How to Choose Your AIoT RISC-V core

Offerings

Why not?

AndesCore

New Entrant

Go
Nature of RISC-V: **Diversity**

- ISA designed to be concise and modular
- High degree of customization
- Supporting many use cases

[Diagrams: Market Dominant, Emerging Market]
Both have well-established ecosystems and preferred OS/middleware.
Emerging Market

- RISC-V customers are focusing on emerging markets
- AI, ML, and IoT that have not yet formed specific OS/middleware
- As the AIoT market grows, RISC-V is a major candidate to choose due to its modular ISA designed for extensibility/specialization
GO FOR RISC-V?

Who Choose RISC-V

Take Advantage
Choose RISC-V

**DRIVING MOMENTUM**
- **Western Digital** ships in excess of **1 Billion** cores per year
- ...and we expect to double that
- Transitioning our product portfolio to **RISC-V** over time

**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

An announcement

**Qualcomm Technologies, Inc.** will be shipping **RISC-V** in a high volume product in 2019

**Final thoughts**
- **NVIDIA will use RISC-V**: processors in many of its products
- We are contributing because **RISC-V** and our interests align
- Contribute to the areas that you feel passionate about!
Big Players

Mediatek, nVidia, Qualcomm and WD contributed 13.5% of worldwide semiconductor revenue in 2018.

Having flexibility to choose one core from the pool of in-house, commercial and open source.
Take Best Advantage of RISC-V for AIoT SoC

In addition to the **modular RISC-V ISA** adding the flexibility, extensibility and scalability, there are highly essential elements for **edge computing devices** running **AI algorithm** and **data processing**.
DSP and Vector Extension

Packed-SIMD DSP(P) and vector extension(V) are a work in progress. Both are designed to accelerate multimedia, Audio, AI, ML and other digital signal processing.

- **Andes** is the Chair of P extension task group
- **Vector**: Expensive and more gate counts for high data rate computation. Will implement on our product line
- **DSP**: Efficient for audio, voice and slow image. Demonstrated significant performance improvement
Speedup with P-Ext on 25-Series

- Basic
- Cmplx
- Ctrl
- Filter
- Matrix
- Ststcs
- Xform
- Utilis
- All

- CIFAR (image classification)
- PNET (90% of face detection)
- AMR voice codec
- MP3 decode

Graphs showing speedup comparisons between RV32P and RV64P for different categories.
Andes Custom Extension

When DSP or vector operations cannot fulfill your requirement on AIoT SoC, RISC-V allows to add your own extension without getting permission. However, the automation tool is crucial for the development of custom ISA extension.

- **Andes** provides **ACE** frameworks for **Domain-Specific Acceleration**.
AndesCore

Andes provides RISC-V cores from power-efficient processors to high-end performance. They all have the common features -

Best Extension
Smallest Gate Counts
Complete Solution
Best Extension to RISC-V

- **Baseline ISA extension** to speed up memory access and branches
- **CoDense** to reduce code size (12% better than RISC-V GCC)
- **PowerBrake** to save power by stalling pipeline
- **StackSafe** HW stack protection

Differentiate your Products!
Smallest Gate Count with High Performance

- AndesCore N22
- Smallest gate counts <15K gates
- Best performance: 3.95 CoreMark and 1.8 DMIPS

Area Optimized!
Complete Solution

- **Pre-integrated Platform** IPs to facilitate SoC development
- **Professional IDE** with powerful plug-ins
- **Extensive software packages** from bare metal, RTOS and Linux

Shorten Time to Market!
Offerings

Andes is your trusted computing expert and best RISC-V partner because...
Core IP Reliability

Andes obtains outstanding reliability of core IP after **14** years experience
- **150+** licensees cumulatively
- **21** RISC-V licensees in 2018
- **>1B** Andes-Embedded SoC shipped in 2018
- With commercial readiness that are robust enough for companies to risk their SoCs on.
SW/Toolchain Expertise

Andes provides excellent support capability on software and toolchain

- Major toolchain maintainer and contributor provides best one-stop support
- Continuous contributions on RISC-V architecture port
DSP and ACE

Edge computing requires AIoT devices with computation performance with low power. Andes provides **DSP** extension and **ACE** (Andes Custom Extension) for Domain-Specific Acceleration.
AndesCore™ RISC-V Families

V-extension, and cores with longer pipeline

**Cache-Coherent Multicores**
- A25MP
  - 1/2/4 A25, L2$, L1/IO coherence
- AX25MP
  - 1/2/4 AX25, L2$, L1/IO coherence

**Linux with FPU/DSP**
- A25
  - N25F, MMU, DSP
- AX25
  - NX25F, MMU, DSP

**Fast/Compact with FPU/DSP**
- N25F
  - V5/32b, FPU, PMP
- D25F
  - N25F, DSP
- NX25F
  - V5/64b, FPU, PMP

**Slim and Efficient**
- N22
  - V5[e], 32/16 GPR

- 5-stage
  - >1.2GHz
  - 3.58 CoreMark
  - 2.09 DMIPS

- 2-stage
  - 700MHz
  - 3.95 CoreMark
  - 1.80 DMIPS
GO FOR RISC-V with Andes

Thank you
Thank you!

More information please visit our booth or visit www.andestech.com