FREQUENTLY ASKED QUESTIONS (FAQ):

SAN Acceleration Using FalconStor® Network Storage Server (NSS)

1. **What is solid-state storage? What are solid-state drives (SSD) and solid-state memory arrays?**

   Solid-state storage or memory is a non-volatile flash storage that is becoming increasingly common and is currently used in consumer products such as digital photography, music players, and USB memory sticks. It is also referred to as NAND flash memory. The term SSD refers to a drive or device that uses solid-state memory and includes a common disk interface such as SATA or SAS. It is a new generation of hard disk drive technology based on flash memory rather than the spinning platter typically associated with traditional hard disk drive (HDD) technology. The phrase solid-state memory array usually refers to a PCIe memory card with a large amount of solid state memory or a rack mount appliance that has a PCIe, SAS, or Fibre Channel (FC) interface that enables it to act as a disk drive array.

2. **Which solid-state technologies are currently available on the market?**

   Solid-state storage today comes in different form factors. The most common is SSD, which integrates non-volatile flash technology in the same form factor as the most current HDD technology, the SATA/SAS interface. This enables the technology to integrate within existing hardware architectures. There are two types of solid-state storage technologies: single-level cell (SLC) and multi-level cell (MLC). The **FalconStor® NSS HC Series SAN Appliances** and **FalconStor® NSS SAN Accelerator** solutions integrate with both types of solid-state storage to provide high performance in an attractive, highly scalable cost-per-capacity model: Either with the MLC in the form of a fully populated SSD expansion shelf, or in the form of two SLC SSD drives per shelf to accommodate higher performance requirements for less cost-sensitive applications or environments.

   The second form factor is bus attached solid-state memory cards. This implementation is generally used internally to a specific server to increase the amount of memory available to that server.

   The third form factor is a purpose-built, PCIe connected or network (FC) shared storage device or array. This form factor provides high scalability and the ability to share the benefits of solid-state memory across server and storage devices. The FalconStor NSS SAN Accelerator solution incorporates a PCIe connected configuration to deliver application-specific and global SAN acceleration, which offers far lower latency than FC connectivity.

3. **Why do I need solid-state storage?**

   Solid-state storage has many advantages in the areas of performance and reliability. Seek time is significantly reduced, allowing for very quick response times and high rates of input/output (I/O) operations per second (IOPS). This translates directly into better response times from applications and can significantly decrease application run time and data processing time, improving the overall productivity of an organization.

   Traditionally, organizations added spindle count to increase the IOPS of their storage infrastructure. This method was very costly in terms of acquisition and maintenance, as they would need to buy more capacity to improve performance, while decreasing the utilization rate of their available capacity.

   SSD technology allows for a very high level of IOPS per capacity unit. Even at today’s high-price rate of solid-state memory arrays, the cost per I/O is 10 to 20 times more efficient than the high-performance HDD storage.

4. **What is the price difference between SSD and regular HDD?**

   The relative price per capacity unit of solid-state memory to HDD technology is approximately 30 to 1, but since the IOPS rate is almost 600 times better, the cost per I/O of SSD is approximately 10 to 20 times more efficient. This is particularly appealing for organizations that provide services needing high performance and availability, such as online
gaming, online financial transaction applications, payroll systems, ERP applications, inventory processing, and virtualization platforms (VDI and server).

5. **How can HotZone® technology from FalconStor Software accelerate applications?**

HotZone technology is a native feature of the FalconStor NSS solution family. HotZone is a caching mechanism that identifies data sets that are most requested and copies them to the solid-state layer for higher-speed access and lower latency. HotZone tracks the I/O profile of data and intelligently decides which data sets to copy to the high-performance layer based on the frequency of access of that data set and the rank of the application requesting that data. The storage array that was suffering from hot data sets is able to get some relief by dynamic on-demand allocation solid-state cache.

6. **What is the difference between HotZone solid-state storage caching and other implementations of large array cache?**

Solid-state storage is usually implemented as a higher tier of storage within a storage array. Data is moved in its entirety to the SSD tier either manually or automatically by monitoring data access patterns over long periods of time, and, based on the level of activity of a certain data set, moving that data set or volume to a higher tier. This approach is expensive in terms of both resources and capacity, as additional capacity has to be reserved for data movement at each tier of the storage infrastructure. In addition, moving data consumes CPU cycles, so this process cannot run during peak storage demand times. Furthermore, the main purpose of automatic data tiering is to have the data most likely to be accessed residing on the highest performance storage. This could be very hard to predict, and the data could be moved long after the requirement has already passed. VDI storage demands are very unpredictable and make long-term automatic optimization methods for tiered storage less effective.

In contrast, HotZone technology can quickly, intelligently, and proactively respond to heavy I/O requests of a specific application, virtual platform, or any workload serviced by the FalconStor NSS infrastructure. Instead of continuously moving data between multiple tiers on a schedule, HotZone copies data to the high-performance solid-state tier, allowing it to react to heavy I/O requests very quickly. HotZone allows administrators to prioritize specific workloads and combines the priority ranking with the data access frequency to decide which data sets take priority to be copied to the solid-state tier. Data sets include databases, messaging, virtual servers, and virtual desktops. In addition, a historical journal allows HotZone to predict application behavior and copy specific data ahead of application requests to the solid-state tier.

Once the access rate drops, the data is simply deleted from the solid-state tier and referenced back to its original location in the storage infrastructure, allowing higher-priority and accessibility data sets to be copied over.

7. **Who should care about solid-state storage or SSD?**

Organizations that should consider solid-state storage or SSD include:

- Customers struggling to meet application performance requirements.
- Customers who are looking to add more disks to their storage to increase their overall IOPS.
- Customers running critical online applications that require high-performance infrastructure (online gaming, virtual desktops, virtual servers, stock and financial transaction applications, and so on).

8. **What is the difference between the implementation of solid-state storage in the FalconStor NSS HC Series SAN Appliances and the FalconStor NSS SAN Accelerator solutions?**

In FalconStor NSS HC Series SAN Appliances, solid-state storage is embedded into the appliances, enabling the acceleration of FalconStor NSS HC arrays by leveraging HotZone functionality or by defining the solid-state storage drives as higher tiers hosting specific application data.

In the FalconStor NSS SAN Accelerator solution, solid-state storage is offered as either a network-attached or PCIe-based array cache extension to the gateway appliances, providing acceleration to all storage resources managed by the appliances, or to specific applications defined by the administrator.

For more information, visit www.falconstor.com/NSS or contact your local FalconStor representative.