

## STEC Inc. CTO looks at the future of flash and solid-state drives

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Solid-state drive (SSD) maker STEC Inc. made several announcements last week, including [enterprise-class multi-level cell \(MLC\) drives](#). The vendor announced that OEMs shipping its drives in storage arrays are Compellent Technologies Inc., EMC Corp., Fujitsu, Hewlett-Packard (HP) Co., Hitachi Data Systems, IBM and Sun Microsystems Inc.

In this Q&A with SearchStorage.com, STEC president and chief technology officer (CTO) Mark Moshayedi said he's hoping for more competitors in this space, as well as better market education of end users on the benefits of solid-state storage. He also reveals the company's top-selling customer and envisions a world beyond flash.

### SearchStorage: Can you talk about what drove STEC to make MLC drives for the enterprise?

**Moshayedi:** Our [OEM] customers would like to see the high performance but a lower cost per gigabyte, about 40% lower than the SLC [single-level cell] equivalent. The performance of our drives is extremely good even with MLC, and the cost per GB becomes a key factor for deployment in read-intensive applications.

### SearchStorage: Don't SLC drives also have slower write speeds?

**Moshayedi:** We can get pretty fast writes, up to 300 MBps, and up to 550 MBps reads, on our third-generation SLC product. That's much higher than we were achieving on second-generation products and higher than anything anyone else is achieving. To put it in perspective, the MLC product gets just over 100 MBps in write speed. It's comparable in performance to the second-generation product using SLC prob. When people talk about read-intensive apps for SLC, they don't take into account algorithms that give both performance and reliability—algorithms that have extremely low write amplifications can offer not only great performance but also long-term reliability. Warranty-wise, SLC lasts five years, but in real applications, it could last 20 years.

### SearchStorage: Other than the performance boost, what's new in the third-generation SLC product?

**Moshayedi:** It has better reliability associated with much stronger [Error Correction Codes \(ECCs\)](#) being applied to flash. It has internal RAID built into the drive itself, a much faster CPU that allows much higher I/O performance and enables 6 Gbps SAS, which we previously didn't have.

### SearchStorage: What kind of adoption has STEC seen from its enterprise SSDs so far? Is any particular OEM partner selling more SSDs than others?

**Moshayedi:** EMC has been out in the marketplace the longest. Other customers have just finished qualifying our drives in the last two quarters. Just for the last six months of this year, [EMC is] going to be purchasing \$120 million worth of product. Let's say they buy \$180 [million] to \$200 million worth of product—that translates to \$5 billion in sales on their side.

### SearchStorage: What's the biggest hurdle to SSD adoption at this point, and how is STEC planning to overcome it?

**Moshayedi:** The biggest issues our customers are having are marketing issues. The problem you have is that when you make the product available as an option, unless people understand just what that option buys them in performance, reliability, power, whatever the other metrics are, generally people don't order it because they don't even understand it.

Education is very important, but the more important thing is there's a lot of misinformation out from an end-user perspective, that [flash](#) is not reliable, that it has limitations with regards to writes, that it's really made for iPods, so how can you use it in the enterprise? All the issues that flash has are things you can overcome in the design. It all depends on [the] controller and firmware that you throw at it.

The major issue in the market is the adoption. Obviously we've done extremely well selling these products and being first to market, but volumes are extremely low. It's not a 5-million-units-per-year market. Even in the next year we'll see 200,000 to 300,000, maybe the year after that 600,000 to 700,000, a maximum of 1 million. Hard disk drives are 30 million units a year already. It's easier there to maintain support staff and keep coming up with the next generation of product. For the SSD market to survive as well, it needs to go through same type of growth.

### SearchStorage: How do you see the future of the MLC and SLC categories playing out? Do you see tiered arrays of different types of flash drives similar to what we have with hard disk drives today?

**Moshayedi:** I think there will be a new tier of storage created with MLC-based SSDs where the performance of those SSDs is lower than the SLC equivalent. If you just need the fastest type of device, use SLC; when you need more capacity and want lower cost, use MLC. If you would call SLC tier zero, maybe MLC becomes tier 0.5.

**SearchStorage:** What do you think the overall SSD and hard disk drive market will look like in a year?

**Moshayed:** It's not going to change much. Hopefully there will be new players to create competition, which is always good for the market. For the next year there'll be some MLC deployment, although not a significant amount.

**SearchStorage:** What will it look like in five years?

**Moshayed:** The next phase of deployment will be in servers in much higher volume. Due to the volume nature of the applications, cost is going to be very important, and MLC is going to be very important. SLC will be purely used for the highest end of storage tiering on enterprise storage devices.

**How about in 10 years?**

**Moshayed:** God knows, but it probably won't even be flash-based. It will probably be nuclear magnetic resonance (NMR) or [phase-change memory \(PCM\)](#). PCM changes the substrate from crystallized to natural form, resisting changes. The advantage is that you're not talking about storing charges, so you don't have the issue of depleting charges that happens on flash. The problem is capacities are not that high right now.

I haven't seen many results out of NMR. Many people are working on this technology, but I haven't seen product out to be able to evaluate it in any type of sizeable device. To us it makes no difference what the media is, we still have to manage it to make sure not to wear it out prematurely, and that's the area of our focus.