RELIANCE VELOCITY

High-performance file system for embedded flash memory

Reliance Velocity is a cutting-edge embedded file system designed to work with all the benefits and challenges of flash memory technology. Our modern flash-friendly file system has patented optimizations to bring performance, reliability, security, system integrity, and longest lifetime to any flash hardware. It includes extended features to meet requirements of a root file system, while providing an optimal user experience over the full lifetime of the design. What's more, Reliance Velocity is easy to integrate into automotive embedded systems, with support for Linux, Android, and QNX RTOS, and excels at handling parallel workloads.

Optimized lifetime and performance

Put the brakes on flash memory wear-out. Reliance Velocity reduces memory degradation with remarkably low fragmentation by using patented allocation algorithms for efficient reading and writing. Velocity has wear prevention features that assist the underlying flash controller, including discard support. With our optimizations, Reliance Velocity greatly reduces flash memory wear on a device, as demonstrated in the lower write amplification in Figure 1. Our testing measured the total erases compared to the application writes, with the lower value from Velocity resulting in both better performance and lifetime.

For high-performance data and video recording, Reliance Velocity is second to none. Designs with multiple streams often experience additional overhead when application writes interleave, which causes fragmentation. Velocity uses smart allocation strategies, handling multiple parallel threads individually, maintaining high-speed data recording without loss in performance or frame loss. Plus, high read/write speeds and low CPU usage ensure highly responsive systems.

Figure 1. Stream lifetime summary

* Lower is better

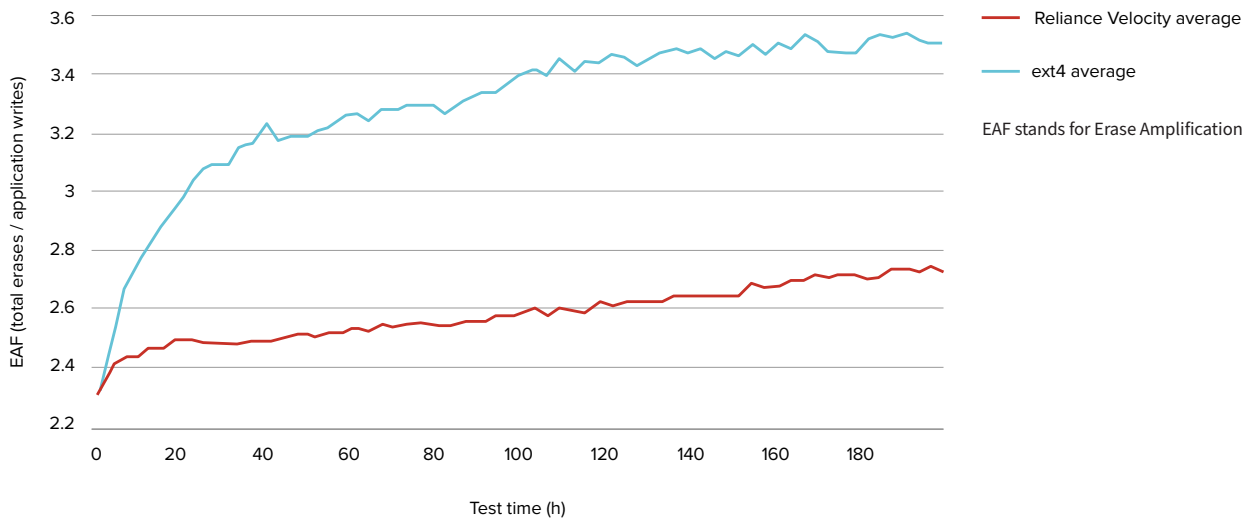


Figure 2. Typical multi-stream automotive workload performance

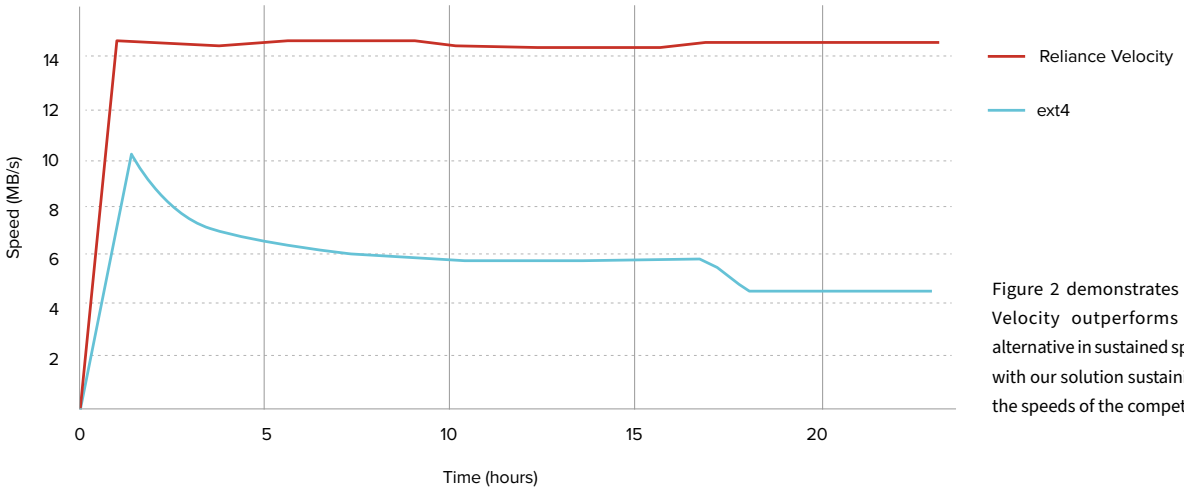


Figure 2 demonstrates how Reliance Velocity outperforms its common alternative in sustained speed over time, with our solution sustaining up to twice the speeds of the competition.

REQUIREMENTS	
Target configuration	32-bit or 64-bit OS, any CPU, virtually any storage media
RAM requirements	100 KB to 150 KB
Supported media	All managed flash memory, NAND and NOR with FlashFX Tera

FEATURES COMPARISON	Reliance Velocity	Linux ext4	Linux VFAT
Specifically designed for flash-media devices	Yes	No	No
Provides system integrity	Yes	Yes	No
File system check after power loss	Background	Foreground	None
Fast, friendly support and customization	Direct	Forum	Forum
CPU usage during reads and writes	Low	High	Low
Options to reduce fragmentation and latency	Yes	No	No

TECHNICAL DETAILS

Main features
Persistence Manager™
File system compression
fsverity and fscrypt support
Symbolic links and device special file support (e.g., FIFO, Sockets, etc.)
Hardlink support
Extended Attributes
File owner and access permissions
Case-sensitive support for file names
ACLs

Partitioning schemes
Supports GPT, MBR, and APM partition schemes

Capacity and extents
Maximum volume size: 8 EiB
Minimum allocation block size: 4096 bytes
Maximum allocation block size: 32 MiB
Maximum file size:
- 32-bit system:
  - (8 TiB – 1) bytes with 4 KiB CPU page size
  - (128 TiB – 1) bytes with 64 KiB page size
- 64-bit system: (8 EiB – 1) bytes

Maximum filename length: 255 bytes
Supported sector sizes: 512, 1024, 2048, and 4096 bytes

Control over data-at-risk

Tuxera Persistence Manager™ is an advanced feature providing system designers with additional control over lifetime and data-at-risk by allowing easy control of commit intervals by set data amount or time interval. This ensures optimal lifetime, while minimizing the potential data-loss.

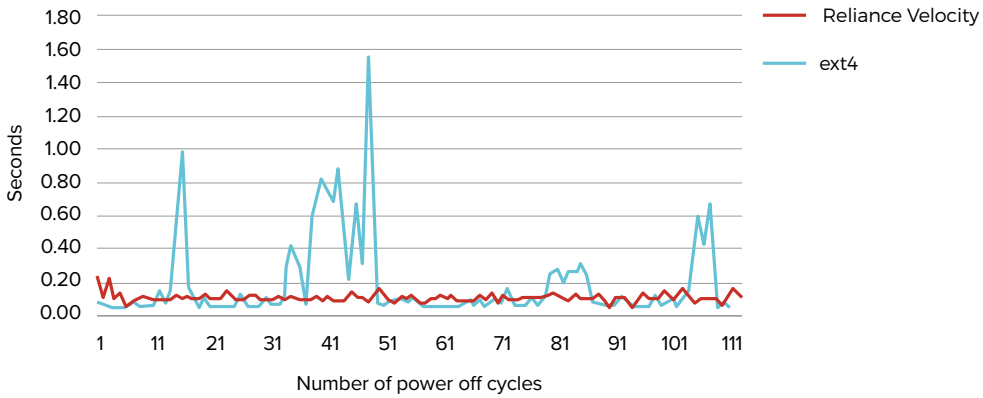
Fast and consistent mount time

2x faster average mount time than ext4

Test performed on ARMv8-A Cortex-A53 Automotive Soc, 32 GB UFS storage.

Figure 3. Mount time after forced, sudden power off

Reliance Velocity compared to ext4



Fast, consistent mount time with rock-bottom latency

After power interruption or system failure, the media will need to be checked. With Reliance Velocity, these checks are performed in the background, resulting in mount time that's 2X faster than ext4 on average. The fragmentation and write amplification minimizing algorithms within Velocity also allow you to experience minimal latency in your applications. So no matter the situation, you can count on Velocity to have consistently low mount time and latency.

Protect data integrity

Errors, power loss, or crashes can cause data loss – or worse – system damage. Atomic writes and intelligent write order ensure videos and other data are reliably saved even during an unexpected power loss or system crash. Reliance Velocity also comes with check and repair tools to ensure file system consistency, fix corrupted volumes, and recover lost files.

Cutting-edge security with modern Linux features

Add an extra layer of data protection. Our Linux solution includes advanced data security features and tools, such as encryption supporting fscrypt, secure delete, and fsverity support. So whether you're focused on real-time patches or security enhanced Linux options, Reliance Velocity is the go-to premium option for modern Linux designs.

Premium validation and outstanding support

Reliance Velocity uses cyclic redundancy checks on all file system metadata to detect media failures. This early warning increases your customer's confidence in the system. When a failure does occur, our award-winning support team is available to offer comprehensive R&D support including integration, testing, benchmarking, reports, and product- and platform-specific optimizations.

Let us ensure your embedded storage remains responsive and stable.
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