CYGNO
Photomultiplier DAQ development

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Dec 15, 2021

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Agenda

- The basic features of the DAQ Module;
- Brief presentation of the initial scope for the electronic board and what we have changed;
- The new and current project;
- Development kit;
- Embedded Linux and the other needs for using the ARM processor;
- Computer visualization of the acquired data;
- Current DAQ Module development overview.

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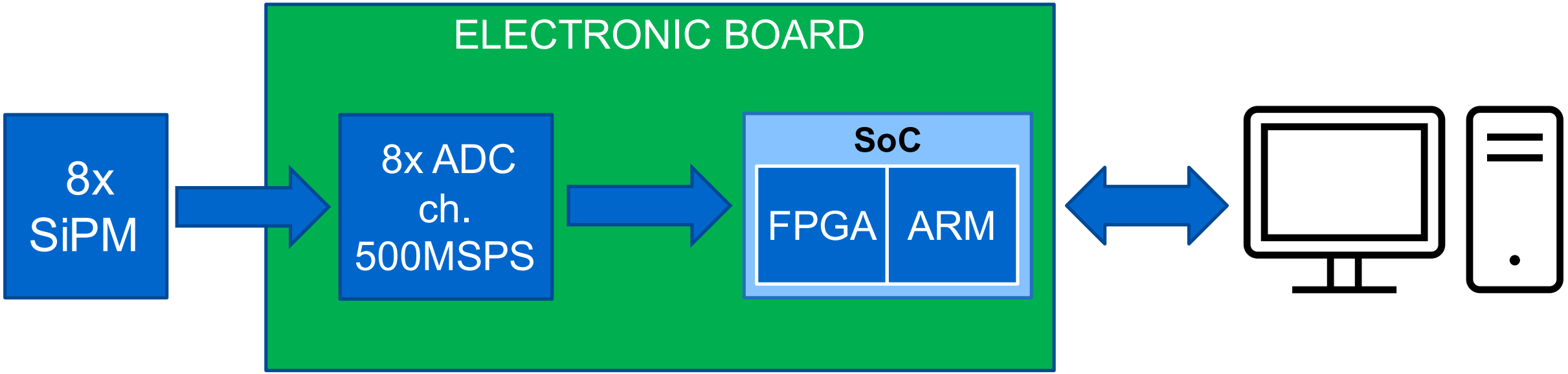
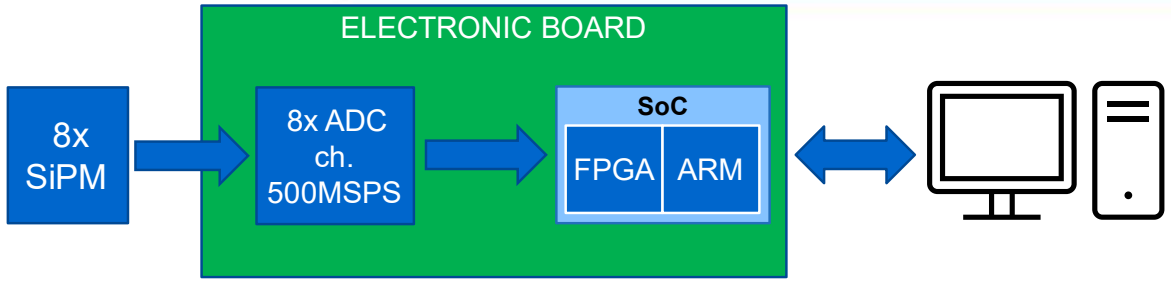
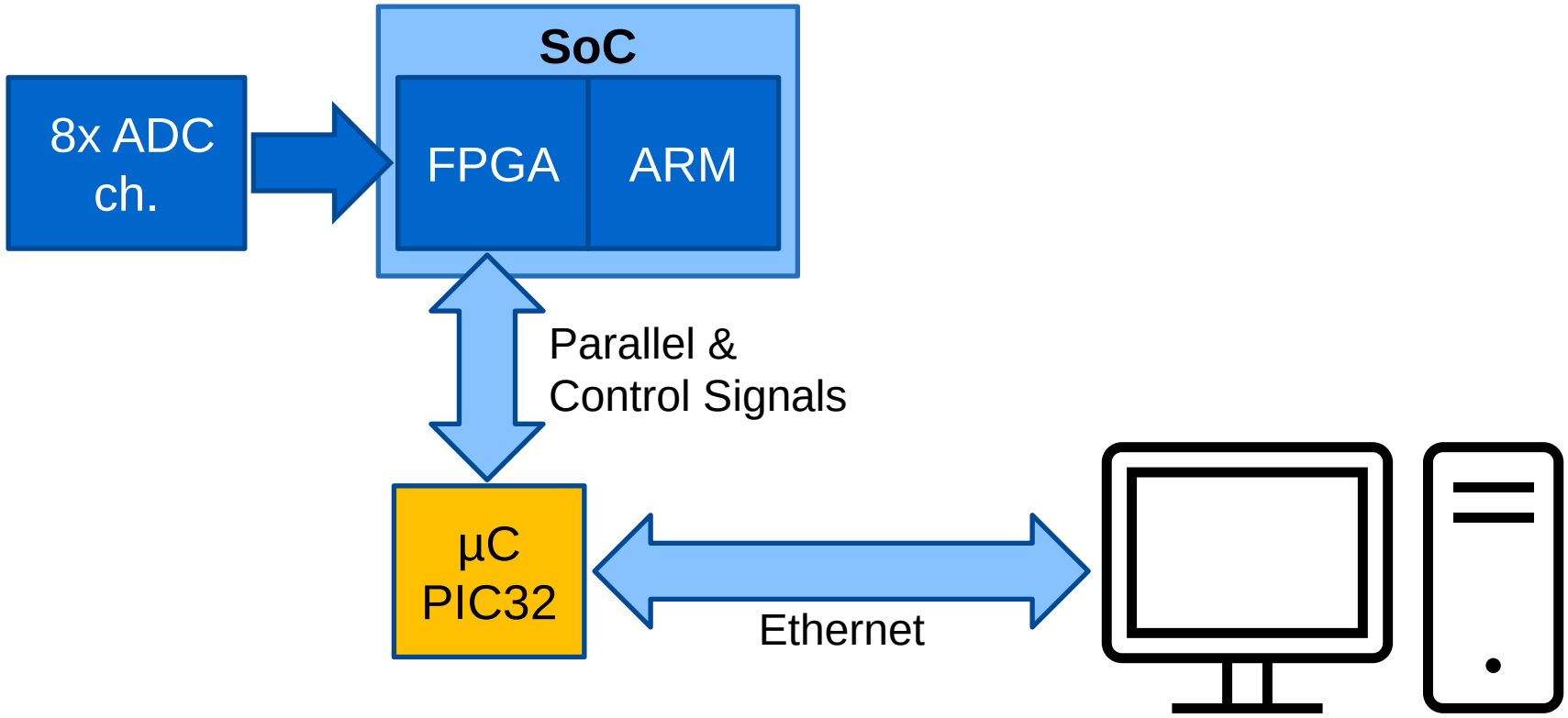
DAQ Module overview

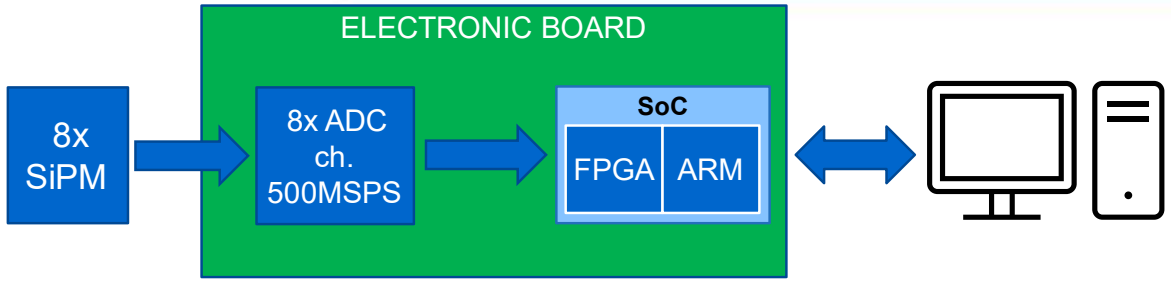


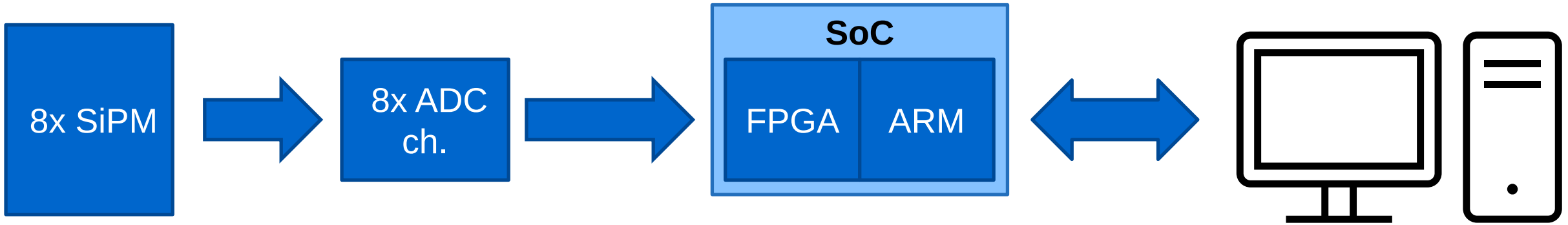
First Scope


ELECTRONIC BOARD
8x SiPM
8x ADC ch. 500MSPS
SoC
FPGA
ARM

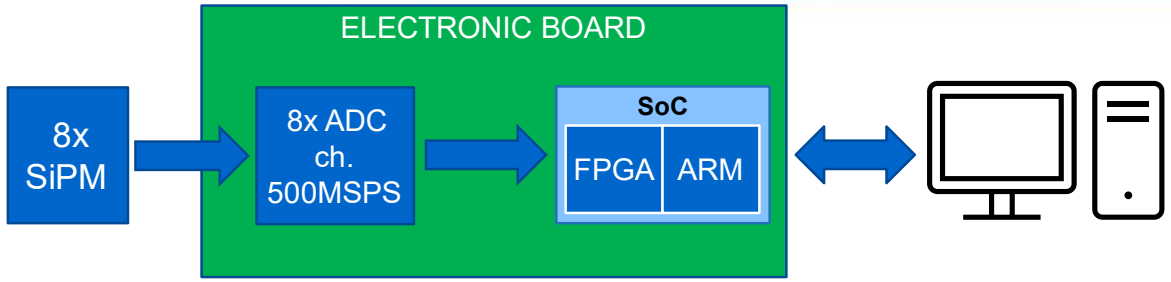

8x ADC ch.
SoC
FPGA
ARM
Parallel & Control Signals
µC PIC32
Ethernet

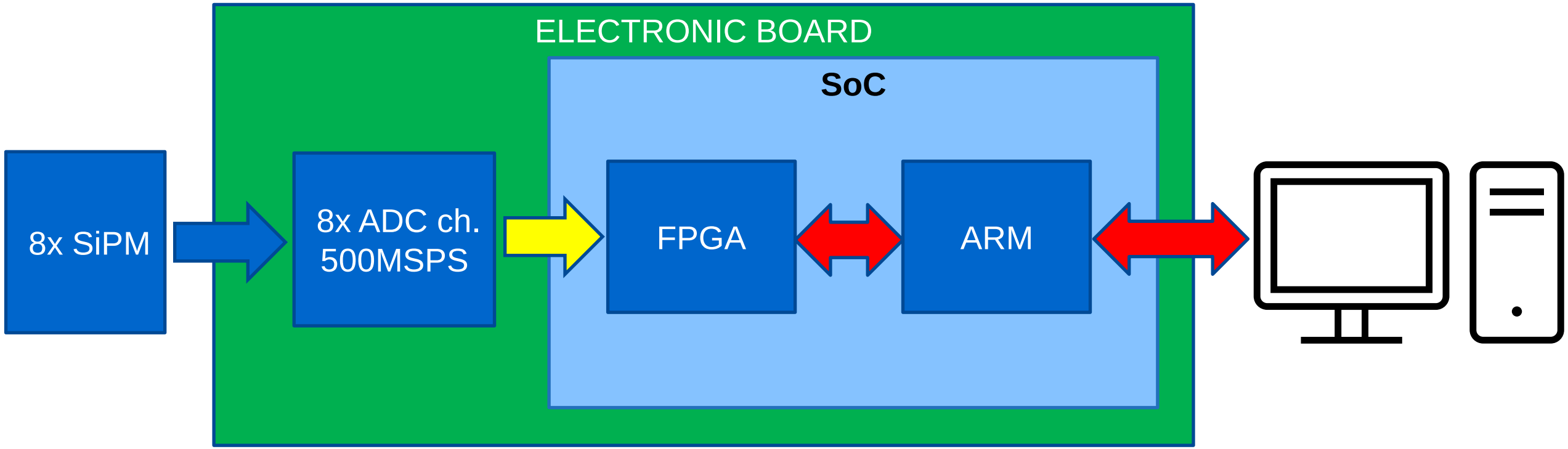
Current design





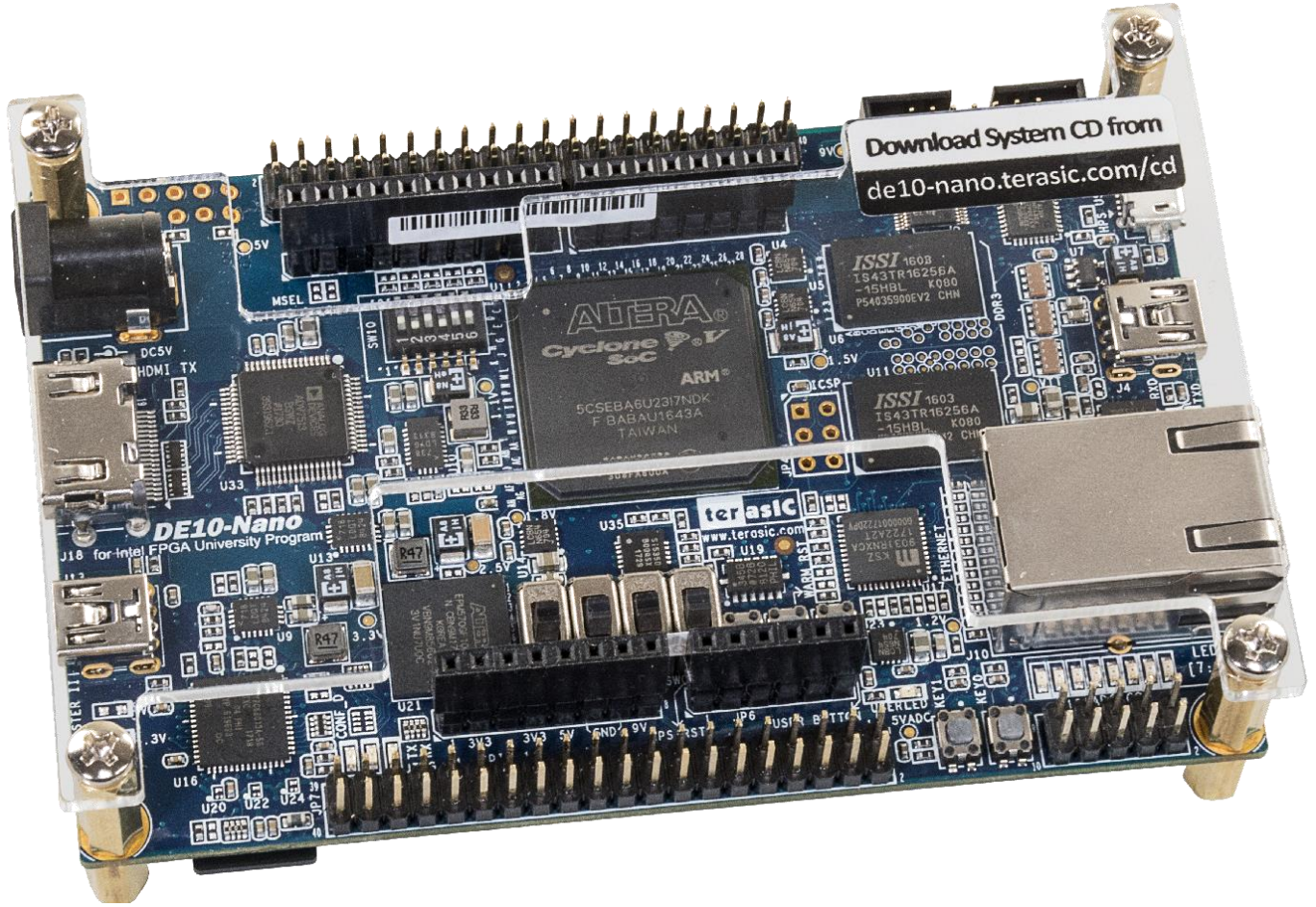
Current design





Development Kit: DE10-Nano from Terasic

- Based on the Cyclone V SoC, which pairs a Cyclone V FPGA with a dual-core ARM® Cortex®-A9 processor.
- The hard processor system includes a full set of peripherals and interfaces. It is equipped with 1 GB of DDR3, a microSD card socket, an ADC, gigabit ethernet, USB-Blaster II onboard for programming; JTAG Mode, USB OTG, UART to USB, and more.

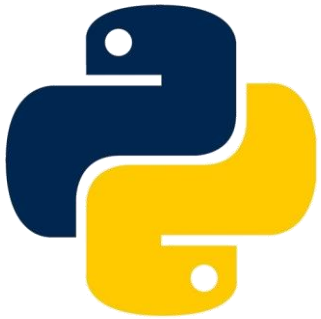


Software Tools

- Use of embedded Linux distribuition, called RSYocto*, from Yocto Project;
- Django Project for rapid web development;
- Visual Studio Code Insiders;
- Quartus Prime Lite;
- Altium Designer;
- Programming Languages: Python and Verilog.

www.intel.com.br

www.altium.com



www.python.org

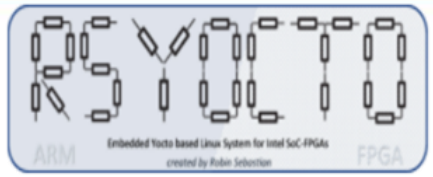
www.yoctoproject.org

www.djangoproject.com

code.visualstudio.com/insiders

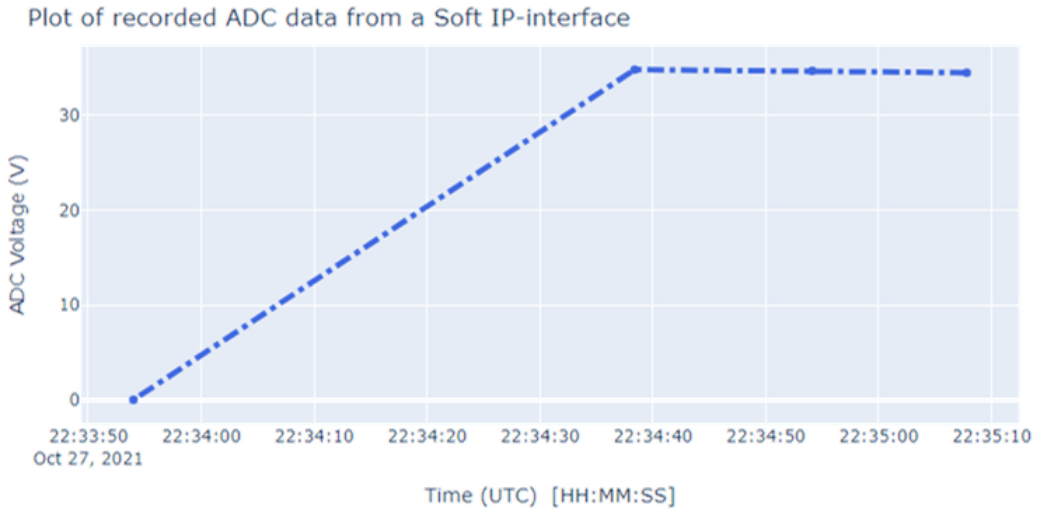
* https://github.com/robseb/Django2FPGAdemo

Software Tools for the current development



Simple Django demo application for using a web interface to control and access the FPGA fabric

FPGA IP data plot



Chnage the FPGA Configuration

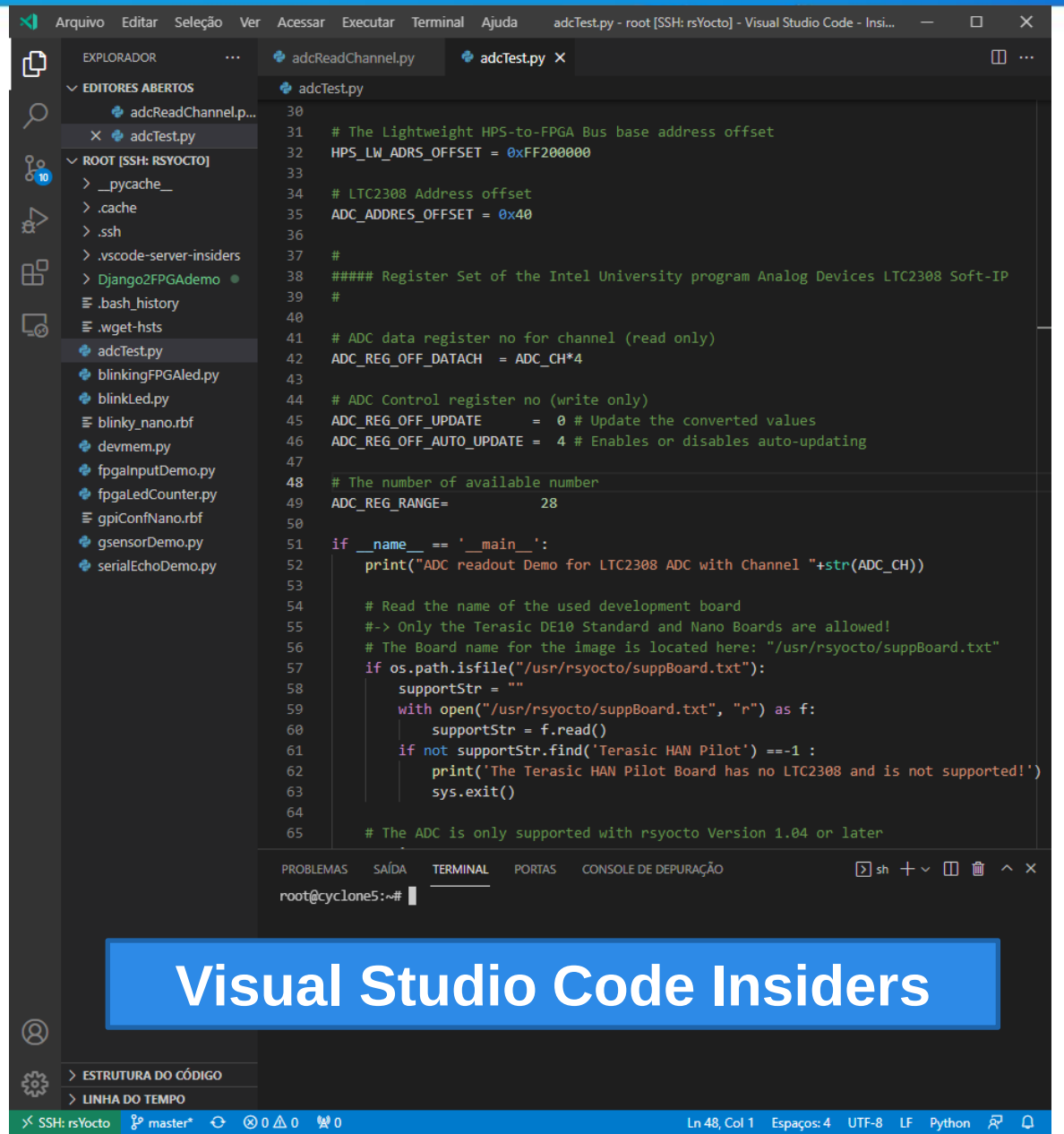
Select a ".rbf"- FPGA configuration file: Click Upload to save the file and configure the FPGA fabric

Escolher Arquivo | Nenhum arquivo escolhido

Upload

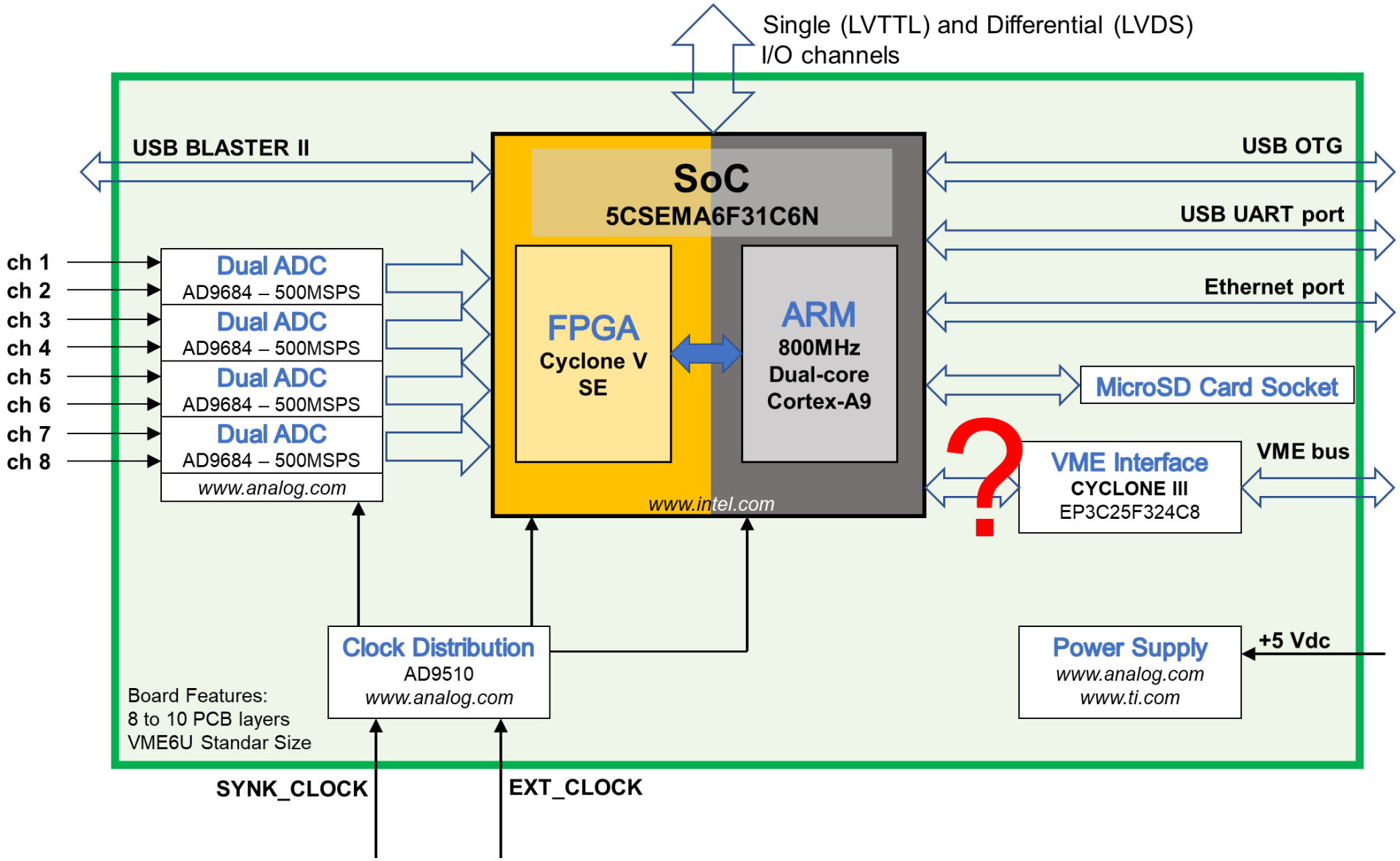
FPGA configuration manager

File Name	Upload Date	Load to the FPGA fabric
FPGAconfigDatabase/2021/10/27/output_file.rbf	Oct. 27, 2021, 10:38 p.m.	Configure FPGA
FPGAconfigDatabase/2021/10/28/output_file.rbf	Oct. 28, 2021, 12:06 a.m.	Configure FPGA
Bootloader FPGA Configuration	-	Roll back



Visual Studio Code Insiders

DAQ Module overview



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Summary

- Survey and selection of technologies/devices: ADC, FPGA, µC. **DONE**
- Drawing electrical schematics: analog input circuit, ADC connections, microcontroller circuit. **DONE**
- Survey of other FPGA due to software licence issue (Quartus Prime). New FPGA family selected: **Cyclone V**. **DONE**
- Second ADC option selected due to transceiver speed limitation in Cyclone V. **DONE**
- Drawing electrical schematics: FPGA circuit. **DOING**
- Defining and drawing ADC to FPGA data buses (16 x 4 LVDS channels). **DONE**
- Learning how to use the ARM processor in the FPGA to implement the Ethernet and USB interfaces. **DOING**

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