Solution Brief

Element Software Delivers Data Efficiencies to Reduce Costs

Always-on global data efficiencies minimize redundancy while maximizing your system

Key Benefits

- Shrink your cloud infrastructure data footprint.
- Manage data that consumes the least amount of space with little to no impact on performance.
- SolidFire meets today's cloud infrastructure storage demands by making flash at scale an economic reality while delivering superior performance.

Accommodating all the demands of business and applications in a cloud infrastructure, on a shrinking budget, with limited space, is a real world for cloud architects who must manage costs, reduce complexity and limit risk. The NetApp® SolidFire® storage system combines all-SSD performance with highly efficient data distribution and management. SolidFire embedded, always-on, granular thin provisioning, multilayer data compression, and global data deduplication techniques meet today's cloud infrastructure storage demands by making flash at scale an economic reality while delivering superior performance.

Global Deduplication

The more digitized your business becomes; the probability of the same data being stored over and over again increases. Storing duplicate data increases the writes to media, multiplies capacity needs, and kicks off a domino effect that requires more space, more power, and more cooling. Cloud architects have an advantage including a holistic approach to consolidating their infrastructures and reducing duplicated efforts. Having a storage platform that delivers and aligns to cloud efficient infrastructure is mandatory.

The Element software's Deduplication Block Service ensures duplicate objects will never be translated into physical data writes onto the block drives. This entire process is performed in line with no performance impact to the system. Element's global deduplication reduces repetitive writes to media increasing system performance by minimizing system resources and increasing the life of the drives by reducing writes to media. Evenly distribute capacity and performance loads across the system, eliminating hot spots.

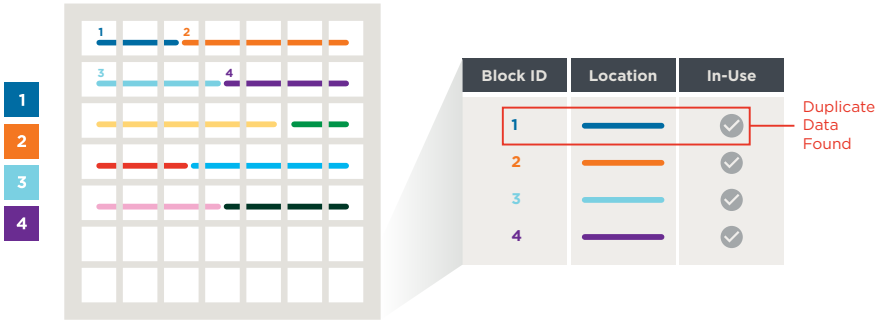

Figure 1) Element software ensures duplicate objects will never be translated into physical data writes onto the block drives, saving phyiscal space without performance impact.

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Multilayer Compression

One key to SolidFire technology is its recognition that flash needs to be handled far differently from traditional spinning disk storage. The SolidFire architecture is designed accordingly, minimizing writes by compressing and deduplicating data before writing to its flash SSDs.

When a host writes data to a SolidFire storage node, that write is divided into 4KB data blocks. These blocks are immediately compressed and stored in the node's NVRAM write cache. Each compressed block is synchronously replicated to one or more additional storage nodes for data protection. An acknowledgement is returned to the host when—and only when—the data has been safely stored in the NVRAM of multiple storage nodes.

Data contained in the compressed data chunk is then hashed. The system looks for that hash value in its index of stored data, which is distributed across the entire cluster. If the data is already present, the SolidFire operating system updates its metadata to indicate that the previously stored block should be delivered when the host reads the data being written, and the newly written block is discarded without ever being written to flash.

If the compressed data block has unique data, it is stored in the system's block pool. The block pool is organized only by the content hash value, rather than by when data was written or from where it originated.

To maximize the efficiency of storing compressed data blocks, the block storage pool doesn't allocate space in fixed-size chunks; instead, the system tightly packs blocks that vary in size, as determined by the compressibility of the data.

4K Granular Thin Provisioning

Systems that use more traditional RAID sets of dedicated drives have typically had thin provisioning implemented after the fact, frequently by automating the LUN expansion process. This often entails adding another slice of a RAID set to a thinly provisioned volume when it reaches some preset threshold. Such automated extension of volumes can, on some systems, cause a performance stutter for a few seconds as space is allocated. In addition, using large allocation extents can reduce the efficiency gains of thin provisioning.

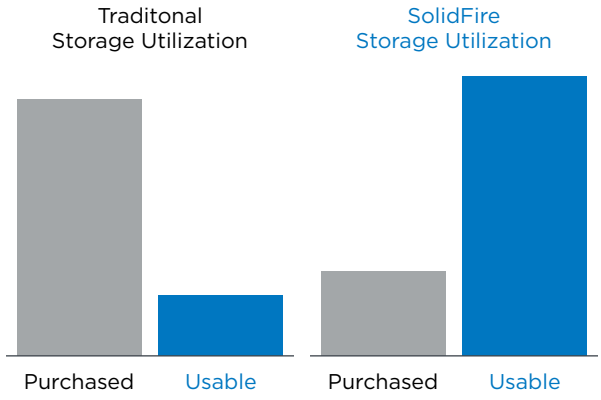


Figure 2) Element software's thin provisioning increases efficiency and reduces overhead by using the smallest allocation possible while maintaining alignment with the native 4KB allocation format used by many operating systems, applications, and modern disk drives.

To minimize the effect of granularity on provisioning, SolidFire allocates data 4KB at a time. This process increases efficiency and reduces overhead by using the smallest allocation possible while maintaining alignment with the native 4KB allocation format used by many operating systems, applications, and modern disk drives.

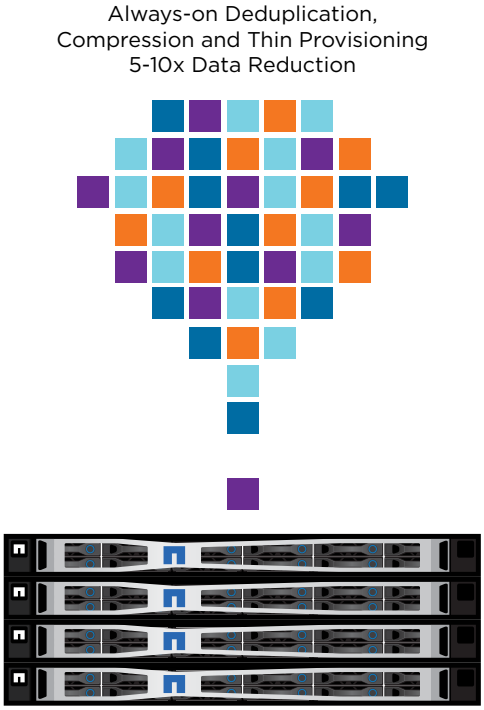
No Performance Penalties

The SolidFire scale-out architecture ensures that network, cache, and compute resources grow in tandem with capacity as the cluster is expanded. Compared with a conventional scale-up model, the SolidFire scale-out architecture delivers linear performance gains as customers increase capacity by adding nodes to the cluster.

The SolidFire scale-out design means plenty of CPU and RAM horsepower to reduce and rehydrate data, regardless of the performance and capacity demands placed on the system. When coupled with a shared-nothing architecture and a distributed replication-based configuration, the SolidFire system enables maximum resource utilization, reducing costs and accelerating innovation.

Benefits of Inline Data Reduction Techniques

- **Performance enhancement.** Improved performance is a key benefit of performing deduplication and compression in line, because there is no performance tax on their usage in a primary storage infrastructure.
- **Guaranteed systemwide efficiency.** The SolidFire system tags and stores data, ensuring that the stored data always resides in its most optimal form, compressed and deduplicated across both the NVRAM and SSD tiers.
- **Increased effective capacity.** SolidFire increases the effective postprocess capacity of the system by reducing the data footprint by 5 to 10 times in line, before it's written to flash. This reduces the cost per gigabyte, forging the path for flash in the data center.
- **Extended media endurance.** SolidFire extends the life of SSDs by wear-leveling write data across all the flash capacity in all the SSDs in the system.



Databases	VDI	Server Virtualization
3 to 4x	4 to 10x	3 to 5x

Figure 3) SolidFire customers see the following combined compression and deduplication gains, on average.

About NetApp

NetApp is the data authority for hybrid cloud. We provide a full range of hybrid cloud data services that simplify management of applications and data across cloud and on-premises environments to accelerate digital transformation. Together with our partners, we empower global organizations to unleash the full potential of their data to expand customer touchpoints, foster greater innovation and optimize their operations. For more information, visit **www.netapp.com**. #DataDriven