Reliance Nitro™ 3.0

## High-Integrity Transactional File System

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

- Rock-solid meta- and 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 quickly and consistently even after power loss
- File and metadata CRC32
- Secure delete of file data by file
- Replaces or coexists with other file systems
- Combine with FlashFX Tera for NAND, NOR or FlashFXe for e•MMC; Also supports HDD, RAM, Disk-on-chip, USB Mass Storage, SD/MMC, and e•MMC
- Easily ported to virtually any 32-bit operating system. Has been used by customers on Express Logic ThreadX, Mentor Graphics Nucleus, ITRON and others. Pre-ported kits available for Microsoft Windows Embedded Compact, Wind River VxWorks, Linux, Android.

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- and 64-bit Windows 7 desktop operating systems.
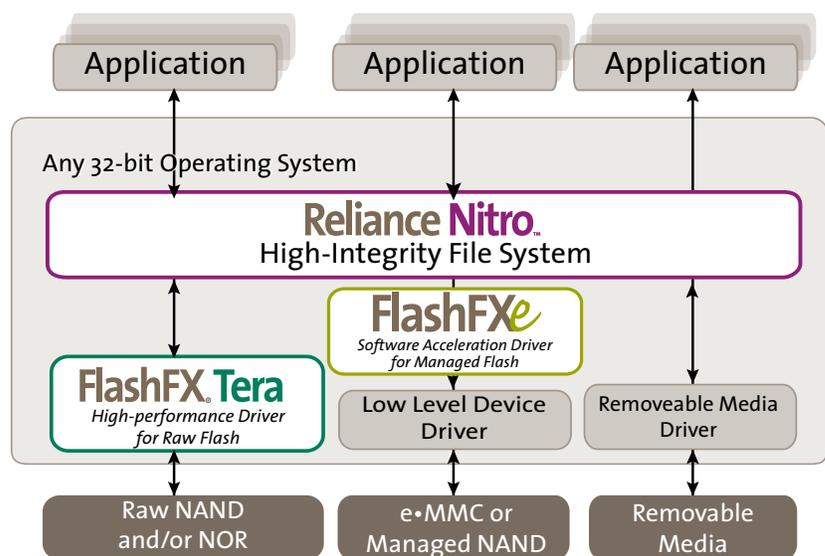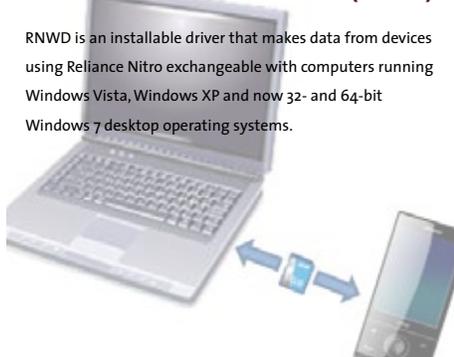
Feature	Reliance Nitro	Windows Embedded	HRFS	ext4
Preserves file system structure	✓	✓	✓	✓
Preserves file data	✓	optional[1]	✓	optional[1]
Simultaneous read and write threads	✓			
File level secure delete	✓[2]			
Guaranteed support response time	✓	✓	✓	
Operating system support	Any	Windows	VxWorks	Linux
Tree-based for fast file access	✓			
Never overwrites live data	✓		✓	
Transaction controls available at run-time	✓		✓	
File data and metadata CRC	✓			Metadata
Common data format across multiple operating systems	✓			

DATA SHEET

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Improved File Operations for Better Responsiveness

The tree-based directory structure of Reliance Nitro enables fast file operations, 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 metadata 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

In cases where power failure may occur, Reliance Nitro has a mount time advantage. 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.

Note: Test was designed to mimic a power failure scenario, but actual results will vary.

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

Self-Diagnostics Ensure Continued Reliability

Advanced instrumentation enables fast, precise diagnosis of errors within the flash memory subsystem. Finding the source of these flash storage failures is normally a time consuming part of the development process, which can delay market availability of embedded devices for many weeks. At the heart of Datalight's new file system diagnostics are full metadata and optional file data CRCs (Cyclic Redundancy Checks), which enable developers to continuously monitor data reliability in any embedded system. Unlike basic file systems such as ext4 and TexFAT, Reliance Nitro is capable of monitoring both user data and metadata to detect inconsistencies and provide early warning of imminent flash failure and/or data inconsistencies.

LOGIC TECHNOLOGY

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Target Configuration	32-bit OS, any CPU, virtually any storage media, 70 KB RAM (typical)
Development System	Windows 32- or 64-bit 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.

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. 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

Reliance Nitro is licensed in ANSI C source and 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. 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.

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

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