FPGA Design

Part V - Soft Core Processors

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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

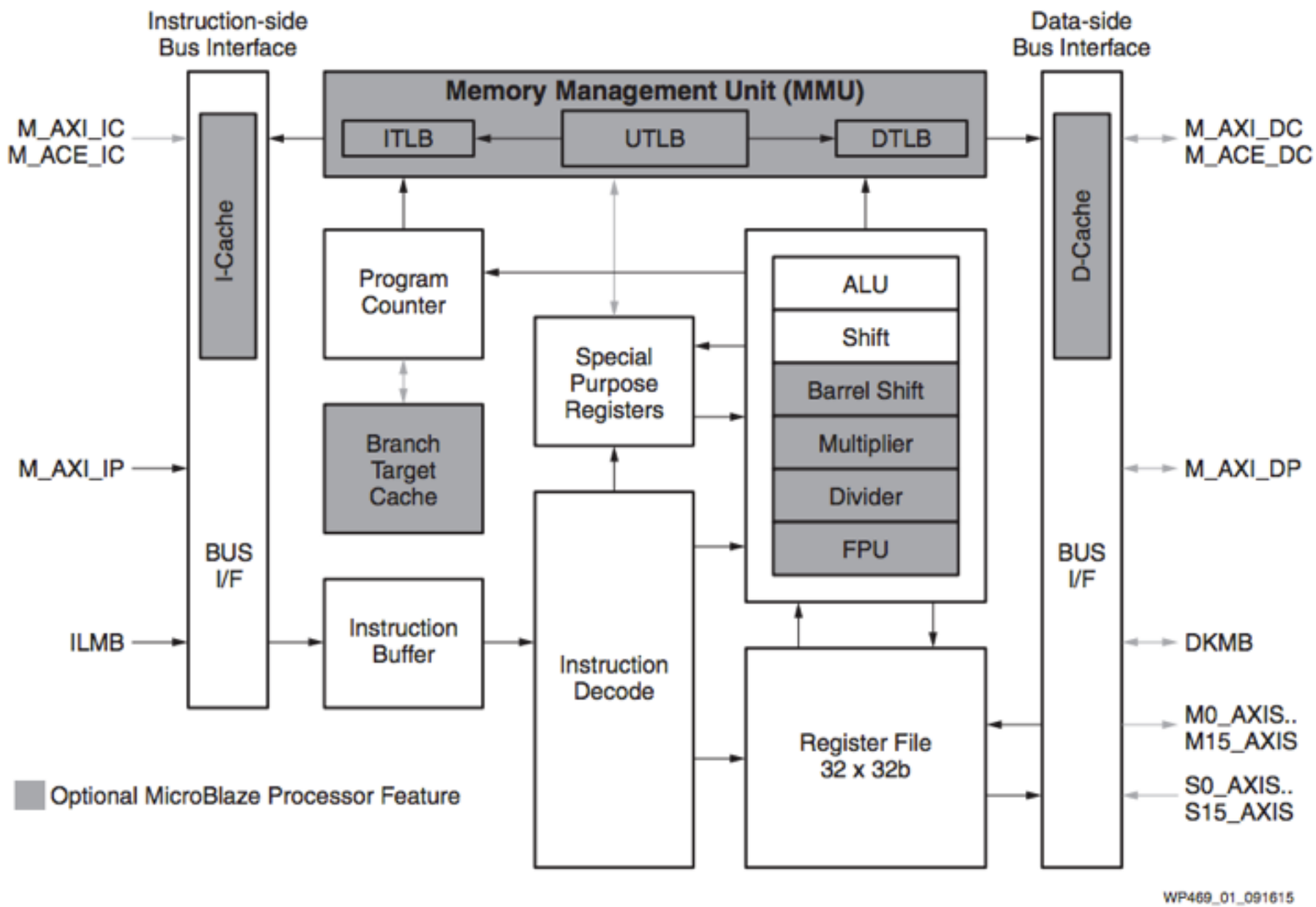
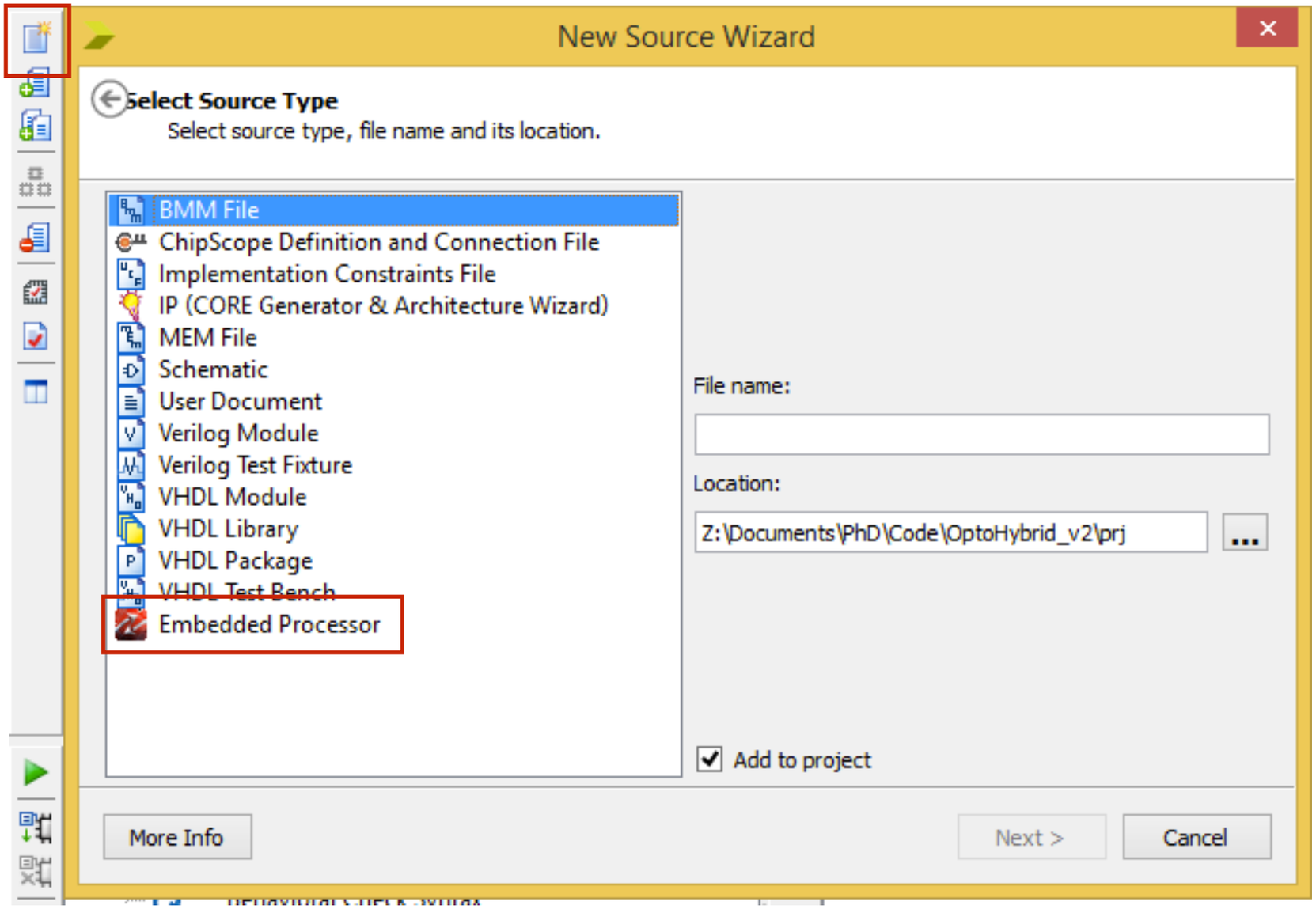
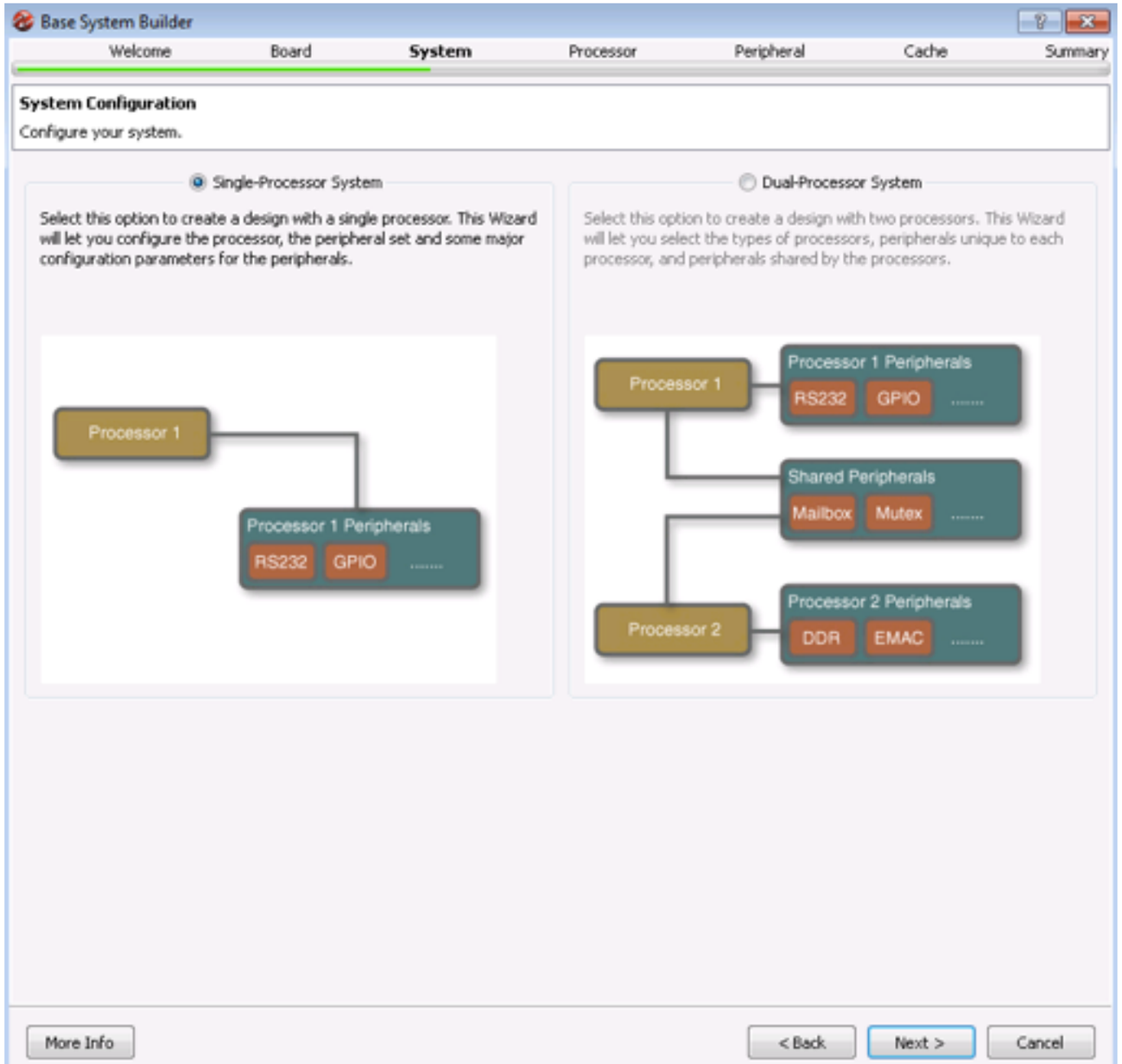


Figure 1: **MicroBlaze Processor Block Diagram**

Create a Microblaze

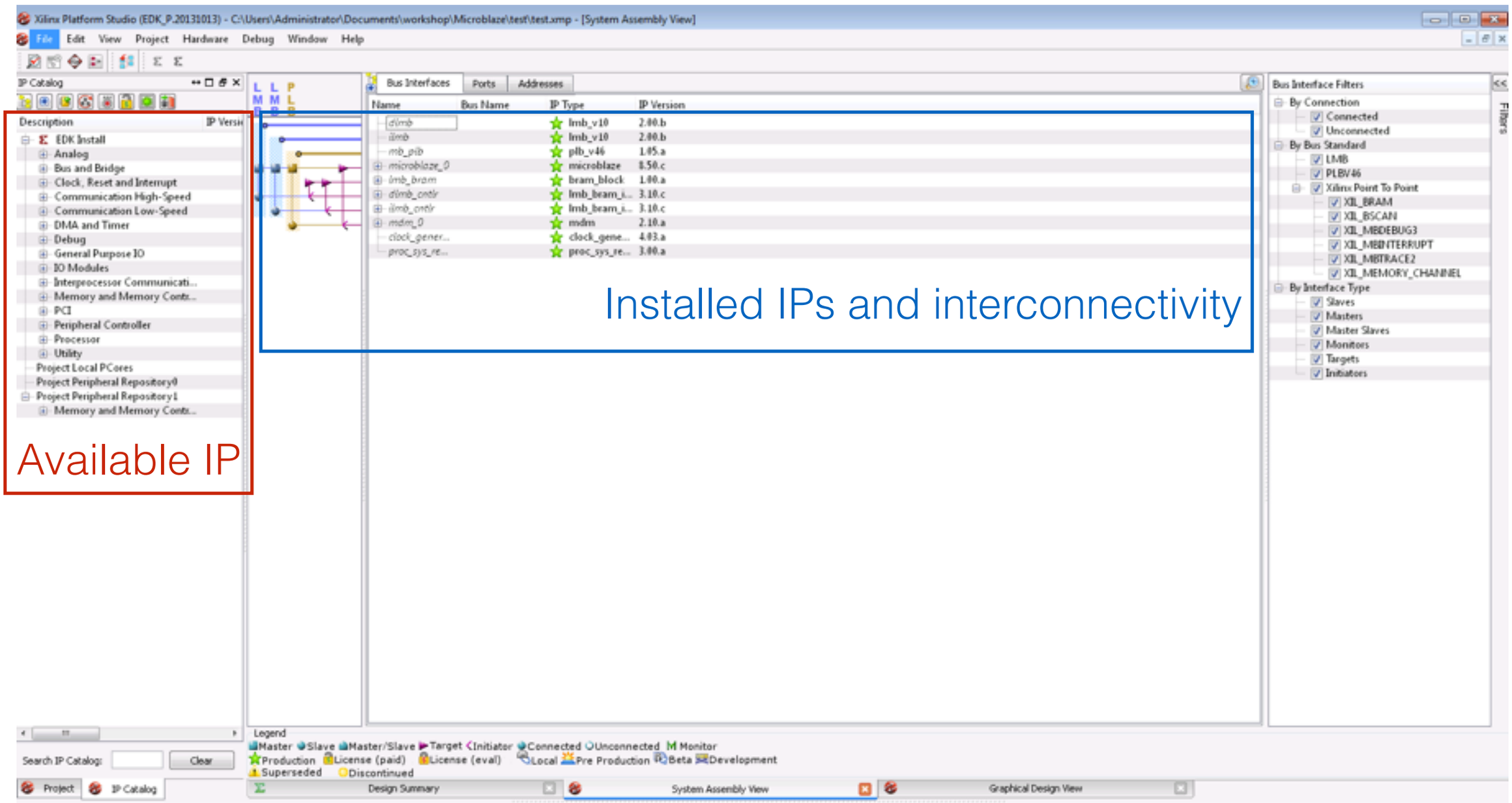


Xilinx Platform Studio



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

Processor schematic



Custom IPs

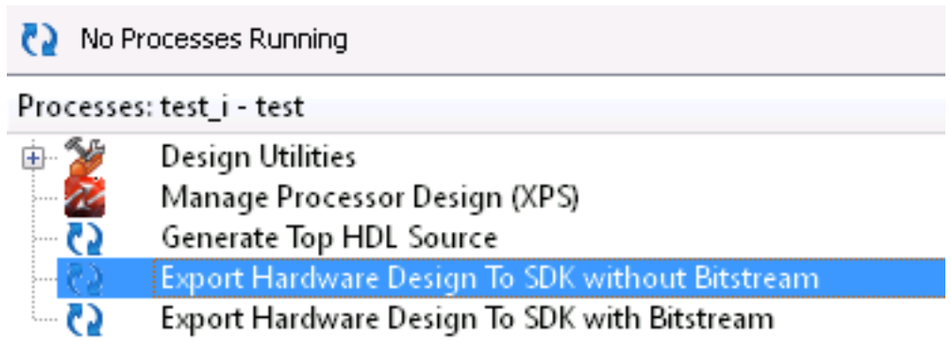
- You can create your own IPs that will connect to the Microblaze. The IPs are written in VHDL and can be accessed through software.

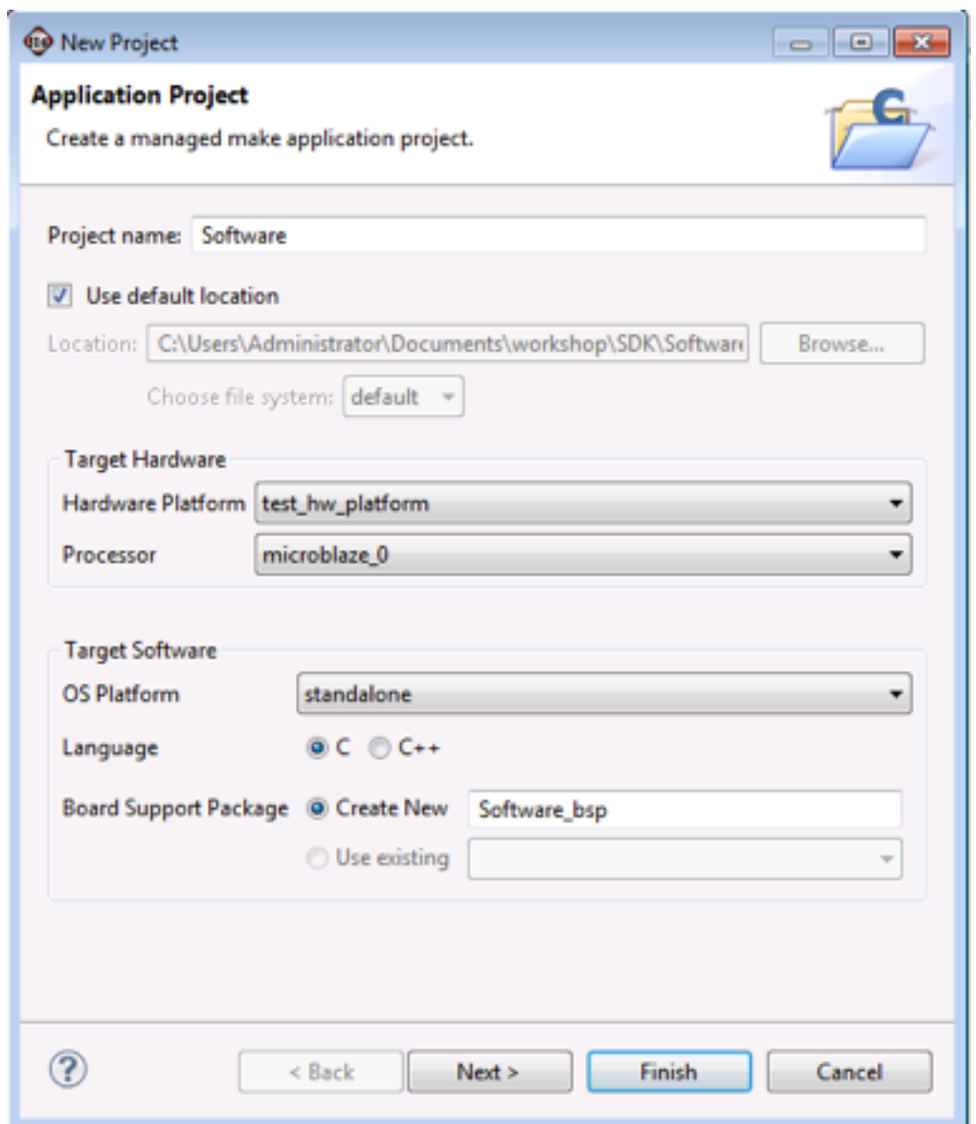
- The CPU uses memory mapping to access various IPs. Each IP is allocated a given range of “memory” which it can use.

- 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

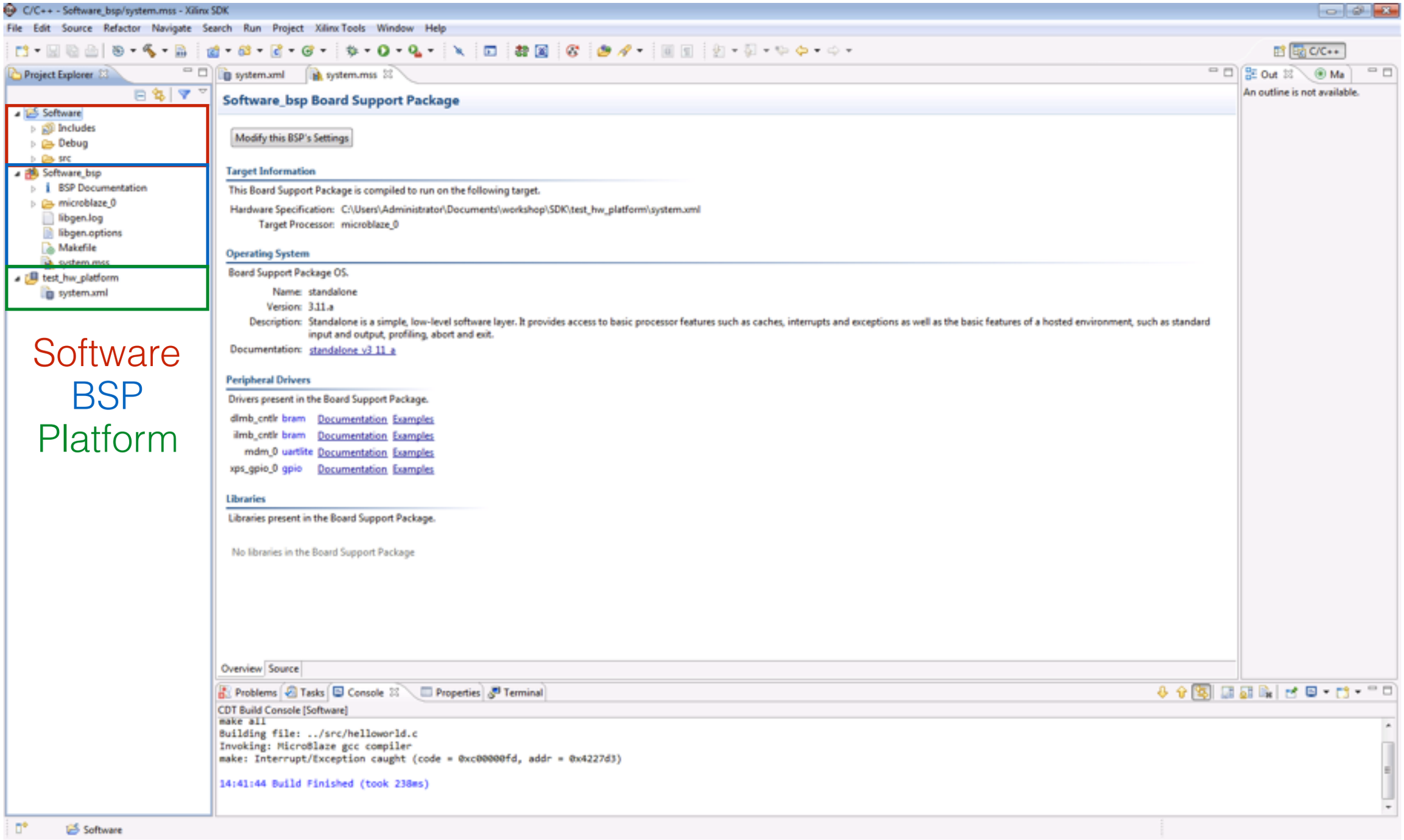
Xilinx SDK



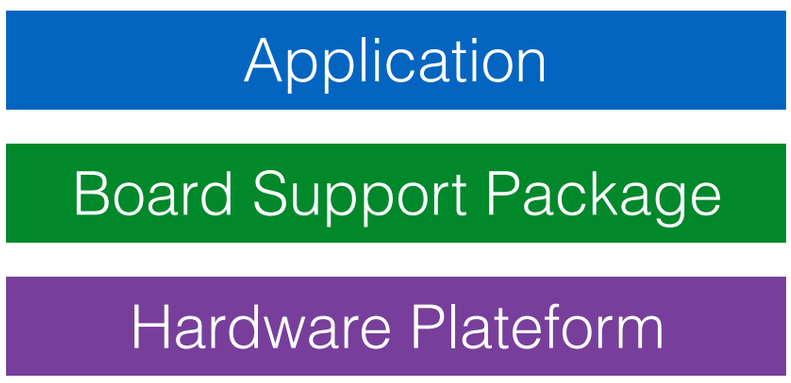


- Xilinx SDK handles the software running on the Microblaze.
- It allows us to write C/C++ code that will be compiled and executed by the Microblaze.

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.