



Exploring Keil FuSa RTS in MDK-6 Pro: A Certified Runtime System for Functional Safety

By Trevor Martin

Introduction

The latest MDK-6 Professional (MDK-6 Pro) release brings with it a powerful functional safety runtime system—Keil FuSa RTS—designed to simplify and accelerate the development of safety-critical embedded applications. Built on Arm’s proven tools and libraries, FuSa RTS provides a robust, certified foundation for embedded software that must comply with safety standards like ISO 26262 (Automotive), IEC 61508 (Industrial), and IEC 62304 (Medical).

Let’s take a closer look at the key components and benefits of Keil FuSa RTS in MDK-6 Pro.

Certified Arm C/C++ Compiler for All Optimisation Levels

At the core of Keil FuSa RTS is the Arm-certified and maintained C/C++ Compiler. Unlike generic compilers, this toolchain is certified by TÜV SÜD, ensuring compliance with functional safety requirements. Crucially, the certification applies to all compiler optimisation levels, giving developers complete flexibility to balance performance and code size without impacting safety compliance.

Certified C Library for Safety-Critical Applications

Alongside the compiler, Keil FuSa RTS includes a certified C standard library that ensures predictable and reliable runtime behaviour in safety-critical systems. This library provides a robust implementation of key C99 and C++98 functionalities, offering deterministic execution and eliminating runtime anomalies that could compromise safety.

With both the compiler and the library certified, developers can confidently build applications that meet strict safety requirements without requiring independent validation of these core components.

Certified Embedded Software Components

Beyond the compiler and C library, Keil FuSa RTS includes a suite of embedded software components designed to simplify the development of safety-critical systems.

CMSIS-Core

The FuSa-RTS embedded components include a certified version of the CMSIS-Core standard library. CMSIS-Core provides all the necessary low-level functions and macros that allow your code to access the Cortex-M CPU configuration registers.

FuSa RTX: A Certified Version of the Keil RTX RTOS

A standout feature is FuSa RTX, a certified version of the widely used Keil RTX RTOS. Built specifically for functional safety applications, FuSa RTX delivers:

- Deterministic real-time performance with a priority-based scheduler.
- Process isolation—a key feature that allows safety and non-safety code to run separately. This reduces the final system certification effort by containing potential faults and minimising risk.

For developers working on mixed-criticality systems, process isolation is a game-changer. It enables a modular certification approach where only safety-related components need full verification, significantly reducing the overall certification burden.

FuSa Event Viewer: Real-Time Debugging for Safety-Critical Code

Keil FuSa RTS also includes the FuSa Event Viewer, an on-chip debug agent that provides real-time annotations of executing code. This powerful tool allows developers to:

- Visualise system execution in real time, offering deep insights into task execution, context switches, and system behaviour.
- Identify potential timing issues or unexpected behaviour that could impact safety compliance.
- Debug and optimise code without halting execution, maintaining system integrity during development.

By integrating real-time debugging and trace capabilities directly into the Keil FuSa RTS, developers can improve system reliability while maintaining strict functional safety requirements.

Conclusion

The introduction of Keil FuSa RTS in MDK-6 Pro is a major milestone for developers working on safety-critical applications. With its Arm-certified compiler, certified C library, FuSa RTX RTOS, and advanced debugging tools, it provides a complete, certification-ready environment that simplifies compliance with stringent functional safety standards.

By enabling process isolation, real-time debugging, and certified optimisations, Keil FuSa RTS reduces certification effort and accelerates time-to-market—making it an essential tool for modern safety-critical embedded development.

Further Information

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