

# RISC-V Autonomous Driving L4 hardware/software co-design

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**RADLER** is focused on the development of an open source, RISC-V based autonomous driving platform for L4 autonomous vehicles, with a permissive license.

## Goals and Objectives

1

A functional prototype of the high performance RISC-V based platform on an FPGA. The platform will contain:

- a multicore high performance general purpose application core enhanced with real-time and AI acceleration capabilities
- a multithreaded, dual-lockstep safety core enhanced with real-time and AI acceleration capabilities
- a configurable RISC-V based general purpose GPU

2

A virtual platform of the designed architecture will be developed, to facilitate software development and design space exploration before the RTL (register transfer level) hardware design is ready.

3

A certifiable software stack according to ISO 26262. This includes the use of the GPU from a bare-metal and a qualifiable real-time operating system and a qualifiable GPU compiler and software stack.



## Hardware/software co-designed platform

### Functional Safety processors

High performance dual thread VeeR EH2 core

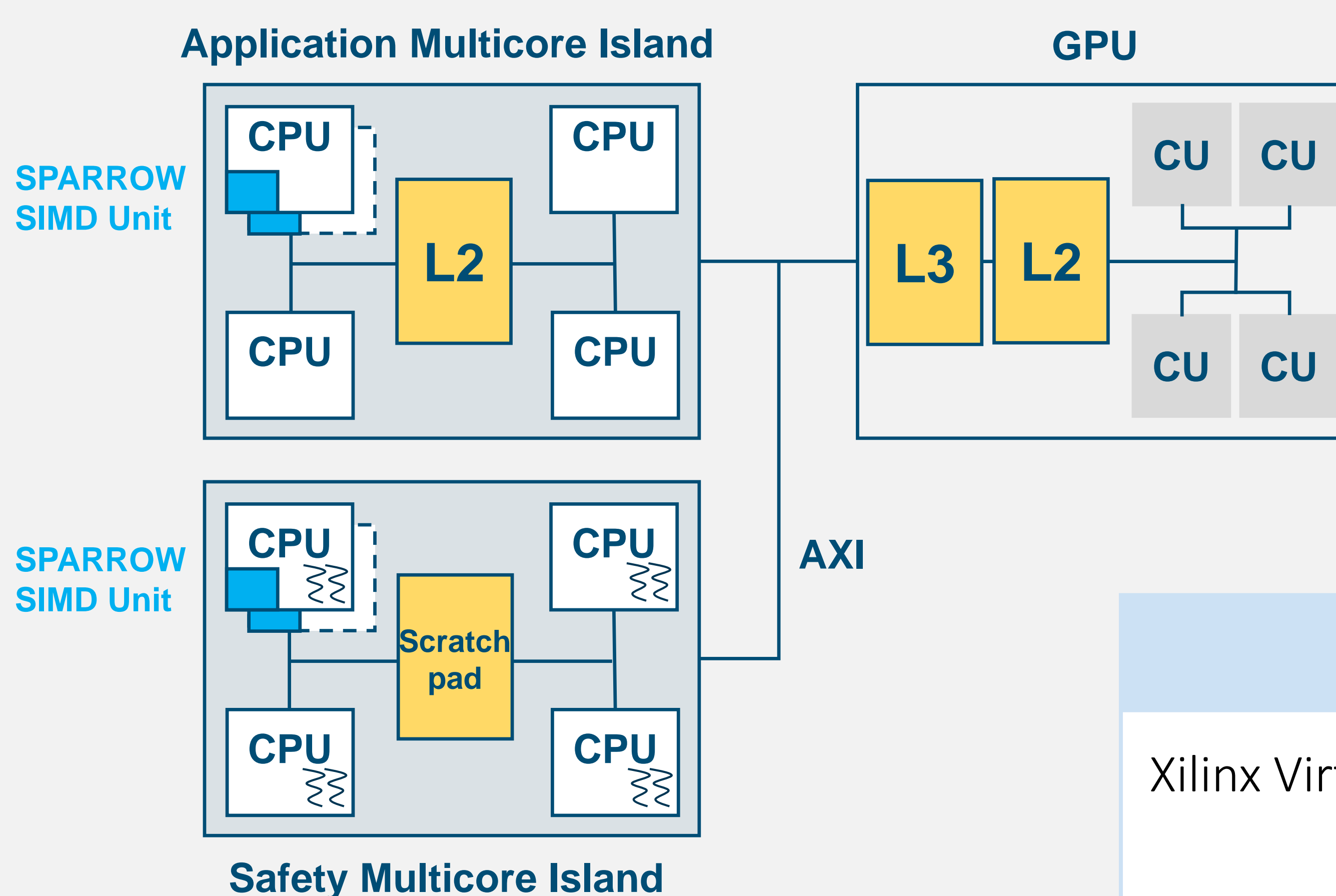
- both scratchpads and caches
- ECC protection
- dual-lockstep functionality
- Modifications to support probabilistic measurement-based timing analysis (MBPTA) for worst case execution time estimation (pWCET)
- Time-predictable branch prediction
- integration with the SPARROW AI accelerator



### Application Processors

Multicore using BSC's Sargantana RISC-V Application Core

- MBPTA support
- integration with the BSC SPARROW AI accelerator



### Virtual platform

A virtual simulation platform based on QEMU will be developed, which will enable software development before the FPGA prototype is ready.

### FPGA prototype

Xilinx Virtex UltraScale+ VCU 128 to be used.

### Integration of the Application and Functional Processors with the RISC-V Vortex GPU

Support for safety critical APIs

### Qualifiable software stack

To support RTEMS operating system and other qualifiable real-time operating systems like the AUTOSAR-compliant Trampoline OS.

