

# Deos Volume Management System (DVMS) with exFAT File System

The optional Deos™ Volume Management System (DVMS) exFAT file system provides a rich feature set that permits read/write capability in-flight. This file system is an optional component for Deos in addition to the DO-178C Design Assurance Level - A (DAL-A) verified kernel file system, which is read-only in-flight. DVMS is well suited for both systems with very large data storage requirements, and also applications with high performance, low latency, and random access read/write file requirements. Additionally, by using the exFAT format, a standard file system format for high-capacity memory devices, data can be easily transferred on or off the Deos based system through removable media supporting exFAT onto Linux or Windows based PCs.

## DO-178 DAL-A Reusable and Adaptable Modules

DVMS was developed as DO-178C DAL-A shared libraries to allow file operations within the time and space partition of the calling application (e.g., a Filesystem in **USE**rspace (**FUSE**) approach). Like all Deos components, DVMS was designed supporting the reuse of certification artifacts and does not require recompilation during its integration. It is a user space library that executes in the context of the calling process and adaptable through XML configuration files. Additionally, the DVMS libraries are hardware media agnostic via a Media Abstraction Layer (MAL). These MALs are available for a variety of media and/or modified for customer specific storage media.

## Overview

- DVMS is available for avionics applications needing the utmost in throughput, low latency, and real-time performance.
- Leverages the Deos Virtual File Library to deliver a POSIX/Linux style interface. Additionally, ARINC 653 Part 2 APIs are also available.
- Can utilize DMA to transfer data to/from user applications.
- Supports single core, multicore, and multiple concurrent partition access to the file system (re-entrant operation).

## Partitioning

- Each user partition can own one or more DVMS partitions.
- DVMS execution time is assigned to its calling application.
- Each DVMS partition, or volume, may contain one or more files.
- DVMS handles mutual exclusion for accesses to the volumes.

## Optional Journaling Library

- File system data structures (metadata), as well as the file data itself, are written to a temporary, but power cycle preserved, area before committing them to their proper location in the storage device.

## Optional Compression Library

- A port of the popular zlib lossless data compression library to DAL-D enables compression/decompression of files on a per volume basis.

## Key Feature Overview

- High Performance Hierarchical Read/Write File System
- exFAT File System Format
- Deos Single Core or Deos SafeMC™ (Multicore) Operation
- Arm, PowerPC & X86 Support
- Flexible APIs
  - ARINC-653 Part 2 APIs
  - POSIX/Linux Style APIs
- Portable, with Binary & Certification Reuse:
  - Media Abstraction Layer (MAL) Decouples Media Device Specifics
  - XML Configurable
- Supports Mixed DAL Application Access
- Maintains Time Partitioning – Shared Library Design Executes in the Context of Calling Application
- Optional Power-Fail-Safe Journaling
- Optional Lossless Compression
- High Performance
  - Supports DAL A DMA Operation
  - Low Latency Design
- Multiple Storage Media Options
  - RAM Disk (included)
  - RAW Interface (included)
  - NAND/NOR Flash (optional)
  - SATA, CompactFLASH, and Other Mass Storage Devices (optional)

## Key Components Include:

- Deos Volume Management System Library**
  - The Deos Volume Management System (DVMS) library shown in the figure below implements a "mesh network" between a set of users, and a set of filesystem volumes or raw partitions on data storage devices.
  - The Deos Volume Management System connects the Deos Virtual File (vFile) library with one or more file system libraries and media libraries.
  - Within a media library there can be multiple data storage devices each with multiple file partitions.
  - Each partition can contain a filesystem or be used for RAW (e.g. direct addressing) access.
- Deos vFile Library**
  - Provides ARINC-653 Part 2 and/or POSIX/Linux compatible API access to user applications.
  - The file path determines the driver or file system.
  - A file can be a device, an actual file in a file system, or a special file specific to the Deos operating system.
  - Applications directly link with the file system media.
  - Includes drivers to access file systems, such as: Deos Kernel File Systems (KFS, LFS, MFS); Linux-style sysfs virtual file systems; Deos Certifiable Fast File System (CFFS); Mount point for custom/user provided virtual file systems; or RAM based file storage.
  - Contains built-in files which are useful for debugging Deos processes and additionally other standard devices, such as: /proc/vm, /proc/res, /proc/videobuf, /proc/kernel, /dev/null, /dev/zero.
- Media Abstraction Layer (MAL)**
  - DVMS uses a MAL to abstract it from a particular physical storage media.
  - MAL's are used to support various media devices: RAM based file system (included); NOR, SATA and IDE Flash Devices; and can be additionally provided for specific customer hardware storage devices.

