Xilinx Open Hardware 2021 design contest

Project name:
FGPU: An Configurable Soft-Core SIMT Accelerator

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Introduction:

A more detailed description of the FGPU architecture, presented in Figure 1, can be found in [1]. The FGPU is an open-source 32-bit multi-core GPU-like processor based on the Single Instruction Multiple Thread (SIMT) execution model. It does not replicate, even partly, any other existing GPU architecture. Even more, the FGPU has its own instruction set architecture, which is composed of 49 MIPS-like instructions inspired by the OpenCL execution model. The translation from a high-level OpenCL code is performed by deploying the dedicated LLVM-based compiler. Another significant feature is that FGPU supports floating-point operations. Up to 8 Compute Units (CUs) can be accommodated, each consisting of 8 processing elements (PEs). A single computing unit can run up to 512 work items (threads). Each work item owns a private memory of 32 registers that can be extended using scratchpad memories. Additionally, an off-chip memory limited to 4 GB can be accessed by any working item. The FGPU includes a direct-mapped, multi-ported, and write-back cache

system that can simultaneously serve multiple read/write requests. Finally, the FGPU is interfaced and controlled over the AXI4-lite bus.