A MICRON **CASE STUDY**

A Drive That Keeps Transportation Businesses on the Go

Worldwide Air Logistics Group Discovers How Micron® S600DC Series SSDs Can Navigate Through Network Boot Storms

For transportation companies, it's not just freight that's on the move—crew members, maintenance personnel and office staff are also in constant motion. These workers rely on instant access to the data network and virtual applications from different locations so they can do their job, wherever it takes them.

"We always have planes in the air and a system operation center that's 24/7. Employees need to be able to walk in and access the virtual desktop anywhere," says Brent Meints, infrastructure architect with Worldwide Air Logistics Group. This Florence, Kentucky company provides domestic and international air cargo services through separate operating subsidiaries, Southern Air, Inc. and Florida West International Airways, Inc.

About two-thirds of Worldwide's staff use Windows® laptops with remote access. The rest use kiosks with zero clients to connect to virtual desktops. The company relies on two VMware® clusters of three ESX® hosts, one cluster for production and one for the virtual desktop infrastructure (VDI). Each cluster is connected to a dedicated EMC® VNX® E5200 and a CLARiiON® CX4-120 for storage.

Because of rewrite latency issues between VMware hosts and backend storage, and SCSI-abort issues where too many virtual machines or hosts are trying to access storage over the same path, Worldwide suffers "boot storm" issues, Meints says.

Micron® S600DC Series SAS SSDs

- Industry-leading storage density—up to 4TB-class capacity in a 2.5-inch form factor
- Full power-loss protection ensures availability and integrity of data in the event of power loss
- End-to-end data protection ensures the accuracy of data throughout the process of writing, maintaining and reading the data
- Comprehensive security suite includes TCG Enterprise encryption, secure download and diagnostics to protect against counterfeiting and malicious attacks on all models, as well as FIPS-140-2 military-grade encryption on select drives

"There's an IOPS issue across the board because we didn't have flash storage (in the network servers)," he says. "The issue was more noticeable in the VMware VDI environment because of the virtual desktops and the way they access storage versus the way production servers access storage."

"You're limited by the IOPS of the individual drives. The 15K SAS drives can only produce X amount of IOPS per drive. They're mechanically limited."

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But when Meints installed two 800GB Micron S650DC SAS SSDs into a Dell™ R630 server that runs VMware, he got a taste of how a faster system with greater capacity could impact a company in the transportation industry.

Speed That Blows Away the Competition

Meints had previously installed Intel® SSDs in all company laptops, and the drives brought the older laptops back to life with their speedy performance and better overall Windows experience.

"I was interested in testing the Micron SSD on the server side, to see the performance and evaluate the capacity and how many gigabytes per dollar we'd be getting," Meints says. "I wondered if it would make more sense for us to start replacing some of our old storage and just go toward flash storage."

He put the two Micron SAS SSDs into the Dell running VMware host server. Then, he compared their read/write and file transfer speeds against a RAID set of two Intel SAS 6 Gb/s SSDs and two Seagate® 6 Gb/s 15,000 SAS HDDs.

The results (all Q=32, T=1) conclusively showed how much faster the Micron SAS SSDs were:

- Sequential read: 14.6X faster than HDDs
  - Micron SAS SSDs: 2108.45 MB/s
  - Competitor SAS SSDs: 884.14 MB/s
  - Competitor SAS HDDs: 143.93 MB/s
- Sequential write: 8.8X faster than HDDs
  - Micron SAS SSDs: 882.68 MB/s
  - Competitor SAS SSDs: 142.84 MB/s
  - Competitor SAS HDDs: 99.82 MB/s
- Random read 4 KiB: 128.7X faster than HDDs
  - Micron SAS SSDs: 463.49 MB/s, 113,157.00 IOPS
  - Competitor SAS SSDs: 374.05 MB/s, 91,320.8 IOPS
  - Competitor SAS HDDs: 3.6 MB/s, 879.9 IOPS
- Random write 4 KiB: 154.3X faster than HDDs
  - Micron SAS SSDs: 302.48 MB/s, 73,846.9 IOPS
  - Competitor SAS SSDs: 142.4 MB/s, 34,767.6 IOPS
  - Competitor SAS HDDs: 1.96 MB/s, 479.2 IOPS

When he copied an ISO image, it took just 35 seconds with the Micron SSDs instead of five minutes with the Seagate HDDs.

"It's not just a difference in speed—it's a significant difference," Meints says. That speed difference would impact booting, restart times and file transfers for VDI users.

Longer-Lasting Performance

Because of the Micron drive's dual-port SAS, which delivers the full performance of 12 Gb/s SAS protocol, Meints expected to see the speed performance, as well as a certain level of I/O and rewrite speeds. But the biggest surprise was the drive's write ability and its longevity.

"With early SSDs, the question was how many rewrites would you get, and how many optimization loopholes would you have to take advantage of to extend the life of your SSDs to compete with the life of a spinning-disk drive," Meints says.

> "I really think a single 2U box with 16 or 20 Micron SAS SSDs would outperform and be just as reliable as our entire EMC array."
>
> BRENT MEINTS
> Infrastructure Manager, Worldwide Air Logistics Group

With the algorithms and controllers now used in SSDs, that worry has been eliminated, he says. "Now I think SSDs are probably going to last as long, if not longer, than the mechanical drives just because [HDDs] have moving parts and failures."

Far Fewer Drives are Required

With a Micron SAS SSD, there's no need to throw more disks at the server to get IOPS up or to create necessary redundancy, Meints says. With end-to-end data protection that ensures data accuracy, full power-loss protection and fast rebuild times, the Micron SAS SSDs provide better performance and the same reliability on fewer drives.

In fact, Meints estimates he could replace the company's 20-drive RAID 10 array of 600GB 15,000 RPM SAS HDDs with only four 800GB Micron SAS SSDs and have 100 times the IOPS. "I really think a single 2U box with 16 or 20 Micron SAS SSDs would outperform and be just as reliable as our entire EMC array," he says.

That makes the Micron S600DC Series SSD hard to beat, he says. "We get a ton of performance, a smaller footprint, less power usage, lower heat generation and no spinning parts to worry about," Meints says. "You get better performance at a better price point per gigabyte. And Micron's been around long enough that most people in IT would be comfortable buying them."

Designed with ultra-fast 12 Gb/s SAS dual-port functionality and robust SAS protocol, the S600DC Series SSD provides flexible storage options for read-intensive, mixed workload or write-intensive applications. These high-performance drives are designed with Micron's proven enterprise MLC flash technology and developed in partnership with Seagate to deliver all of the technology elements of the solid state storage equation.

Fast Facts

- **Customer:** Worldwide Air Logistics Group
- **Industry:** Transportation
- **Primary Contact:** Brent Meints, infrastructure manager
- **Challenges:** Overcome boot storm issues and slow performance when accessing remote servers.
- **Solution:** Install two Micron S650DC SSDs on the server side.
- **What Made the Difference:** The performance, capacity, endurance and reliability of Micron's S650DC SSD.
- **Result:** Significantly faster booting, restart and file transfer speeds; smaller footprint, less power usage and heat generation; increased performance at a better price point per gigabyte than HDDs.

Learn more at https://www.micron.com/products/solid-state-storage/product-lines/s600dc#/

To be contacted by a member of our SAS SSD team, complete the form at http://go.micron.com/Have-a-Rep-Contact-Me.html

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