High Performance Server SAN using Micron M500DC SSDs and Sanbolic Software

White Paper

Overview

The Micron M500DC SSD was designed after months of close work with major data center service providers and analyzing various common applications. The rich features, optimized endurance, and ensured quality of service over random workloads make it the perfect fit for data centers. The M500DC uses Micron’s extended performance and enhanced reliability technology (XPERT) features to help ensure data integrity, extended drive life, and optimize performance. Micron provides world-class support and proven quality and reliability that can only be offered by a truly vertically integrated SSD supplier.

Sanbolic’s software defined storage platform enables the M500DC together with industry standard servers to be deployed as highly available converged “Server SAN” solutions, or as a scale out block file/file storage server cluster offering features comparable to Tier 1 storage arrays. There is no need for dedicated SAN or NAS hardware, as internal server storage is abstracted across the server cluster into a single, highly available storage pool that can be presented to applications as block or file storage. It can easily be upgraded or expanded as required—the active-active scale out architecture enables additional storage drives and additional nodes to be incorporated into a single environment that can scale out to petabytes of capacity.

Software defined storage solutions using Micron M500DC SATA SSD drives provides high performance at a very competitive price point, allowing enterprise to introduce public cloud-like economics and scalability into their data centers today.

Key Benefits

The Server SAN is significantly more cost effective than proprietary storage arrays and offers performance and features equaling high end flash storage arrays. Industry standard servers are the building block and carry a dramatically lower gross margin than proprietary storage arrays. The type of storage drives and networking cards used in the server will depend on the workload, but the customer has the flexibility to choose the latest drives based on performance and/or pricing. The Micron M500DC drives provide a good balance of cost and performance.

The M500DC was designed to handle the variety of application and expected reliability required by data centers. Key benefits of these SSD include:

- Low total cost of ownership
- Enhanced performance—including excellent sustained random performance
• High reliability and quality—protect mission critical data with enterprise-class data path, power-loss, and error code correction (ECC) protection

• Optimized Endurance—achieve 1-3 drive fill per day for 5 years, reducing the need to replace drives more frequently

• Enterprise Features—The M500DC uses Micron’s XPERT features, including adaptive read management (ARM/OR), data path protection, redundant array of independent NAND, reduced command access latency (ReCAL), and NAND customizations. These improve performance and reliability, provide flexibility to integrate the SSD to the end applications, and ensure long-term, trouble-free operation.

• Worldwide NAND Flash Leadership—Micron SSD customers have the assurance of working with the world’s leader in NAND Flash design

While the M500DC SSDs perform well as internal direct attached server storage, this type of deployment can result in loss of data availability should the server go off line, limits capacity and performance scalability, and results complex management of many “islands” of storage. Using Sanbolic’s software defined storage platform enables the storage to be abstracted from multiple servers, protected against server failure, and managed centrally as a single resource. A complete set of Tier 1 storage array features is provided in the software.

Sanbolic’s active-active architecture provides the ability to scale out to petabytes of storage, millions of IOPS, and gigabytes of bandwidth. Clusters of servers scale out linearly, while presenting a single system image. All block or file data is available from any port on any machines in the cluster, ensuring availability. The active-active architecture supports geo-distributed deployments, providing not just hardware-efficient disaster recovery capability, but support for distributed workloads.

Sanbolic can also incorporate legacy SAN storage at a customer’s site into the centrally managed storage pool, eliminating storage islands and the need to “rip and replace” existing storage investment to get the benefit of software defined storage. Server SANs or software storage controllers using M500DC storage drives can be easily integrated into the existing architecture. By managing storage centrally and moving key services like RAID, snapshots, clones, de-dupe, replication, and QoS into a common software platform, the customer can dramatically reduce management and software licensing costs. This approach can also cost-effectively ensure data availability, disaster recovery, geo-distribution, and QoS across the entire storage environment, including legacy SAN hardware.
Architecture

The server SAN is deployed using multiple “storage units” that consist of a standard server containing storage drives and networking cards. Sanbolic is agnostic as to the hardware it runs on, but typically the server should be a rack mount server that can house a dozen or more storage drives, with multiple PCIe slots for networking cards.

Sanbolic abstracts the data from each server into a shared pool and provides data availability, data protection and other storage services in the software layer. It enables an architecture including multiple storage tiers and multiple geographic sites to be managed centrally.

The type of networking cards and SSDs in the server should reflect the workload it is intended to support. The Micron M500DC SSD provides a good balance between cost and performance, enabling a pure SSD solution to be cost-effective for Tier 1 and Tier 2 workloads.

Most workloads are not particularly processor intensive, so servers used for storage units do not need a large number of cores. Converged infrastructure running both storage and application workloads on the same servers will typically use processors with additional cores.

Example of a four node Server SAN with 60TB net capacity before dedupe

Alternatively the Server SAN can be deployed as a cluster of dedicated storage controllers running on industry standard servers and exporting the storage using fibre channel, iSCSI, FCOE, NFS, and/or SMB to separate compute servers. In this environment the entire storage pool is accessible through any port, and the same data set can be exported simultaneously using heterogeneous protocols. For example, database servers can access the data over fibre channel, while a management interface on a laptop can access the same data over SMB.
Example of Four Node Distributed Storage Controller

Storage Services in Software

The software defined storage platform delivers storage services typically found in a high end storage array. These include data availability and protection services such as RAID, mirroring, remote replication, and snapshots, data management and efficiency services such as cloning and de-dupe, and SLA management services including granular QoS and intelligent data placement across multiple tiers of storage. The platform also supports active-active geo-distributed data access.

Sanbolic Software Defined Storage Platform
Unified Tiered Storage Architecture

The example four node Server SAN pictured on page 3 provides 60 TB of net capacity before dedupe, and delivers close to a million read IOPs and over 100,000 OLTP IOPS. It provides a compelling alternative to a flash storage appliance.

For larger environments additional nodes can be added to scale out to petabytes of storage capacity. The individual nodes can have different drive configurations, depending on the workloads to be supported. Sanbolic enables the storage environment to be managed centrally across tiers.

For example, Tier one workloads may be deployed on storage units comprised of Micron M500DCs and multi-port fibre channel networking, protected with RAID 10 and mirrored to a secondary data center. Tier 2 workloads may be deployed on storage units using Micron M500DCs protected with RAID 60 and using snapshots replicated to a secondary data center for data protection. Sanbolic enables SSDs and HDDs to be combined into hybrid persistent storage volumes with intelligent data placement. Tier 3 storage can use hybrid volumes for lower cost archiving applications.

Because the server SAN is comprised of modular “building blocks” consisting of industry standard servers and drives, it can easily be dynamically expanded or upgraded, or repurposed if the workload no longer requires it.

Geo-distributed Architectures

The Sanbolic platform provides native capability to support multiple geo-distributed data centers. These can be fully active-active, with a single data set available at multiple locations simultaneously. Data centers can also be active-passive, as is typical in disaster recover architecture. Sanbolic also provides capability to automatically move snapshots of Tier 2 data to a secondary data center if the objective is to allow data recovery but not workload failover. In all cases the multi-datacenter storage resource can be managed centrally as a single system.

Conclusion

A server SAN using Micron M500DC SATA SSDs, industry standard servers and Sanbolic’s software defined storage platform provides a high performance, yet cost effective and flexible solution for enterprise storage requirements. The server SAN can run workloads directly on the storage nodes as well as exporting storage targets to other servers. Sanbolic’s software platform provides features equivalent to enterprise storage arrays, and flexible centralized management across storage tiers and geographic locations.
For more information contact sales@sanbolic.com

About Sanbolic Inc.

Sanbolic is a next-generation provider of scale-out architecture solutions for the modern data center. Sanbolic’s software platform manages scale-out of converged architectures of compute and storage. With over 13 years of building scalable architecture solutions for the global enterprise and in production at hundreds of government organizations and enterprises across the globe, Sanbolic brings hyperscale company economics to the enterprise by making enterprise data and workloads highly available and elastic based on business demands.

Sanbolic Headquarters

Boston Headquarters
309 Waverley Oaks Road
Suite 101  Waltham MA 02452
(617) 833-4242
sales@sanbolic.com

©2014 Sanbolic, Inc.