

## Viking Modular eliminates the battery in DDR3 non-volatile module

*DDR3 ArxCis-NV module combines super-capacitor DRAM and flash memory to deliver a persistent memory solution that saves critical data from power failure events.*

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Viking Modular's new approach to high speed non-volatile memory uses the company's extensive experience in both DRAM and solid state drive technology to create hybrid memory that provides the speed of DDR3 with the long-term "high availability" storage retention of flash memory. Both high availability and disaster recovery are two serious concerns for datacenter operators; the Viking ArxCis-NV solution delivers an elegant solution for protection against potential data loss. The ArxCis-NV module has the additional advantage that it does not require a battery.

### Batteries stink

One thing I learned from building mobile devices for three decades is 'I hate batteries.' While we take for granted our wireless mobile lifestyle, it would not be possible without batteries. The latest lithium-ion batteries are orders of magnitude better than the technologies we used over the years, but they still are batteries. Batteries need sophisticated recharging circuits, otherwise they can undergo a temperature runaway and will explode. They are made out of heavy metals and need to be recycled. They need to be replaced on a relatively frequent basis, and replacements need to go through a painful series of conditioning steps before entering service. Finally, when you really need them, they may not last long enough to retain data during a long-term power outage. Yet, data centers worldwide still rely on batteries to provide protection of the critical data within their servers and storage controllers.

### What is a super-capacitor?

Capacitors are used throughout electronic circuit boards to regulate voltages that can vary due to component power usage, distances and conductance across the devices. They work by storing a varying incoming electronic current while putting out a constant level. The larger the capacitor, the more current can be stored in the device. Like a battery, they can supply a circuit with enough energy to operate for a limited amount of time. Super-capacitors have been used in this application for decades, even supplying enough current to keep a mobile computer alive while batteries are swapped. But, use in this type of non-volatile memory application is fairly recent because it requires the use of flash memory, the same kind used in solid state drives, of the same capacity as the volatile memory in the device.

### How does the non-volatile memory system work?

Servers and storage controllers use high speed Dynamic Random Access Memory (DRAM) for many applications, but buffering or caching the output data is one of the most critical. If the system loses power, the cache is gone unless the DRAM has some kind of non-volatile feature, and if the cache is targeted for a rotating drive or RAID striped across multiple drives, data will be corrupted in the system and cannot be recovered. The non-volatility has been provided by various types of battery systems, with the more recent applications involving the venerable lithium-ion battery and associated charge circuit. Viking's new DDR3 ArxCis-NV DIMM offer increased levels of protection by using an input voltage monitoring circuit to detect power failure, and immediately writes the contents of the DRAM to an onboard flash memory array, using the super-capacitor to provide power during the operation.

**ArxCis-NV with cable-attached super-capacitor****What are the cost tradeoffs?**

The cost of the battery and charging circuit are traded against the cost of the flash memory, controller and super capacitor, so the module costs more than a battery version. However, when the cost of maintaining the batteries deployed in a data center, the flash memory and super-capacitor quickly becomes a money winner. Pre-conditioning a battery, taking down a server, taking apart the server, replacing the battery and then recycling the old one consumes data center technical resources both in terms of IT resources and server availability. But the trump-card is long term data retention provided by the flash memory. While the best lithium-ion batteries provide retention measured in a few days, flash can retain data for upwards of ten years. A power outage can last weeks after some disasters, while a power outage of years would imply more problems than a corrupt storage system.

**Versions available**

The ArxCis-NV is available in 2GB, 4GB & 8GB DDR3 versions . All models use 32GB of multi-level cell flash memory. Other options include super-capacitor size of 25, 50 or 75 Farads and designation of flash manufacturer (Micron, Samsung or Toshiba). Systems can take advantage of the additional flash memory by taking incremental snapshots of the DRAM.

**SSG-NOW Assessment**

Viking Modular, a division of manufacturing giant Sanmina-SCI, is a leader in the development of high density DRAM modules, persistent memory devices, including solid state drives and its unique SATADIMM. Server, controller and appliance manufacturers will increasingly adopt the maintenance-free ArxCis-NV. Data center operators likewise will appreciate the lack of worries regarding the care and feeding of batteries in their servers and storage arrays. With the growing number of lights-out data centers and sophisticated storage systems installed in regional offices and even small businesses, the Viking DDR3 ArxCis-NV will find deployment in an increasing number of applications.

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