



SpringbokSQL and Fusion ioMemory™ PCIe Solutions Conquer Database I/O Bottlenecks for Superior Performance

Solution Focus

- Database management systems
- MySQL
- MariaDB
- postGIS

Summary of Benefits

- Database appliance optimized for database performance
- Small footprint
- Savings in energy and rack space
- Ease of deployment and maintenance
- Low energy consumption
- High reliability

The Challenge

Having spent his entire 30-year career in database administration, database development, and the database administration industry, Alex Alexander, Co-founder and CEO of SpringbokSQL noticed that DBAs perform many redundant tasks when rolling out a new project. They are constantly building, sizing, and deploying database servers and looking for better I/O, all with limited time and personnel.

“A typical company, instead of going with the biggest pipe, doesn’t worry about the pipe,” notes Alexander. “So they do everything else but open the pipe. But the only thing they don’t think about is getting a bigger pipeline. So what companies usually end up doing is settling for less.”

Alexander points out that in computing infrastructure, there are generally two types of server categories, the application server and the database server, but server hardware is typically very generic and not optimized for either the application or database processing. SpringbokSQL focuses specifically on the database server, which is uniquely and highly dependent on I/O performance—input and output operations per second. Database servers should be developed in a fundamentally different way from application servers because of the database server’s critical reliance on I/O.

Alexander suggests that the entire database is only as fast as the system’s I/O allows; frequently a company’s biggest architecture bottleneck is I/O performance: “The SpringbokSQL idea was born based on this premise—the creation of a database appliance—a server or machine, which is specifically optimized for the database workload, which are heavily I/O-intensive.” The idea was to conduct testing and benchmarking to determine how to build the fastest possible hardware that is optimized for database processing. Therefore, the entire machine is built solely for database throughput and high availability.

“Companies spend a lot of time worrying about the CPU capacity, worrying about the memory capacity,” said Alexander. “But the single most important component when it comes to database throughput is I/O—how fast you can store and retrieve the data from the database. And the faster you can do it, the faster your application becomes. So in order to build the fastest possible database machine, you have to figure out the fastest possible way to connect your I/O to your server—and PCIe flash devices are the fastest way to connect your I/O to your servers today.” Since, according to Alexander, a database is only as fast as the system’s I/O allows, databases should be sized from the I/O to the CPU and memory, not vice versa.

“Suppose a company is planning to roll out an online dating site or some kind of gaming site,” suggests Alexander. “You invite a database architect, because you want to build the fastest user experience possible. Today’s users are very impatient. We would like to see the results refreshing pretty much instantaneously. This performance is delivered by front-end applications in, by and large, the database server. Because whatever you do, you’re always storing or retrieving the data.” However, in a typical company setting, system architects are not given six months to a year to extensively test every available I/O or server configuration option. SpringbokSQL sought to solve that problem and prevent DBAs from wasting time with endless cycles of database sizing and tuning trying to achieve a performance-optimized database solution.

Testing PCIe Flash Memory Options

Alexander wanted to build a database appliance that delivered superior usability, reliability, and performance. To address usability the SpringbokSQL database appliance was designed to allow for seamless integration into customers’ existing infrastructure without disrupting business-critical operations. To solve the challenges of reliability and performance SpringbokSQL focused on PCIe flash devices.

“In doing our research to develop the fastest database appliance possible, we figured out that the best way to connect I/O to our appliance is by using PCIe flash memory. Once we determined this, the next iteration was to seek out every possible PCIe vendor on the market, perform benchmarks on the devices, and evaluate the result,” said Alexander. “We wanted to select one vendor that we could work with—a partner who would listen to our feedback and optimize the technology based on our feedback.”

There is a sea of various options when it comes to SSDs or PCIe flash memory. During the eight-month testing period, SpringbokSQL tested nearly every possible PCIe vendor on the market with benchmarks primarily focused on database-specific tests executed on multiple databases—PostGIS/PostgreSQL, MySQL, and MariaDB. For testing scenarios, Springbok selected five real-world issues that companies are struggling with on a daily basis and performed these specific tests with the database I/O.

SpringbokSQL focused squarely on customer pain points. Number one on the list was replication of the slave log. Companies have a master database and slave databases. When capacity and transactions increase, the slave databases start falling behind, primarily because of memory limitations. “Companies then figure they should have more servers processing these transactions,” said Alexander. “What they actually do, though, is complicate the server infrastructure. However, the problem is only solved if you find the fastest I/O, so the slave just never falls behind. And essentially, this is why our first series of tests that we published was purely focused on replication performance. We staged the test by intentionally stopping the slaves and then powering them up after a certain time lag to see which one could catch up first. And in our tests, PCIe flash devices from SanDisk—the Fusion ioMemory™ SX300 PCIe Application Accelerator—was the fastest possible configuration for our customers to use.”

The Solution

The SpringbokSQL appliance was born to address a gap in the marketplace. According to Alexander, the appliance is both very fast and very reliable. “I always want to strive for perfection,” he said.

A plug-and-play solution, the SpringbokSQL appliance saves customers the effort of undergoing months’ worth of research and testing. “This appliance reduces your deployment time,” said Alexander. “You can literally be up and running with this database in a matter of a few days, without months and months of research and

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CEO and Co-Founder, SpringbokSQL

testing. Customers can purchase the appliance and fast forward toward having the fastest possible throughput.” The SpringbokSQL appliance, offered in a compact 1U configuration, also saves rack space and energy and can replace the workload previously performed by multiple servers.

In order to simplify the architecture and administration, SpringbokSQL removed all moving parts, including all spinning disks. All data resides on PCIe flash devices, which makes it very reliable. In fact, SpringbokSQL appliances are NEBS Level 3 certified so they can be deployed in mobile transport environments, such as on ships or moving trucks.

When deploying SpringbokSQL appliances, customers can easily select their configuration. Customers no longer need to worry about how many cores or RAM they have, but focus only on how much database capacity they need. SpringbokSQL database appliances are available in three configurations: 1.5TB; 3TB; and 6TB. On the back end, SpringbokSQL deploys Fusion ioMemory SX300 PCIe Application Accelerators, which come in several capacities in a low-profile form factor allowing SpringbokSQL to scale appliance capacity to fit end user requirements. As SpringbokSQL’s extensive competitive testing showcased, the Fusion ioMemory SX300 PCIe Application Accelerator is optimized for the mixed workloads that the SpringbokSQL database appliance addresses and is capable of delivering low latency performance and hundreds of thousands of IOPs.

The Results

Most database servers are running today at 10,000 input/output operations per second (IOPS). However, SpringbokSQL was able to achieve up to 800,000 IOPS with the Fusion ioMemory SX300 PCIe Application Accelerator during their performance tests.

After having built the SpringbokSQL database appliance that was his brainchild—a product he had considered for a decade—Alexander received a telling compliment from a client. “He literally told me, ‘Alex, if your product was in the Olympics, I would worry about it getting tested for steroids.’ This is how fast it was. At the customer site, in replication tests, our appliance was able to catch up with the master database within four hours. It took the database server provided by the hosting company five days to accomplish that same task,” explained Alexander. “You can see the massive difference between four hours and five days—this is the type of performance that we can deliver today in cooperation with SanDisk.”

In addition, Alexander pointed out that the appliance is a small footprint, saving both energy and rack space. It is easy to deploy, easy to maintain, low energy consuming, and ultimately, very reliable.

After every product iteration of the SpringbokSQL appliance—even once Alexander has deemed it at a level of ‘perfection,’—SpringbokSQL asks, “What else can we improve?”

Changing the Role of the Database Administrator

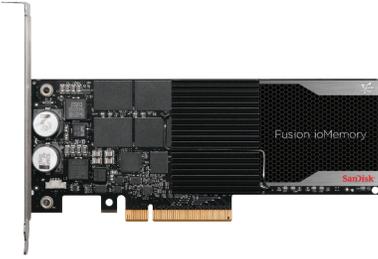
SpringbokSQL is proud that their appliance contributes to a more exciting career for database architects and administrators. Deployment of the SpringbokSQL appliance relieves DBAs of low-level tasks, such as database sizing and testing. Instead, administrators can focus on learning more about database features, enhancing logical database design, and improving application features and performance. The SpringbokSQL database appliance handles the performance, availability, and reliability of their backend infrastructure, freeing DBAs to focus on more critical aspects of their role.

“We’re very happy with SanDisk. Our partnership worked out really well that we were able to bring to the market the fastest possible appliance today.”

Alex Alexander
CEO and Co-Founder, SpringbokSQL

Products

- Fusion ioMemory™ SX300 PCIe Application Accelerator
- SpringbokSQL appliance



Fusion ioMemory™ - SX300

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At SanDisk, we're expanding the possibilities of data storage. For more than 25 years, SanDisk's ideas have helped transform the industry, delivering next generation storage solutions for consumers and businesses around the globe.

Partnership with SanDisk

SpringbokSQL selected SanDisk as their vendor based on their extensive tests. However Alex Alexander was also looking to partner with a company with longevity, continuity, and a history of flash memory knowhow. Alexander notes that, since SanDisk has been a flash memory company throughout its history, the Company has greatly contributed to PCIe flash design: "SanDisk was the first company who actually listened to our feedback. They made improvements to the device configuration, so we started using that solution in our configuration. In addition, the people I established a relationship with initially are still onboard. I think the best thing about SanDisk is continuity. Since the moment we had a relationship, it continued. We had the same people involved. I think, together, in cooperation, we developed something really valuable. I think this is a very good partnership."

He continued, "SpringbokSQL is a software and a hardware company. SanDisk is a software and hardware company too. Not only do we have the fastest possible PCIe flash device at our disposal, but also SanDisk developed a file system for this PCIe flash device. So that combination created the fastest possible throughput."

Alexander believes that deploying a product other than SanDisk results in using a file system that is not optimized for PCIe flash: "That's the uniqueness of SanDisk. Not only do you have a hardware device, along with their experience in flash device design, but also the hardware is mated to the file system that SanDisk developed."

Future plans

SpringbokSQL will continue to build appliances in cooperation with SanDisk. "Our next generation of appliances will be liquid cooled to reduce energy consumption by at least 400%. We plan to reduce the footprint by as much as 10 times the current configuration. We strongly believe that liquid-cooled computing is the future of technology and our biggest goal right now is to bring supercomputing technology down to the 'average' company, delivering the ultimate in reliability and performance."

"I strongly believe that the partnership between SpringbokSQL and SanDisk has a very bright future. I feel very passionate about computing myself. We continue to innovate. We're going to keep pushing forward and keep delivering faster performance, better reliability, smaller footprint, less energy consumption. We're going to change computing."

About Springbok SQL

SpringbokSQL, Inc. manufactures a database appliance and load balancer. The company was incorporated in 2014 and is based in Henderson, Nevada. SpringbokSQL's solutions make it easy for companies to grow and scale database architectures, saving thousands of dollars in labor and hardware costs. The Company has succeeded in designing and deploying the fastest, most available database environments. The Springbok SQL database appliance is a pre-packaged or pre-configured, balanced set of hardware, software, service, and support. The appliance is sold as a unit with built-in redundancy for high availability and positioned as a platform for DBMS use in online transaction processing (OLTP) and/or data warehousing.