

Introduction

KEK IPNS E-sys
Ryotaro Honda, Yun-Tsung Lai

3 days of intensive lecture

- 1st ~ 2nd day: Lecture at classroom + 3 examples
- 3rd day: For those who can solve the rest of examples, they can work on the development tasks.

The lecture might not be able to be finished on the 2nd day, so we will continue on the 3rd day.

For those who want to get the credits

- Judged by attendance status, attitude, and performance of the 3 examples
- At least 1 of the 3 examples needs to be solved to get the credit

Please complete the questionnaire after this course.

It is the first attempt for FPGA intermediate seminar for experimental physics.

We are worried about the definition of “intermediate-level” without experience.

We would like to make it with appropriate difficulty, so please cooperate with us.

FPGA is a tool for digital signal processing.

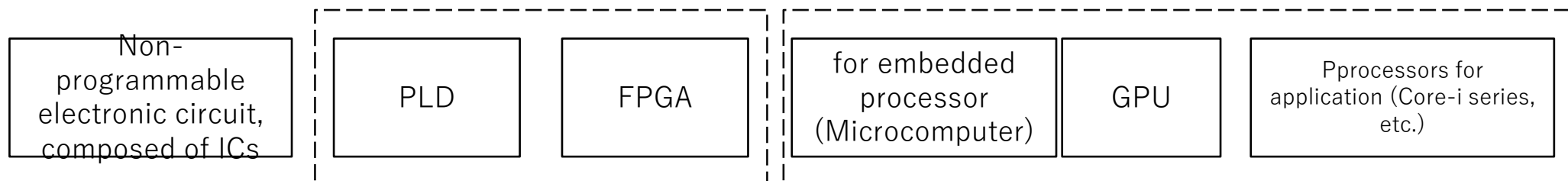
Even if FPGA is the most suitable tool, it doesn't mean we can implement dream-like algorithms.

Operations to be implemented (signal processing):

These are widely defined as digital operations

- Writing control register to ADC IC
- Using TDC to measure detector signal with an accuracy of 500 ps.
- Baseline correction of waveform from a waveform digitizer
- Numerical calculation of charged particles' motion in a magnetic field

Computing device

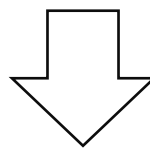


What can FPGA do?

Implementing complex numerical algorithms?

Full use of high-level synthesis to create FW just like software?

Recently popular machine learning with FPGA?



Understanding the FPGA's structure and being able to implement the necessary functions using the most suitable components

FPGA can do => **Xilinx FPGA can do**

Logically correct firmware => **Actually working firmware**

The way to implement processing in FPGA

Basic knowledge of electronic engineering ⇒ Self-learning with textbooks

Ideas of implementing operations ⇒ Reading the papers

Understanding the device (FPGA) for implementation ⇒ **This course + self-learning**

Lots of documentation for Xilinx FPGAs

(user guide, application note, product guide, white paper)

Even the content this time is extracted from about 1500 pages of documents.

To become a FPGA expert, you have to read over 3000 pages of documentation.

Xilinx documentation is too difficult for beginners.

In addition, the attendee are not electronics experts.

This training course will help you to enhance your understanding of Xilinx FPGAs.

The goal is to make you be able to read Xilinx documents after this course.