An In-depth Look at the RamSan-120 Solid State Disk

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Introduction

The RamSan-120 solid state disk is Texas Memory Systems' entry-level solution for companies with smaller databases, files and data that still require incredible performance. The unit will help accelerate OLTP, batch and data warehousing environments with its DDR RAM memory and fast 2Gbit Fibre Channel ports. Because the RamSan-120 Fibre Channel controller and Management Control Port are imported directly from the RamSan-320/325, the system has proven interoperability and excellent management tools. The slim 1U form factor makes the RamSan-120 an easy addition to your data center.

The RamSan-120 can help customers accelerate applications up to 25x over existing hard disk drives and RAID solutions.

-*The World's Fastest Storage*®. I/O rates higher than 70,000 IOPS and sustained, random bandwidth greater than 400 MB/second.
-*Completely Non-Volatile.* Data is backed up to one internal hard disk drive when external power fails.
-*Power Protection.* The single power module is hot swappable because it is backed up by two batteries which can provide more than enough power to backup the unit in the event of external power failure.
-*Interoperable*. The RamSan is "just another disk" to the network, meaning it can be implemented in any way a conventional Fibre Channel disk can.

Figure 1: The RamSan-120: The World's Fastest Storage®

Section 2

Performance

Performance is key to a quality solid state disk. The RamSan-120 inherits its performance characteristics from the RamSan-320/325, the World's Fastest Storage®. The RamSan-120 delivers over 400 MB/sec of sustained, random bandwidth and 70,000 random I/Os per second. It is the highest performing solid state disk with a 1U form factor.

Bandwidth

The RamSan delivers its bandwidth to hosts through two 2Gb Fibre Channel interface ports. High bandwidth provides two main benefits:

1.   Some applications require high bandwidth.
2.   High bandwidth enables the RamSan-120 to be shared across multiple hosts without impacting performance.

Competing solid state disks that have less bandwidth than the RamSan-120 cannot support all of the applications that the RamSan supports and cannot be shared with as many hosts without compromising performance.

An important note as you compare solid state disk to RAID: our solid state disk bandwidth numbers can be sustained with random data streams. RAID systems can only sustain high bandwidth numbers with sequential data streams.

I/Os Per Second (IOPS)

IOPS are the single best indicator of how well a solid state disk or any other storage device supports database traffic. Solid state disk drive manufacturers like to talk about low latency-- the "lag time" in between a drive receiving a request for data and providing that data. In fact, most solid state disk manufacturers claim latency numbers from 10 microseconds to 50 microseconds. The truth of these numbers is borne out in the IOPS. If all latencies are so similar, then performance for solid state disks should be similar. In fact, nothing could be further from the truth. The highest performing SSD competitor claims 60,000 random IOPS; a number that is still less than the entry-level RamSan-120, even though the competing units are physically larger and more expensive.

The RamSan-120 can deliver 70,000 random IOPS to your applications. A single port on the RamSan-120 can provide 50,000 random IOPS. We stress "random IOPS" because RAID manufacturers occasionally cite their IOPS performance. Discerning buyers should be aware that these quoted numbers are almost always sequential IOPS performance. The problem with sequential IOPS

is that almost no 'real world' applications actually result in sequential disk access.

So why do you need IOPS? IOPS are needed to process database transactions. Database transactions have two main characteristics: they are small (averaging around 8K), and they are random. Small random file accesses thrash hard disk drives. In fact, a really good disk drive can provide around 300 random IOPS. A fast RAID can handle 5,000 random IOPS. This brings us back to the original question -- it is important to support a high number of IOPS because your servers can produce a high number of IOPS.

When your processor is faster than your storage, then your processor literally waits on storage for data needed to perform calculations -- this is called I/O wait time. If your processor is waiting, then your users are waiting. In addition, you are wasting a significant investment in the latest processors.

By supplying incredibly high random IOPS, the RamSan-120 eliminates I/O wait time for all of its stored files. Because its random IOPS capabilities are so high, a single RamSan-120 can provide I/O acceleration for multiple host servers.

When you consider our combined bandwidth and random IOPS performance, it is clear why we call RamSan "The World's Fastest Storage®".

Section 3

Reliability & Availability

The RamSan-120 is the first solid state disk to included a RAID (redundant array of independent DIMMs) protected memory system. The RamSan-120 has two banks of eight ECC protected memory modules. If a single module fails in either or both banks, data and performance are not compromised. Due to the fact that ECC memory is used, the system will also gracefully recover from single bit errors on the memory. These features offer the highest level of data protection in the solid state disk industry.

The RamSan-120 is a non-volatile solid state disk. Two batteries power the system in the event of external power failure. An internal hard disk drive provides persistence in the event of an extended power failure. The power module in the RamSan-120 is hot swappable.   After external power is lost, the RamSan-120 will operate fully functional for one minute. After one minute, the unit will turn off the Fibre Channel controllers and begin de-staging data from memory to the internal hard disk drive. With an 8GB unit, this destaging takes 2.5 minutes.

TMS offers a variety of support options, including next-day or 4-hour onsite support, advance parts replacement, and onsite spare kits.

For more information on TMS support options, visit www.superSSD.com/warranty.asp.

Manageability

The RamSan product line includes the most management features of any solid state disk to ensure the most effective and efficient use of your investment.

Any computer can access the RamSan's management capabilities over the network or directly attached to the unit. From either a Telnet or Browser interface (all password protected) the administrator can monitor the RamSan's various sensors and status alerts and fully configure the system.

Figure 2: Screenshot from the Browser Configuration Interface
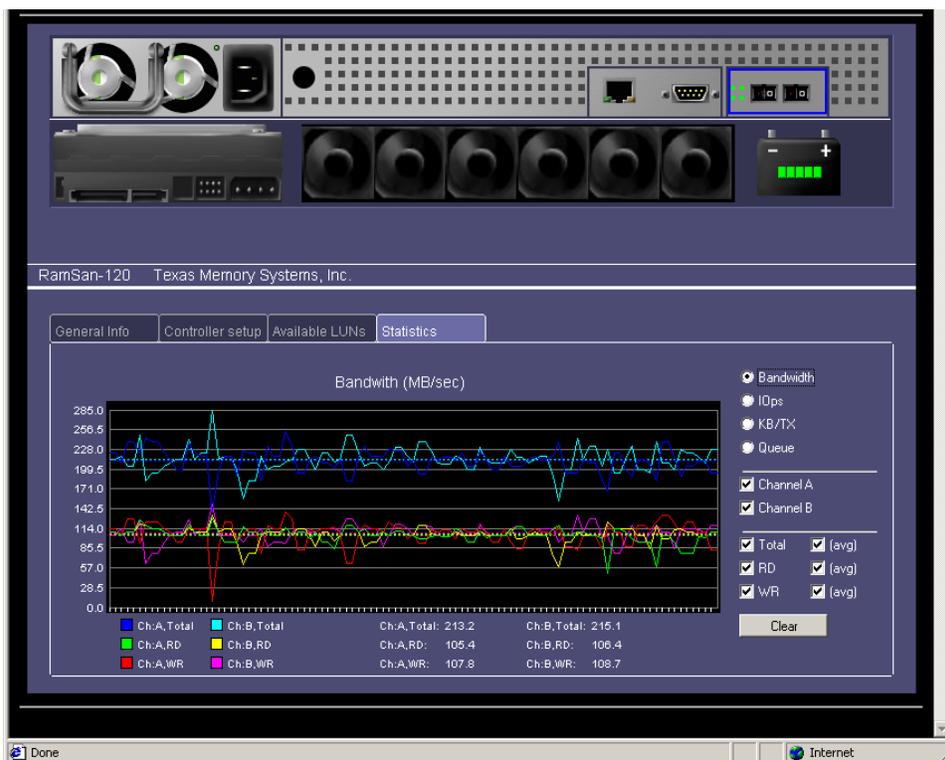
From these interfaces, the administrator can

- Configure from 1 to 64 LUNs of variable capacity. The LUNs can be used by a single server or shared across multiple servers.
- Manage LUN masking lists for each Fibre Channel interface port. The LUN masking lists can be used to grant universal access or limited access to specific worldwide port names.
- Configure Fibre Channel controller settings.

- View all SNMP alerts, system temperatures and the status for every major component.
- Specify the IP address for the RamSan.

Unlike many other storage appliances, the RamSan-120 also incorporates a front panel display and basic control scheme. The front panel display shows Fibre Channel port activity during normal operation and flashes any system generated warnings. Using the buttons next to the front panel display, the user can specify the RamSan's IP address and initiate a manual shutdown of the unit.
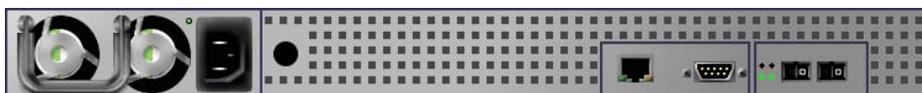
The RamSan-120 should be fully compatible with existing SNMP monitors.

Connectivity

The RamSan-120 uses Fibre Channel interfaces to directly connect to up to two host devices and to storage networks for connection to a virtually unlimited number of devices.

Figure 3: Back Connectivity of the RamSan-120

Each RamSan-120 includes two 2Gbit Optical (LC) Fibre Channel interface ports. The RamSan supports both 2Gbit and 1Gbit devices and auto-negotiates to operate in the proper mode. The RamSan supports all three of the topologies available under the Fibre Channel protocol:

1. Point-to-point. The RamSan-120 properly implements the point-to-point (n-port to n-port) topology for Fibre Channel. Through the point-to-point topology, the RamSan-120 can be directly attached to up to two host servers. Point-to-point connections are faster than the other methods for attaching storage.

2. Switched Fabric. The switched fabric topology implies that there is a storage network switch (such as those from Brocade and McData) between the host and the RamSan-325. Switched fabric topologies can be used to provide unparalleled scalability and redundancy for storage networking. Because Fibre Channel switches tend to add very little latency to storage transactions, the switched fabric topology is still an excellent choice for high performance storage.

3. Arbitrated Loop. In many ways, arbitrated loop is the legacy topology for Fibre Channel. Arbitrated loop operates very similar to the old token ring local area networks and tends to be somewhat slower than the other topologies. In addition, arbitrated loop can support far fewer devices than the switched fabric topology. This functionality allows the RamSan-120 to be connected directly to host bus adapters and storage devices that work best with arbitrated loop. The RamSan-120 will also work when connected to a private arbitrated loop hub.

Section 8

Interoperability

Storage hardware is notorious for problems with interoperability. Texas Memory Systems built the RamSan to help alleviate this situation. It bucks the industry trends by providing the ultimate in interoperability for virtually any environment and application that supports Fibre Channel. It appears as "just another disk" (or, if desired, up to 64 disks) to any network or server it is connected to. This means that anywhere a Fibre Channel disk can go, the RamSan-120 can, too.

RamSans have been successfully deployed in Microsoft, AIX, HP-UX, TRU-64, Linux, IRIX, OpenVMS and Solaris environments. TMS is partnered with a wide variety of companies to ensure continuous interoperability support and testing of Fibre Channel connectivity hardware.

If you have followed Texas Memory Systems over the years, you will know that we have invested a lot of effort in ensuring that our Fibre Channel interfaces are interoperable with other storage network components. In fact, our RamSan-520 was the first solid state disk to pass Brocade's Fabric Aware interoperability certification, the RamSan-210, was the first solid state disk to be both certified Solaris Ready and Designed For Windows 2000, and the RamSan-320 was the first solid state disk to be certified IBM Totalstorage Proven.

Figure 4: Some TMS Interoperability Partners

Section 9

For More Information

TMS specialists are available to provide feedback on what the RamSan-120 can do in any particular application or environment. Call the main office in Houston, Texas at 713-266-3200 or do one of the following:

-For more in-depth information, visit www.superSSD.com
-Existing customers contact support@superSSD.com.
-Potential customers contact sales@superSSD.com.

Also consider these other articles and white papers, available online or through your TMS representative:

-What the Tera-RamSan can do for Business
-Faster Sybase/Oracle/SQL performance with Solid State Disk
-Understanding IOPS
-The Storage Performance Dilemma
-And many more…ask your TMS rep!