

IBM STORAGE

IBM FlashCore[®] Technology



IBM FlashCore technology refers to the IBM innovations that enable IBM FlashSystem storage to deliver extreme performance, IBM MicroLatency[®], enterprise-grade reliability, and wide range of operational and cost efficiencies. These technologies and innovations are represented in the FlashCore hardware-accelerated architecture, IBM MicroLatency modules, and many other advanced flash management features.

What makes FlashCore technology unique?	
Hardware-Accelerated Architecture	FlashSystem arrays use an all-hardware data path to minimize the amount of software interaction during I/O activity, resulting in the highest performance and lowest latency for all-flash storage arrays.
IBM MicroLatency Modules	FlashSystem delivers extreme performance, greater density, unlimited scalability, and mission-critical reliability by using IBM-designed, purpose-engineered flash storage modules.
Advanced Flash Management	Unique, patented IBM hardware and software innovations enable FlashSystem to provide the most reliable, feature-rich, and highly available flash data storage.



Delivering the extreme performance you need to win

Engineered for Flash	IBM FlashCore technology is designed to use flash storage. As a result, everything from the data paths and controllers to the software move at the extreme speed of flash.
Parallel Design	Every flash controller can perform up to 40 operations in parallel, or 1,760 simultaneous flash accesses in a 57TB system. This enables consistently fast I/O responsiveness as FlashSystem goes from one I/O per second to millions.
Hardware-Only Data Path	Non-IBM flash storage uses software execution to manage data transfers. In contrast, IBM FlashCore technology features a hardware-only controller data path, which provides the lowest latency in the industry today.
FPGAs in the Data Path	I/O in the modules is processed by dedicated FPGAs. This ensures ultra-low latency, even under extreme load, with less variability in response time than other all-flash array storage.
Distributed RAM	Instead of traditional controller-based DRAM cache, FlashCore technology uses distributed RAM located at the module level. This accelerates metadata for flash addressing and translation activities, resulting in faster I/O activity.
High-Speed Interface	MicroLatency modules use high-density pin connections. This enables higher speed data transfer with more concurrent I/O operations, across the host interface to the flash chips and back again.
Non-Blocking Crossbar Switch	Instead of PCIe connections and SAS controllers, FlashCore technology uses proprietary, redundant, non-blocking crossbar switch backplanes, providing higher internal data bandwidth and allowing more concurrent I/O activity.
Write Buffer and Hardware Offload	FlashCore technology uses a specially designed hardware-based flash translation, which processes write operations as quickly as possible to provide the highest level of write performance.
IBM Garbage Collection	IBM proprietary garbage collection takes into account several attributes to reduce excess write activity (write amplification) and get the most life out of every flash block.



Providing industry-leading reliability, availability, and serviceability (RAS)

IBM Variable Stripe RAID®	Patented Variable Stripe RAID is unique in the industry. It enables more efficient flash storage retention and availability, with little to no impact on data protection or system functionality.
Hardware RAID	System-level hardware RAID provides supplementary data protection for failures affecting entire flash storage modules. It also speeds write operations and provides faster flash storage rebuilds.
IBM-Engineered ECC	FlashCore technology implements a more powerful hardware-based error correcting code. You gain even greater reliability and lower cost, higher density flash.
Single-Box Highly Available Architecture	FlashCore technology creates a whole new level of availability and serviceability for flash storage systems with all key, non-passive components contained within field-replaceable units or modules.
IBM-Optimized Over-Provisioning	IBM-optimized over-provisioning helps FlashSystem supply highly available flash storage and faster write I/O performance, even when the storage system fills up with customer data.
Wear Leveling	Along with optimized over-provisioning, FlashCore technology wear leveling better preserves FlashSystem flash storage lifetimes.
Line Speed Data-at-Rest Encryption	Dedicated chips inside modules provide AES 256 hardware-based, data-at-rest encryption at internal data path line speed with no impact on I/O latency. This makes it much easier to deploy data security for flash storage.
Concurrent Code Load and Maintenance	Highly available controller hardware and concurrent code load enable FlashSystem to stay online during hardware service or code change activities.