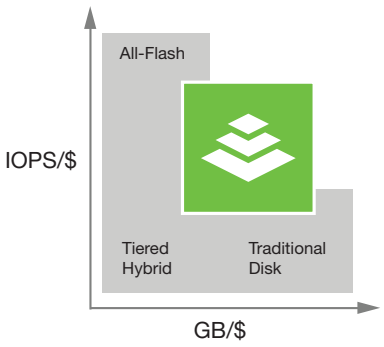

Figure 2: Nimble Storage delivers the best of both price/performance and cost-effective capacity.

Protect Data with Instant Backups and Restores

Reliability is built into the CASL architecture starting with integrity checks that ensure data consistency; highly available, redundant controllers with quick failover for continuous operation; and RAID-6 to transparently protect against dual-disk failure. In addition, Nimble Storage provides the ability to store primary and secondary data, including backups, on one array. This greatly simplifies backup operations, eliminates the need for separate backup storage, and makes backup windows a thing of the past. Nimble Storage's integration with leading hypervisor and application solutions, such as VMware and Microsoft, ensures virtual machine and application-consistent backups.

Using point-in-time, space-efficient snapshots, Nimble can backup and restore data in minutes. Snapshots are instantaneous and occupy minimal space on disks, so customers can back up data frequently and store months of incremental snapshots on the same array. Backups can be set to run automatically and locally stored snapshots can be instantly restored because no data needs to be copied, delivering better Recovery Time Objectives (RTO) and Recovery Point Objectives (RPO).

Nimble Storage can also automatically and efficiently replicate data offsite for disaster recovery or archiving. The array only transfers the compressed, block-level changes over Ethernet to a secondary array. As a result, customers can protect more applications and data, maximize uptime, and further improve RTO and RPO service levels.

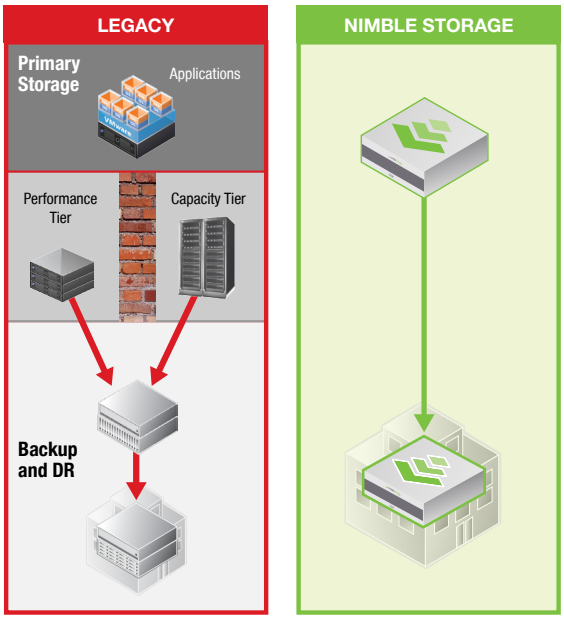

Figure 3: Nimble Storage simplifies IT infrastructure by eliminating the need for separate storage solutions for backup/restore and disaster recovery.

Empower IT

Nimble Storage empowers IT by rethinking the storage lifecycle to deliver true operational efficiency. This is accomplished by simplifying management tasks and leveraging the power of data sciences with InfoSight. InfoSight's deep data approach delivers storage health insights that can be leveraged to streamline maintenance and
support. InfoSight provides granular alerting, accurate forecasting, and a level of overall storage health insight that vastly improves productivity and optimizes system availability.

At the heart of InfoSight is a powerful engine comprised of deep data analytics applied to telemetry data gathered from Nimble arrays deployed across the globe. Millions of sensor values are collected per day per Nimble Storage array.

InfoSight transforms the millions of gathered data points into actionable information that allows customers to realize significant operational efficiency through maintaining optimal storage performance, projecting storage capacity needs and proactively monitoring storage health with granular alerts.

Administrators no longer have to exhaustively gather and process logs and performance data to identify trends or detect performance issues.

The insights and actionable information presented via the secure cloud-based InfoSight Portal help customers easily adhere to storage best practices and make intelligent decisions regarding how to evolve their storage environments to support ever-changing workloads. It transforms the spectrum of time-consuming storage lifecycle activities into a seamless, instant experience.

All features are included with Nimble Storage, so there is no need to purchase separate feature licenses or host/guest agents.

Nimble's wizard-driven user interface and automated capabilities ensure push-button deployment. New storage volumes can be provisioned in three easy steps. Nimble Storage application profiles automatically tune arrays for maximum performance and configure data protection policies, reducing manual tasks. Likewise, zero-copy cloning creates clones of volumes instantly, saving hours of configuration and substantial capacity. These clones are ideal for deploying virtual machines and virtual desktops, as well as creating data sets for test and development purposes.

IT can easily monitor storage, back up data, and perform other tasks from the Nimble Storage management tools and VMware vCenter using the Nimble Storage plug-in. From one console, IT can create data stores, set snapshot and replication schedules, restore data from snapshots, track capacity and performance, and create clones in a single operation.

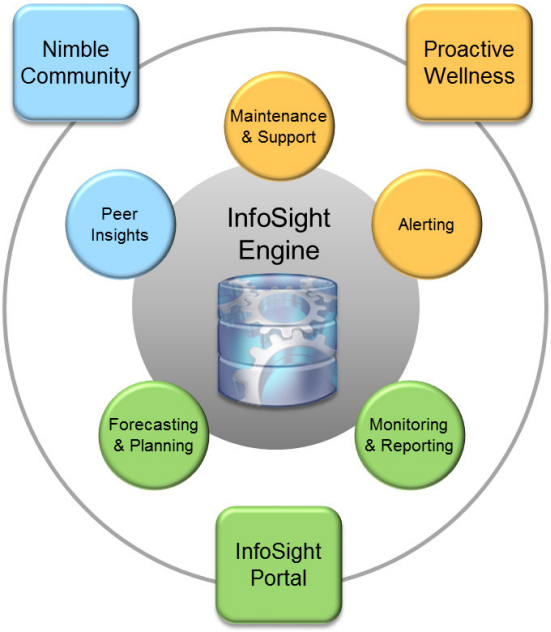

Figure 4: Nimble Storage InfoSight enables unmatched operational efficiency using a data sciences-based approach to the storage lifecycle.

Nimble Storage Software Features

Feature	Function	Benefits
Cache Accelerated Sequential Layout (CASL)		
Dynamic Caching	Reads active "hot" data from flash which is populated on writes or first read	▪ Accelerate reads, resulting in sub-millisecond latency
Write-Optimized Data Layout	Coalesces random writes and sequentially writes them to disk as a full stripe; optimizes free space in the background	▪ Accelerate writes as much as 100x, and get sub-millisecond latency and optimal disk utilization
Application-Aligned Block Size	Enables variable blocks to match application data block size	▪ Optimal application performance
Universal Compression	Always-on inline compression for all workloads	▪ Reduce capacity needs 30-75% for all workloads with no performance impact
Thin Provisioning	Allocates disk space as data is written	▪ Pool storage and maximize utilization
Zero-Copy Clones	Create copies of existing active volumes without needing to copy data	▪ Create clones in seconds and save diskspace – ideal for VDI and test/development
Hot-Swappable Controllers	Fast, automated failover of controllers without disruption (active/standby)	▪ Reduce impact to end users or applications ▪ No performance hit or capacity overhead
RAID-6 and Hot-Swappable Disks	Fast implementation of dual-parity RAID-6 with background scrubbing and support for disk hot swap	▪ Fast rebuild times with better resiliency than RAID-10 ▪ No performance hit or capacity overhead
Improved Data Integrity	Block-level checksum and descriptor verified when data is accessed	▪ Improve data integrity with no performance impact ▪ Eliminate erroneous data access due to incorrect addressing
Instant Snapshot and Recovery	Backup and restore data using point-in-time, space-efficient snapshots taken at regular intervals	▪ Take thousands of snapshots per volume with no performance impact ▪ Back up and restore data in minutes (RTO) and create frequent recovery points (RPO)
Efficient Replication	Copy compressed, changed data to the secondary site for disaster recovery or other use	▪ Fast, affordable disaster recovery and backup remote sites over the WAN
Nimble Host and Application Integration		
Custom Application Profiles	Pre-defined policies for block size, caching, compression, and data protection for Microsoft and VMware	▪ Eliminate the need for manual application tuning and data protection configuration
Windows VSS Enablement	Nimble provider/writer for Microsoft VSS framework	▪ Take application-consistent backups, simplify data protection for Exchange, SQL Server
Plug-in for vCenter	Monitor, provision and protect volumes and virtual machines from vCenter	▪ Manage storage from vCenter and take consistent backups of virtual machines
Adapter for VMware Site Recovery Manager	Automate disaster recovery for VMware, including failover and failback support	▪ Simplifiy disaster recovery, including testing failover/failback
VAAI Support	Support VMware vStorage API for Array Integration	▪ Accelerate provisioning and improve performance
Oracle Snapshot Manager	Application-consistent backups of Oracle databases	▪ Simplify backup and recovery of Oracle databases
Nimble Management and Proactive System Support		
InfoSight Portal	Present single view to InfoSight including case management, alerts/triggers, reports, performance analysis, and capacity planning	▪ Get deep insight on the state of storage with actionable reports and alerts on set events ▪ Manage existing cases and create new ones from one location ▪ Proactively address performance bottlenecks and plan for capacity growth
Proactive Wellness	Monitor and analyze data to identify trends and abnormal operations; send alerts on critical issues	▪ Spot and remedy potential issues, maximizing uptime, performance, and utilization
Secure Remote Support	Allows remote troubleshooting, configuration and problem resolution	▪ Reduce burden on IT staff and quickly resolve problems
Non-Disruptive Upgrades	Upgrade software with no disruption to applications	▪ Maximize uptime and user productivity through continuous availability

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