RISC-V for Real-time MCUs – Software Optimization and Microarchitectural Gap Analysis

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• Analyze Real-time on RISC-V
  • CV32E40P, an open-source industrially supported RV32IMFC core, 4-stage in order
  • FreeRTOS, a popular open-source RTOS

1. Software Optimizations for FreeRTOS
2. Measure Interrupt Latency and Context Switch Time
3. Quantify gap to ARM Cortex-M3
   • Difference due to automatic Register Stacking and Nested Interrupts
   • Come up with extensions

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Optimized FreeRTOS   Context Switch Time (WCET)   Interrupt Latency (WCET)
vs Vanilla RISC-V FreeRTOS   +33%   +20%
vs ARM Cortex-M3 FreeRTOS   -26%   -50%