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Global Application and SAN Acceleration with Solid-state Storage

Abstract: Solid-state storage or memory is becoming an increasingly common storage offering, providing many advantages in the areas of performance and reliability through quick response times and high rates of input/output operations per second (IOPS). This paper investigates the deployment models of solid-state storage, and explains how the FalconStor[®] Network Storage Server (NSS) SAN Accelerator solution enhances this technology to deliver additional value through application-specific and global SAN acceleration.

Introduction

The performance of an organization’s IT infrastructure has a direct impact on the success of the business. The faster employees and systems can process orders, check inventory, and respond to customer requests, the more competitive that organization will be.

As organizations deploy more powerful servers and higher speed networks, they need to improve the performance of their storage infrastructure to keep up with the demands of the new components. Traditionally, organizations have dealt with storage performance bottlenecks in one of two ways: by upgrading their storage infrastructures with high-performance disk resources such as Fibre Channel (FC) or SAS drives, or by installing additional disk spindles on existing drives to match the profiles of the most I/O-intensive applications.

The introduction of solid-state storage allows organizations to rethink the way they approach performance bottlenecks. However, hosting whole applications on high IOPS, low-latency solid-state disk can be very cost-prohibitive. Organizations need an innovative way of deploying solid-state storage and reaping its benefits without the high price tag.

Automatic storage tiering or data caching?

To answer this question, we need to take a closer look at application behavior, especially those applications with large processing requirements. For instance, ERP applications with periodic heavy workloads (such as accounts receivable/payable, inventory and warehousing reports) do not need a high-performance infrastructure all of the time, nor do they process all of the data at once. In such a case, an ideal solution would only have the data that the application will process on high-performance resources such as SSD, and only when necessary.

Automatic data tiering can identify data sets that have been heavily accessed by an application, and then move them with variable granularity to the higher tier of storage for the next time an ‘I/O storm’ hits the storage environments. This process in itself can present a heavy load on the storage infrastructure. (Figure 1.)

Through automatic tiering, users can review historical access trends to make appropriate data migration decisions. However, this approach fails to address the immediate need of an application processing new data. Data movement can be severely delayed if there are more than two tiers of storage. Furthermore, users have to account for additional storage capacity; typically 15 to 20%, dedicated as a data movement buffer. (Figure 2.) Lastly, highly accessible data sets residing on the highest tier need to be moved back once their access trends decrease.

The other approach to leveraging solid-state storage is to use it as an extension of the disk controller cache to address peaks in storage performance demand. Disk array storage controllers have always relied on cache to accelerate reads and writes to the disk drives. However, a cache with volatile memory cannot be considered as a higher tier of storage, and could be very limited in terms of scalability.

As read requests hit a specific data set, this data set can be copied to the higher tier of storage. Solid-state, and all subsequent reads, can be accommodated from the solid-state layer delivering high-performance reads with very low latency and superior response time. Once the data is no longer in-demand, it can be deleted from the cache and referenced back to its original location allowing for new in-demand data sets to be copied to that highest tier. This concept can provide significant acceleration to a SAN environment at a relatively low cost, but it lacks the intelligence to be flexible and effective enough to address different needs of a complex storage and server infrastructure.

Figure 1: Automatic tiering

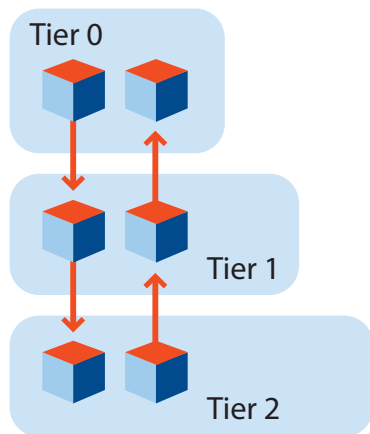
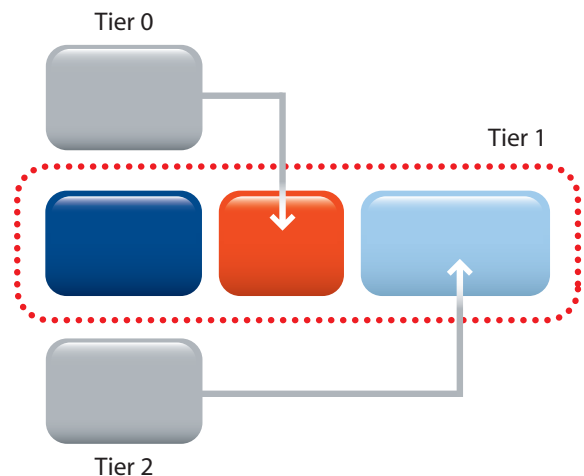


Figure 2: Automatic tiered storage

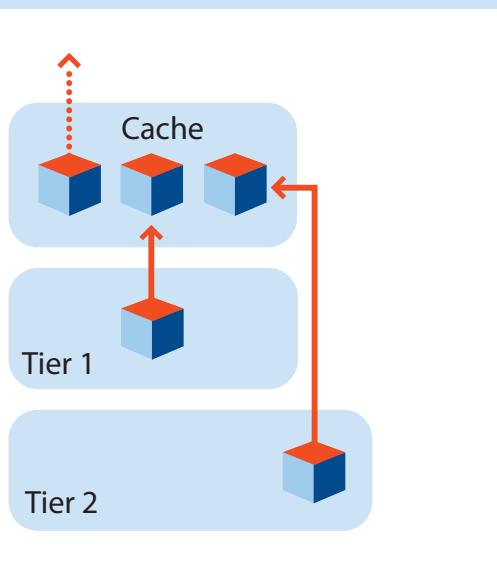


Intelligent, predictable acceleration

The FalconStor® Network Storage Server (NSS) SAN Accelerator provides a cost-effective alternative to traditional methods of application and storage acceleration, enabling organizations to leverage solid-state storage in a flexible manner to improve the performance of business applications without requiring significant investments. (Figure 3.)

The FalconStor NSS SAN Accelerator utilizes solid-state memory as a cache, but it uses the cache differently from traditional solutions. Managed solid-state resources can be segmented into read/write acceleration zones used as a shared general cache for different applications and storage resources. The solution can also be used as a dedicated segment for specific applications where the entire application data can be migrated to that tier.

Figure 3: HotZone technology monitors disk access patterns and copies highly accessed data to the cache



HotZone® functionality, a caching mechanism from FalconStor Software, is optimized to work with random access database applications by monitoring the disk access pattern and intelligently copying the highly accessed data to the cache for fast read access. HotZone is enabled with a Quality of Service (QoS) feature that can guarantee priority access to certain applications.

In addition to copying the datasets with the highest I/O profile, the FalconStor NSS SAN Accelerator allows organizations to prioritize workloads and define their retention time in the cache. This flexibility provides predictable performance acceleration per application to match degree of importance of certain workloads. Historical trending and intelligent profiling of data enables HotZone functionality to proactively predict application behavior and optimize the distribution of the data to effectively maximize performance.

The solid-state tier receives all new disk writes requests to the SAN, significantly accelerating application write processes. This approach to accelerating both read and write requests to the SAN provides consistent acceleration, even in legacy storage environments.

Cost-effective global SAN acceleration

FalconStor NSS SAN Accelerator can seamlessly integrate within a storage environment and exploit solid-state performance to substantially improve SAN performance without a huge expense or a forklift upgrade. In this manner, the FalconStor NSS SAN Accelerator more than doubles the storage environment IOPS at less than one-third the cost of adding new spindles, providing optimum value and return on investment (ROI).

About FalconStor

FalconStor Software, Inc. (NASDAQ: FALC), the provider of TOTALLY Open™ Data Protection solutions, delivers the most comprehensive suite of products for data protection and storage virtualization. Based on the award-winning IPStor® platform, products include the industry-leading Virtual Tape Library (VTL) with deduplication, Continuous Data Protector (CDP), File-interface Deduplication System (FDS), and Network Storage Server (NSS), each enabled with WAN-optimized replication for disaster recovery and remote office protection, and the HyperFS™ file system. Our solutions are available from major OEMs and solution providers and are deployed by thousands of customers worldwide, from small businesses to Fortune 1000 enterprises.