



Imperial Technology's Solid State Disk – Satisfying the Need for Speed in a SAN

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Management Summary

Many enterprises have turned to storage area networks (SANs) to cope with rapid information growth and spiraling storage costs. These dedicated networks allow storage to be consolidated and shared as a common pool, resulting in significantly lower management costs, higher utilization, and greater flexibility. **In a few short years, SANs have become widely adopted as the best way to connect large amounts of storage to a collection of open servers.**

SANs also offer fast access to storage. Fibre Channel, the de facto standard for SAN interconnects, supports line speeds of 1 and 2 Gbps with low overhead and minimal latency. However, some applications that require high performance like transaction processing still find that storage access is the limiting factor, even when connected to a SAN. Have you ever waited on the phone with a customer service representative because the system took a long time to process a transaction? The performance of enterprise applications can significantly affect business productivity. **Time is money, and if SAN storage is the bottleneck, then there is a need for speed!**

The bottleneck in a SAN is not typically the network but rather the disk drives, because they are limited by the physics of rotating platters. Amidst the lightning-fast electrons and silicon that drive computer systems today, disk drives are one of the last vestiges of the mechanical world. When a server accesses storage, a disk platter must rotate and a magnetic head must move to the correct position to complete the read or write. This takes precious time.

An elegant and cost-effective means to bolster storage performance in a SAN is to employ solid state disk (SSD) technology. SSD uses electronic memory (DRAM) instead of magnetic disks to deliver access speeds approximately 200 times faster. These systems look like fast disk storage to a server and can store frequently-accessed files to dramatically improve application performance.

Enterprises that feel the need for speed should consider Imperial Technology, the leading provider of SAN-enabled SSD systems. Its *MegaRam* product family can connect directly to Fibre Channel SANs and share its capacity among multiple applications in the same way as consolidated disk storage. MegaRam can be a “performance pool” that storage administrators allocate as needed to meet the changing requirements of applications and users. Read on for more details about the benefits of MegaRam SSD and why it makes sense to build it into your SAN as a dynamic performance resource.

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The Need for Speed

Storage area networks (SANs) are here to stay. They deliver a host of benefits, most notably the ability to significantly lower storage management costs – by far the largest component of total cost of ownership. They also allow administrators to scale and reallocate storage as necessary to meet changing requirements. While fast, SANs can become the bottleneck in overall application performance.

Performance is a function of a balanced system. If water at a constant pressure is flowing through a pipe of varying width, the point where the pipe is smallest – the bottleneck – is what limits the overall flow. Only by expanding the bottleneck can more water flow. **Ideally, it is preferable to have a pipe of a single, continuous width – a perfectly balanced system.**

Application bottlenecks can occur in several places. The processing power of the server (a factor of CPU speed) as well as the amount of system memory can limit performance. The operating system may need to be tuned. Too much traffic on the front-end network or Internet connection can also slow the application. Finally, storage access (i.e., disk I/O) can be the bottleneck. **Rather than blindly throw hardware at a problem, smart IT departments will conduct a performance analysis to identify specific constraints.**¹

With this in mind, storage access is more and more likely to be the bottleneck because of a growing imbalance between processor speeds and disk I/O in computer systems. CPU speeds in GHz, disk drive capacities in GB, and network bandwidth in Gbps will continue to grow quickly for the foreseeable future. However, the speed at which a disk drive can process I/Os will grow only slightly due to mechanical limitations. Picture a pipe that remains thin in the middle but gets fatter and fatter at each end over time. This is what will happen to computer systems as these trends play out, **and therefore IT managers will need to pay increasing**

attention to storage performance, especially for critical files and databases.

Solid State Disk to the Rescue

One can buy large storage arrays with more disk drives and stripe data across them to increase storage throughput. However, this is a sort of “sledgehammer” approach that quickly becomes cost prohibitive. The selective application of solid state disk (SSD) technology, though it costs more than disk drive capacity, can be a much more cost-effective solution.

A solid state disk (SSD) can deliver gigantic performance improvements when applications frequently access a small number of “hot” files. Relational databases and transaction processing applications typically make frequent updates to transaction logs, indices, and temporary tables that comprise only 3 to 5% of system data.² If these files are placed in SSD systems with ultra-fast access times, applications can experience performance improvements by as much as an order of magnitude or more. While the most common use for SSDs is to accelerate relational databases, almost any application can benefit if storage access speed is a bottleneck.

Enterprises are concerned about application performance because it directly affects the bottom line. **Applications support business processes that, in turn, further enterprise objectives like customer satisfaction, profitability, and shareholder value.** The fact is enterprises rely increasingly on systems like enterprise resource planning (ERP), supply chain management (SCM), customer relationship management (CRM), e-mail, process control, and e-commerce to sustain day-to-day operations. When systems are slow or off-line, business operations slow down or cease. **Storage performance may seem an arcane topic at first glance, but when properly understood in the context of modern business, it is exceedingly important.**

¹ Imperial offers a free software tool called *Minimon* that can locate system bottlenecks.

² Imperial offers another software program that determines which files are most active and, therefore, are the best candidates for placement in an SSD system.

Furthermore, while SSD itself is an important and cost-effective application accelerator, it becomes even more valuable in a SAN for the same reasons that disk arrays do. **First, a shared resource is more valuable than a dedicated one.** The flexibility to share SSD capacity among multiple applications and have it reallocated, as needed, brings greater benefit. **Second, it is much easier to administer centralized assets versus those scattered around an organization.** This means fewer costly and hard-to-find IT workers are needed to manage them. **In essence, when an SSD system is connected to a SAN, it becomes a dynamic performance resource for selectively improving application performance when and where it is needed.**

MegaRam Solid State Disk

Imperial Technology has been in the SSD business for over 20 years and is the industry leader. Its MegaRam family of enterprise SSD products are engineered for high performance, robustness, scalability, and broad connectivity. Capacity ranges from 134 MB to 51 GB. MegaRam systems are host-platform independent and support up to 16 SCSI or 8 Fibre Channel ports. **MegaRam's ability to connect to a SAN and be shared as a common resource is a key capability.**

To ensure data integrity, MegaRam employs powerful error detection and correction algorithms that can correct up to 6 full bytes of data. For high availability, the systems include redundant battery backup and a disk drive on which to save data if the system loses power. MegaRam supports both local and remote management.

Conclusion

SSD solves an important application performance issue that will become more prevalent in the foreseeable future. As disk capacities, CPU speeds, and network bandwidth continue to advance, the performance limitations of spinning disks will become more pronounced. In many cases, installing SSD systems to speed access to hot files will alleviate the problem.

Enterprises that currently have or plan to acquire a SAN should consider including MegaRam SSD systems as a flexible, on-demand performance resource. The importance of application performance to business success suggests that SSD deployment will no longer be just a reaction to specific, dire performance problems. **Rather, a solid state disk should be deployed proactively in a SAN to address the need for speed.**



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