

Introduction to FPGA



What is an FPGA ?



- FPGA – “Field Programmable Gate Array”
- What FPGA can do:
 - Can you use your Intel processor as an AMD processor tomorrow and again as an Intel processor the day after tomorrow?
 - You receive software updates frequently, did you ever received a hardware update? Can you upgrade your core i5 to core i7?
 - Can you fix a bug in your chip after you have already received it?



What is an FPGA ?

- FPGA is a “Programmable Hardware”
 - As you do software programming to get the desired functionality, FPGA must be programmed to get the desired functionality.
 - At power-on FPGA is blank and cannot perform any task. It must be programmed to use as a particular hardware.
 - Due to the “programmable” feature, the FPGA is highly flexible and upgradable.

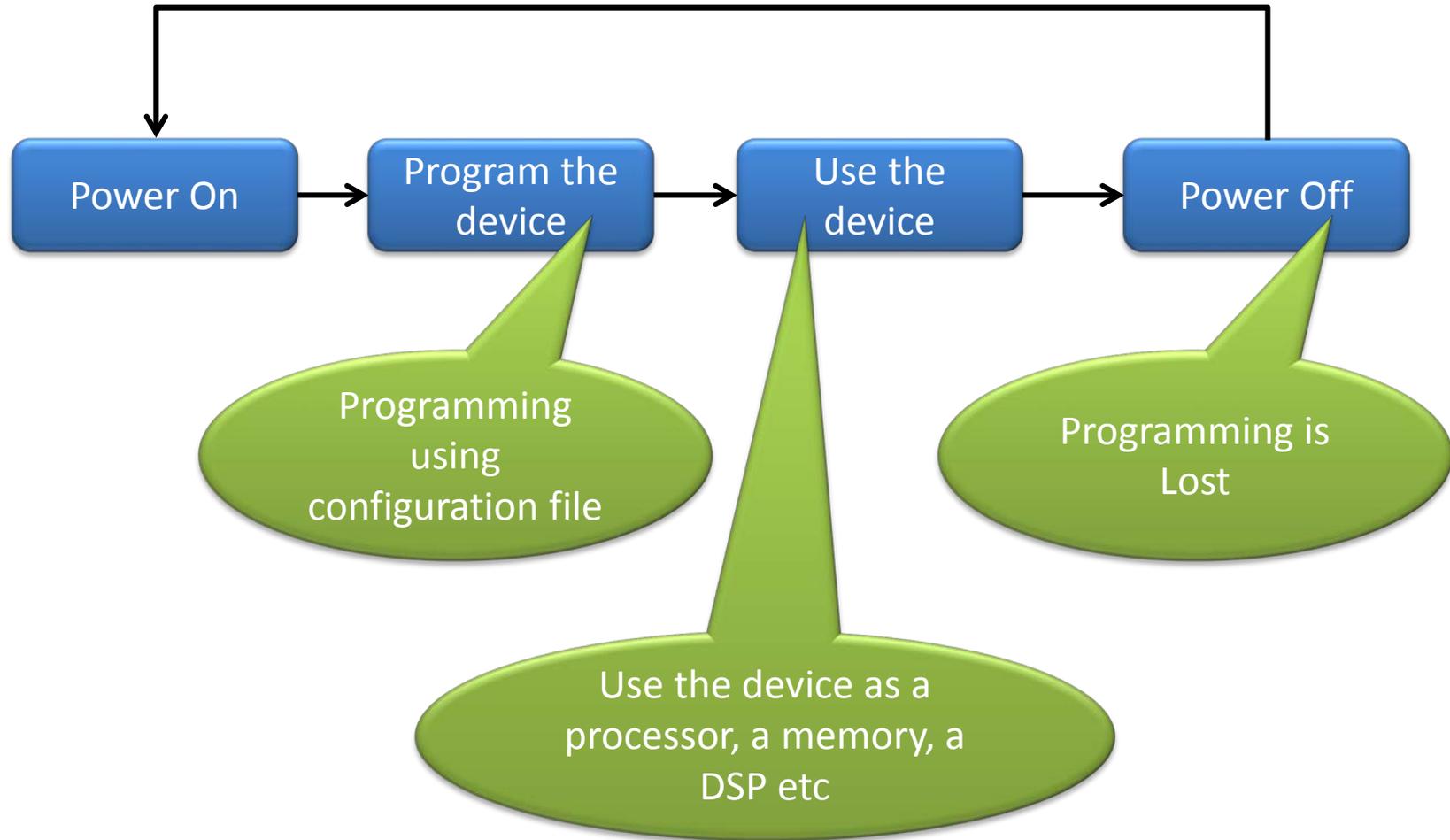


Two main Companies

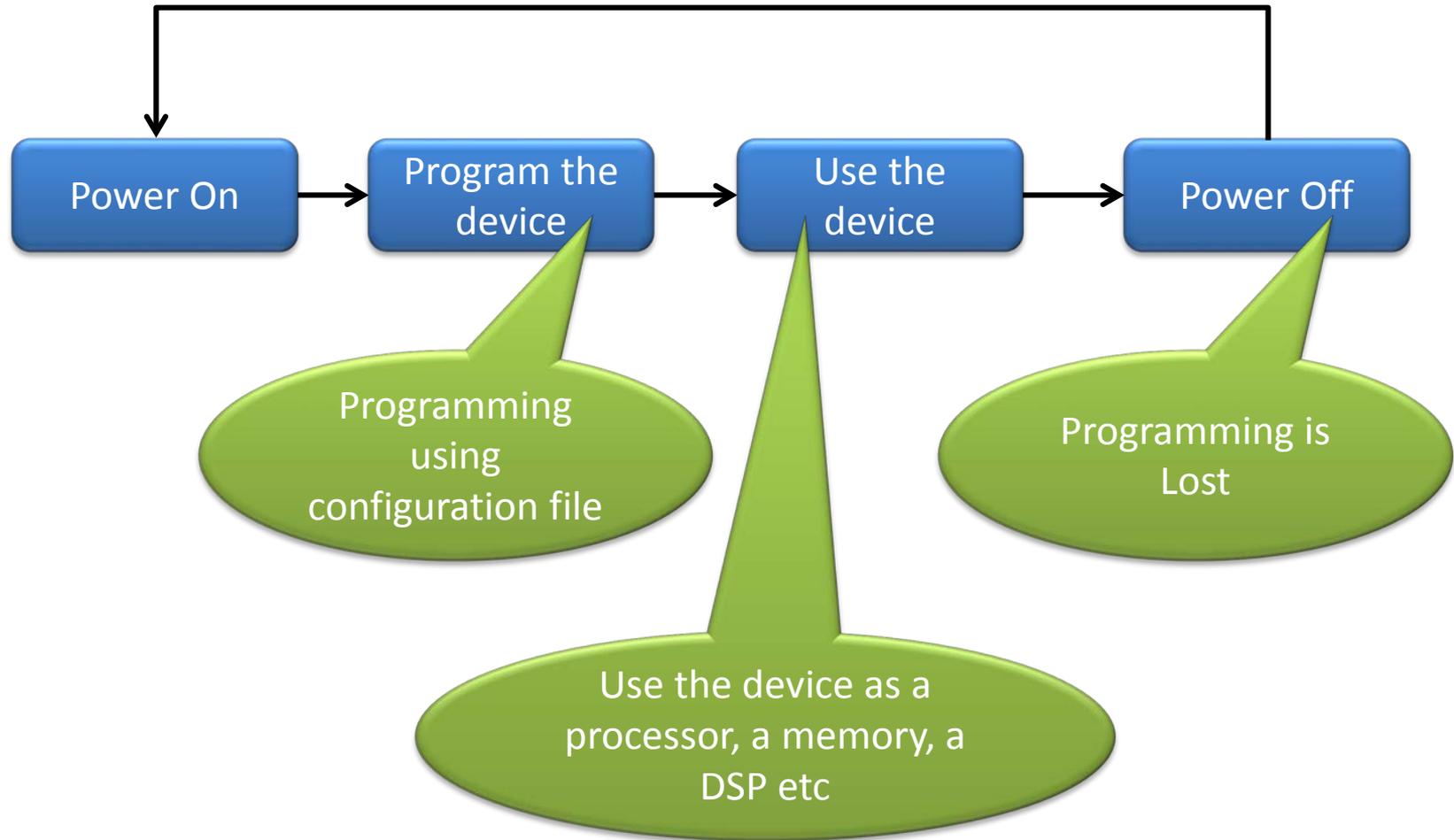


We chose Altera
for this lab course

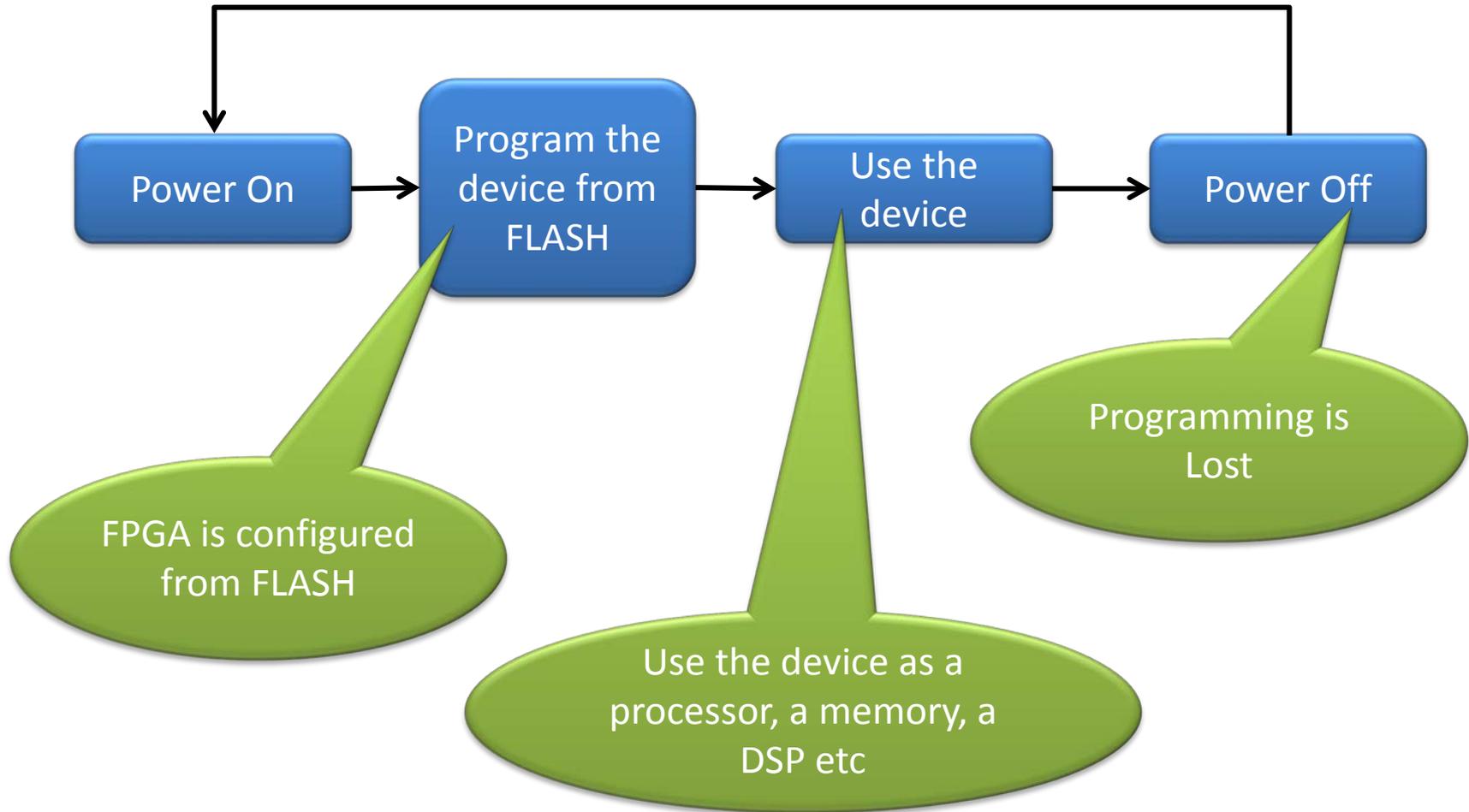
FPGA usage flow



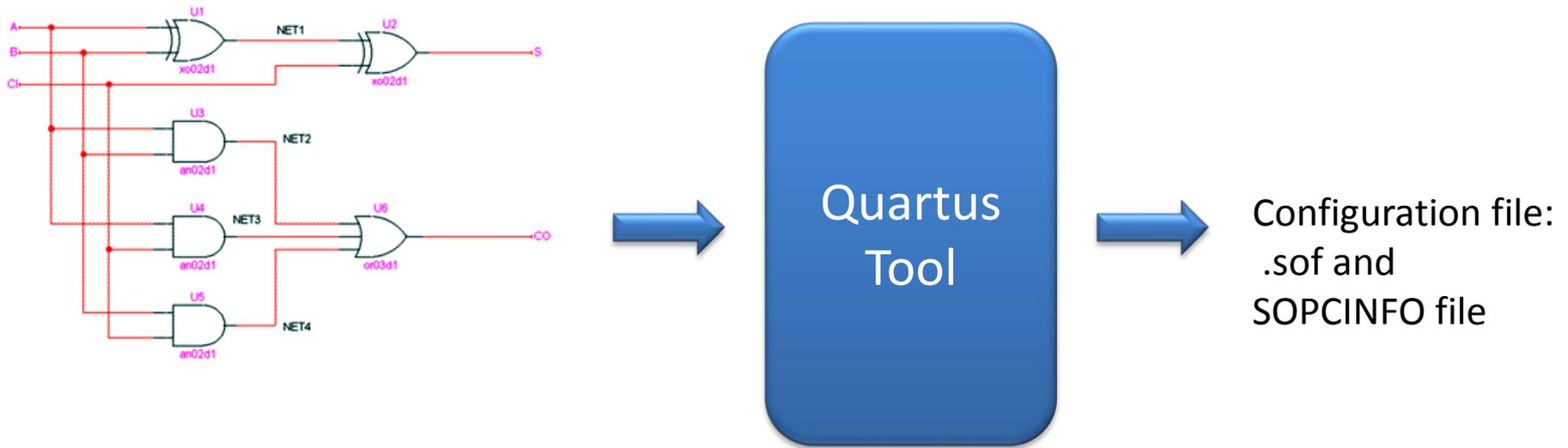
FPGA programming flow



Configure using FLASH file (.JIC)

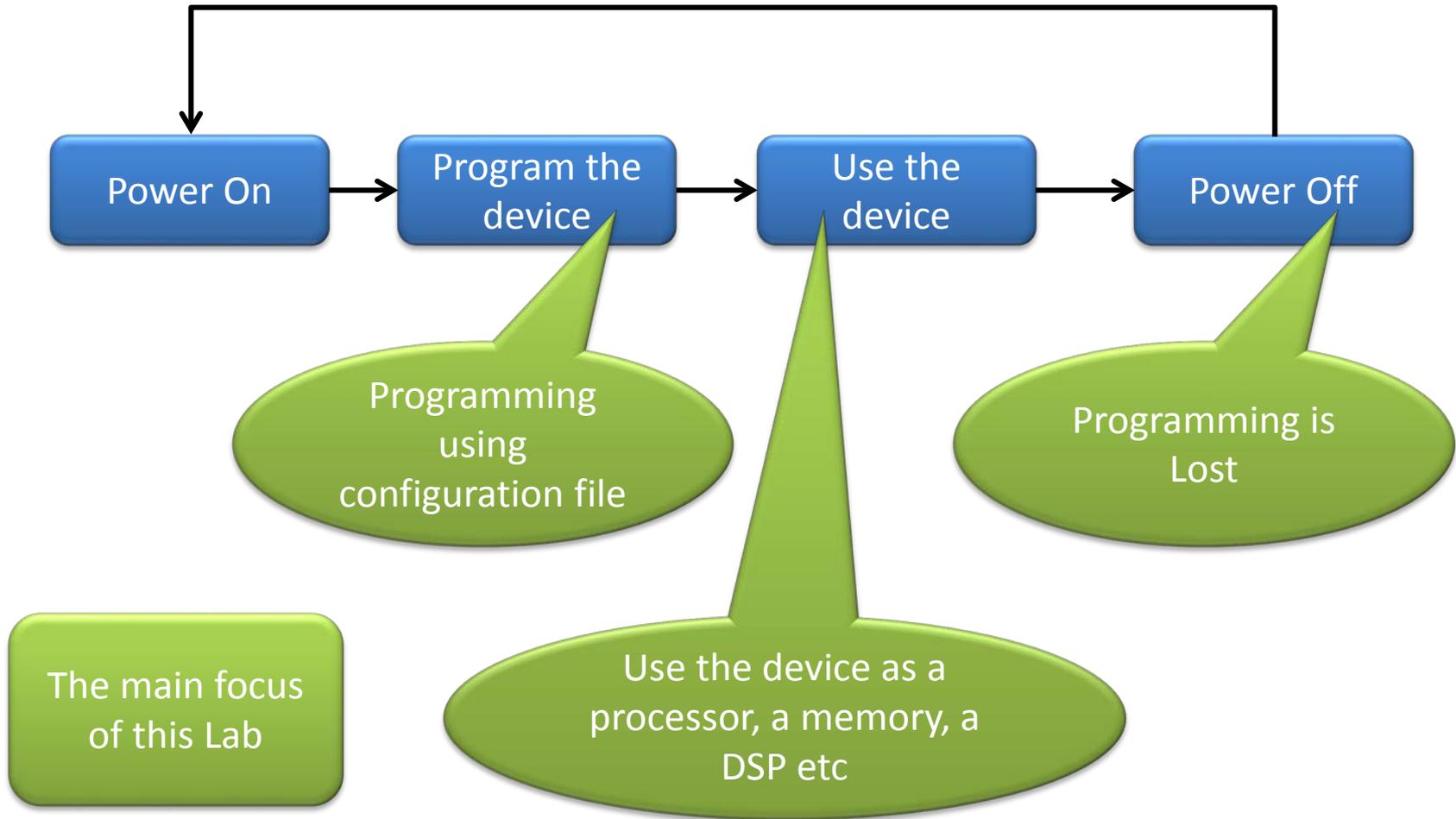


Altera FPGA programming flow



- The Quartus tool takes your design as an input and generates configuration files “.sof” (SRAM Object File) and SOPCINFO (**more on it later**) files

FPGA usage flow

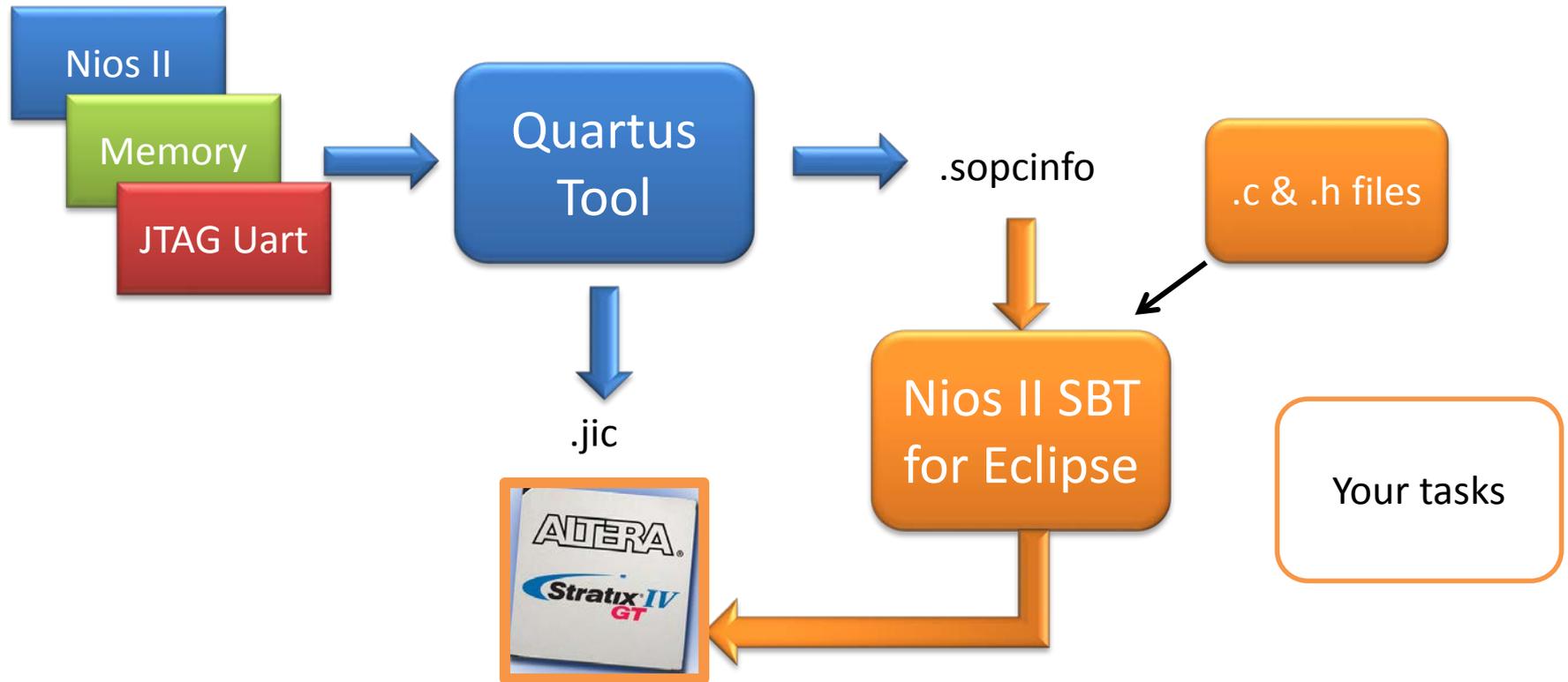


FPGA usage flow

- In this lab course, we will provide SOPCINFO file and JIC file (flash programming file)
- Your tasks will be,
 - Use the JIC file to configure (program) the FPGA
 - Write a C code to program the processor (NIOS processor) on the FPGA
 - Show us results



Flow used in this lab course





Advantages of FPGA

- Flexibility
- Upgradability
- Low cost for small projects
- Time to the market
- Prototyping
- High performance DSP algorithms



Disadvantages of FPGA

- High cost for big projects
- Wastage of on-chip resources in programmable routing
- High power consumption compared to the same implementation on full custom design
- Low operating speed compared to the same implementation on full custom design

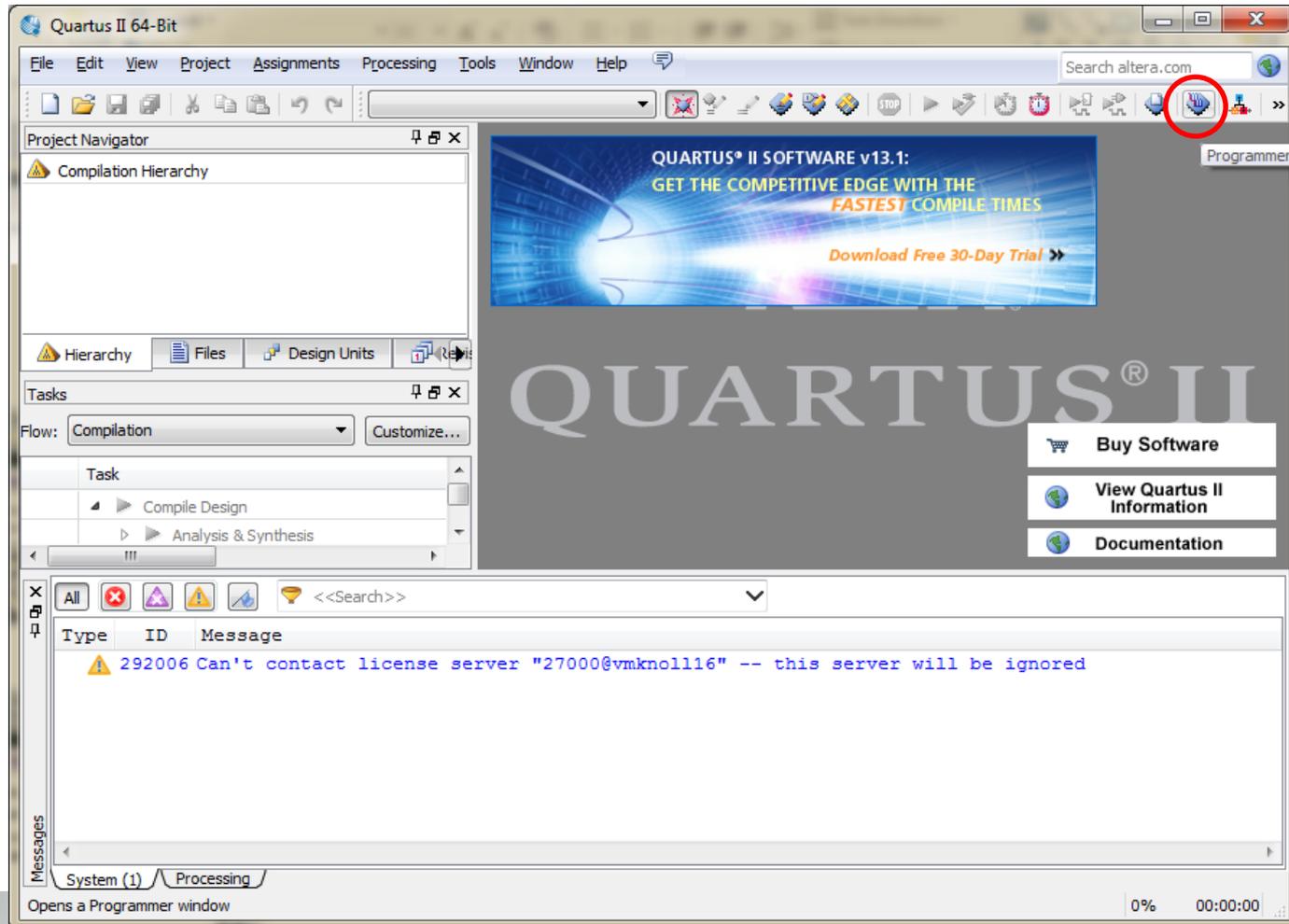


Questions



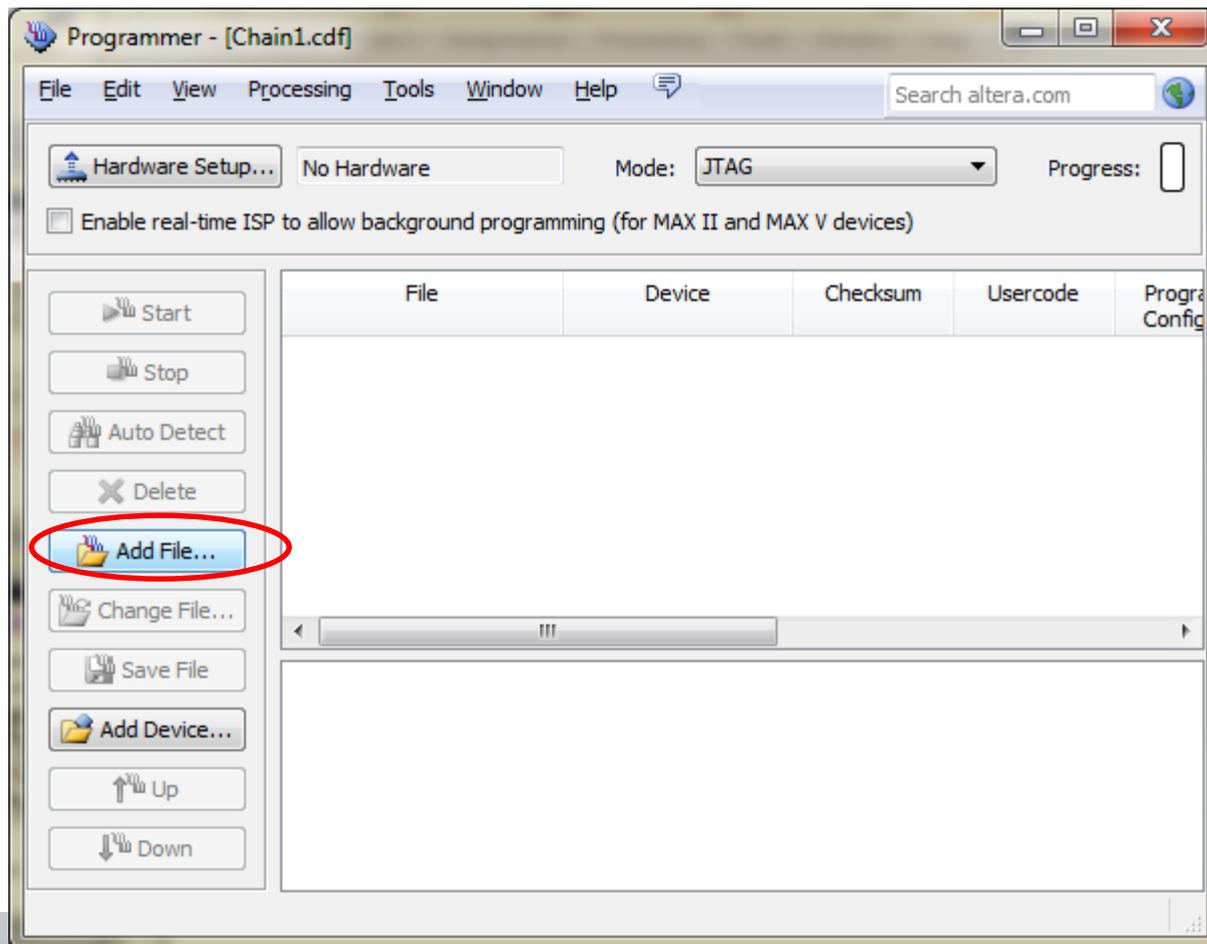
Control Panel

- Program the FPGA using .SOF file:



Control Panel

- Program the FPGA using .SOF file:



Task overview: Your tasks

- Configure the FPGA using the provided JIC file
- Create a BSP project using SOPCINFO file
- Execute the “Hello world” C program on the NIOS core (feel free to use template)



Questions

