Welcome to the next generation AURIX™ TC4x

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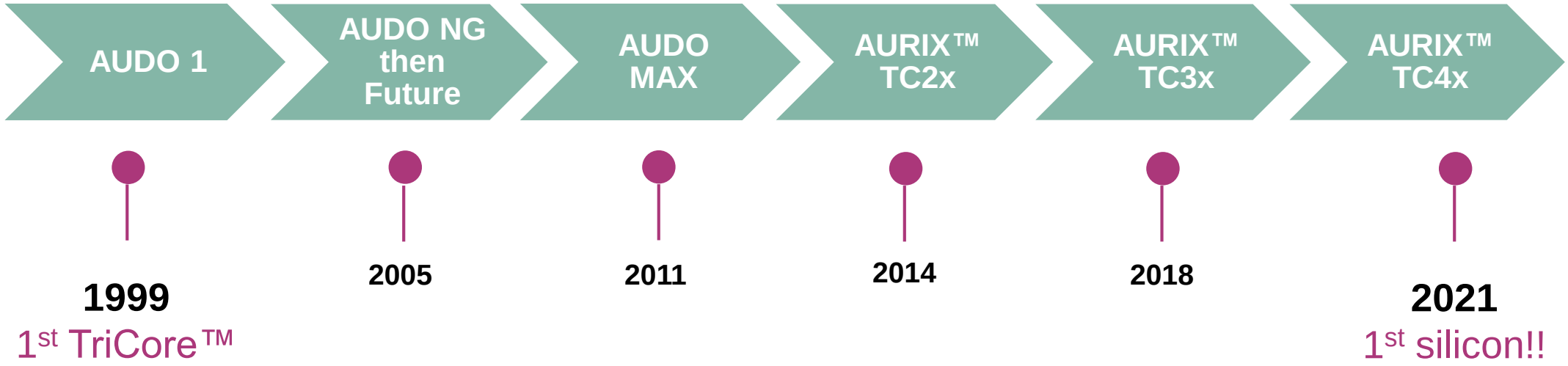
TriCore™ is the trusted choice for Automotive, with shipments to exceed 1 Billion Units by end of 2022

The TriCore™ concept was born in 1999

TriCore™ integrates three functions: DSP, RISC & MCU

The success story started in Powertrain and spread to the entire automotive MCU market



845,000,000 TriCore™ shipped to date including >320,000,000 AURIX™

What does the future car need?

Headroom to grow	› OEMs and Tier 1's need performance headroom for future upgrades
High Performance with AI	› More performance needed for mobility and autonomous driving › AI is needed to enable this transformation
New E/E architecture	› The E/E architecture will change to reduce complexity › Resulting in adoption of zone based architectures
Fully connected	› The future car is fully connected and always online
Fast Time to Market	› Technology is changing fast, the market must respond faster than ever before

The AURIX™ TC4x meets these future needs and more, providing the industries most extensive major upgrade path for auto MCUs

Whilst ensuring **dependability**

Headroom to grow

- Feature rich to offer applications headroom to grow
- Scalable family HW and SW concept for platform reuse

High Performance with AI

- More processing power from TriCore™v1.8 with virtualization support and new AURIX™ Accelerator Suite
- Parallel Processing Unit (PPU) for affordable AI

New E/E architecture

- Optimized devices for Zone and Domain control,
- Optimized devices for complex sensor and actuator control

Fully connected

- Enhanced connectivity, new high speed interfaces
- Data Routing Engine for efficient communication
- Faster cloud connection and crypto agility for SOTA

Fast Time to Market

- Seamless "Ease of Use" tool chain and software offering
- Model based design support for rapid prototyping
- Early development support based on virtual prototyping

AURIX™ TC4x extends a proven architecture with a rich set of new features, furnishing the headroom needed for future growth

Headroom to grow

More Performance…	Enhanced TriCore™ v1.8, Up to 6 CPUs, up to 500 MHz **New!** AURIX™ Accelerator Suite
More Memory…	Upto 25 MB on chip-flash
More Safety and Security	Security according to ISO21434, ISO26262-2018 compliance for Safety to ASIL-D **New!** CSRM and CSS security modules
More Real time control…	**New!** eGTM timers, High Resolution PWMs **New!** Low latency interconnect (LLI) to PPU
More Connectivity…	**New!** 5 Gbps Ethernet, PCIe ,10 Mbit T1S Base Ethernet and CAN-XL **New!** Data Routing Engine accelerator
More Freedom from interference	**New!** TriCore™ v1.8 with upto 8 Virtual Machines per Core and Hypervisor

But a car is still a car. It must be robust, reliable, available, safe and secure, this is what Infineon calls dependability

Robust	Reliable	Available	Safe	Secure

AURIX™ history

- AURIX™ TC3x is ultimate benchmark in robustness
- Trusted automotive partner with Long-term commitment
- Holistic architecture based on deep application know-how

AURIX™ safety features

- AURIX™ TC4x safety concept built on proven AURIX™ TC3xx
- Strong feature reuse from TC3xx
- New features are optimised for enhanced safety

Infineon Automotive Dependability

AURIX™ implements industry standards

- New cybersecurity modules meet the new ISO 21434 standard
- Safety up to ASIL-D according ISO26262-2018 Standard

High Performance with AI

Upgraded TriCore™

New TriCore™ v1.8

Up to 500 MHz

60% more ASIL-D performance

AURIX™ Accelerator Suite

Parallel Processing Unit: PPU
Up to **78 times** more performance[1]

Data Routing Engine: DRE
Up to **50% more** performance[1]

Signal Processing Unit: SPU
Up to **4 times** more performance[2]

CSRM / CSS
Up to **8 times** more performance[2]

TriCore™ and **AURIX™ Accelerator Suite** combine to deliver a major performance upgrade of up to 3 times vs. AURIX™ TC3xx

Whilst maintaining safe and secure real time performance

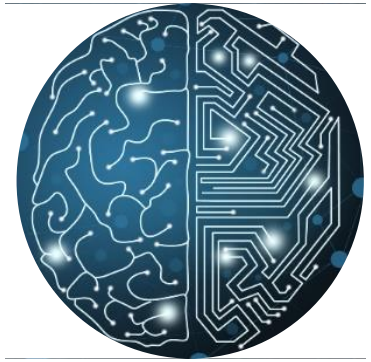
[1] vs. TriCore™ v1.8

[2] vs. AURIX™ TC3xx

Why are AI capabilities important?
New use cases for low-power AI are emerging

High Performance with AI

Artificial Intelligence & Neural Networks



Automotive AI Use Cases

Domain/Zone Control

- Modelling
- Model Predictive Control
- IDPS & other security methods

ADAS

- Object classification
- Advanced Radar Signal Processing
- Sensor Fusion

xEV Applications

- Predictive Control
- Virtual Sensing
- Advance State of Health (SoH) and State of Charge (SoC) algorithms

High Performance with AI

Parallel Processing Unit: PPU

SIMD Vector DSP for AI

PPU Compute Cluster

- Scalar Core
- SIMD Core
- L1 Memory
- System Components
  DMA, Shared Memory

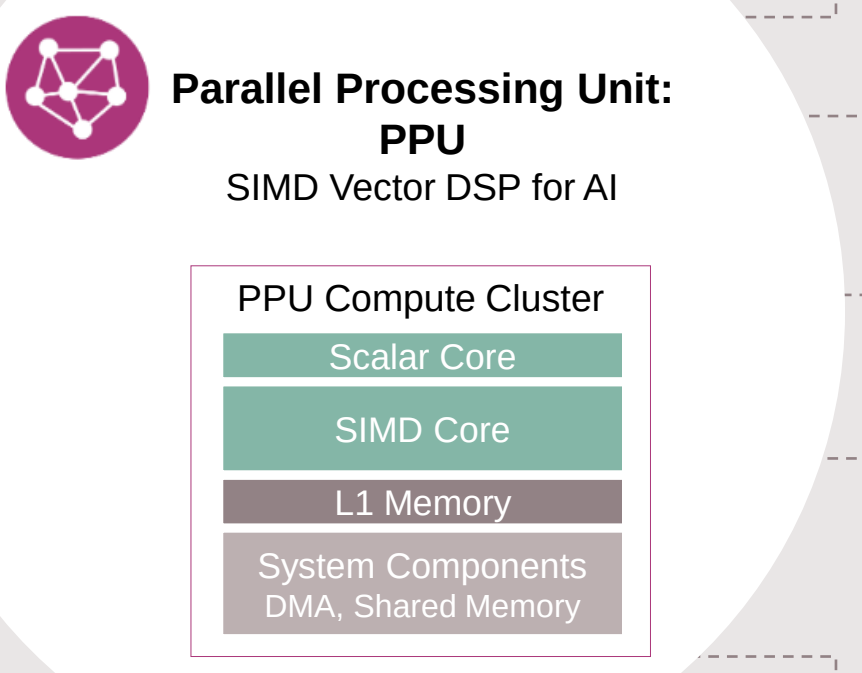
Dedicated resource for AI

...offering **affordable intelligence**

High Performance with AI

Parallel Processing Unit: PPU

SIMD Vector DSP for AI

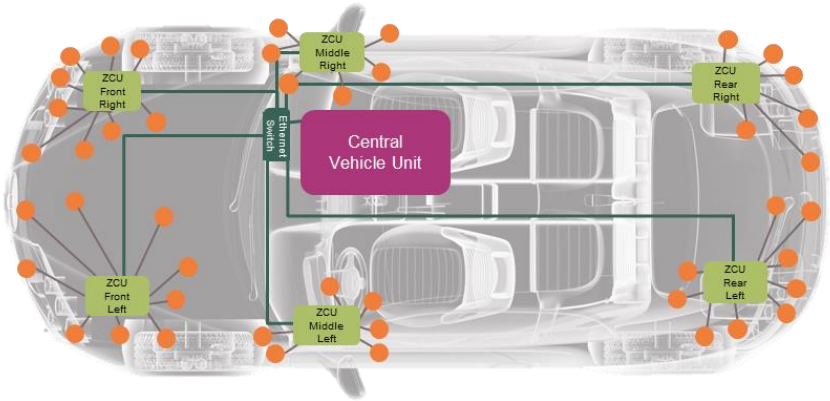


- SIMD vector DSP (VDSP)
- Optimize performance / cost for various neural network architectures
- Up to 78x more performance vs TriCore™ v1.8 dependent on the algorithm
- AURIX™ TC4x offers scalable PPU portfolio
- Integrate more sophisticated functions per ECU

The E/E architecture will change and zone architectures will become more widely adopted

New E/E architecture

4 key requirements of zone control	AURIX™ offers…
Higher Performance and versatility	› Up to 6 new TriCore™ v1.8 › Up to 5 application specific accelerators to offload TriCore for optimal efficiency
Safety and Security	› Support of latest safety & security standards › Security cluster minimizes latency, maximize throughput and enables SOTA
Freedom of interference	› Hypervisor enables separation and isolation › TriCore™ v1.8 with Hypervisor Mode › Up to 8 Virtual Machines per TriCore™
Richer connectivity	› New high speed comms interfaces plus legacy automotive busses › Communications accelerator for fast processing and forwarding



Provide **hard realtime performance** for **safety critical SW** with safe isolation

Provide **cost effective** solution that still functions with **legacy sensors & actuators**

The future car has a hierarchical network and is always connected to cloud services

Fully connected

AURIX™ Accelerator Suite TC4xx DRE/CRE Routing accelerators

- Reduces SW processing load of data transmission
- Increases performance and throughput by up to 50% vs TriCore™ by reducing routing latency and jitter

TC4xx Ethernet MACs and Ethernet bridge

- Performance & redundancy for safety critical application in daisy chain & ring topologies

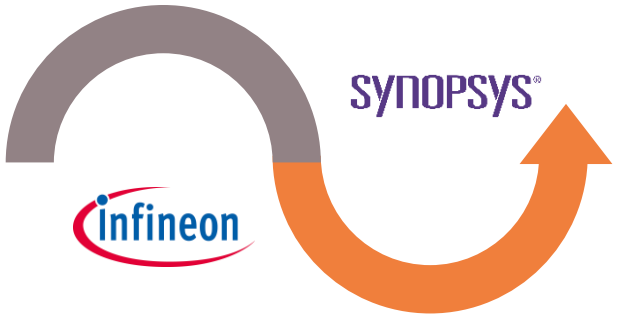
NEW! Scalable high speed communication interfaces

- 5 Gbps Ethernet and PCIe
- Support for new communication standards, 10 Mbit
- T1S Base Ethernet and CAN-XL

reduces communication load on CPUs and enables safety critical real time communication

The infrastructure is in place to get started with AURIX™ TC4x using either simulation

Fast Time to Market



Synopsys offers an AURIX™ TC4x Virtual Prototype **(VP)** in the **Synopsys Virtualizer Development Kit**

Start development independent of HW availability

Address new automotive use cases in AI and xEV and improve SW quality

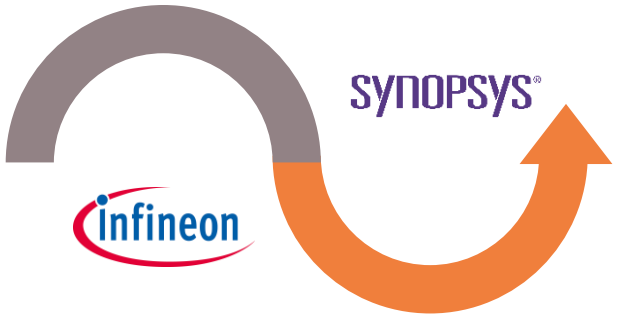
Developed in co-operation with software & tool partners, consists of several independent interoperable packages, including the PPU toolchain

Enables ease of use and fast TTM

Or using first silicon, with the MetaWare for AURIX™ Development kit

Fast Time to Market

The **Synopsys** **ARC MetaWare Toolkit for AURIX™ TC4x** SDK enables those wishing to start development with AURIX™ TC4x silicon



Basic SW Ecosystem
- Auto code generation via model based design and auto vectorization
- Compiler supporting C/C++ & OpenCL and debugger
- Simulation tools for easy application & kernel development

xNN SDK for AI flow
- Tool automates & optimizes mapping of neural network models
- Reduce computation, memory and bandwidth requirements

HW Optimized libraries
- PPU optimized vector library including BLAS/LAPACK
- Basic linear algebra subprograms
- Linear algebra package

The AURIX™ TC4x will meet these future needs and more…. providing a major upgrade path for Tier 1's and OEMs

Whilst ensuring **dependability**

- **Headroom to grow**
- **High Performance with AI**
- **New E/E architecture**
- **Fully connected**
- **Fast Time to Market**

AURIX™ TC4x is sampling now to lead customers

The Synopsys Virtualizer Development Kit and ARC MetaWare Toolkit for AURIX™ TC4x are available now

More partner offerings will be shared over 2022

Part of your life. Part of tomorrow.