

The MediaTek logo consists of the word "MEDIATEK" in a bold, sans-serif font, enclosed within a white, rounded rectangular shape that has a slight 3D effect with a shadow on the right side.

**MEDIATEK**

# MediaTek RISC-V for Sensor Hub

2019/3/12

# Outline

- Motivation
- Mediatek Sensor Hub design focus
- Concentrate our energy
- Result

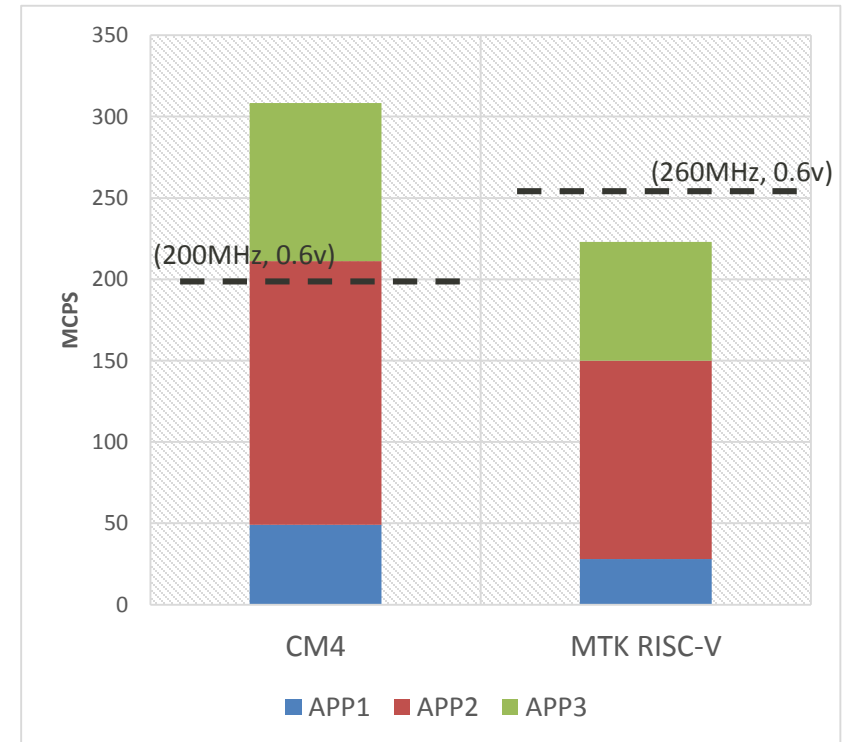
# Motivation

- Customers have strong requirement on differentiation of Sensor Hub
  - 1 Billion shipment per year
  - Deeply third party engagement
- Why RISC-V
  - Commercial IP
    - low controllability & less differentiation
  - Proprietary IP
    - large effort to build our own eco-system

	Commercial Licensing	Proprietary	Open standard RISC-V
ISA quality	Good	Good	Good
PPA & Cost	△	V	V
SW reuse	△	V	V
Open platform ecosystem	Good	Effort to build	Good
ISA extensibility	△	V	V
Design customization	X	V	V

# MediaTek Sensor Hub Design Focus

- Low power
  - Better performance on low voltage
- Various application
  - Application specific extension

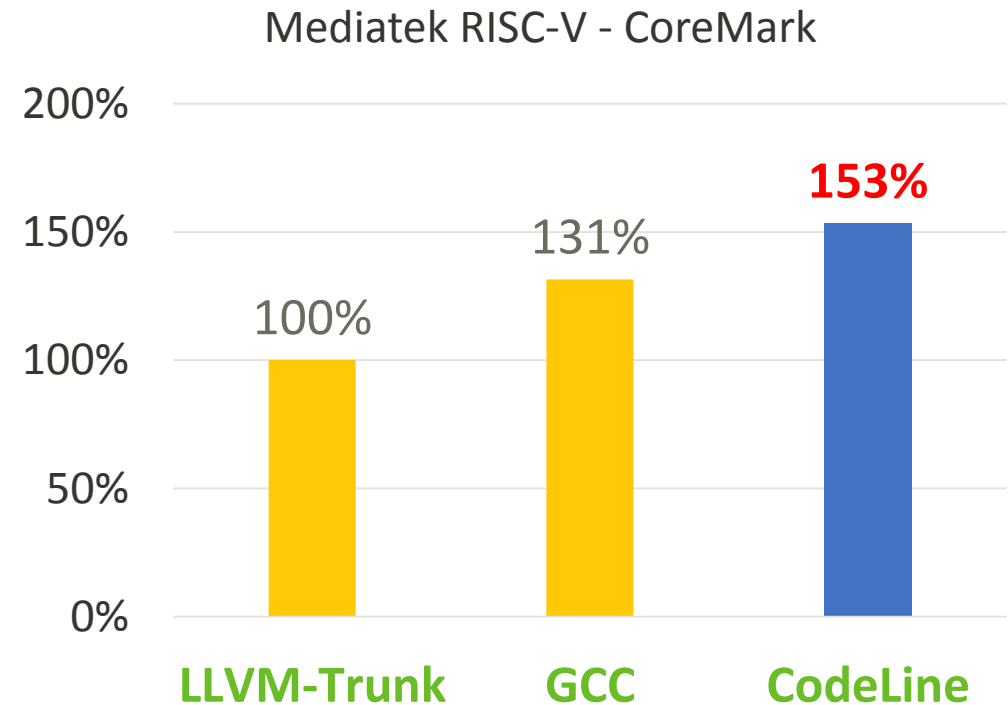


# Concentrate Our Energy

	Leverage RISC-V	Design focus
ISA Spec	✓ (follow defined spec)	
Simulator	✓ (early dev & functionality)	
System & uArch (SW/HW co-design)		✓ (multi-issue, pipelining, interfaces, ...)
Design verification	✓	✓
PPA optimization		✓

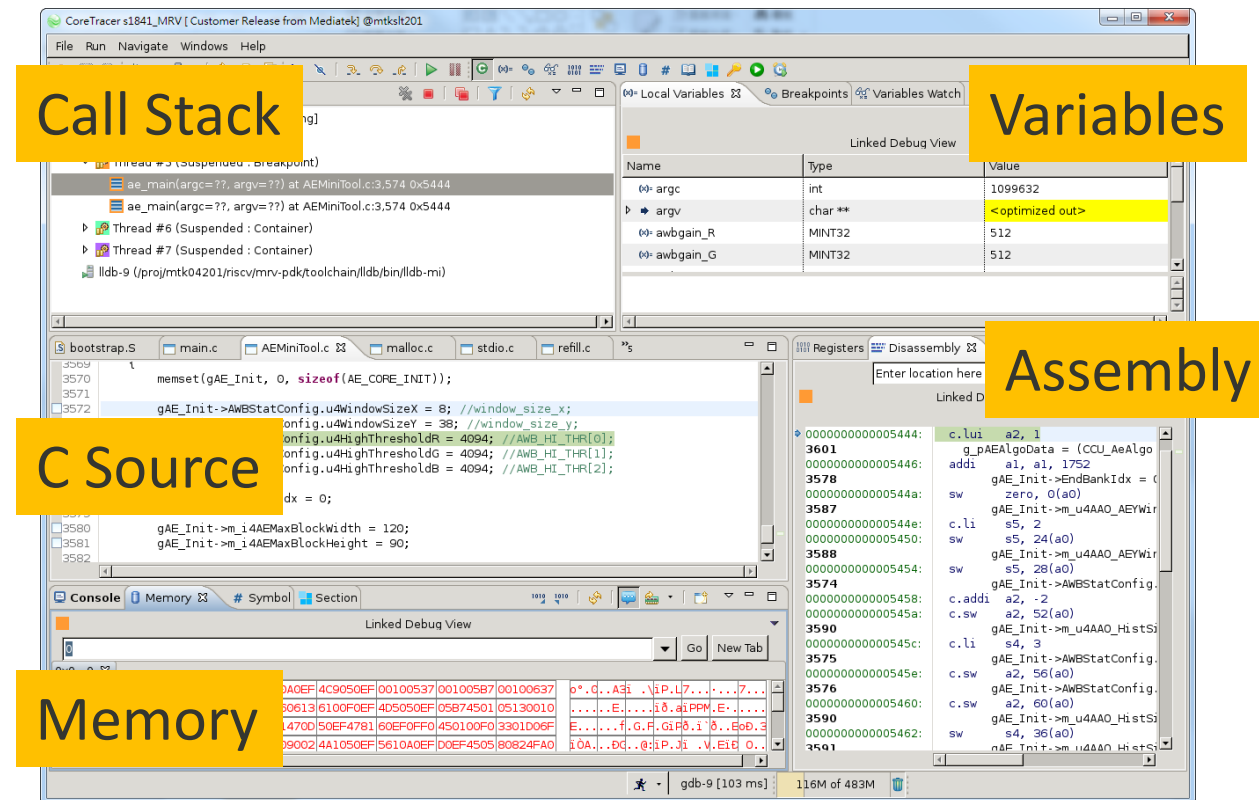
# Concentrate Our Energy

- GCC + GNU Binutils
  - Feasibility exploration
    - Decent performance
    - Rich features
- LLVM RISC-V backend
  - Product development
    - Compatible with existing toolchain
  - Adjust pipeline information
  - Implement MTK's extensions



# Concentrate Our Energy

- LLDB native debugger
  - Integrated with MTK CoreTracer
    - Enhance compatibility with Eclipse CDT plugin
  - Improve testing framework for remote debugging



# Results

- Development efforts and schedule
  - Save 30% efforts on HW/SW development
  - Delivered first MTK RISC-V solution within 12 months
- Comparison
  - Performance : +60% – +75%
  - Frequency: +37%
  - Power efficiency : +36%

	CM4	MTK RISC-V
Freq.	100%	137%
CoreMark <small>(score / KB)</small>	2.4 / 3.4	4.0 / 3.3
Power efficiency	100%	136%
Core arch.	Single-issue	Dual-issue
Pipeline	3	6



# Summary

- RISC-V is a perfect fit for MediaTek's Sensor Hub
  - Good base for ecosystem
  - Allow us to have differentiation on low power and application extensions
- Concentrate our focus on the key factors we need
  - Well-defined ISA Spec + full-featured SW codebase + key implementation
- For Sensor Hub applications, MTK's RISC-V could:
  - Boost 2~2.5X core performance
  - Improve 36% power efficiency

# Thank You

Question & Answer