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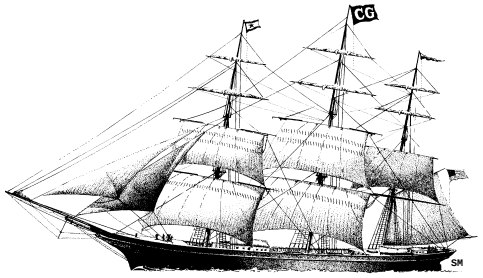

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New Features in FalconStor's *IPStor* Deliver A Mix of Performance and Cost That Is *Just Right*

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Management Summary

Many enterprises have already turned to storage networking for more capable and cost-effective storage. SAN and NAS are now mainstream technologies. **The next, progressive step toward storage utopia is *intelligent storage networking***, which involves placing the smarts for critical storage functions in the network where they can be leveraged across all storage arrays and servers.

FalconStor Software, Inc., of Melville, New York, is already delivering such a solution – *IPStor*. It is an open, software-based storage networking platform that:

- Pools heterogeneous storage (with or without virtualizing it),
- Delivers advanced storage services for improving system availability, performance, manageability, and cost-effectiveness, and
- Effectively works independent of storage vendor, server operating system, network connectivity (i.e., Fibre Channel or IP), and data structure (i.e., block or file).

As a result, IPStor brings many benefits to the table, and the most significant is lower storage total cost of ownership (TCO). Meanwhile, FalconStor continues to move forward and recently announced two new IPStor features that target storage performance and cost optimization: *HotZone* and *I/O Accelerator*.

HotZone acts much like a storage "triage manager" by continuously tracking which data is most frequently accessed and, periodically, moving the "hottest" blocks to a fast storage device like solid state disk (SSD). It therefore maximizes the benefit of the faster and more costly storage. **HotZone can significantly increase application performance**, especially for applications that frequently access a small number of reference files, such as relational database managers.

I/O Accelerator increases performance by establishing an optimized *persistent* cache. It employs a high-speed staging device (again, such as SSD) to temporarily store bursts of input/output operations (I/Os). Then, it reorganizes the I/Os and moves them to the final storage device in a fast, optimized manner.

Both HotZone and I/O Accelerator not only boost storage access speeds, but also lower overall storage costs by enabling enterprises to squeeze the most performance from a given storage infrastructure. Costly upgrades can be avoided or deferred. These features are two more good reasons to consider FalconStor for an intelligent storage networking solution. Read on for more details.

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IPStor for Intelligent Storage Networks

In the race to keep up with the storage requirements of the digital enterprise, the world is turning to intelligent storage networks.[1] First, it is far more efficient to make a pool of storage broadly accessible over a network than to chain together many individual servers and storage arrays. Second, by placing storage intelligence in the network, important functions can be leveraged across all storage arrays and servers – no matter which vendor, operating system, connectivity, or protocol. The net result is a robust, flexible, high-performance storage infrastructure at a much lower TCO.

FalconStor's IPStor solution, is an open, software-based storage networking platform. IPStor Servers reside in the storage area network (SAN) and virtualize or pool all attached storage arrays. Servers connected to the SAN effectively see a single unit of storage capacity that can be dynamically and securely allocated as necessary. IPStor is designed to be independent of storage vendor, server operating system, network connectivity (i.e., Fibre Channel or IP), and data structure (i.e., block or file) – a common ground that ties everything together. It also offers a variety of storage services for enhancing performance, availability, manageability, and cost-effectiveness. These include active-active failover, point-in-time disk journaling, snapshot copy, remote replication, multi-pathing, automatic capacity management, zero-impact backup, and centralized management. **In essence, IPStor is designed to be an all-in-one solution for intelligent storage networking.**

Enterprises can benefit from IPStor in a number of ways:

- **Lower administration costs** – Storage can be administered centrally, as a single entity, rather than as many islands, resulting in economies of scale in management, higher utilization of capacity, and lower TCO.
- **Lower acquisition costs** – Enterprises can spread the cost of software for storage services across a larger number of servers and storage devices. They also have more leverage in procurement because they can deploy storage from multiple vendors. Furthermore, they can more easily establish tiers of storage with different price and performance characteristics to optimize costs.
- **Extended value and useful life of storage equipment** – All storage assets, including legacy and new equipment, can take advantage of IPStor's storage services, thereby extending their value and useful life.
- **Choice of architecture** – Because IPStor supports a range of technologies and protocols, enterprises are free to choose the best approach for their needs today. As technologies mature and as enterprise needs evolve, the storage architecture can adapt.
- **Interoperability** – As a vendor-neutral entity into which all servers and storage devices connect, IPStor can eliminate some of the interoperability issues in multi-vendor SAN environments.

In short, IPStor enables a more functional and cost-effective storage infrastructure for supporting the information requirements of the modern enterprise. But FalconStor is not standing still. It recently announced two important new features: HotZone and I/O Accelerator.

HotZone – A Storage Mix That Is Just Right

Many of us keep car keys on our person while storing things like old college textbooks in a box somewhere in the attic. The obvious reason is because we need to access the keys quickly and frequently, but textbooks rarely, if ever. Well, the same can be said of information. Some applications, such as relational databases and transaction processing, frequently access a small number of "hot" files[2] – like the car keys in our example. By placing these files on ultra-fast storage media such as SSD (see box below), the performance of enterprise applications can dramatically increase.

This is where the HotZone feature can make a difference. **HotZone automatically tracks which storage blocks are frequently accessed and moves them onto the faster storage device.** As access patterns change over time, it

[1] See *Intelligent Storage Networks – Creating a More Cost-Effective Storage Infrastructure* in **The Clipper Group Explorer** dated February 22, 2002, at www.clipper.com/publications.htm.

[2] For example, logs, indices, and temporary tables.

periodically moves the new "hot" blocks to the faster device and moves the older, cooler blocks back to the original disk. As a result, performance is continually optimized and enterprises can get the most out of their faster and more costly storage.

HotZone delivers worthwhile benefits:

- **Faster application performance** – Applications run faster and, therefore, the business processes they support are more productive.
- **Lower overall storage costs** – Like Goldilocks' last bowl of porridge, HotZone allows enterprises to buy and maintain a storage mix that is *just right.* Whether it is SSD coupled with RAID arrays, or two types of RAID arrays with different cost and performance characteristics, enterprises can minimize overall storage acquisition costs by deploying two tiers of storage and making the best use of the faster and more costly tier.[3] Through automation based on policies set by the administrator, HotZone also eliminates the administrative costs that would be associated with manually allocating the hot and cool areas.

I/O Accelerator – Optimized Cache

The I/O Accelerator feature incorporates a high-speed staging device, like SSD, as a persistent cache. Like a spring or cushion, the cache "absorbs the impact" of sudden bursts of data. When an application server sends an I/O, the IPStor Server relays it to the persistent cache and sends an acknowledgement to the application server so it can continue processing other I/Os. Then, IPStor reorganizes the staged I/Os and moves them in an optimized (i.e., faster) order (think "presorted") to the final storage device. **The result is better performance, especially for applications with many random I/Os, like databases.** Therefore, if storage throughput is currently a bottleneck in the system, a relatively small investment in SSD for use as persistent cache can be a less-expensive solution than buying another storage array and striping data across it.

Solid State Disk: The Need for Speed

Solid state disk (SSD) uses electronic memory (e.g., DRAM) to deliver access speeds approximately 200 times faster than the hard disk drives used in storage arrays. **Though more expensive, the smart and selective application of SSD can be a cost-effective means to enhance storage performance.** To promote deployment in enterprise environments, some SSD vendors have added SAN connectivity and high-availability features to their products, such as error detection and correction, battery backup, and flushing data to disk during power outages.

Furthermore, both HotZone and I/O Accelerator can share the same high-speed storage device. IPStor can split it between the two functions on a percentage basis, as specified by the user. Depending on the particular application and environment, one function may yield more of a performance gain than the other, so this flexibility is useful.

Conclusion

HotZone and I/O Accelerator are solid additions to IPStor's already-robust feature set. **They offer smart ways to boost performance while minimizing incremental costs.** HotZone, in particular, is a unique and powerful tool, fitting into and even driving the macro trends of automation, tiered storage classes, and the selective use of SSD to boost SAN performance. Furthermore, these features will serve to lower storage TCO in the long run by tuning the infrastructure to deliver optimal performance and potentially sparing enterprises from more costly upgrades.

FalconStor has again distinguished itself in the intelligent storage networking market. Enterprises that want a flexible, comprehensive, software-based solution for improving the functionality and cost-effectiveness of their storage infrastructure would do well to take a close look at IPStor.

[3] For an in-depth discussion about tiered storage classes, see *Tiered Storage Classes Save Money — Getting The Most Out Of Your Storage Infrastructure* in **The Clipper Group Explorer** dated August 29, 2002, at www.clipper.com/publications.htm.

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