

Tuxera Flash File System technical specifications

General information

Supported operating systems	<ul style="list-style-type: none"> • Android, Linux, Tizen, Chrome OS, and Firefox OS
Hardware architectures	<ul style="list-style-type: none"> • ARM, ARM64, Intel x86/x86_64 or compatible, MIPS, PowerPC, and more • Tuxera Flash File System is a kernel space solution built on top of Tuxera's widely deployed and robust file system implementation • Support for all flash-based storage types like eMMC, UFS, eSD, SD card, CF card, UFS card, and SSD • Support for APM, GPT, and MBR partition schemes
Root/internal file system support	<ul style="list-style-type: none"> • Tuxera Flash File System is based on Tuxera file system implementation with the following extended features to meet all the requirements of the internal/root file system: <ul style="list-style-type: none"> » Symbolic links and device special file support (e.g., FIFO, Sockets, etc.) » Extended Attributes support » File owner and access permission support » Case-sensitive support for file names » Hardlinks support
Capacity and extents	<ul style="list-style-type: none"> • Maximum volume size: 8 EiB • Minimum allocation block size: 4096 bytes • Maximum allocation block size: 32 MiB • Maximum file size: <ul style="list-style-type: none"> » 32-bit system: <ul style="list-style-type: none"> » (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

System requirements

Minimum system requirements	<ul style="list-style-type: none"> • 1 MiB of RAM • Processor: 25 MHz 	Memory and CPU footprint	<ul style="list-style-type: none"> • Read-write: 140–160 KiB • Read-only: 70–80 KiB • CPU usage: 0–20%
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Proprietary file system features

Power-safe/fail-safe	<ul style="list-style-type: none"> • Tuxera proprietary fail-safe technology ensures volume consistency and data integrity if storage is removed, or if power/battery is disconnected.
System (rootfs) partition	<ul style="list-style-type: none"> • Suitable for use on the system (rootfs) partition.

Flash memory-specific features

Optimized file system parameters	<ul style="list-style-type: none"> • Flash memory vendor-specific optimizations to reduce Write/Erase Amplification Factor (WAF/EAF)
Wear leveling	<ul style="list-style-type: none"> • Online Discard and FITRIM support
Storage optimizer	<ul style="list-style-type: none"> • Ensures efficient random and sequential write operations

Reliability and security features

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| Reliability | <ul style="list-style-type: none"> • Rigorous quality assurance, wide deployment, and fault-tolerant design guarantee outstanding robustness. |
| Security | <ul style="list-style-type: none"> • Encryption support using industry-standard AES256 encryption • User/group quotas support • Secure boot via dm-verity support |

Performance and lifetime features

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| High performance | <ul style="list-style-type: none"> • Advanced algorithms, data structures, and low-level system integration ensure maximum I/O throughput, efficient memory and free space management, low CPU usage for small and large files, and high IOPS for file operations. Tunable settings and workload-specific optimizations. Low power use optimized for increased battery life. • When saving files in flash storage such as eMMC, SD cards, UFS cards, or MMC, full speed can be achieved. • Reduces data fragmentation • Fast boot time • Prevents frame loss (drops) |
| Lifetime | <ul style="list-style-type: none"> • Flash-friendly design extends the lifetime of flash-based storage media. |

Test suites

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| Tuxera Fail-Safe Test Suites | <ul style="list-style-type: none"> • Comprised of different categories and test cases. The test cases cover various areas of file access including creating, renaming, deleting, and truncating. Tested access patterns are sequential, random, and mixed workloads. Concurrency is also checked. |
| Tuxera File System Test Suite | <ul style="list-style-type: none"> • Benchmark the file system performance in different use scenarios. Test cases include data-, metadata-, and application-specific workloads, and local and network performance. Data collected includes speed, CPU utilization, and fragmentation. |
| Tuxera Lifetime Test Suite | <ul style="list-style-type: none"> • Measure the Write/Erase Amplification Factor (WAF/EAF) of flash storage operating in conjunction with file systems under various workloads. |
| Tuxera POSIX Test Suite | <ul style="list-style-type: none"> • Tuxera maintains POSIX File System Test Suite. The following system calls are tested: chmod, chown, link, mkdir, mkfifo, open, rename, rmdir, symlinks, truncate, and unlink. |

Licensing, integration, and maintenance

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| Customization and maintenance | <ul style="list-style-type: none"> • Provides maintenance services so Tuxera Flash File System development can be safely customized using: <ul style="list-style-type: none"> » Product answers to inquiries » Minor version product available |
| Integration | <ul style="list-style-type: none"> • Integration provided to adapt to any platform or build system (e.g. Yocto). |
| Licensing | <ul style="list-style-type: none"> • Proprietary, commercial |

Additional tools

File system utilities

- mktffs: formats volumes, creates the rootfs images for system partition integration
- tffsck: checks and repairs volumes
- tffslabel: shows/sets volume label
- tffsuuid: shows/sets volume UUID
- tffsdebug/tffsdump: collect debug images

Get in touch to start your evaluation of Tuxera Flash File System: sales@tuxera.com