FPGA Design

Part V - Soft Core Processors

Thomas Lenzi
Objective

- In this presentation we will learn how to create a microprocessor on the FPGA and how to code in C/ C++ for them.
Microblaze
Processors on VHDL

- Using the flexibility of the FPGA, it is possible to implement a full microprocessor on it.
- Xilinx provides its own implementation of an ARM processor called the Microblaze.
Microblaze architecture

Figure 1: MicroBlaze Processor Block Diagram
Create a Microblaze
Xilinx Platform Studio

- GUI that allows you to build your processor using IPs.
Processor schematic

Available IP

Installed IPs and interconnectivity
Custom IPs

• You can create your own IPs that will connect to the Microblaze. The IPs are written in VHDL and can be accessed through software.

• The CPU uses memory mapping to access various IPs. Each IP is allocated a given range of “memory” which it can use.

• In software, the user simply has to read/write to a given address using pointers and the communication with the module takes place.
Xilinx SDK
Xilinx SDK

- Xilinx SDK handles the software running on the Microblaze.
- It allows us to write C/C++ code that will be compiled and executed by the Microblaze.
Eclipse editor
Abstraction layers

• The software is decomposed in layers:

  • The Hardware Platform describes what the Microblaze is made of (components, memory, …).

  • The Board Support Package is a HAL (Hardware Abstraction Layer) which contains drivers for the hardware.

  • The Application can make use of the BSP to call given parts of the Microblaze.