



晶心科技

投資者說明會

張弘毅

發言人

113年5月28日



投資安全聲明

除本文包含的歷史資訊外，本演示文稿中涉及的事項均為前瞻性陳述，涉及某些可能導致實際結果出現重大差異的風險和不確定性，包括但不限於天氣、競爭產品和定價的影響、半導體產品供需的全行業變化、快速的技術變革、半導體行業週期、和一般經濟狀況。

除法律要求外，晶心不承擔因新資訊、未來事件或其他原因而更新任何前瞻性陳述的義務。



報告標題

- 晶心公司簡介
- 財務與經營狀況
- 關鍵應用與趨勢
- 研發暨技術能量



晶心科技公司簡介



晶心亮點

- 2005年3月設立於台灣新竹科學園區。
- 根基穩健的高科技上市公司。
- 員工人數超過500人；80%為工程師。
- 獲得TSMC 2015年新的 IP OIP Award。
- 晉升為RISC-V國際聯盟(前身為RISC-V基金會) 首席會員。(2020)
- 獲得AI Global Media頒發「2020年最傑出嵌入式處理器IP供應商」。
- EE Awards亞洲金選獎 - 「Taiwan 產品獎」, 「Asia 企業獎」(2021)
- 2023亞太區 前五百大高成長企業

晶心任務

- 創新架構高效能/低功耗嵌入式處理器。

晶心利基

- 智能及環保之電子設備
- 雲端應用,人工智慧及物聯網

晶心科技公司現況

晶心科技指標性資訊

19 Years

Pureplay CPU vendor

500+

Employee , > 80% R&D

400+ Customers

Licensing AndesCore™

14Bn+ SoC

Total Customer Shipment

2023年營運數字

Revenue \$ Growth

1.05 Bn, NT\$

13.5% YoY

License \$ Growth

18.3% YoY

Royalty \$ Growth

-1.2% YoY

SoC Shipping Q'ty

2.1Bn

晶心科技參與RISC-V International (RVI) 組織的工作



Founding & Premier Member from 2016



Board of Directors



Chairs/Co-Chairs of Task Groups



Technical Steering Committee



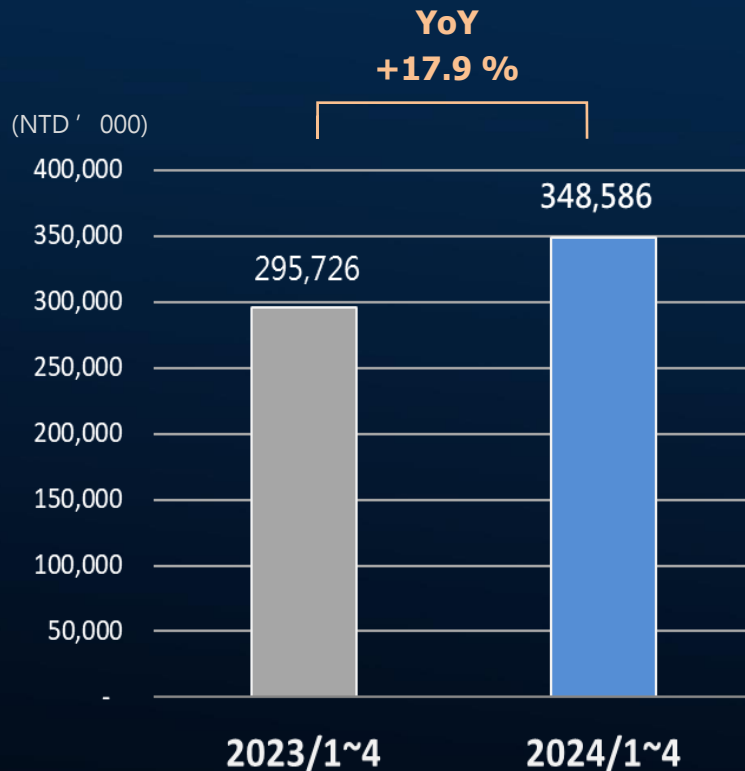
Ambassador



財務與經營狀況

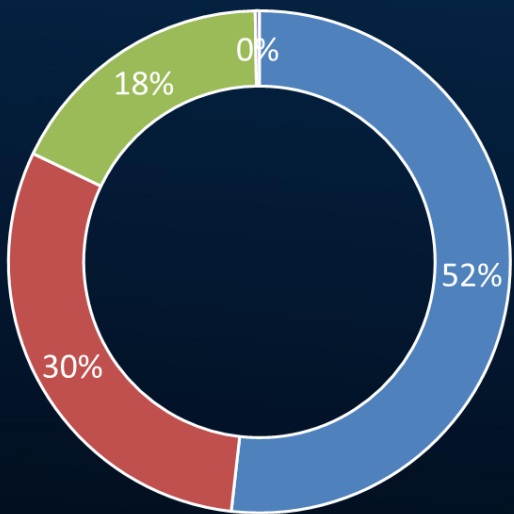


2024/01 ~ 04 整體營收分析

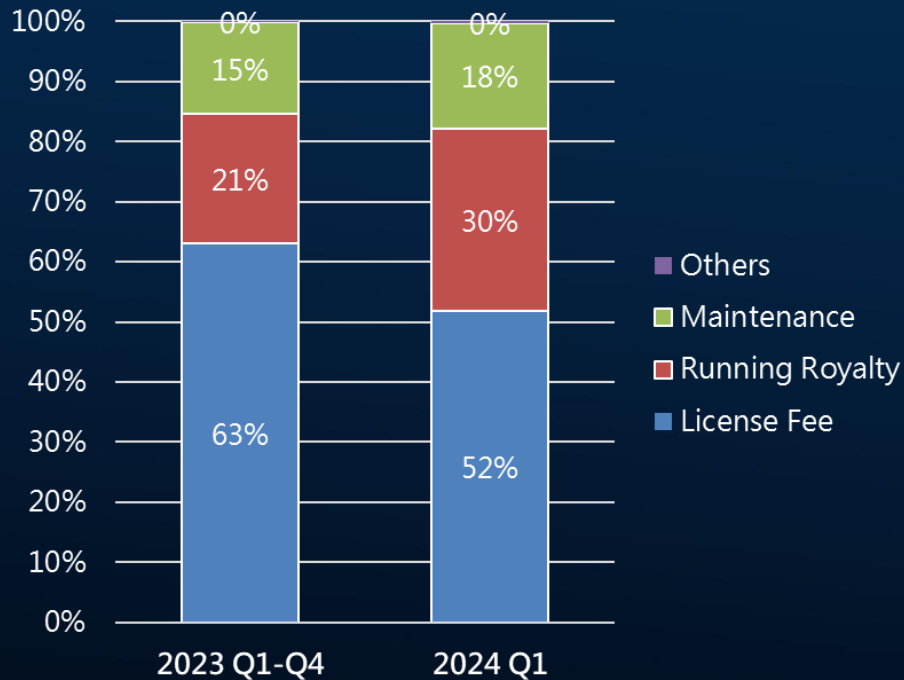




2024 Q1 營收商業模式分析

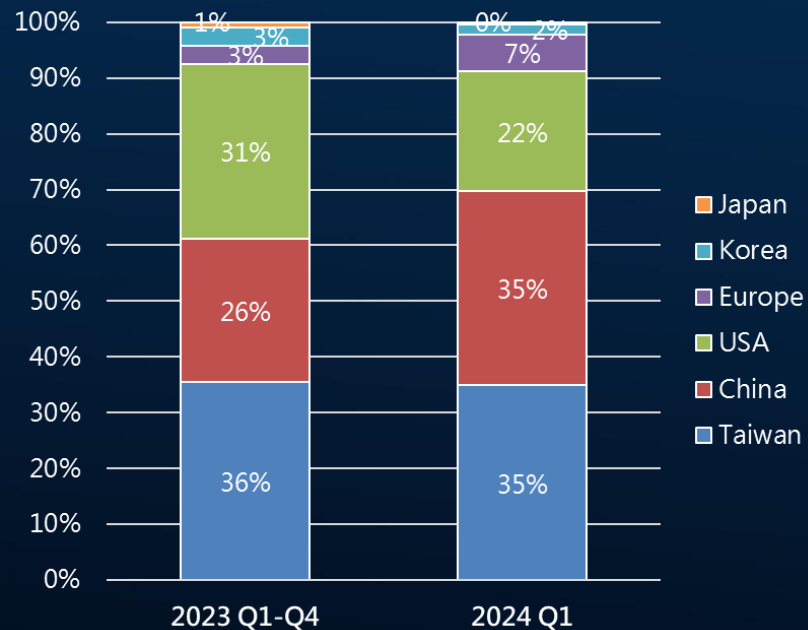
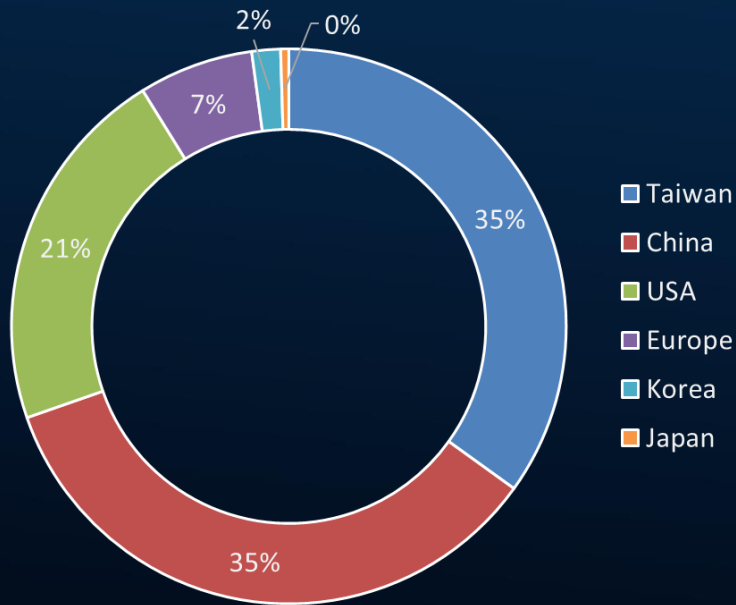


- License Fee
- Running Royalty
- Maintenance
- Others



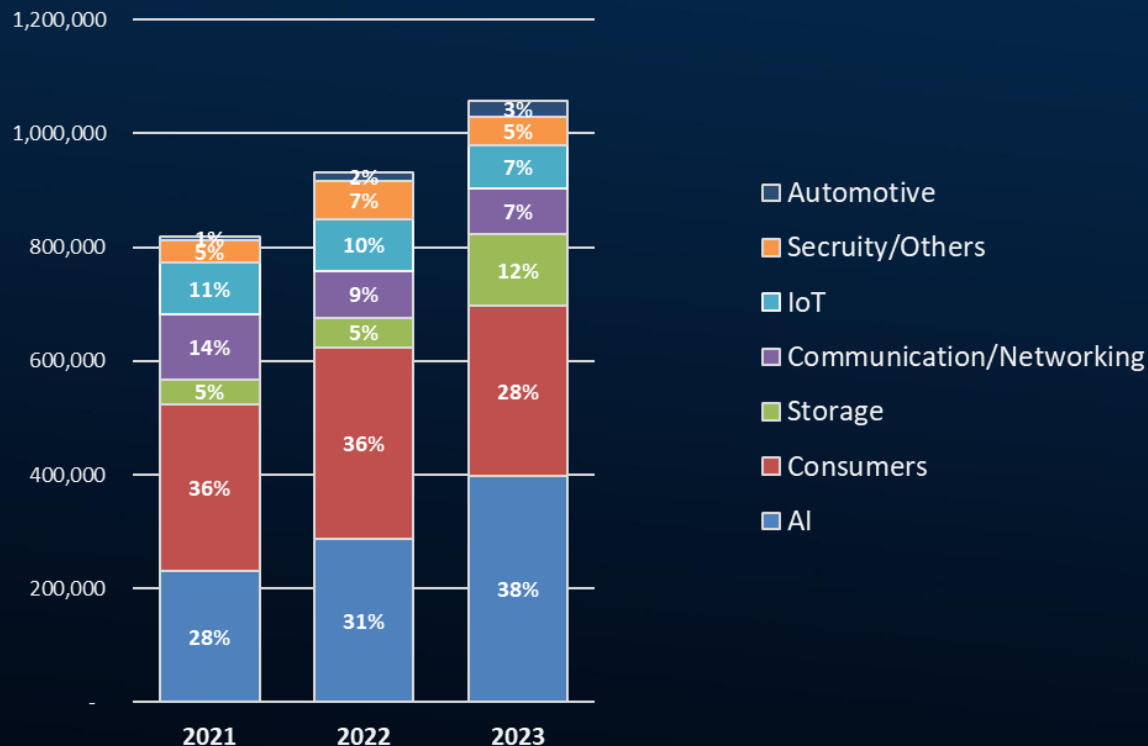


2024 Q1 地區別營收分析



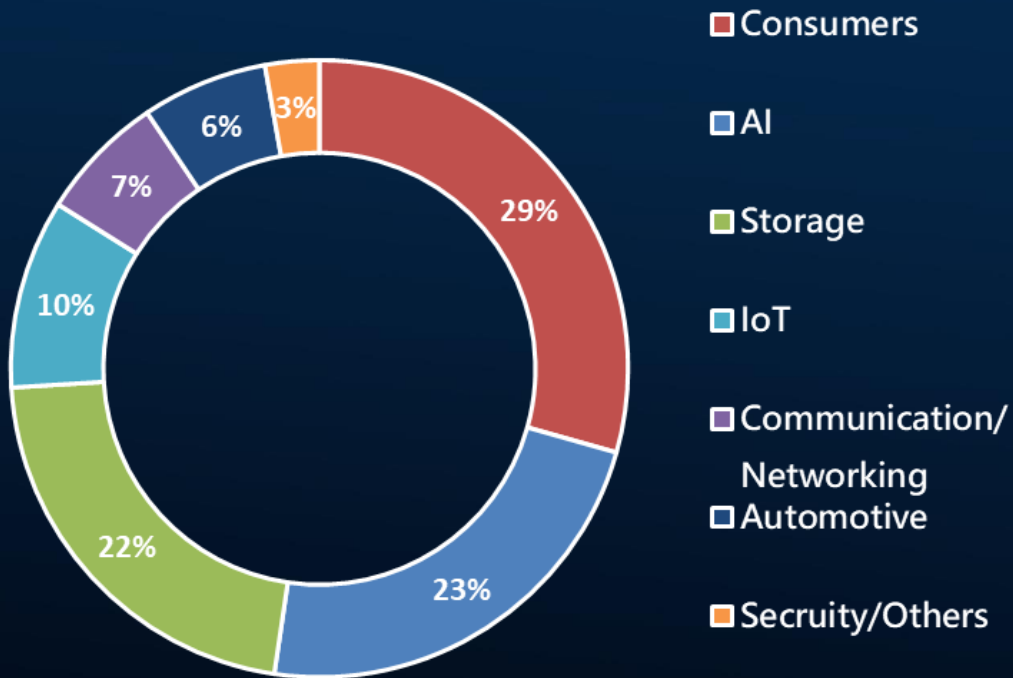
2021 ~ 2023 營收應用類別分析

(NTD ' 000)





2024 Q1 營收應用類別分析





2024 Q1 營業費用分析

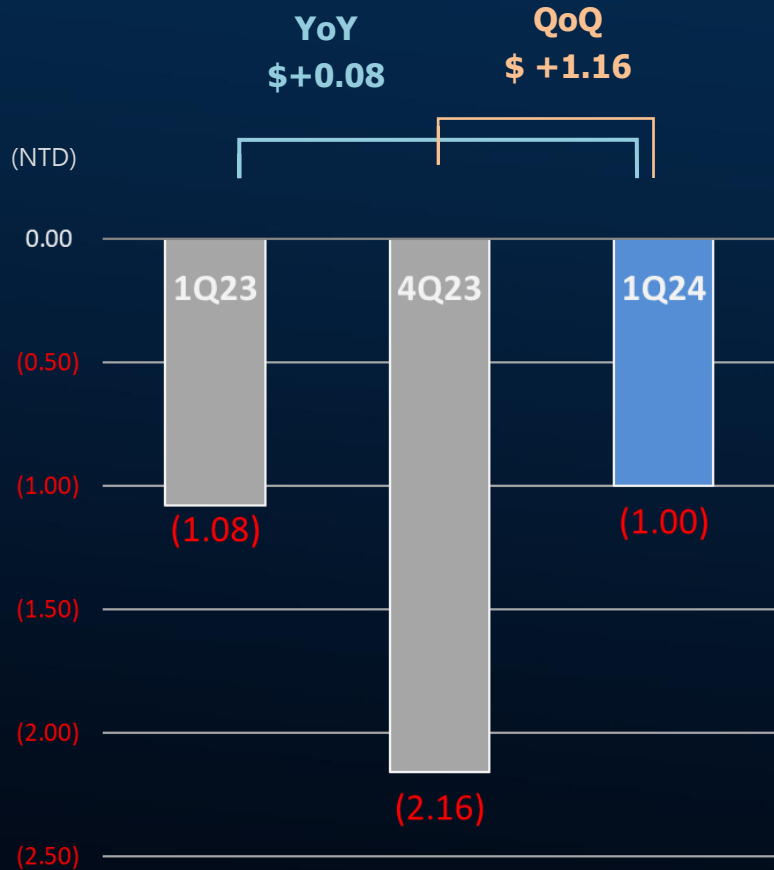


1Q23 4Q23 1Q24

Taking RISC-V® Mainstream



2024 Q1 每股盈餘分析






關鍵應用與趨勢

主要應用趨勢



The global Automotive market size was valued at USD 341255.0 million in 2024 and is expected to expand at a **CAGR of 16.4%** during the forecast period, reaching USD 848836.0 million by 2031.


RISC-V will capture 10% of the Automotive market by 2025
Counterpoint, Sept 2021



The global Internet of Things (IoT) market size is projected to grow from \$714.48 billion in 2024 to \$4,062.34 billion by 2032, at a **CAGR of 24.3%**...

Read More at:-
<https://www.fortunebusinessinsights.com/industry-reports/internet-of-things-iot-market-100307>

RISC-V will command 28% of the IoT market by 2025
Counterpoint, Sept 2021

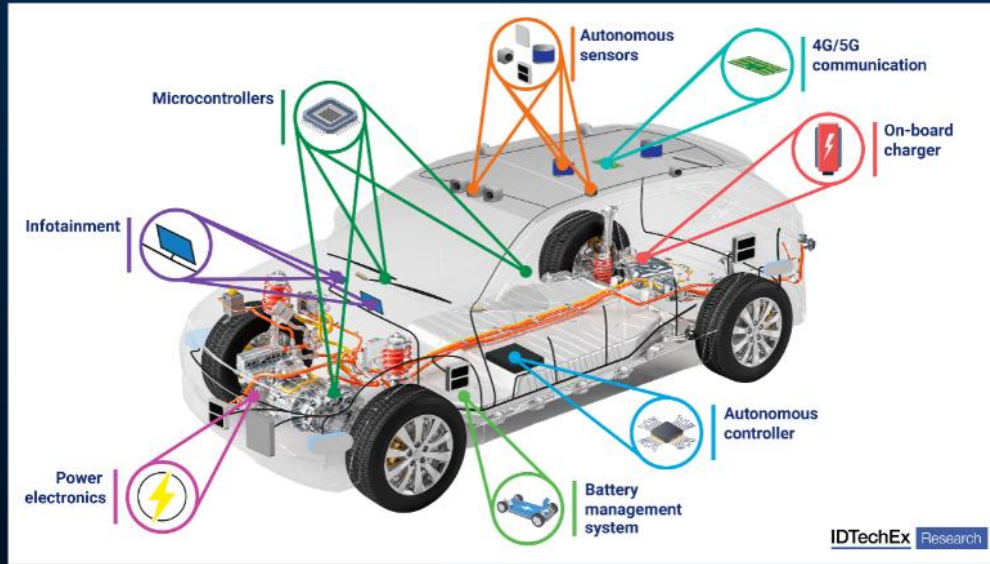


The market size in the Artificial Intelligence market is projected to reach US\$305.90bn in 2024.

The market size is expected to show an annual growth rate (**CAGR 2024-2030**) of **15.83%**, resulting in a market volume of US\$738.80bn by 2030.
www.statista.com

RISC-V-based AI SoCs will grow 73.6% CAGR to 25B units and \$291B in revenue by 2027
Semico Research, Dec 2021

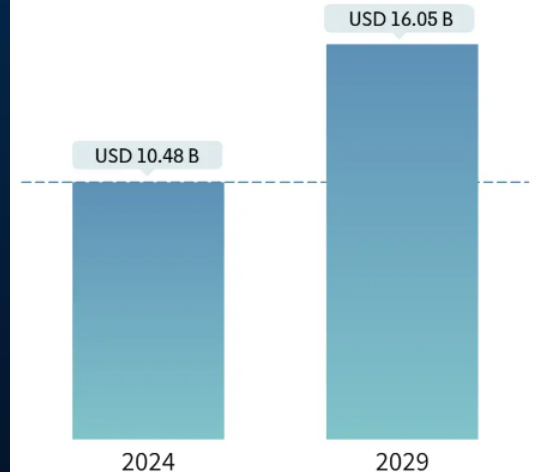
Fast Growing Automotive MCU Markets



Global Automotive MCU Market

Market Size in USD Billion

CAGR 8.92%



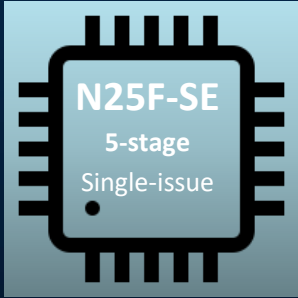
Source : Mordor Intelligence



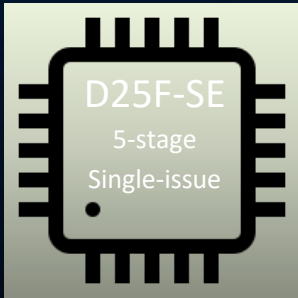
<https://www.mordorintelligence.com/industry-reports/global-automotive-mcu-market>

- Semiconductor devices in vehicle are growing fast!
- Global automobile MCU market size in 2024 will reach USD\$10.48B, and \$16B at 2029, CAGR 8.92%
 - The total number of MCUs will reach 5.7 billion in 2024
 - Including 8/16/32-bit
 - The proportion of 32bit CPU MCUs is increasing year by year due to more complicated features integration required

Safety Mechanisms Andes FuSA cores Implemented




Mainstream Processing



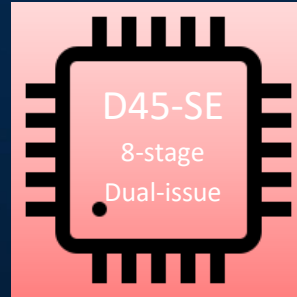
Common Safety Features

- Advanced ECC
 - Address Decoder
 - White Noise Protection
 - Error Status Indication
- Core Trap Status Bus Interface
- Stack Protection
 - StackSafe
- NMI (Non-maskable Interrupt)
- PMP

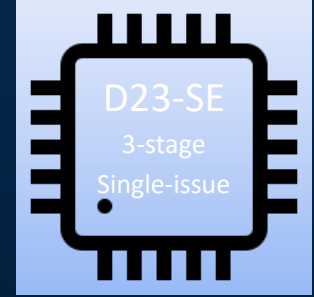
External Safety Mechanisms

- WDT (Watch Dog Timer)
- Software Test Library (STL)
 - Partner:  RESILTECH
 - Resiltech could provide chip-level STL service

Mission Critical

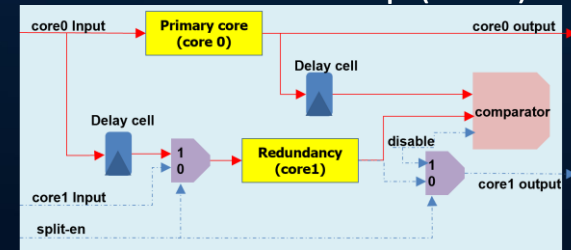


Low Power & Security



D45-SE and D23-SE applied:

- Dual-Core LockStep (DCLS)



- Bus Protection
 - Information Redundancy
 - Frame Counter
 - Timeout Detection

Andes Automotive Ecosystem



Security/HSM

Rambus

RT64x eHSM

SECURE-iC
THE SECURITY SCIENCE COMPANY

Securyzr™
HSM

普盛微电子
FORESEM

HSM

Virtual Open Systems

VOSySmonitoRV

TrustKernel

TEE

豆荚
Beanpod

PUF security

PUF/HSM

AUTOSAR

VECTOR

恒润科技
HARM TECHNOLOGIES

CETC
普华基础软件

AUTOSAR

SIEMENS

Capital VSTAR
Nucleus SafetyCert

FPT

Fpt Software

KopherBit

MaaZ AUTOSAR



Safety RTOS & STL



WITTENSTEIN

SAFERTOS



Microsoft

Microsoft Azure RTOS

WINDRV

VxWorks

RESILTECH

STL

Compiler/Debugger/Tool

iar

EWRISCV

LAUTERBACH
DEVELOPMENT TOOLS

TRACE32 Debugger

ASHLING

Compiler

Green Hills
SOFTWARE

MULTI IDE / Compiler
RTOS

LDR
ASSURED

LDR Tool Suite

TASKING

RiscFree IDE/Compiler

PARASOFT

Parasoft C/C++ Test

RISC-V for Datacenter & Cloud



RISC-V offers unique
Opportunity for
accelerators



Custom computing for
AI and
other emerging
workloads

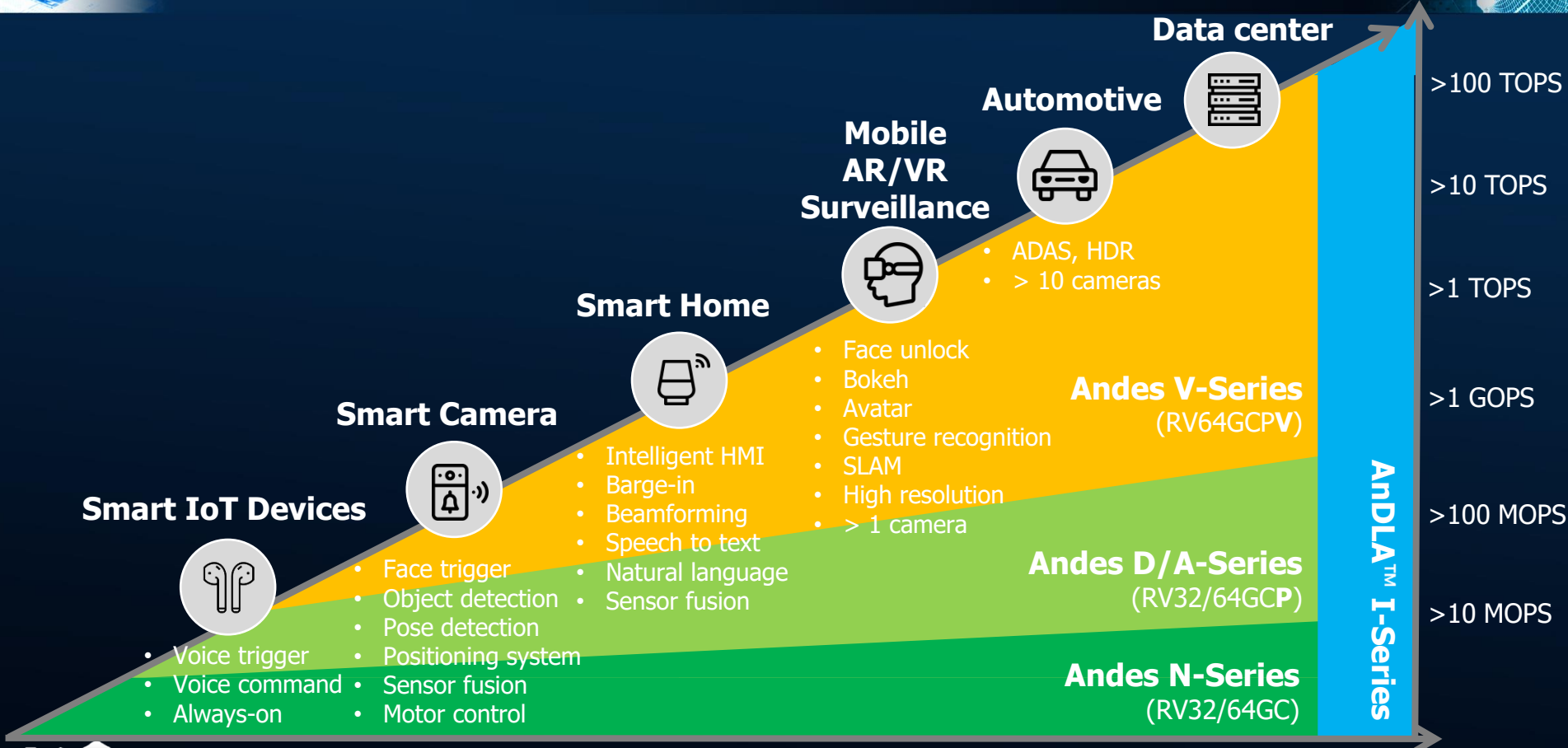


Achieve your
performance and
power targets

RISC-V CPU core market will grow 115% CAGR, capturing > 14% of all CPU cores by 2025

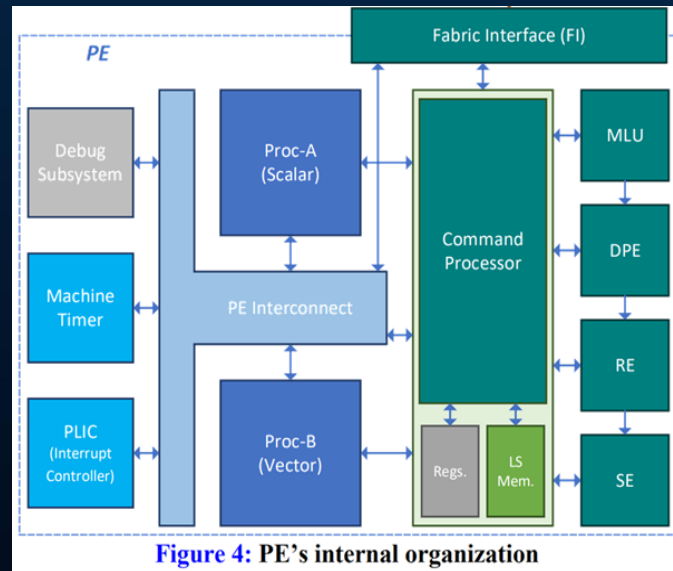


Andes RISC-V Processors to Fit Your AI



MTIA: Meta Training/Inference Accelerator

- ISCA 2023 paper, "MTIA: First Generation Silicon Targeting Meta's Recommendation Systems"
- Proc-A/B: AX25-V100, an early version of the popular NX27V
- Custom extensions: for new interfaces, instructions and registers
- Performs quite well on low and medium complexity models

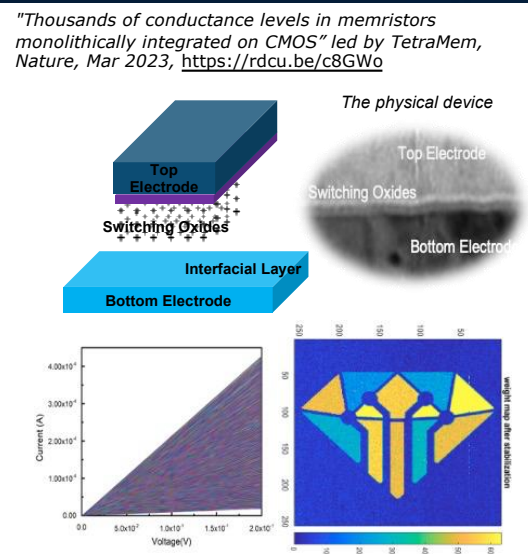


All photos: courtesy of ACM

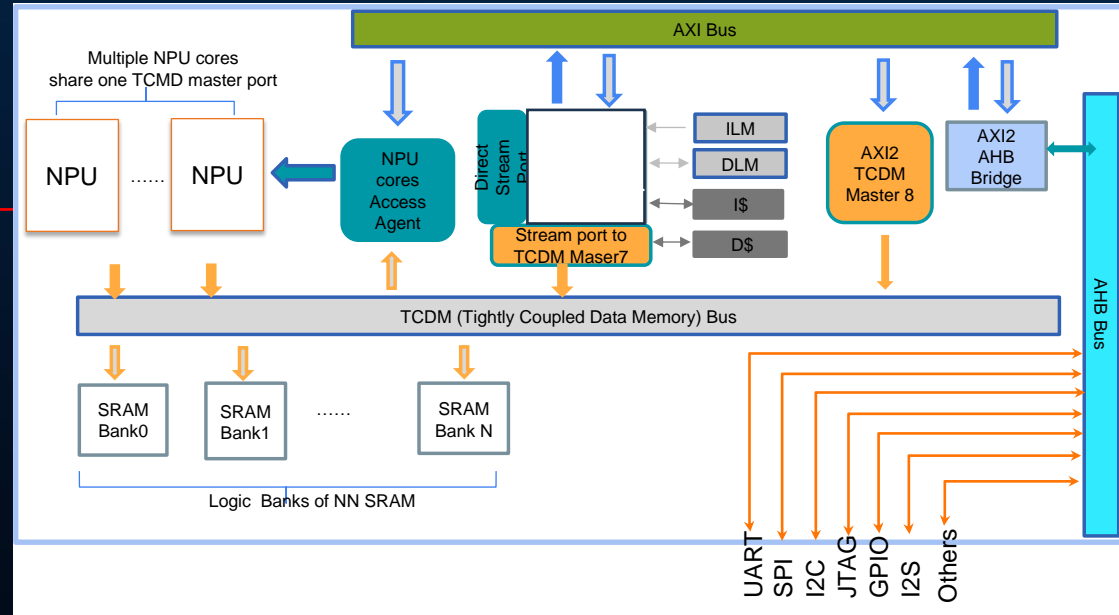


Edge AI With Analog In-Memory Computing

- **TetraMem** Analog In-Memory-Computing MX200 (**RRAM-based**)
- 8-bit 256x256 (**64K**) MAC Engines, **>30 TOPS/W** performance
- ML core operators (conv, gemm) processed in NPU
- Remaining operations processed in RISC-V Vector processors and control CPU



Powered by 8 bits multi-level RRAM device





Endpoint AI

- Renesas R9A06G150 Voice-Control ASSP
 - With **100MHz DSP-capable D25F processor**
 - ML-based voice recognition gets >50% speedup by using P-extension

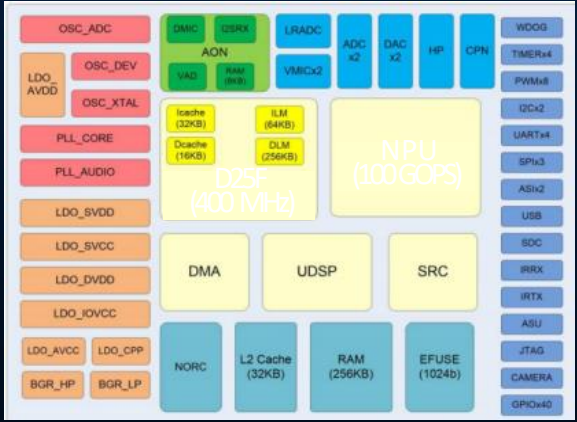


Voice HMI ASSP 100MHz 32-bit RISC-V with DSP, FP ext.
 V932Z453V
 10u-09-08F6

CPU Andes-D25F RV32IMAPP [Extensions] Andes StackSafe, PowerBrake, Recoverable NMI, Branch prediction PMP 16 regions	Memory Code Flash (256 KB) SRAM (128 KB) [w/ 4x32KB power-off] Data Flash (16 KB) Standby SRAM (1 KB) QSPI (1ch)	Analog 12-bit ADC (6ch) w/ 2 SH 12-bit DAC (2ch)	Timers 16-bit GPT (4ch) 32-bit Low Power Timer (4ch) WDT
Communication SCI (2ch) w/ FIFO, Manchester I2C (1ch) SPI (1ch) w/ FIFO PDM (2ch) SSIE (2ch) IRDA (SCID)	System Machine Timer DTC DMA (8ch) On-chip Oscillators (HOCO, MOCO, LOCO) Ext. Oscillator/Clock (MOSC) 32-bit DOC	Safety Bus Master MPU SRAM Parity Check Clock Accuracy Check CRC Calculator IWDG Oscillation Stop Detection	Package QFN 48 QFN 32 QFN 24

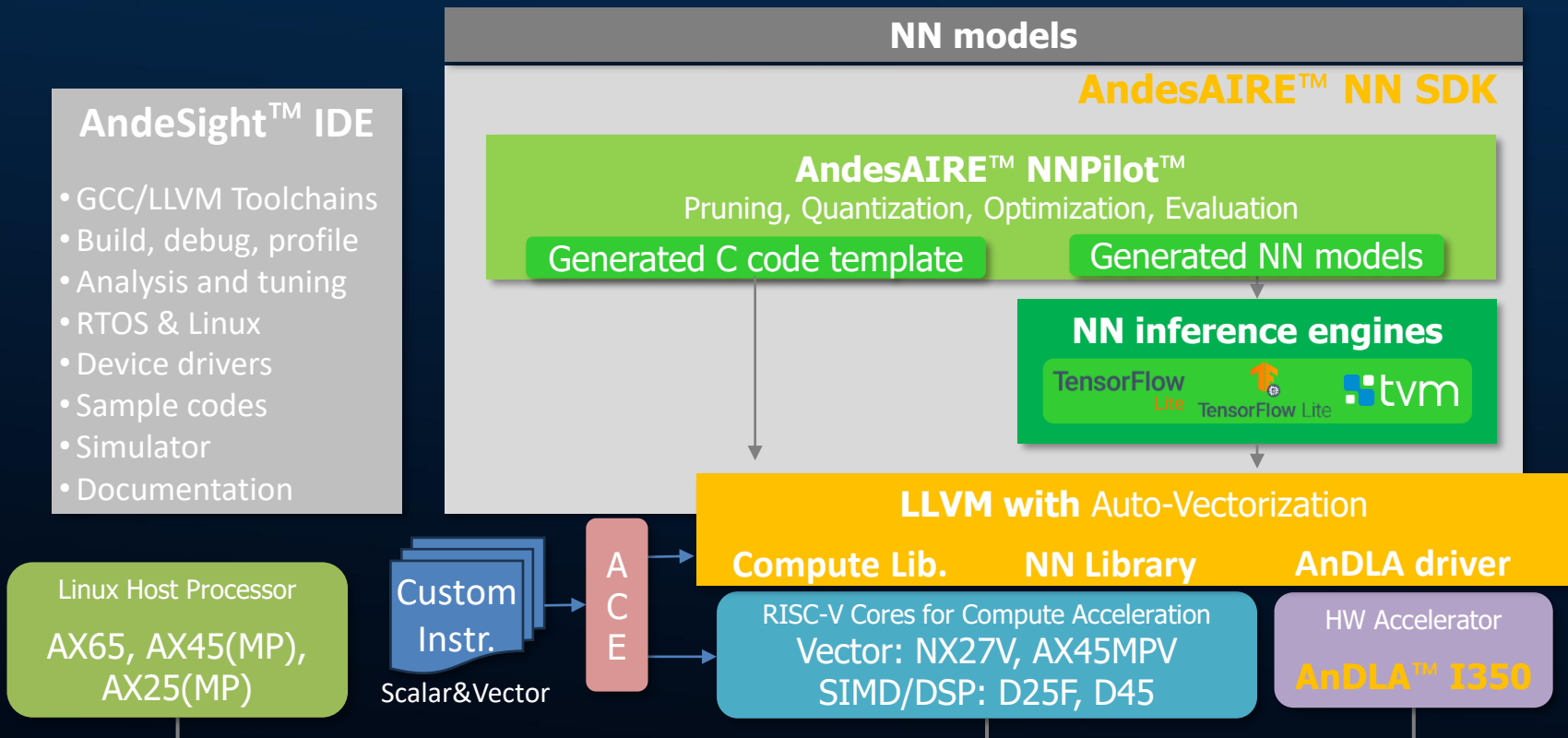
- Spacetouch SPV60 Intelligent audio processor

- High performance for customer development
 - ◆ 100 GOPS NPU for noise reduction, echo cancellation, howling suppression
 - ◆ uDSP for FFT/IFFT, atan, log, etc.
 - ◆ **400MHz D25F with ID caches/Local Memory**
- Rich audio interfaces and other peripherals
- Applications:
 - ◆ Intelligent voice, smart earphone, professional audio



AndesAIRE™: Andes AI Runs Everywhere

■ HW/SW Solutions for AI from the Edge to the Cloud





研發暨技術能量

晶心科技的 CPU Core IP

AX60 Series 13-stage OOO Linux MP <i>Categories</i>	AX63	AX65	AX66/AX67	AX6X-SE	A72~A78; N1/V1/X1
	<i>Power-efficient</i>	<i>Mid-range</i>	<i>Extended</i>	<i>FUSA</i>	
45 Series 8-stage Superscalar	N45, NX45	D45	AX45MPV, AX46MPV A45(MP), AX45(MP)	D45-SE	A53/55, R52/ R82, M7
27 Series 5-stage MemBoost		NX27V	A27(L2), AX27(L2)		A5/7/35
25 Series 5-stage Fast&Compact	N25F, NX25F	D25F	A25(MP), AX25(MP)	D25F-SE N25F-SE	A5/7/35, R4/5, M4/33
Compact Series <i>Categories</i>	N22, N225	D23		D23-SE	M0/0+/3/33/4
	<i>Embedded Control</i>	<i>Compute Acc.</i>	<i>Linux AP</i>	<i>FUSA</i>	<i>References</i>

■ To be released in 2024: D25F-SE, D45-SE, AX46MPV, AX66

■ Under Planning : D23-SE, AX63, AX67, AX6X-SE

Note: roadmap subject to change without notice

RISC-V Continues to Rapidly

- **RISE: RISC-V Software Ecosystem, a project under LF Europe**
- **To accelerate the development of RISC-V open source SW**
- **Led by industry leaders**
- **Areas to focus over time:**

- Compilers & Toolchains
- Language Runtimes
- System Libraries
- Debug & Profiling Tools
- Simulator/Emulators
- Kernel and Virtualization
- Linux Distro Integration
- System Firmware



- **More at <https://riseproject.dev>**

晶心科技合作夥伴暨生態系統

Category	Partners
IP	
SW and Dev Env.	
Design Service, Foundries, EDA and others	



感謝聆聽