Pontificia Universidad Católica de Chile
Escuela de Ingeniería
Departamento de Ingeniería Eléctrica
IEE2463 Sistema electrónicos programables

Laboratory 10

ZYBO-Z7 UART Communication and Multiprocessors Handling

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1. Laboratory Goals

The goals of this laboratory are:

- To understand how to configure the UART1 module within the PS.
- To understand how to connect one Microblaze with the PS through General Purspose AXI port.
- To learn hot to handle a Microblaze and a Cortex A9 in a same application project in Vitis.

2. Previous Requirements

These requirements are mandatory to perform the laboratory. Not accomplishing them count as missing the laboratory.

- You must have previously installed vitis/vivado version 2020.1.
- You must read the ZYbo Z7 Board Reference.
- You must understand the design flow between vitis and vivado to program a microprocessor.

Note: **Version of the software 2020.1 is mandatory**. This is important to avoid compatibility problems.

3. Laboratory Activities

Create a new project in **Vivado** and:

- Create a block design with a ZYNQ Module and configure it only with the required features.
- Enable the UART1 of ZYNQ.

Export the hardware and launch Vitis (no bitstream is required in this step, only the XSA file)

- Study the provided code to initialize the UART. Understand the main functions of the library xuartps.h.
- Initialize the Vitis console and exchange date between the PC and the Cortex A9-0 through UART.

Come back to Vitis and modify the hardware as:

- Add a Microblaze processor. Suggeted configuration: No cache memory, 128kB of local memory and with Debug Module (mandatory for debugging).
- Enable a Slave General Purpose (GP) AXI port into the ZYNQ.
- Connect the Microblaze Master AXI port to a Slave General Purpose (GP) AXI port o the PS, which is the gate to access to the UART1 hardware.

Generate bitsteam, export hardware and launch Vitis again. IN Vitis:

- Create a new platform project with the new hardware.
- Update the application project to target the new hardware.
- Add a new application project that target the microblaze within the previously created application project. Now your application project contains 2 projects, one target the Cortex A9-0 and other that targets the Microblaze-0.
- Create a code for the Microblaze-0 that configure and initialize the UART1. (same code as used previously for the Cortex A9-0.
- Create dummy project into the Cortex A9-0. So, it does not try to access and configure the same UART1 hardware that Microblaze is accessing.
- Debug both processor simultaneously. Validate that now Microblaze is accessing the UART hardware and is communicating with the PC.

4. Complementary Homework

To fulfill this homework is mandatory, but not evaluated.

- Configure the UART to receive the data through interrupts.
- Create a code into the Cortex A9-0 to control buttons, switchs and LEDs. While the Microblaze communicate the PC through UART.