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IDC TECHNOLOGY SPOTLIGHT

Building Intelligent Storage Solutions for the Cloud and Today's IT Environment

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Sponsored by Intel and Xyratex

The storage industry is heating up as a result of the globalization of markets and the increasing dependence on electronic communication, exponential data growth (especially machine-generated data), new regulatory requirements for protecting and retaining data, and reliance on data to differentiate and grow business value. In response, the following trends continue to emerge that are influencing technology and business storage:

- *Adoption of virtualization*
- *Energy and cost conservation*
- *New use cases*
- *New types of data*
- *Serverization*

These business and technology trends have created new challenges for solution providers. Products have to address more complex industry requirements and need to be delivered in a timely manner to stay ahead of the competition. This Technology Spotlight examines the challenges faced by solution providers related to the aforementioned storage technology trends, the benefits to organizational business value, and how the combined expertise, storage technology, and resources of Intel and Xyratex support these industry trends in meeting the demands of the ever-changing storage market.

Adoption of Virtualization

Server virtualization has enabled organizations to consolidate physical servers, improve utilization of resources, improve time to market, and reduce application downtime. In turn, it has placed additional demands on storage systems. Environments with large virtualization deployments struggle with storage growth, consistent performance, and management complexity. Often, storage is what precludes the timely deployment of new virtual machines and new applications. To address these challenges, storage solution providers must ensure that their systems are easier to manage and more resilient, support dynamic workloads and enable consistent performance, and take advantage of innovations and improvements in hardware, processors, and memory.

Energy and Cost Conservation

The economic downturn and limited energy resources in many geographies have placed greater focus on conservation. Solution providers continuously seek ways to reduce waste, reduce energy consumption, and reduce costs — all without reducing the quality or service of the systems. This focus on efficiency is driving providers to seek new hardware that consumes less energy and to use newer technology such as smaller form factor hard disk drives, flash, and SSD; the industry is also looking to reduce costs and energy consumption by reducing data footprint and applying new cooling

and power techniques inside the system, the rack, and the datacenter itself. To stay in step with the demands of the market, providers must accelerate the time to market of products that take advantage of these new technologies without disrupting existing revenue streams.

New Use Cases

The traditional storage markets — high-performance computing, enterprise, and data protection and archiving — are becoming more and more fragmented because of new applications and use cases demanding specific features and functionality. The traditional structured data market, though continuing to grow, is growing significantly slower than the unstructured file data market. In this fast-growing data segment, not all files are created equal or accessed consistently. There are machine-generated files that must be analyzed, application-generated files that might have to be archived, data-as-a-service files that are often accessed by multiple users at the same time, video streaming and surveillance video files that are stored but rarely accessed, and other types of files that have a variety of attributes and use cases. It is no longer possible for one system to address all these use cases; as a result, solution providers are facing the challenge of building products that address the specific requirements without creating extraneous costs due to customization. Vendors must design systems that are modular enough to address the variety of use cases without giving up economies of scale.

New Types of Data

The 21st century has seen an increase in digitization of information where industries that have relied on paper as a preferred storage medium for information are moving to storing information in electronic format. This trend is creating new types of data with unique storage requirements. As a consequence, the governance rules that applied to the paper medium are being transferred to the digital format, creating challenges in retention of data over time. Storage solution providers have been tasked with determining a way to deliver resilient and sustainable architectures that enable an organization to retain its digital information assets for long periods of time without incurring additional operational or financial burden.

The dynamic market environment is forcing vendors to consider alternative approaches to delivering storage solutions to market. In the coming year, it is expected that the storage industry will continue on the path of serverization where applications run on standard server platforms, giving the system its unique personality through software. The use of commodity components and standards-based platforms can expedite the delivery of a product to market while retaining the ability to modify the configuration with new components as they become available on the market. Staying agile is key to staying ahead of competition and retaining the capacity to respond quickly to changing or emerging demands in the market.

Serverization

The trend toward serverization of storage and the use of commodity components has significant benefits to solution providers trying to stay ahead of the curve. To capitalize on the benefits of serverization and commoditization of storage components, solution providers need to develop products that can take advantage of economies of scale and economies of scope. Economies of scale imply that components can be used in multiple systems, giving the provider the volume necessary to bring down overall costs. Economies of scope allow the provider to leverage the expertise across a broad spectrum of products, shortening time to market and time necessary to integrate new components. If utilized properly, this approach to delivering new or improved systems to market can have a positive impact on the business value while addressing the emerging challenges of today's datacenter.

- **Economies of scope should enable the delivery of best-of-breed solutions.** Providers can leverage their expertise to design and deliver configurations that address the desired results of application performance, scalability, and resilience.

- **Economies of scale reduce the cost of materials and overall manufacturing by leveraging volume purchases.** Economies of scale also improve time to market because they simplify inventory management for products built as well as in support of systems deployed in the field.
- **Neither the economies of scope nor the economies of scale should affect the quality of the product.** The use of common components and industry-standard interfaces should be the foundation for quality engineering across product lines.
- **Using commodity components allows for faster delivery of next-generation products.** The solution provider must be confident that using standards-based components will expedite their consumption, delivering faster, bigger, more efficient products to the end user while realizing value to the business.

Considering Intel and Xyratex

In the past few years, there has been a shift from proprietary architecture storage systems to industry-standard x86 server-based storage platforms. This trend is expected to continue; it is most visible in the NAS market, which has a compound annual growth rate of over 50% (see IDC #226223) for capacity, but can also be seen in SAN architectures as well as in application-specific systems such as disk-based backup appliances with deduplication, VTL, object-based archiving platforms, surveillance video targets, and other vertical-specific applications.

In 2010, Intel announced the availability of its Intel Xeon C5500/C3500 series but with significantly lower power consumption than the chips used in enterprise servers. The new Intel Xeon C5500/C3500 series with integrated PCI Express (PCIe) puts input/output (I/O) functions on a dual-processing Intel Xeon processor and incorporates RAID acceleration and nontransparent bridging for high-availability failover. The integration of these storage-specific features has enabled storage providers to deliver denser storage with robust performance and thermal options across a variety of products using a common architecture.

It takes more than a processor to build a robust storage system that can deliver capacity, performance, and reliability to a variety of applications. Xyratex partnered with Intel, combining Intel's new processor design and Xyratex's subsystem design expertise, to create and deliver subsystems that can support a variety of applications and use cases. Xyratex understood that it takes "two sides of the same coin" to create a storage system: an industry-standard hardware subsystem and software applications.

Software applications give the system its personality and unique operating environment. Industry-standard hardware subsystems enable the software application to achieve its optimal results, bring newer features to storage, and provide faster time to innovation for customers. There are many options to consider when building a hardware subsystem for a given application. Even when components are standard, there still needs to be an understanding of how the components interact with and affect each other as well as how to integrate them for consistent management, performance, and reliability.

Xyratex combined its experience in building high-quality storage enclosures and subsystems with the latest Intel technologies to embed server and storage capabilities into a unified storage application platform. These platforms take full advantage of the Intel Xeon C5500 processor and allow storage system developers to merge data protection, virtualization, high availability, and storage application into a compact scale-out system that allows end users to scale I/O bandwidth and capacity with no more than 150 watts of power required for each embedded server module.

Xyratex's key value is in the software integration layer and the company's ability to leverage its extensive experience and expertise in constructing hardware platforms that enable solution providers to give such platforms a chosen personality and bring the product to market quickly, reliably, and cost-effectively. The software integration layer executes independently on its own processor within the platform, monitors the health of the platform, provides autonomic responses to various conditions, is the software integration layer available between the platform and application, simplifies exception

handling, and takes full advantage of the enclosure hardware architecture to provide advanced software features.

All the software integration features work together to increase the overall system's quality. Higher levels of granular control of various components lead to better decisions that reflect more accurately end users' needs.

Xyratex offers its customers two main areas of value:

- Reducing and containing costs associated with system manufacturing and component integration
- Engineering know-how and quality

Containing Costs

The market has become more fragmented by use cases and data types, making it more complicated and costly to procure and integrate existing and new components that are often faster, denser, and smaller; require less energy; and produce less heat. Xyratex takes the complexity and cost out of integrating new components and enables any product line to benefit from its volume buying power. The benefits to the customer are reduced cost of components and accelerated time to market with the latest hardware.

Engineering Know-How

Xyratex has focused on designing systems that fit the personality the software will give it. There are specific areas that have become critical to storage solution providers and where Xyratex has offered significant value-add in storage know-how. Engineers with extensive experience are able to leverage their expertise in the design or modification of systems to address a variety of use cases without incurring additional costs or losing the benefits of volume purchases or the quality of the design.

- Designing high availability into systems is crucial. Xyratex platforms use the SBB form factor and ensure that the architecture supports hot-swappable components and high-availability configurations. This includes high-performance intercontroller communication paths that can support synchronous operations, redundant controller memory copy, and management software to ensure no single point of failure.
- Power efficiency is a major focus in a number of areas. Xyratex has designed power supplies that are used across the OneStor family of storage enclosures. The enclosures are also designed to address the complexity around thermal management. The enclosures all have variable speed fans, which are controlled by the software integration layer and built into the SBB module. Inside each enclosure are strategically placed thermal sensors that can register where the hot spots are. The system responds by dynamically varying the speed of the fans, providing the right amount of cooling in the right area at the right time.
- Reliability, availability, and serviceability (RAS) are critical for enterprise-class storage systems. Xyratex integrates RAS features, such as memory power protection, reduction of heat and vibration, and redundant power and cooling, into every storage system design and has a track record of reducing system and component failures and cost of service in the field. For example, Xyratex has used its understanding of disk drives to design enclosures that are considerate of rotational vibration and heat generated by fast-spinning and denser drives. Furthermore, Xyratex tests all drives with its patented testing methodology for 24 hours in the storage system, ensuring not only higher drive reliability but also higher system reliability. Reliability statistics have indicated that this patented process is capable of detecting infant mortality failures within the 24-hour test period. This is important because it improves the quality and lowers the cost of the overall system since the solution provider doesn't have to take on drives that might fail. This level of quality is key to optimizing the customer's out-of-box experience.

- Many applications, such as server virtualization, demand consistent storage performance. Though many factors contribute to a system's performance, Xyratex has engineered its platforms to ensure optimal design for maximum performance. Examples of Xyratex's performance optimizations include integrating a PCIe switch in the controller, enabling high-performance PCIe connectivity between controllers, and reducing I/O latency in an active/active configuration. The ever-changing market demands a flexible solution. Xyratex understands that not all applications are mission critical or high performance. The platforms Xyratex designs are specific to the needs of the solution provider. If PCI expansion capability is important, Xyratex offers a Server System Infrastructure (SSI)–based system as well as the SBB-based active/active systems. This platform uses industry-standard form factor motherboards with multiple PCIe slots and is generally not deployed in a high-availability configuration.

Emerging complex usages for storage, such as compression, encryption, RAID, distributed RAID, and data deduplication, have driven up compute utilization significantly. To meet the growing demands, all Xyratex Application Platforms are based on Intel Xeon processors to provide high performance, greater throughput, and more flexibility. Xyratex puts great effort into optimizing the design and configuration of these systems to maximize Intel's compute and integrated advanced storage capabilities with the latest storage technology, such as small form factor HDDs, SSDs, and PCIe-connected flash storage.

By leveraging the capabilities and scale of Xyratex and Intel, solution providers can focus on their core competencies and deliver more robust and competitive solutions to the market.

Challenges

The storage market is in a continuous state of flux. Customers demand solutions that are designed to solve their problems and to give them a competitive edge. New technologies are being brought to market that change how storage is deployed, used, and managed. The key challenge for Xyratex and Intel will be to stay ahead of the adoption curve by delivering capabilities, hardware, and software that enable solution providers to respond quickly and bring to market solutions that are competitive. Intel will have to continue to explore ways to embed capabilities essential to any storage solution within its new processors to accelerate the overall performance of the system. Xyratex will have to stay abreast of the trends in the market and bring to market new and fresh ideas that simplify solution building.

Conclusion

In today's ever-changing market, and to compete successfully, a solution provider must adhere to the following criteria:

- Minimize cost of design and production
- Respond to the demands of the market in the shortest amount of time possible
- Maintain quality
- Contribute to the goals of the buyer

Economies of scope and economies of scale are fundamental approaches to achieving these goals. It is critical for solution providers to identify and focus on their core areas of expertise. To achieve economies of scale, they should leverage the expertise of others in areas that are not core competencies. Intel and Xyratex have partnered to offer solution providers a platform that constitutes a scalable, flexible, and cost-effective building block. Together, Intel and Xyratex offer extensive experience and expertise in building platforms that reflect the demands of the changing market. The hardware platforms based on Intel processor technology and Xyratex's GEM software allow solution providers to focus on areas of differentiation that can help them compete in their specific area.