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

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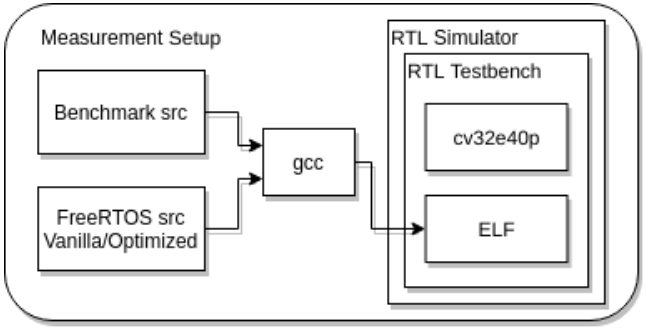
Summary

- 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



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