

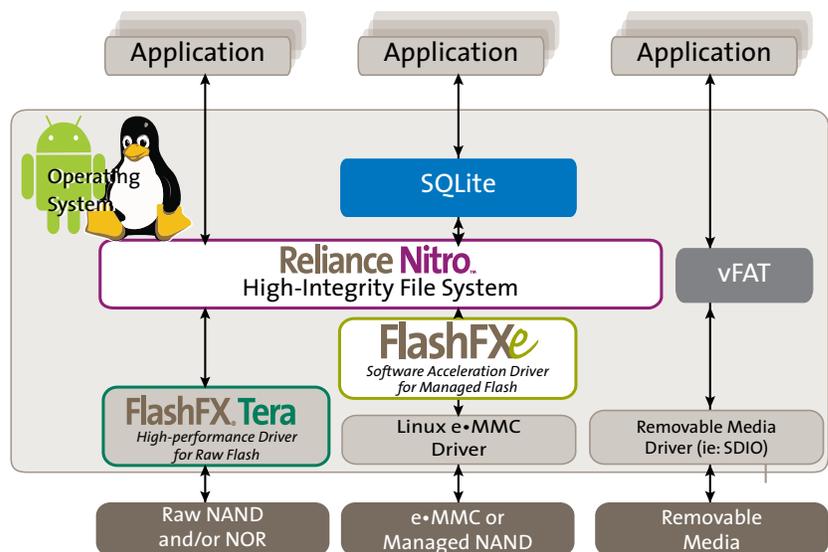
Reliance Nitro™ 3.0

High-Integrity Transactional File System for Linux & Android

Datalight Reliance Nitro™ ensures rock-solid data reliability while providing the performance needed to create an optimal user experience. It is a transactional file system created specifically for embedded devices where power loss may occur, protecting critical system and user data from corruption. Additionally, Reliance Nitro assures reliability of each metadata block with CRC32, and works with a broad array of storage media – including raw flash memory, e•MMC, RAM, hard disk, USB mass storage, STAT and PATA disk, and SD/MMC. Datalight works closely with the Linux community to ensure seamless integration for Linux devices. The speed of file and directory access is improved by several orders of magnitude while maintaining complete metadata and file data integrity. The unique combination of tree-based directory architecture, extent based design, and faster atomic transactions, improves performance for I/O throughput and metadata operations. Dynamic Transaction Point™ technology gives developers unprecedented control over the file system.

Key Features

- Uncompromising performance
- Rock-solid metadata, user data reliability
- Dynamic Transaction Point technology offers control of performance vs. data-at-risk
- Extent-based file system for faster file operations
- Atomic transaction model protects user data and meta data from corruption
- ACID compliant
- Boots more quickly than ext3 and ext4 after power loss
- File and metadata CRC32
- Secure delete of file data by file
- Replaces or coexists with other file systems
- Performance enhancing discard interface for NAND, NOR and e•MMC; Also supports HDD, RAM, Disk-on-chip, USB Mass Storage, SD/MMC, and e•MMC
- Works with virtually any 32-bit or 64-bit Linux host environment
- Compatibility verified with Linux kernel revisions 2.6.29 through 3.x



Feature	Reliance Nitro	ext4	ext3
Fault tolerant during unexpected shutdown	Structure & data	Structure	Structure
Flexible transaction point settings can be set during runtime	✓		
Fast I/O performance	✓	✓	✓
Fast metadata handling for many small files	✓		
Power loss recovery time	Fast	Variable	Variable
Multithreaded	✓	✓	
Interoperable Windows desktop data exchangeability via USB or SD	✓		
Guaranteed support response time	✓		
GPL protection	✓		
Metadata CRC32	✓	✓	
File level secure delete	✓		

Reliable Data Exchangeability with Reliance Nitro Windows Driver (RNWD)

RNWD is an installable driver that makes data from devices using Reliance Nitro exchangeable with computers running Windows Vista, Windows XP and now 32-bit Windows 7 desktop operating systems.



Faster File Operations for Better Responsiveness

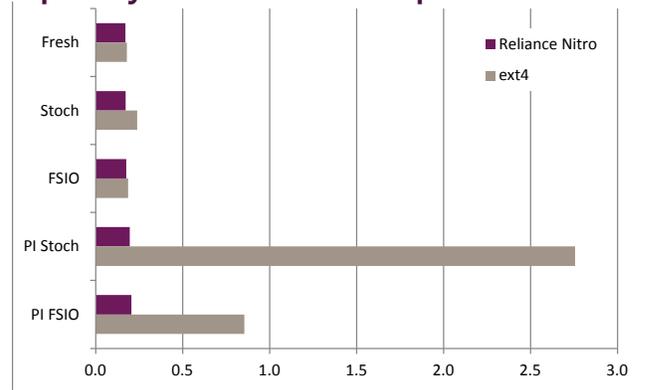
The tree-based directory structure of Reliance Nitro enables much faster file operations than ext4 (and ext3), particularly when working with many small files. In a side-by-side test creating 1000 small files, then opening and deleting them, Reliance Nitro demonstrated vastly improved operational performance over ext4. The test also measured the time to create and delete a directory tree. As the results demonstrate, raw throughput is not the only measurement that is important to file system performance. The way a system handles its meta-data can be just as important.

File Operations, in seconds	Reliance Nitro	ext4
Create 1,000 files	0.8	42.7
Open 1,000 files	0.0	0.0
Delete 1,000 files	0.1	32.4
Create dir tree	21.6	268.3
Delete dir tree	1.7	157.6

Faster Mount Times

Reliance Nitro mounts consistently faster and in cases where power failure may occur, has a mount time advantage of 95%. There is no need to replay a journal or perform any other file system checks; Reliance Nitro always keeps the disk in a known good state. This and other performance features give your customers noticeably faster mount times, especially where there is a random I/O penalty such as on hard disk drives and many types of solid state media, like eMMC.

Reliance Nitro Mounts Consistently Faster, Especially After Power Interruption



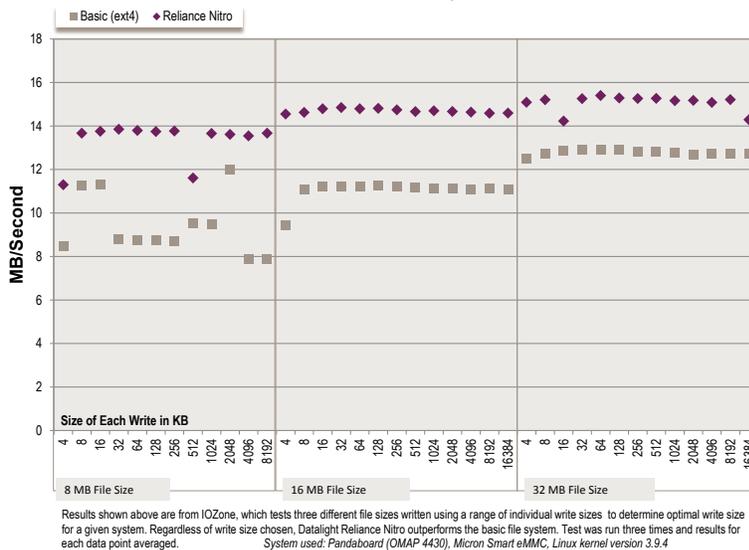
Mount times for a variety of use scenarios run on a Pandaboard using Linux kernel v3.9.4 and 16GB Smart Modular eMMC flash part. Disk partition was 4GB and was aligned on 1GB boundary. "Stoch" is stochastic test program developed to simulate random use; FSIO is a file-system independent test developed by Datalight to exercise a wide variety of IO patterns. "PI Stoch" and "PI FSIO" are those tests run after power-interruption to test power recovery times.

Faster Random and Sequential Performance

For today's complex use cases, it's not enough to excel in only one dimension of performance. Read speeds as well as write speeds, sequential as well as random performance must be considered and optimized. Reliance Nitro achieves superior results across a broad spectrum of configurations and gives developers an unprecedented level of control over data-at-risk.



Reliance Nitro Performance Exceeds Basic File System at Every Write Size; Remains Superior All The Way to the Media



Solid Reliability for a Better User Experience

Device reliability is multi-faceted; implications include everything from device corruption to a less than optimal user experience, creating real-world problems ranging from warranty returns to user annoyance, the enemy of customer loyalty. Because Reliance Nitro is a copy-on-write transactional file system, live data is never overwritten, making the system extremely fault tolerant, even after an uncontrolled system shutdown caused by power loss or component failure. True transactional architecture ensures rock-solid data reliability; Reliance Nitro maintains complete metadata

Target Configuration	32-bit OS, any CPU, virtually any storage media, 70 KB RAM (typical)
Development System	Windows 32 host; 4 MB of disk space for Reliance Nitro
Supported Media	Flash memory, RAM, HDD, CF cards, USB Mass Storage, SD/MMC, and eMMC
RAM Memory Required	100 KB to 150 KB (nominal)
Media Volume Size	Each partition (or disk) can be scaled from 100 KB to 32 TB (terabytes)
Max File Size/Name Length	Available free space/1,024 UTF-8 bytes (or OS imposed limits)

Dynamic Transaction Point Technology APIs Supported

In addition to APIs common to most file systems, Reliance Nitro supports these Dynamic Transaction Point™ APIs that provide compile time and run time control over transactions:

- Transact Now
- Get & Set Transaction Mode
- Get & Set Transaction Mask
- Get & Set Advanced Attribute
- Get & Set OEM Attribute
- Mount & Dismount
- Volume Format
- Volume Check
- Volume Info

Supports All POSIX APIs

*Operating system specific implementations for these APIs vary. Please refer to Developer's Guides and API References included with the SDK for the applicable operating system port or visit our website.

and file data integrity while providing the performance needed to create an optimal user experience. Dynamic Transaction Point technology gives developers compile-time, mount-time and run-time control.

Better Design Flexibility

Every file system must balance the tradeoff between data-at-risk and maximum data throughput. Only the Dynamic Transaction Point technology found in Reliance Nitro gives device manufacturers total control to find the ideal balance for any use case and to make adjustments while the device is running. This capability makes field upgrades fail-safe, for example, as these applications must update several files in an atomic fashion. When using other file systems, if a power interruption occurs before the update is complete, the application may not recover. This is easily accommodated with Reliance Nitro's run-time configurable transaction points.

Software Development Kit and Licensing

Licensed in ANSI C source, Reliance Nitro includes a comprehensive Developer's Guide, API reference, and validation utilities. Runtime distribution can be licensed per unit or per project. Consult your Datalight representative for options that apply to your project.

Professional 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. 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.

Rock-Solid Reliability

"We've successfully completed our test of Reliance Nitro simulating 20 years of product life for our product with over 1.2 billion SQLite database write transactions. I wanted to thank you for the excellent support that you have given us during this selection process. You guys have an excellent product, wonderful engineers, and great support!"

-Engineering Manager,
Smart Grid Monitoring
Technology Company

