

EMC VFCache

Server Flash cache for superior performance, intelligence, and protection of mission-critical data

ESSENTIALS

- Reduces latency and increases throughput to dramatically improve application performance
- Extends EMC FAST technology into the server for added intelligence
- Delivers performance with protection by leveraging back-end data services provided by EMC networked storage

IT organizations are faced with an application-performance challenge caused by an imbalance between the processing power of servers and the access time of storage disks. Server processing power continues to advance, doubling every 18 months, yet disk drive throughput remains the same. This has caused a bottleneck in the input/output (I/O) stack whereby the server and the application have capacity to process more I/O than disk drives can deliver. This is referred to as the “I/O gap.” Flash drives in the array have helped to close this gap by providing an order-of-magnitude better performance. Now, server-based PCIe Flash technology is accelerating I/O performance by even another order of magnitude over Flash drives.

EMC® VFCache™ is a server Flash caching solution that reduces latency and increases throughput to dramatically improve application performance by leveraging intelligent software and PCIe Flash technology. VFCache accelerates reads and protects data by using a write-through cache to the networked storage to deliver persistent high availability and disaster recovery. Coupled with array-based EMC Fully Automated Storage Tiering (FAST) software, VFCache creates the most efficient and intelligent I/O path from the application to the data store. The result is a networked infrastructure that is dynamically optimized for performance, intelligence, and protection for both physical and virtual environments.

SUPERCHARGED APPLICATION PERFORMANCE

VFCache accelerates block I/O reads to accelerate applications that require the highest input/output operations per second (IOPS) and/or the lowest response time. The software uses the PCIe card as a cache of the most frequently referenced data, shrinking storage access time while offloading the I/O processing from the storage array. By sitting in the server on the PCIe bus, VFCache bypasses the overhead of network storage access, reducing response time from milliseconds to microseconds. VFCache puts the data into the server I/O stack, closer to the application to dramatically improve performance. With throughput improvements of over 300 percent and reductions in latency by as much as 50 percent, VFCache takes application performance to an entirely new level, giving it the boost it needs.

VFCache is optimized for web applications, online transaction processing (OLTP), customer relationship management (CRM) and enterprise resource planning (ERP) databases, email applications, and other read-intensive workloads with a small working set. VFCache is designed to minimize CPU overhead in the server by offloading Flash management operations from the host CPU onto the PCIe card. In addition, VFCache offloads much of the read traffic from the storage array, allowing it to allocate greater processing power to other applications. While one application is accelerated with VFCache, the array’s performance for

other applications is maintained or even slightly enhanced. As VFCache is installed on more servers in the environment, the result is a highly scalable I/O processing model. The environment as a whole, including the servers and the storage system, is capable of processing increasingly more IOPS.

VFCache provides complete and flexible control over the scope and granularity at which it can be enabled. In physical environments, users can enable or disable VFCache at the source volume level or LUN level. In virtual environments, the VFCache capacity is provisioned to an individual virtual machine (VM). The allocated cache capacity inside the VM is then configured at the virtual disk level.

| | Specification | EMC VFCache |
|----------|-----------------------|--|
| Software | Environments | Physical and virtual |
| | Operating Systems | Windows: 2008 (x86_64), 2008 R2 (x86_64), 2008 R2 SP1 (x86_64) |
| | | Linux: RHEL 5.6 (x86_64), RHEL 5.7 (x86_64) |
| | | VMware: vSphere 4.1 and 5.0 |
| Hardware | Form Factor | Half-height, half-length |
| | PCIe | Gen2, x8 |
| | NAND Technology | 34 nm SLC |
| | Capacity | 300 GB |
| | Random 4K Read | 715K IOPS |
| | Random 4K Write | 175K IOPS |
| | Sequential 128K Read | 3 GB/s |
| | Sequential 128K Write | 1.8 GB/s |
| | Latency | <50 μ s |
| | Power | 25 W |

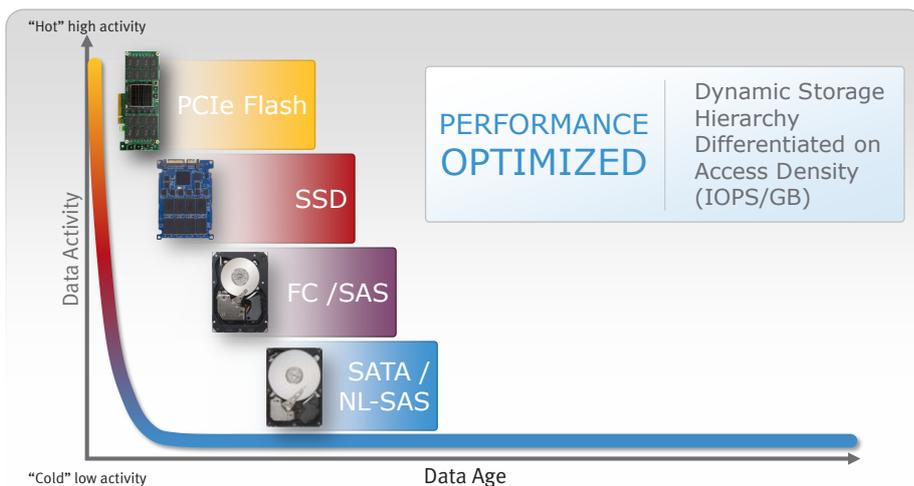
AUTOMATED CACHING INTELLIGENCE

VFCache intelligently delivers read requests directly from cache memory. The caching optimization within VFCache automatically adapts to changing workloads by determining which data is most frequently accessed and promoting it into the server Flash cache. VFCache is completely infrastructure agnostic. Sitting between the application and the storage array, it does not require any changes to either. It is transparent to the storage, application, and user. Once the VFCache card has been installed, no user intervention is necessary to start seeing performance benefits.

EMC's architectural approach is to leverage the right technology to get the right data to the right place at the right time and cost. To accomplish this, EMC has developed its FAST array-based software, which automates the movement and placement of data across storage resources as needs change over time, optimizing applications while lowering costs. VFCache extends FAST into the server, adding another tier of intelligence and performance to the I/O stack. When coupled with FAST, VFCache creates the most efficient and intelligent I/O path from the application to the data store. With both technologies, EMC provides an end-to-end tiering solution to optimize application capacity and performance from the server to the storage. As a result of the VFCache intelligence, a copy of the "hottest" data automatically resides in the server for maximum speed. As the data slowly ages and "cools," it is automatically moved to the appropriate tier of the storage array—from the cache to Flash drives to Fibre Channel/SAS drives to SATA/nearline SAS drives over time.

Data Continuum

As data "cools" and ages, different technologies apply



TOTAL PROTECTION

While accelerating performance, VFCache simultaneously delivers enterprise-class protection of mission-critical application data. Data in the cache is simply a copy of data that is already stored on the array, while the master copy is maintained by the advanced data services that only EMC's trusted networked storage provide, including high availability, end-to-end integrity, reliability, and disaster recovery. VFCache leverages a write-through algorithm which ensures that newly written data persists to the networked storage array, such as EMC Symmetrix® VMAX® and VNX® series. If the server fails, the data remains protected and accessible on the array.

VFCache includes a unique software option that enables users to split the PCIe card between caching and direct-attached storage (DAS). This provides flexibility for users to simultaneously use the card as a caching device for mission-critical data and as a read/write storage device for temporary data. Users can fully optimize their workloads by adjusting caching or DAS without having to change their card deployment. With this feature, both read and write operations from the application to the DAS are done directly to the PCIe Flash capacity in the server. Since the DAS portion does not persist to any storage array, it is best used only for ephemeral data, such as operating system swap space and temporary file space.

With a three-year Enhanced warranty, VFCache has been designed to be completely user installable, maintainable, and upgradable. EMC Global Services offers basic remote Virtual Service Delivery (VSD) implementation and assessment services as well as worldwide remote technical support for VFCache 365x24x7.

CONTACT US

To learn more about how EMC products, services, and solutions can help solve your business and IT challenges, contact your local representative or authorized reseller, or visit us at www.EMC.com.

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