

File Systems



**Truly fail-safe file systems
for all types of storage**

HCC has been developing embedded file systems for more than a decade and has a highly optimized range of file systems designed to meet the performance requirements of any application. Using HCC file systems will make your application more reliable and will help to protect your customer's data. HCC file systems can be seamlessly dropped into any environment to support any storage media, RTOS, compiler or microcontroller.

■ File Systems

Five highly optimized file systems: Each file system is finely tuned to provide the best performance for its intended environment. With full support for traditional FAT and Flash systems, developers can choose a system optimized for flexibility, performance or resource-limited environments.

Extensive target media drivers: HCC collaborate closely with the industry's leading storage suppliers and can provide support for almost any flash device or storage medium. We routinely supply drivers for everything from simple USB pen drives and SD cards, to the most advanced NAND and NOR flash.

No-compromise fail-safety: HCC has developed truly fail-safe file systems that guarantee the highest possible data integrity.

With abstractions for more than 15 real-time operating systems, and our broad range of products, our one-size-doesn't-fit-all approach is sure to provide an optimal solution for most applications. Why not get a file system that is designed to meet your particular needs and ensure that your data is securely, efficiently and reliably cared for?

■ FAT File Systems

All of HCC's FAT-compatible file systems can be used with NAND and NOR memories in conjunction with our fail-safe Flash Translation Layer, SafeFTL, which acts as the driver and provides wear-leveling, bad block management and error correction.

FAT: High Performance 12/16/32 FAT File System. Full featured FAT file system optimized for high-performance with FAT12/16/32-compliant media. There's extensive support for external media, including SD/MMC and Compact flash cards, or any device arranged as an array of logical sectors.

THIN: File System for Resource-Limited Applications.

Full-featured FAT file system for MCUs with limited resources. THIN is compatible with media such as SD/MMC and Compact flash cards. The code has been designed to provide a balance of speed vs. memory, with options that allow the developer to make performance trade-offs using available resources. This permits a full file system to be run on a low-cost microcontroller with limited resources.

SafeFAT: Fail-safe File System. Robust, full featured fail-safe FAT file system that provides the same features as a standard FAT file system. It implements a system of journaling/transaction operations that provide the strongest possible assurance that all memory operations will be performed correctly, and that the system can recover coherently from unexpected events such as reset or power loss.



Flash File Systems

SafeFLASH: Fail-safe File System. Designed for high performance and 100% fail-safety. It can be used with all NOR and NAND flash as well as any media that can simulate a block-structured array. SafeFLASH supports dynamic and static wear-leveling and provides a highly efficient solution in which data integrity is critical.

TINY: Fail-safe Limited Resource File System. A full-featured, fail-safe flash file system for use in resource-constrained applications. TINY is designed for use with NOR Flash with erasable sectors <4kB. Typical devices include Atmel DataFlash AT45, MSP430 internal flash, and many serial flash devices including ST and Microchip SST Serial Flash. It eliminates many fragmentation and flash management problems and results in a compact and reliable file system that provides a full set of features, even on a low-cost controller.

Advanced Fail-safety

Conventional FAT file systems are not fail-safe and often experience difficulties when common problems such as power loss or unexpected resets occur. Corrupt files can sometimes be corrected using 'check-disk' but this requires manual intervention and often valuable data is lost.

Product quality and performance can be seriously undermined by this kind of problem, but the threat can be eliminated by using a robust fail-safe file system from HCC. When used in a correctly designed system, it will guarantee that data will always be consistent. Our file systems are transaction-based but permit single file operation without reference to the rest of the system. In order to ensure the maximum integrity, our media drivers are also designed to provide fail-safe behavior. We have some of the industry's leading experience in this area, why not talk to us about how to implement your application in the most robust way possible?

Supported Flash & Media Devices

HCC supports a huge array of storage media from the most basic USB pen-drive to the most complex Solid State Drive (SSD). The number and variety of available flash devices changes at an incredible rate. Nonetheless, HCC supports hundreds of flash devices from manufacturers including Adesto, Intel, Micron, Toshiba, Hynix, Samsung, Spansion, Macronix, Microchip, Winbond and many others. We support hundreds of flash parts as well as numerous specialty devices including Solid State Drives (SSD), MLC flash and ClearNAND. All HCC file systems conform to a standard API and are fully interchangeable.

Our fail-safe Flash Translation Layer, SafeFTL, can be used in conjunction with our file systems to provide wear-leveling, bad block management and error correction for almost any known device.

	FAT	THIN	SafeFAT	SafeFLASH	TINY
NAND Flash	Y*	Y*	Y*	Y	N
NOR Flash	Y*	Y*	Y*	Y	Y*
Small Sector NOR	Y*	Y*	Y*	Y	Y
MMC/eMMC/SD/SDHC/SDXC	Y	Y	Y	N	N
Compact Flash	Y	Y	Y	N	N
SSD Flash	Y	Y	Y	N	N
USB Mass Storage	Y	Y	Y	N	N
RAM	Y	Y	Y	Y	Y

* Requires SafeFTL flash translation layer.

■ Broad Range of Target Processors & Tools

HCC usually delivers file systems with tested drivers that are fully abstracted for a particular real-time operating system, micro-controller and compiler. In most cases there is little or no integration effort required by developers.

RTOS Abstractions

RTOS abstractions are available for the following systems: CMX RTX, eCOS, emBOS, EUROS, FreeRTOS, Keil RTX, Nucleus, Quadros RTX, ThreadX, μ -velOSity, μ C/OS-II, and many others. Importantly, for custom schedulers and super loops, HCC offers an abstraction for 'No RTOS'. We also offer our own eTaskSync, a small cooperative scheduler, which is designed to handle all processing and interface requirements of HCC middleware. This means that developers can choose our robust quality and outstanding performance irrespective of their legacy software.

Extensive Compiler Support

Eclipse/GCC, IAR Embedded Workbench, Keil ARM Compiler, Freescale CodeWarrior, Atmel AVR Studio, Green Hills Multi, Microchip MPLAB, Renesas HEW, TI Code Composer Studio, Mentor CodeSourcery, Atollic True Studio and many more.

Microcontrollers

ARM Cortex-M0/M1/M3/M4/R4/A8, ARM7/9/11; **Atmel** AVR32, SAM3/4/7/9; **Freescale** ColdFire, Kinetis, PowerPC, i.MX, Vybrid, QorIQ; **Infineon** C164, XMC1000, XMC4000; **Microchip** PIC24, PIC32; **NXP** LPC1300/1700/1800/2000/3000/4000; **Renesas** SuperH, RX, RL, 78k; **SiliconLabs** EFM32, SIM3; **Spansion** FMO/FM3/FM4; **STMicroelectronics** STM32; **Texas Instruments** MSP430, Stellaris, C2000, Hercules, DaVinci, Sitara, Tiva; **Toshiba** TMP M0/M3;

■ Licensing & Purchasing

All HCC reusable software components are royalty-free and distributed in source form with support and maintenance included for one year with all purchases. We deliver sample projects tailored to an environment agreed with customers to ensure the quickest possible start. Visit HCC's website to find a sample license and to obtain the contact details of your local sales representative. Or, simply send an email to info@hcc-embedded.com and we will send all the details you require.

All trademarks and registered trademarks are the property of their respective owners.



US sales office: 1999 S. Bascom Avenue Suite 700, Campbell, California 95008 • **Tel.:** +1 408 879-2619

European sales offices: 24a Melville St, Edinburgh EH3 7NS Scotland, UK • **Tel.:** +44 7918 787 571

1133 Budapest, Váci út 76., Hungary • **Tel.:** +36 1 450 1302

info@hcc-embedded.com • sales@hcc-embedded.com • www.hcc-embedded.com