METASAT
High Performance On-board Processing and TASTE

Project Coordinator:
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METASAT will provide a holistic and modular model-based framework to design and test software modules that target open architecture hardware, high-performance computing platforms for the space and aviation domain.

OUR CONSORTIUM

Barcelona Supercomputing Center — Centro Nacional de Supercomputación (BSC)

fentISS

Collins Aerospace

ikerlan — MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE
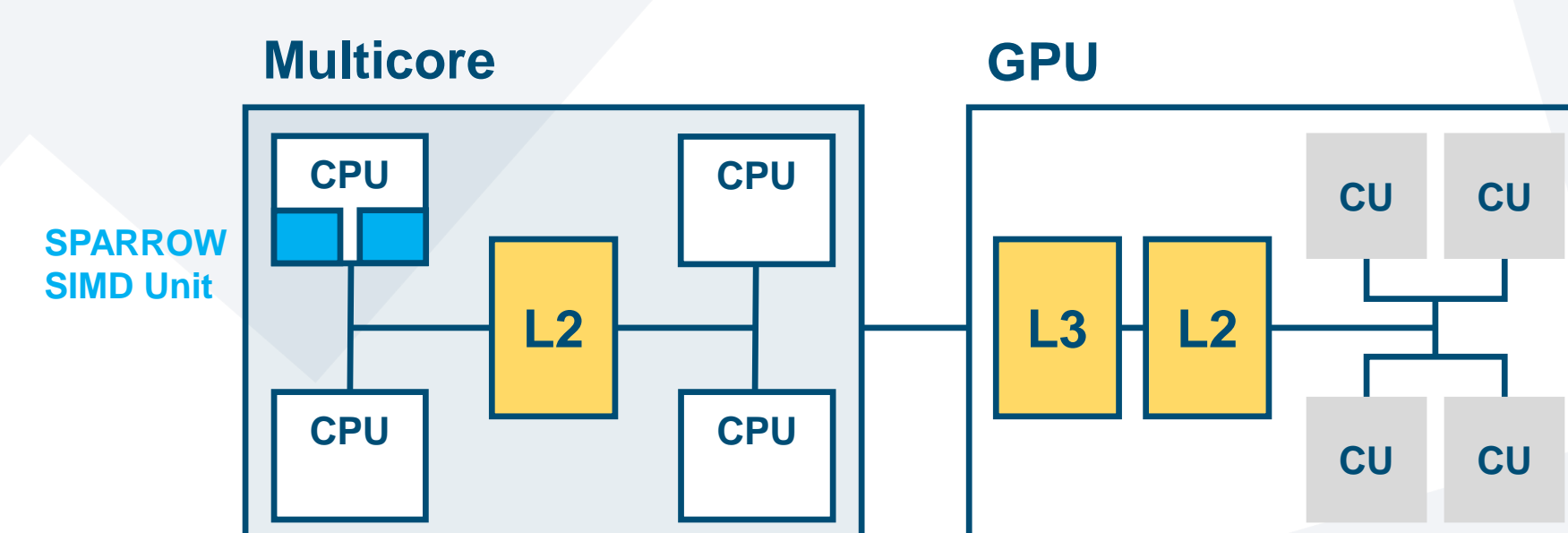
OHB

The need

To find a solution to manage the growing hardware and software complexity of new satellite designs using reliable on-board software technology, through a combination of model-based design and a qualifiable software stack for mixed criticality.
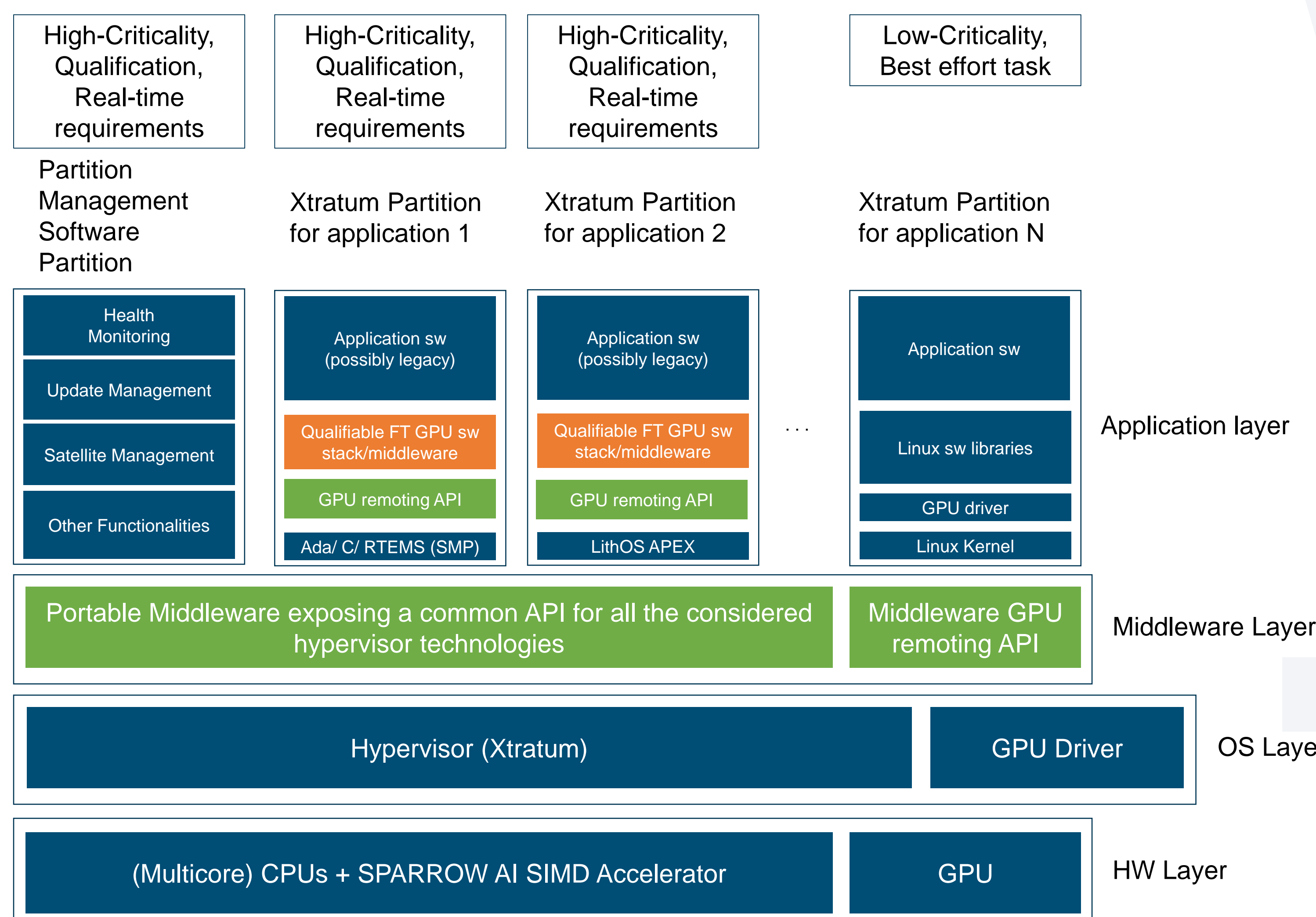
Ambition

- Open hardware, high-performance platforms including multicores, GPU and AI accelerators
- Open source model-based software stack: TASTE
- Strong focus on standards to enable interoperability
- Virtualisation: Hypervisor
- Digital twin: Virtual platform based on QEMU and Verilator
- AI-based design and testing
- On-board AI for FDIR

Vision

High-performance multicore platform based on FrontGrade Gaislers's next generation space processor based on RISC-V, NOEL-V, extended with the SPARROW SIMD AI accelerator and coupled with an open source, RISC-V based GPU, Vortex. It will be open source and implemented on an FPGA, and capable of mixed-criticality workloads, using the Xtratum hypervisor.

Multicore
GPU
SPARROW SIMD Unit
CPU CPU L2 CPU CPU
L3 L2 CU CU CU CU

taste

Embedded With RTEMS — www.rtems.org

High-Criticality, Qualification, Real-time requirements	High-Criticality, Qualification, Real-time requirements	High-Criticality, Qualification, Real-time requirements	Low-Criticality, Best effort task
Partition Management Software Partition	Xtratum Partition for application 1	Xtratum Partition for application 2	Xtratum Partition for application N
Health Monitoring / Update Management / Satellite Management / Other Functionalities	Application sw (possibly legacy) / Qualifiable FT GPU sw stack/middleware / GPU remoting API / Ada/ C/ RTEMS (SMP)	Application sw (possibly legacy) / Qualifiable FT GPU sw stack/middleware / GPU remoting API / LithOS APEX	Application sw / Linux sw libraries / GPU driver / Linux Kernel

Application layer

Portable Middleware exposing a common API for all the considered hypervisor technologies	Middleware GPU remoting API

Middleware Layer

Hypervisor (Xtratum)	GPU Driver

OS Layer

(Multicore) CPUs + SPARROW AI SIMD Accelerator	GPU

HW Layer

FRONTGRADE Gaisler

RISC-V

KHRONOS GROUP — SC

QEMU

VERILATOR

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