

4GR™ Flash File System

Reliable Flash File System for Next Generation Consumer Mobile Devices

4GR was created to meet the demands of mobile phone manufacturers who are developing the next generation of mobile technology. This generation of mobile phones requires the ability to deal with large amounts of storage and a variety of data types from small text files to very large streaming media files. In addition, these data must be able to be stored and retrieved without failure even after loss of power. The challenges of reliably storing data under these conditions are beyond the capabilities of old technology flash file systems based on FAT.

Highly Reliable

4GR is built on Datalight's pioneering transactional file system technology, which ensures 100% file system reliability. Transaction points commit a "known good state" of both user and metadata to memory at selectable intervals. If a power glitch occurs between transaction points, 4GR boots to the known good state committed to memory by the last transaction before the power failure.

KEY BENEFITS OF 4GR

- Eliminates data loss or corruption
- Reduces warranty costs and user complaints
- Enhances device performance with fast boot times and support for common NAND Controllers
- Reduces time-to-market with drivers for over 100 state-of-the-art NOR and NAND flash parts
- Utilizes patented bad block management, wear-leveling, and compaction

Fast Boot Times

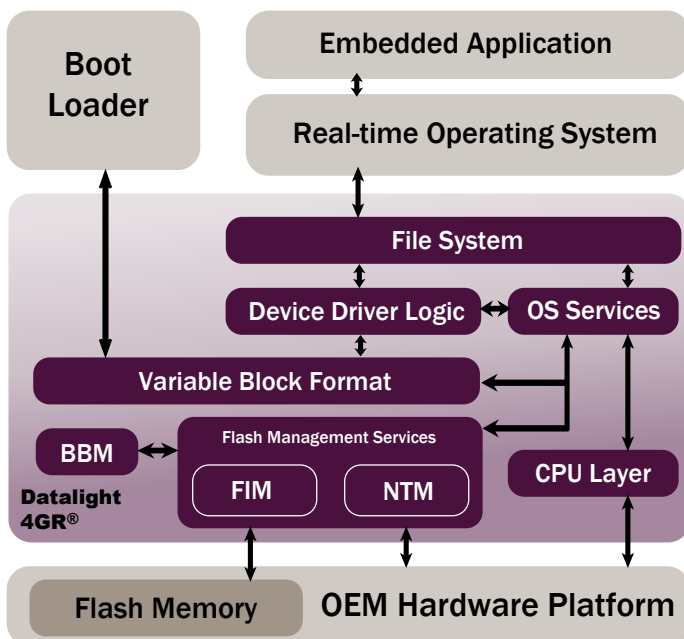
At the time a transaction point is executed, new data is written to a new area on the storage media. The transaction is atomic so that if a power interruption occurs, the file system will still have the last saved data available. Using this approach allows 4GR to be more effective than other file system technologies such as journaling or logging file systems. With 4GR, there is no need for CHKDSK or SCANDISK utilities to check the integrity of the storage media at boot time. This allows 4GR devices to boot faster than FAT-based file systems.

Data Security

4GR allows developers to separate secure system data from active user data through support of multiple partitions. The 4GR data format is proprietary, enhancing the security of data saved.

Easy to Integrate and Test

Datalight provides versions of 4GR for Linux Kernel 2.6 and WinMobile 5.0. An RTOS porting kit is also available which allows developers to port 4GR to any 32-bit OS, using a set of POSIX-based file system APIs. There is no other flash file system that offers the breadth of support for flash hardware that 4GR does. Drivers are written for over 100 flash parts, including NAND, NOR, and NAND Controllers. NAND Controllers allow for increased device performance by using hardware ECCs, power management, and data caching where available.



FEATURES & BENEFITS

RELIABILITY

- Both user data & metadata is preserved during unexpected power failures
- Data writes are atomic; no chance of corruption during writes
- Flash life is maximized with wear-leveling, garbage collection, and patented bad block management

HIGH PERFORMANCE

- Hardware ECCs and 2KB page operations can be enabled with support for common NAND Controllers
- File system boots in under 1 second, regardless of disk volume

DESIGN FLEXIBILITY

- Use varying types of flash (NAND, NOR, and MLC NOR i.e. “Sibley”) in the device
- Customizable transaction settings
- Custom configure multiple partitions to separate data types

FASTER TIME-TO-MARKET

- Fast integration of all-in-one file system and flash driver
- Pre-written Flash Interface Modules (FIM) and NAND Technology Modules (NTM) for over 100 state-of-the-art flash parts

Target System Configuration	32-bit OS, any CPU, NAND or NOR flash memory, 70 KB RAM (typical)
Development System Hardware	Windows 32 host (for WinMobile) and Linux host (for Linux); 4MB of disk space for 4GR; sufficient RAM for development tools
Supported Media	NAND & NOR flash memory
In-System Memory Space	80KB to 120KB (nominal)
Media Volume Size	Each partition (or disk) can be scaled from 64 KB to 2 terabytes
Maximum file size / file name / directory size	4 GB / 255 characters (configurable at development time) / 4GB*
Block size	Selectable as 512 bytes, 1 KB, 2 KB, 4 KB, 8 KB, 16 KB, 32 KB, and 64 KB
Transaction Settings	Event-based (i.e. directory create) or manual (i.e. IOCTL or API-based) or timed*

*additional restrictions may be due to target operating system

Software Development Kit

The 4GR Software Development Kit (SDK) for Linux Kernel 2.6 and WinMobile 5.0 includes the ANSI C source for 4GR, a Developer's Guide, an API reference, and tools for using 4GR. Custom tools include utilities to test a 4GR formatted drive. The 4GR for Linux 2.6 SDK was built using versions 3.4 and 4.0 of the GNU C compiler, and is implemented as a kernel loadable module. This SDK may also be used with other distributions of Linux (i.e. Red Hat, MontaVista, WinRiver), but may require toolset modifications in order to support the development environment.

Support and Licensing

Datalight's Technical Support is well-known in the embedded industry. Our technical support team has a strong commitment to making your devices work reliably, from evaluation to implementation. With a hard-earned reputation for great customer service, Datalight regularly goes “above and beyond” to make sure no need is overlooked. Two types of support and maintenance contracts are available; an annual maintenance update and support contract, or a premium support contract that includes in-depth consulting.

FREE 30-day Evaluation

Evaluation version is available free for 30-days to allow developers to integrate 4GR into their device and transact up to 50,000 times. Datalight license agreement required.

About Datalight

Datalight is the market leader in software technologies that manage data in embedded devices; increasing reliability, flexibility, and performance in our customers' devices. For over 23 years, Datalight's focus on portable, flexible solutions has enabled OEMs including Canon, Intel and Symbol to save money, reduce development time and get to market faster. These accomplishments have earned Datalight a reputation as a provider of reliable and cost effective software solutions that are backed by a commitment to customer service and satisfaction.



Software for Trustworthy Data on Successful Devices