Reliance Edge™

File System for Decision-Quality Data at the Edge of the IoT

Datalight Reliance Edge™ is the only file system designed to capture and preserve decision-quality data with deterministic behavior required by today's autonomous systems. Reliance Edge is a transactional file system that protects critical system and user data from corruption specifically for systems where power loss may occur. Datalight's unique file system works with a broad array of storage media including: e•MMC , SD/MMC, NVRAM, USB mass storage, and SATA (or PATA) disks. Reliance Edge continues the legacy of file system products in the Reliance family that have shipped in hundreds of millions of devices and is supported by Datalight's award-winning support organization.

Key Features

- Rock-solid meta and user data reliability
- Reliable operation does not require media having atomic sector writes
- Ideal for resource-constrained environments, Reliance Edge can be configured to use as little as 4 KB of RAM, 12 KB of code
- Simple, easy-to-understand architecture makes implementation quick and efficient
- Atomic transaction model protects both user data and meta data from corruption
- Boots quickly and consistently even after unexpected shutdown or power loss
- Includes tools for disk image creation on a Microsoft Windows-based workstation
- Quicker to implement and more cost-effective than file systems you build yourself
- Replaces or coexists with other file systems
- Works with virtually any block device driver supporting HDD, RAM, USB Mass Storage, SD/MMC, or e•MMC
- Data stored on removable media accessible on a PC using Image Copy tool
- Pre-ported to FreeRTOS and easily ported to virtually any microcontroller RTOS
- Ships as source code that is MISRA C:2012 compliant
- MISRA C:2012 Design Assurance Package available to commercial licensees
- Open-source version available for evaluation and personal use
- Commercial-use license for those who cannot comply with GPL v2 restrictions or require warranty and support guarantees

Reliance Edge can be configured to meet the specific needs of your application by reducing complexity, optimizing resource use, and maximizing performance. Whether your application requires a single log file, a pre-defined set of files with fixed names, or complete flexibility to modify file hierarchy during runtime, Reliance Edge has easy to understand options. Data storage experts at Datalight can help you make the most of them. Our POSIX-like API option makes integration straightforward and Reliance Edge has the configuration flexibility to fit into even the tiniest of systems.

Ultimate Control with Determinism

Reliance Edge configuration options allow developers complete control over which features are included, providing ultimate control to make the file system fit your specific use case. Regardless of how it's configured, Reliance Edge's key file system operations are deterministic, providing unprecedented predictability.

Feature	Configuration Options		
	Full POSIX	Small POSIX	FSEssentials
Preserves file system structure	✓	✓	✓
Preserves file data	✓	✓	✓
Never overwrites live data	✓	✓	✓
Transaction controls	✓	✓	✓
Metadata CRC	✓	✓	✓
API set	POSIX-like	POSIX-like (not including rename)	Constrained
Number of files	Variable	Variable	Fixed
Number of volumes	Multiple	Multiple	Multiple
Maximum stack depth	824	744	556
Buffers (minimum)	12	6	5
Thread-safe	✓	✓	✓
File references	Names	Names	Numbers
Code size (ROM)	17.6 KB	16.7 KB	10.6 KB
RAM requirement	8.4 KB	5.3 KB	3.9 KB
MISRA C:2012	✓	✓	✓

Full POSIX Configuration:

This configuration includes a full POSIX-like file system API, including path-based file access, file handles, directory operations (including atomic rename), transactions, and file system formatter. Configuration options with support for up to ten tasks, ten open file handles, 512-byte block size, and absolute minimum number of twelve buffers were used to determine code size and RAM requirement.

Small POSIX Configuration:

A reduced code size (ROM) option is illustrated by the Small POSIX configuration, which excludes rename but includes all remaining POSIX-like APIs. The number of buffers used in this configuration was reduced to the new minimum of six, which reduces the RAM requirement. Configuration options were otherwise the same as the Full POSIX configuration.

FSEssentials Configuration:

This configuration includes the full FSE API, which supports read, write and truncate on numbered files, as well as transactions. Configuration options of 512-byte block size and absolute minimum number of five buffers were used to determine code size and RAM requirement.

Volume Size Comparisons

Block Size (in bytes)	512	1,024	2,048	...	65,536
Max Volume Size	7.3 GB	61 GB	500 GB	...	256 TB

Fast, Consistent Mount Times

In cases where power failure may occur, Reliance Edge has a definite mount time advantage. There is no need to replay a journal or perform any other file system checks—Reliance Edge always keeps the disk in a known good state.

Better Reliability for a Better User Experience

Device reliability means different things to different people. Lack of reliability can have consequences ranging from a failed mission due to lost or corrupted data, warranty returns due to program corruption, or a frustrating user experience—the enemy of customer loyalty. Because Reliance Edge is a copy-on-write transactional file system live data is never overwritten making the system extremely fault tolerant, even after an unexpected system shutdown caused by power loss or component failure. True transactional architecture designed into Reliance Edge ensures rock-solid data reliability as Reliance Edge maintains complete metadata and file data integrity while providing the performance needed to create an optimal user experience. Dynamic Transaction Point™ technology gives developers complete compile-time and run-time control.

Target Configuration	Typically a 16- or 32-bit microcontroller; with or without an RTOS; as little as 4 KB RAM (config. dependent)
Development System	Windows host; 40 MB of disk space for Reliance Edge
Supported Media	eMMC, SD/MMC, CF cards, RAM, NVRAM, USB Mass Storage, or HDD
RAM Required	4 KB to 19 KB (depending on configuration)
Maximum Volume Size	7.3 GB at 512 byte block size to 256 TB (terabytes) at 64 KB block size
Max File Name Length	Configurable at compile time, typically between 6 and 40 bytes in length
Path name length	No fixed limit. Individual name length defined at compile time

Reliance Edge reliability has been tested for hundreds of millions of iterations at the API level and billions of iterations of power fail simulation. Designed for maximum portability, Reliance Edge has initially been tested on Microsoft Windows and FreeRTOS using GCC in various flavors including Atmel Studio 6.2 and using Visual Studio 2008, 2010 and 2013.

Our Quality Assurance team uses multiple internally developed tools to verify basic functionality via API tests. As for stress testing, Reliance Edge has survived billions of iterations of power fail simulation and hours of stochastic tests covering well over 100 million cycles without a single failure.

Control Over Data At Risk

Only Dynamic Transaction Point technology found in the Reliance family of file systems gives device manufacturers total control to manage data-at-risk for any use case. This capability makes field upgrades fail-safe, for example, as these applications must update several files in an atomic fashion. If a power interruption occurs before the system update has completed using other file systems the application may not recover.

Integrity Checking Guards Against Data Corruption Due to Media Failure

Advanced instrumentation enables fast, precise diagnosis of errors within the storage subsystem. Finding the source of these storage media 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 file system diagnostics are full metadata CRCs (Cyclic Redundancy Checks), which enable developers to continuously monitor data reliability in any embedded system. Unlike basic file systems such as FAT, Reliance Edge is capable of monitoring metadata to detect inconsistencies and provide early warning of imminent media failure and data inconsistencies.

Data Exchangeability

If the media used with Reliance Edge is removable, such as a USB drive or a SD card, data on that media can be copied to and from a Windows-based computer using the Reliance Edge Image Copier/Image Builder command line utilities.

Software Development Kit and Licensing

Open Source Licensing

Reliance Edge is available as an open source project for evaluation and personal use and may be used, modified, evaluated and distributed without charge provided the user adheres to v2 of the GNU General Public License (GPL) and does not remove the copyright notice.

Commercial Licensing

Businesses and individuals that for commercial or other reasons cannot comply with the terms of the GPL v2 license must obtain a commercial license before incorporating Reliance Edge into their software for distribution in any form. Commercial licenses can be purchased from Datalight and authorized resellers.

In addition to full source code, commercially licensed kits include a comprehensive Developer's Guide, full API reference, and validation utilities. Design Assurance documents and MISRA C:2012 compliance matrix are also available to commercial licensees. Runtime commercial distribution can be licensed per product, processor family or product line. Consult your Datalight representative for recommended options for your project.

Package Comparison

Item	Open Source Package	Commercial Package
Source code	X	X
Utilities		
Configuration Utility	X	X
Formatter	X	X
Checker		X
Image Builder	X	X
Image Copier		X
Tests		
Disk full Tests		X
API Tests		X
fsstress test	X	
Documentation		
Detailed comments	X	X
Reference Manual	available[1]	X
Readme	X	X
MISRA C:2012 Compliance Matrix		available[2]
Software Requirements Specification		available[2]
Software Design Document		available[2]

[1] can be downloaded for no charge from Datalight website

[2] MISRA C:2012 Design Assurance Package can be purchased separately

Professional Technical Support

Datalight's award-winning technical support is well known in the embedded industry. Customers come to Datalight for the great products and come back project after project for 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 service means 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.

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

About Datalight

Datalight products have delivered proven reliability in hundreds of millions of devices in demanding product categories like automotive, medical, retail, industrial automation and military/aerospace. When data integrity, device lifespan, and design flexibility matter, the world's leading device manufacturers invest in solutions from Datalight. Our product line includes Reliance Nitro, a transactional power fail-safe file system; FlashFXe software acceleration for managed flash and FlashFX Tera comprehensive software management for raw flash.

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