

GPU@SAT

GPU@SAT is the innovative IngeniArs' IP-Core solution that brings **Artificial Intelligence, Computer Vision** and **High-Performance Computing** algorithms directly **onboard satellites**. It is designed to be integrated on both commercial and Space Qualified FPGAs/ASICs, **supporting also Class 1 High Reliability Missions**.

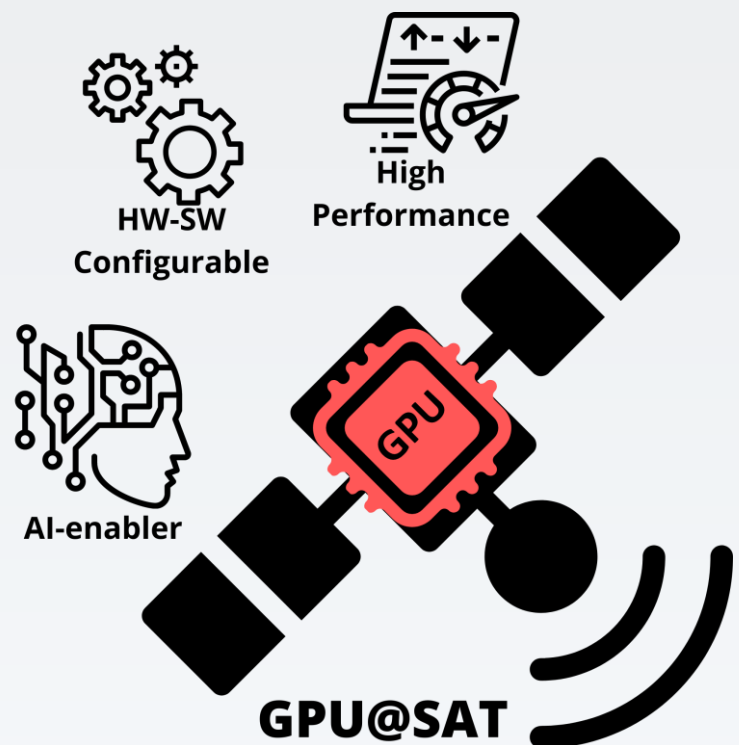
No weight, no space: GPU@SAT design can be directly integrated into the FPGAs already available on existing subsystems.

Key Features

- **Operation per Second (OPS)** scalable with the number of CUs
 - Support for FPU
 - Up to 220 MHz clock
- **Hardware board independent**
 - No additional units required
 - Embarked in existing FPGAs
 - FPGA Technology independent
- **Framework for applications development**
 - Skeleton for developing applications
 - App Zoo
 - Support for different high level programming languages
- **Modular compiler based on LLVM**

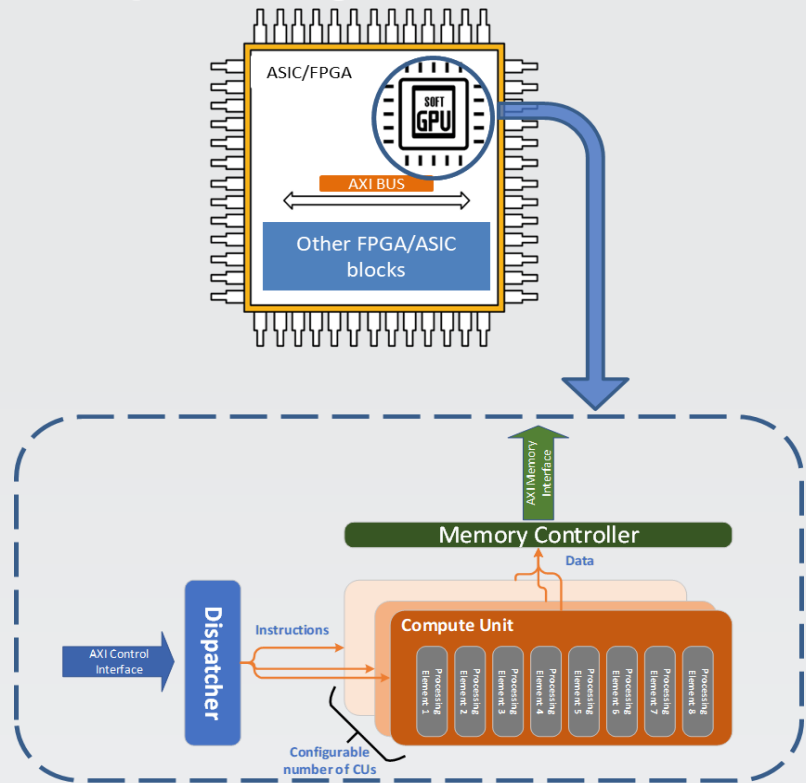
The right power at the right time: the flexible design of the GPU@SAT allows to configure the number of Compute Units (CU) with respect to the complexity of the application. The IP-Core can be easily integrated with further ad-hoc FPGA processing blocks to enhance the end-to-end data processing chain.

Standard Connections, easy Connections: GPU@SAT design is conceived to communicate with other IP-Cores inside the same FPGA by exploiting the standard AXI bus, reducing the development effort of the interfaces.

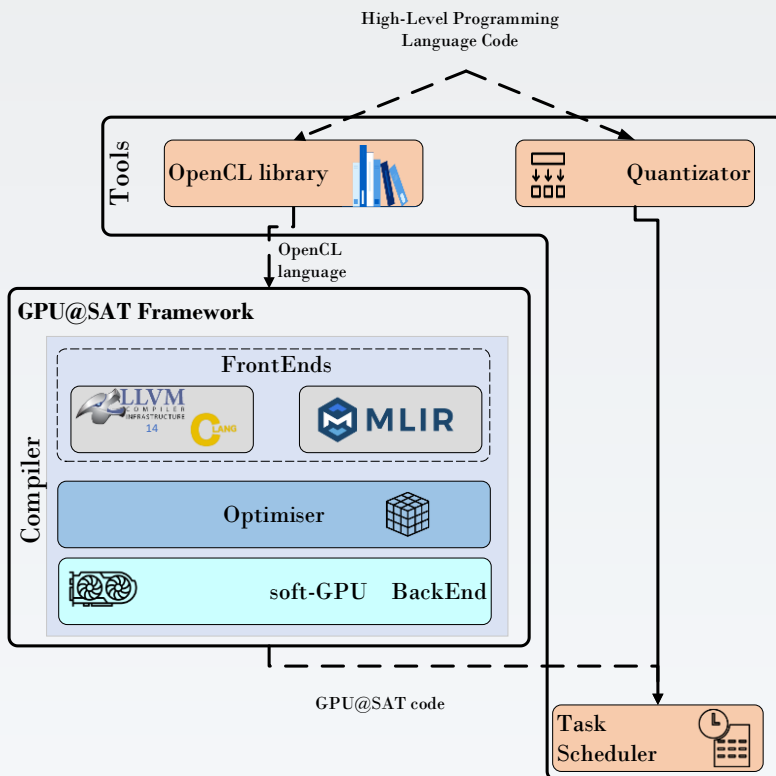


GPU@SAT Hardware features

- **GPU@SAT has been implemented in several Rad-Hard FPGA devices.**
 - Xilinx KU060, Microchip MPF500T, and Microchip RTG4
- **FPU support directly onboard satellite**
 - The FPU can be enabled or disabled with respect to the application/requirement or accuracy and the available space on the host FPGA
- **Reprogrammable HW**
 - GPU@SAT can be programmed via OpenCL kernel
- **Power consumption Bounded to the power of the host FPGA, requiring only (at most) 5W for GPU@SAT**



GPU@SAT Software features



To support the development of applications, a complete framework for the GPU@SAT has been developed.

- The compiler is based on LLVM 14
 - Support for **multiple FrontEnd** (OpenCL, C++)
 - Support for **TensorFlow** (porting service by IngeniArs)
 - **Dedicated Optimiser and BackEnd**
- **Task scheduler for organizing the operations**
 - HW schedule via Finite State Machine (on demand)
 - SW schedule via external processor
- **Example and skeleton for new applications**
- **AI@SAT**
 - The application zoo dedicated to GPU@SAT IP-Core