

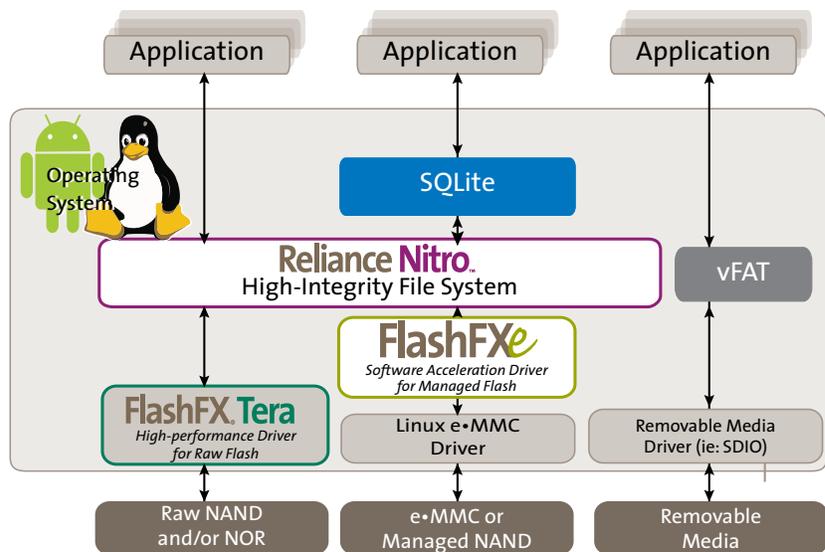
FlashFXe™

Storage Acceleration Software for eMMC and Managed NAND

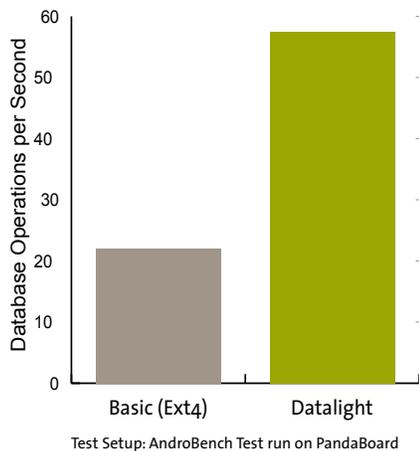
FlashFXe™ is the only eMMC software flash accelerator for Linux operating systems that dramatically reduces write amplification – a key shortcoming of solid-state storage – improving performance, increasing endurance and reducing energy consumption of your embedded device. Designed to be used with the Datalight Reliance Nitro high-performance file system, FlashFXe has been developed by Datalight, the experts that created the FlashFX® family of flash memory management tools — the top choice for data-critical applications of leading OEMs for decades. Datalight’s responsive and accessible support engineering staff will help streamline your development and get your project done quickly and efficiently.

Key Features

- Improves random write and database operations by up to 50%
- Improves endurance puts 40% less wear on flash memory
- Uses less than half the energy at the flash subsystem level
- Flash-aware allocation and host RAM caching
- Intelligent synchronization preserves data integrity without slowing the system
- Power fail safe behavior offers reliability with protection from data loss during power failures
- Fast mount operations deliver instant-on experience



Ultrafast Database Performance



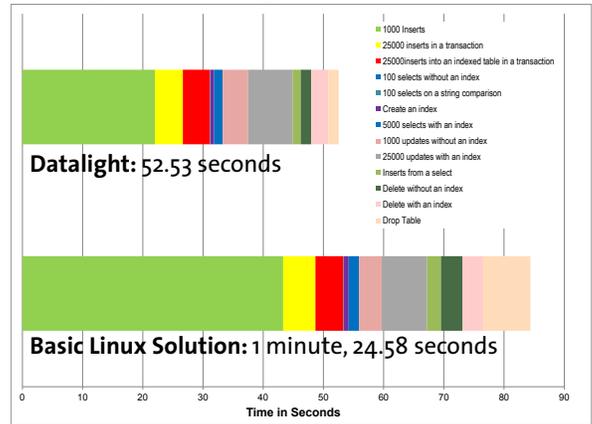
Feature	FlashFXe	Linux eMMC Drivers
Flash-aware Allocation	✓	
Host RAM Caching	✓	
Intelligent Synchronization	✓	
Fast Mount Operations	✓	✓
Flash Characterizer	✓	
Tuned for file system optimization	✓	
Datalight Flash Management Expertise and Best-in-class Support	✓	

Better Overall Performance

System responsiveness is a top requirement for all embedded devices. The marketing for most flash media highlights best case sequential performance and can show impressive throughput. However, random I/O performance, the most frequent type of I/O, can be much different. FlashFXe is designed to optimize data transfer, bringing random write performance much closer to what you'd expect for sequential writes. It uses a multi-tiered approach to managing I/O to allow small random writes to be efficiently handled, while maintaining power-loss safe operations. FlashFXe works with Datalight Reliance Nitro file system to deliver high-reliability and protection of data from corruption. For example, because FlashFXe knows that Reliance Nitro is a copy-on-write file system, it can more efficiently organize internal operations.

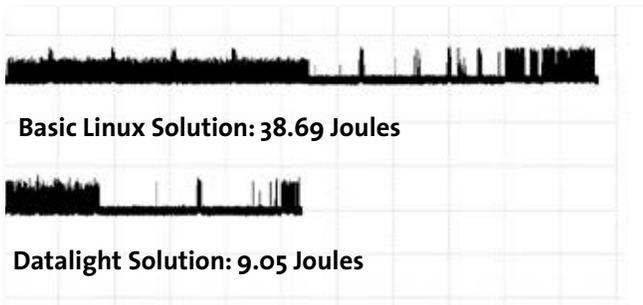
A comparison using RL Benchmark of a system using Datalight FlashFXe and Reliance Nitro to the basic Android solution on the same hardware shows that the Datalight solution completes the same 13 functions in less than half the time.

Comparison using RL Benchmark



Test Setup: PandaBoard ES RevB; OMAP4460; Micron 16GiB eMMC; Android 4.1.1; 3.2.0+ Linux kernel

Energy Efficiency



Test Setup: PandaBoard ES RevB; OMAP4460; Micron 16GiB eMMC; Android 4.1.1; 3.2.0+ Linux kernel

Reduced energy consumption means extended working time for battery-powered devices, letting your customers get more work done per charge. Datalight software reduces the workload, minimizing power consumption at the flash subsystem level to a fraction of that used by the basic software configuration. These traces show the amount of energy consumed by the storage subsystem – in this case a 16 GB eMMC part on a OMAP board – during a test run using Datalight FSStress test to simulate database transactions. Our results show that the system using Datalight software uses roughly a quarter of the energy compared to the basic solution.

On the headless system tested, the Datalight solution achieved a reduction in overall system energy use. On systems that have a backlit screen or other energy intensive peripherals, additional savings will be gained due to power-hungry components being able to “sleep” more often.

Improved Endurance

The lifespan of flash is becoming dramatically shorter, dropping from over 100,000 P/E cycles to under 3,000 in the last few years. While acceptable for many “disposable” consumer devices, industrial and long-lived embedded applications need strategies to extend flash life if they are to take advantage of the cost and performance benefits of newer parts. The efficiency of Datalight software allows far less data to be written (less write amplification) compared to the basic Linux solution, resulting in significantly fewer erases and longer flash life.

	Basic Linux Solution	Datalight Solution
Application run time	1 min, 27 sec	53.5 seconds
Total erases	707	405
MB erased	35.75	4.375

Test Setup: PandaBoard ES RevB OMAP4460
Micron 16GiB eMMC, Android 4.1.1, 3.2.0+ Linux kernel



System Requirements

Target Configuration	Linux, Android, Reliance Nitro, any CPU, eMMC flash memory, 150 KB RAM minimum
Development System	Linux host; 20 MB of disk space for FlashFXe; sufficient development tool RAM
Target System	Reliance Nitro 3.1 or higher; Linux version 2.6.38 - 3.7; Android Gingerbread 2.3.3, IceCream-Sandwich 4.1.1 and JellyBean 4.2; Managed flash: eMMC 4.41+, SD, USB, SATA, PATA

Characteristic	Description
Access Size	Optimum write size for accessing the media. The eMMC CSD contains this value.
Erase group size	An area to manage separately. This value can be found in the eMMC CSD.
Buffer size	Defines the amount of system RAM to use for data buffering.
No barriers	Improves performance by minimizing the flushes to disk to only those required for data reliability.
Number of active regions	Awareness of active regions or open erase groups enables FlashFXe to maximize performance.
Pre-erase	Directs the FlashFXe formatter to erase and discard or TRIM the flash media at format time. If not used, the media will be erased as it is written.
Region cache	Defines the amount of host RAM to be used for metadata storage. Increasing the region cache improves performance.
Page size	The size of the smallest block. Matching page size between media and file system allows greater efficiency.

Customizable Configuration for eMMC, Other Managed Flash Disks

FlashFXe is designed to deliver the maximum performance and minimize write amplification, in part by using detailed characteristics of a given eMMC device or managed flash disk as specified by the manufacturer. Characteristics include optimum access size and alignment, erase group size and count of active regions or open erase groups.

Consulting and Engineering Services

Datalight offers expert consulting and software development services for reliable data management in embedded systems. Our code and documentation standards have been developed through decades of experience delivering industrial grade software solutions for use with leading embedded operating systems. You can count on Datalight to meet or beat your expectations for quality and on-time delivery.

Software Development Kit

FlashFXe is licensed in ANSI C source and includes a comprehensive Developer's Guide, API reference, and validation utilities.

Technical Support

Datalight's support for customers is well known in the embedded industry. It's been said that customers come to Datalight for the great products and stay for the excellent technical support. Our technical support team has a strong commitment to making your devices work reliably, from testing to implementation. Our hard-earned reputation for great customer service means that Datalight regularly goes above and beyond to make sure your project performs flawlessly.

Annual support subscriptions are available with a choice of service level options that provide reliable access to responsive Datalight file system experts, ensuring your project stays on schedule.

About Datalight

Datalight is the software expert for reliable data storage on devices. For over 30 years, Datalight has provided trusted solutions that have been deployed across all segments of the embedded industry—from cellphones to satellites to submarines. Our patented products have been proven to speed time to market for development platform and device manufacturers.

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