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pls
Development Tools

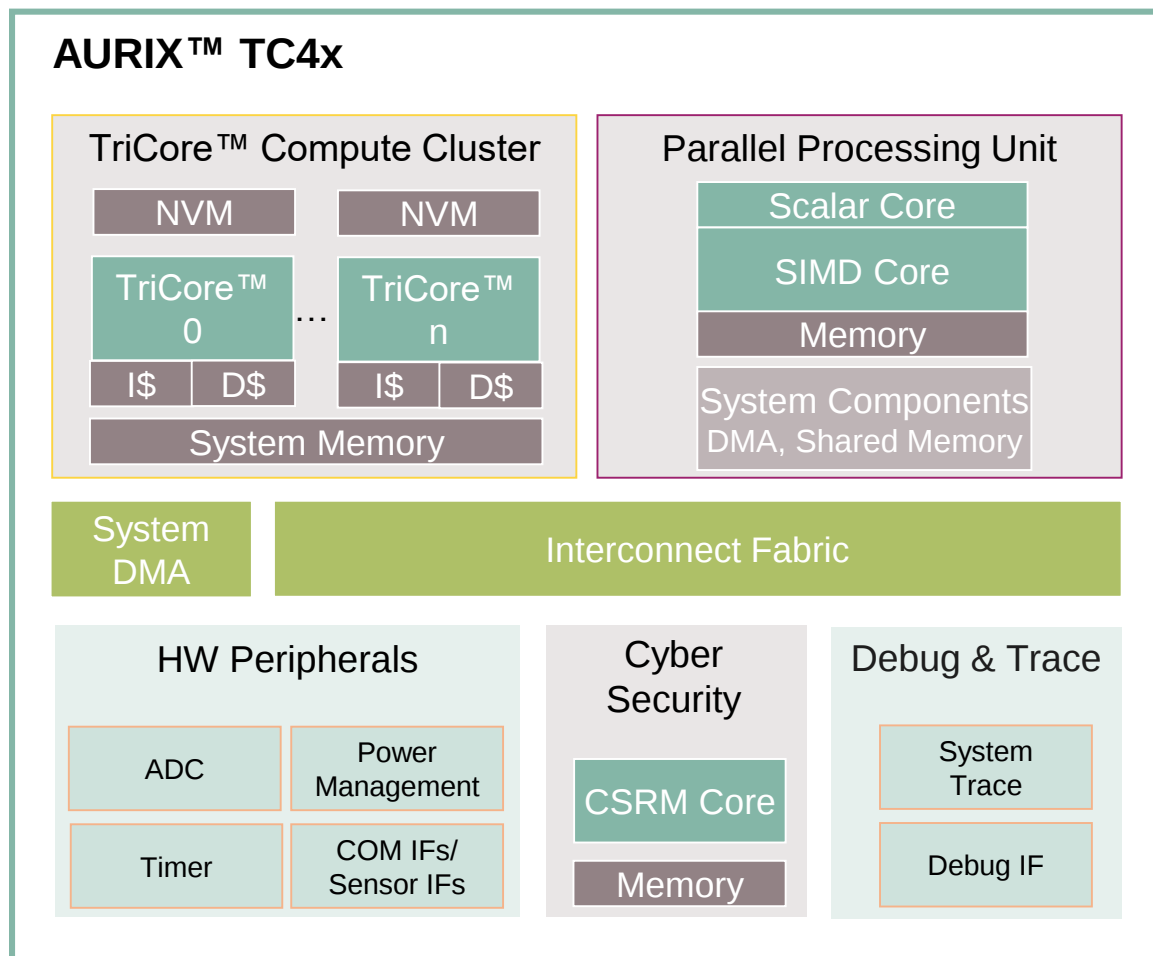
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The Magic of the PPU

Kajetan Nürnberger

 **infineon**

AURIX™ TC4x automotive microcontroller



- In automotive, the demand on processing power is constantly increasing
- AURIX™ TC4x fulfills these requirements by providing a heterogenous architecture
- PPU is an accelerator capable of execution the same operation on multiple data elements in parallel.
- Huge speed up can be achieved for linear algebra bases and neural network algorithms

Some example how much acceleration can be achieved by PPU

Algorithm	Performance improvement * PPU (cycles) vs. TriCore (cycles)
Kalman Filter State Vector Size: 24 Measurement vector Size: 12	> 8
Scalar Product Size: (1x128 * 128x1)	> 6
SGEMV v2 Size: (1x128 * 128x128 + 1x128)	> 9
DBSCAN (1000points)	> 15
Quadratic Peak Interpolation (1024points)	> 10

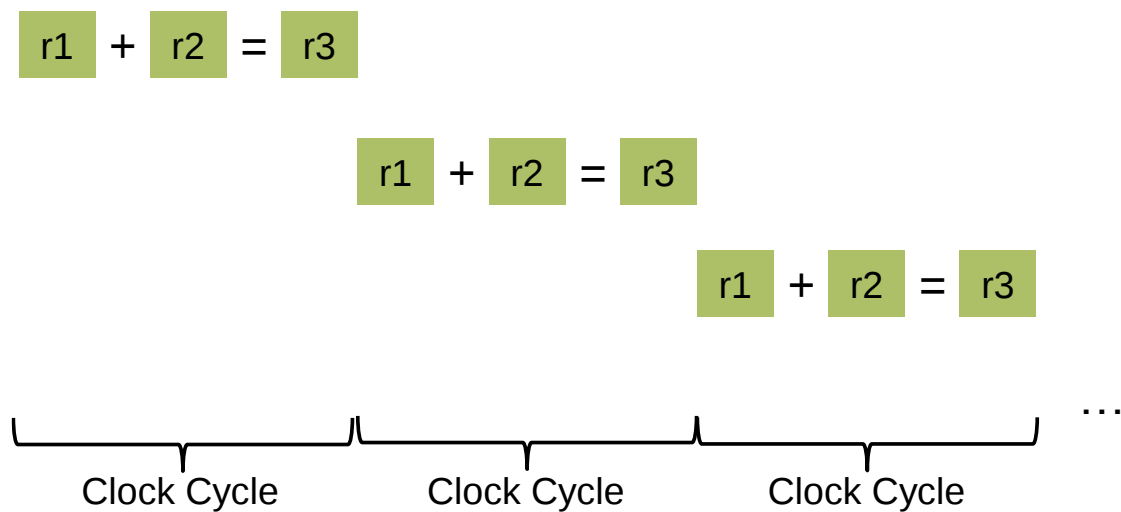
PPU can provide a huge speed up for the right algorithms

*: Exact speed up depends on PPU configuration and application context

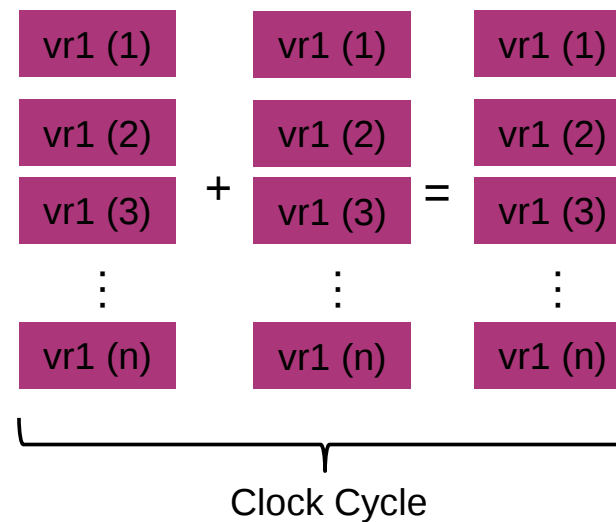
How does the acceleration of PPU work

```
for(int i = 0; i < 256; i++)
{
    Out[i] = In1[i] + In2[i];
}
```

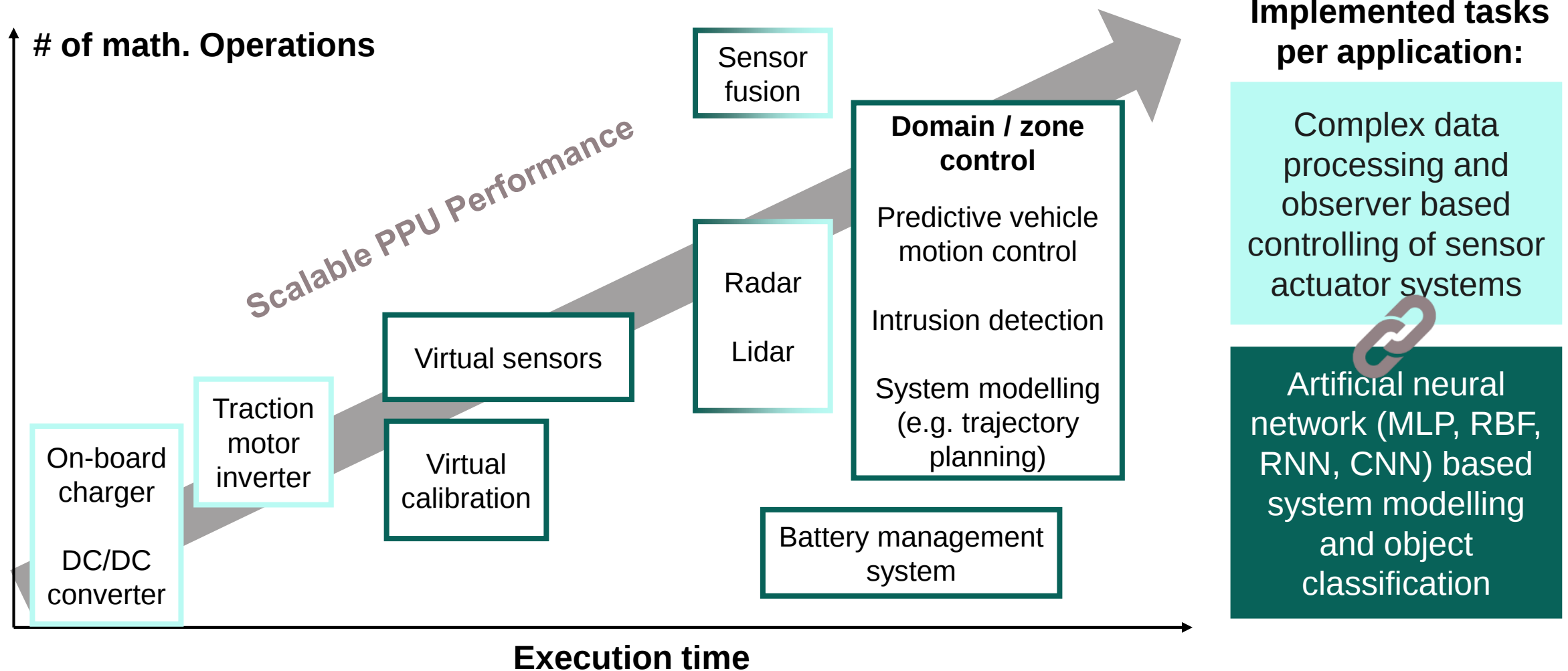
TriCore™



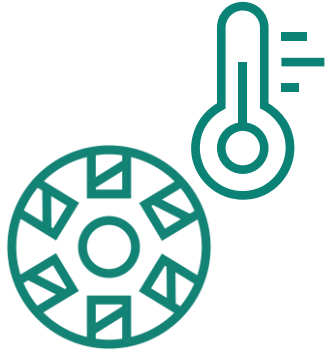
PPU



PPU is a flexible architecture to address applications with fast execution times and/or large data processing requirements



Examples for Automotive ECU AI Use-Cases



E-Motor rotor position observer
E-Motor temperature estimator



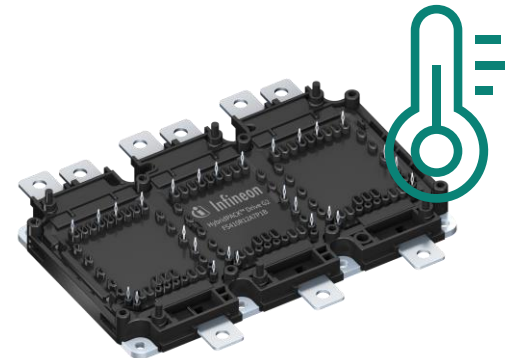
Gearbox predictive
maintenance



Enhanced Trajectory
Control

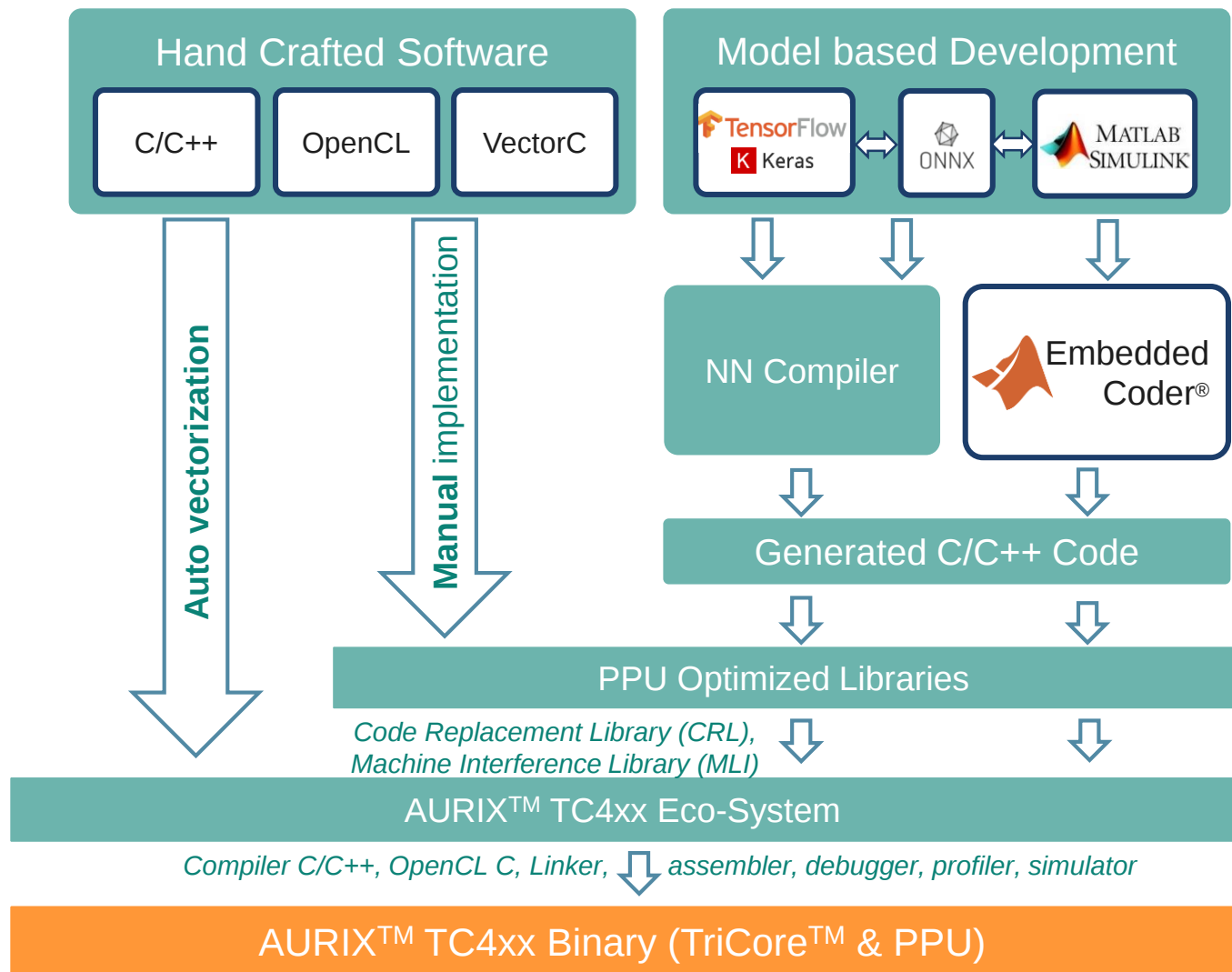


BMS Systems



Temperature estimation
of power modules

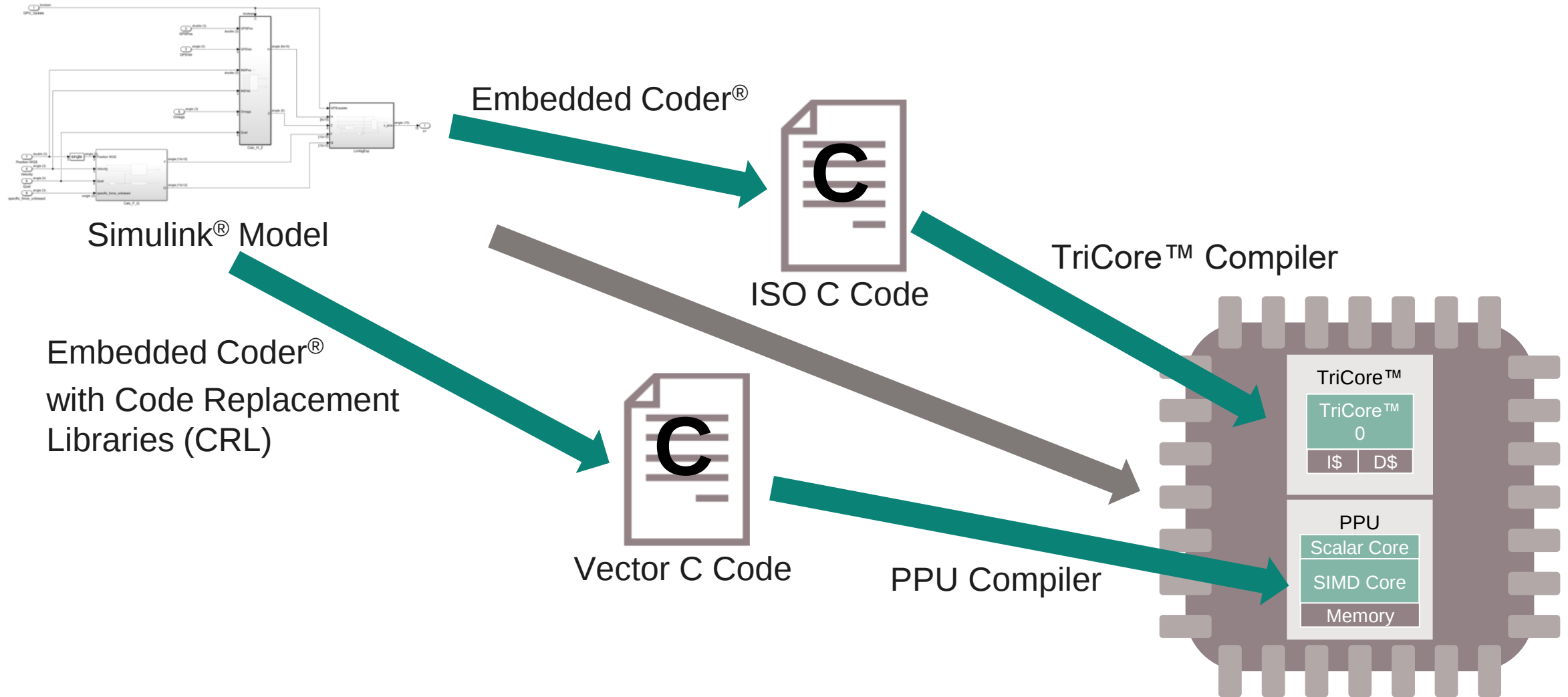
Model-based Development Support for AURIX™ TC4x



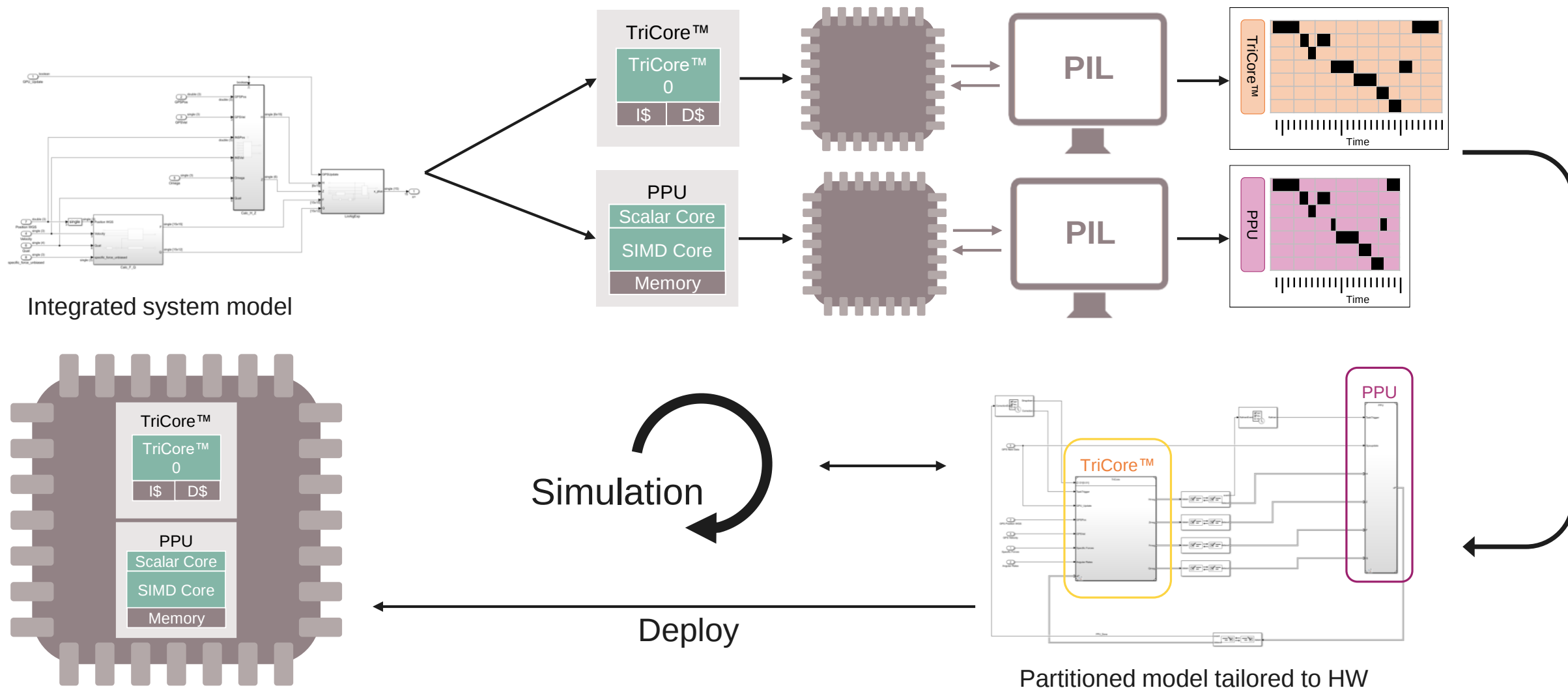
Development Workflow

- › Heterogenous compute architecture of AURIX™ TC4x is covered by a multi-core code generation using Embedded Coder®
- › Parallel programming model of PPU is supported by specific libraries
- › Embedded AI workflow is supported by the NN SDK from the MetaWare Toolkit for AURIX™ and Embedded Coder® workflow

Simulink® & Embedded Coder® enable a smooth transition between different computing architectures



Solving the computing resource allocation dilemma



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AURIX KNOWLEDGE LAB 2024

Any Questions?

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