ECE641 Spring 2012 Term Project

RS232 Communications Interface Between Computer & FPGA

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Outline

- PC COM port Communication & Microprocessor UART
- The Altera Nios II Microprocessor and the SOPC Builder
- Building the Nios II Processor Hardware
- Building the Nios II processor Software
- Demonstration

PC COM port Communication & Microprocessor UART

- Serial COM port is present on all computers
- As Legacy RS232 or RS232-emulated USB interface
- Can be used for Computer control of microcontroller-embedded system
- Simple to use with generic APIs like
  - Open port
  - Read port
  - Write port
  - Close port
- UART is present all most embedded microcontrollers.
- Easy to use
  - configure bits rate, data size, etc then send and receive data

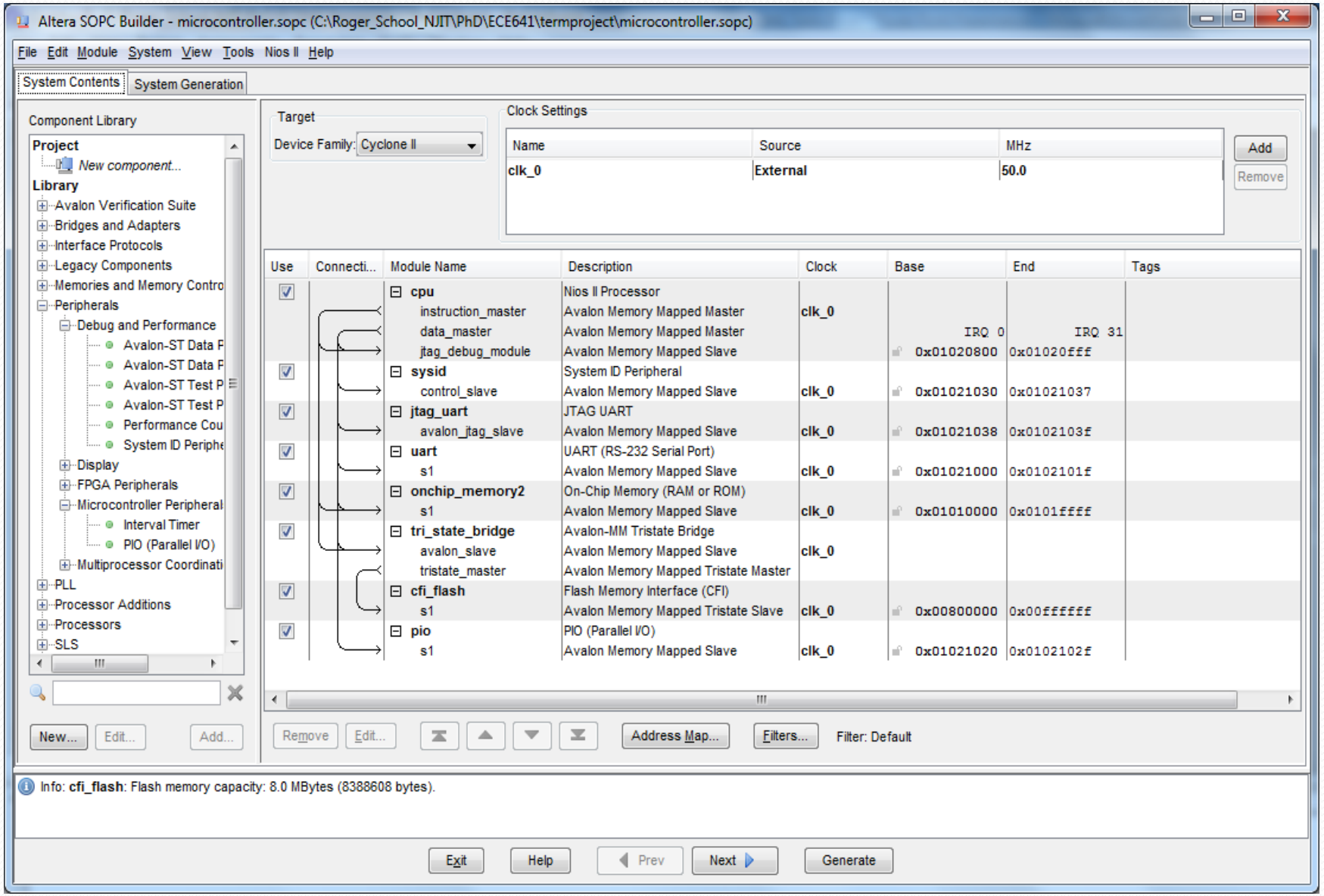
The Altera Nios II Microprocessor and the SOPC Builder

- Altera's Nios II processor core in on its FPGAs
- Hardware design help from Quartus II SOPC Builder
- Various hardware components available for use
- Design reduces to assembling desired components
- Changing a few settings and then generating VHDL or Verilog.
- Part of the code generated is to be used for subsequent software project for the embedded Nios II processor and its peripherals

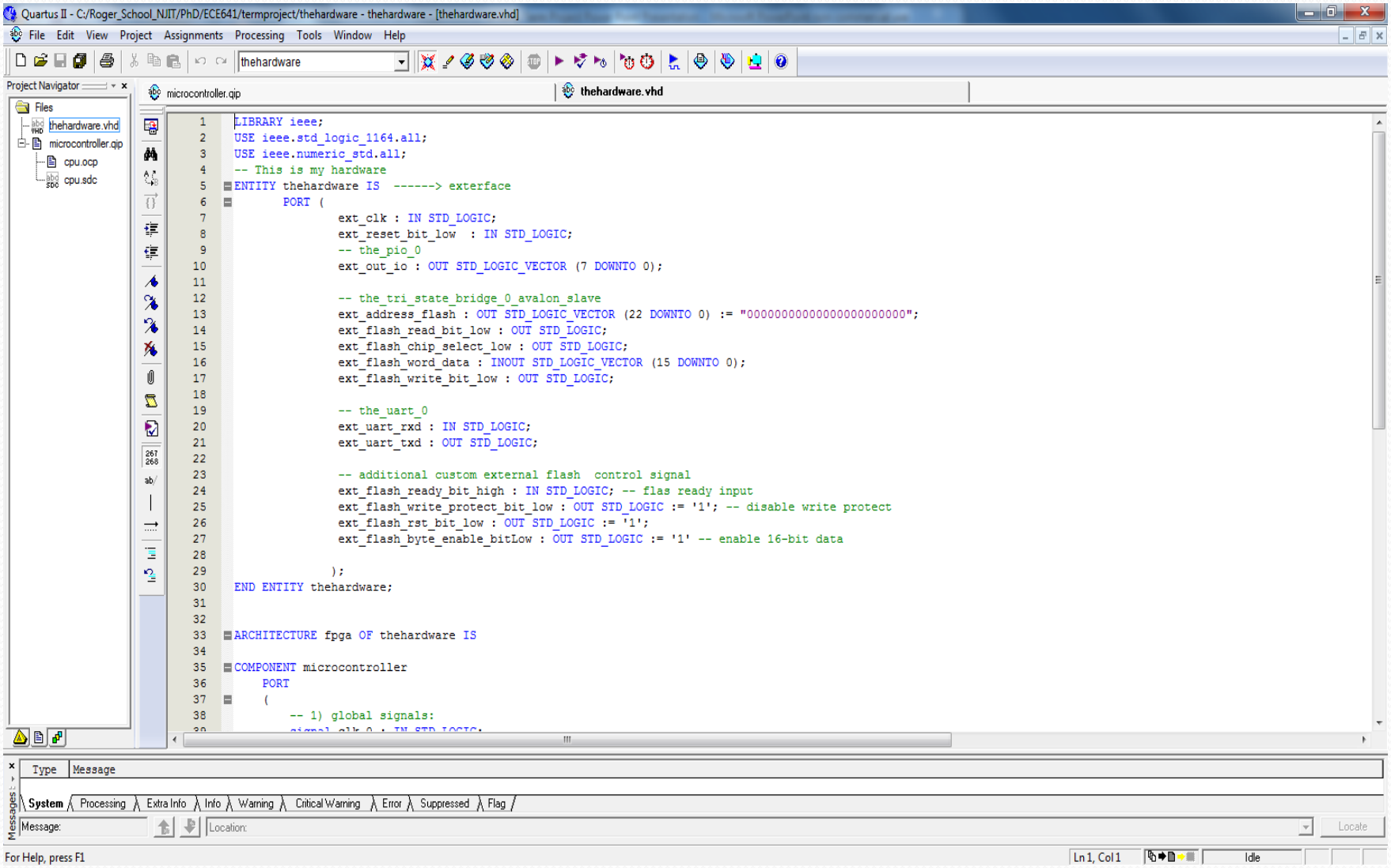
Building the Nios II Processor Hardware

- Components:
  - Nios II processor
  - External CFI flash from the DE2 board
  - Debugging JTAG UART
  - LED output IOs
  - UART
- Start a Quartus II project
- Create the top-level entity with IOs
  - Clock
  - reset
  - UART rxd
  - UART txd
  - CFI flash
  - Green LEDs
- Launch the SOPC builder
- Add the desired hardware components to the design
- Generate the SOPC builder VHDL code
- Assign the IO pins, add the top-level VHDL code, compile and download the code into the FPGA

Nios II Hardware Design Using SOPC Builder



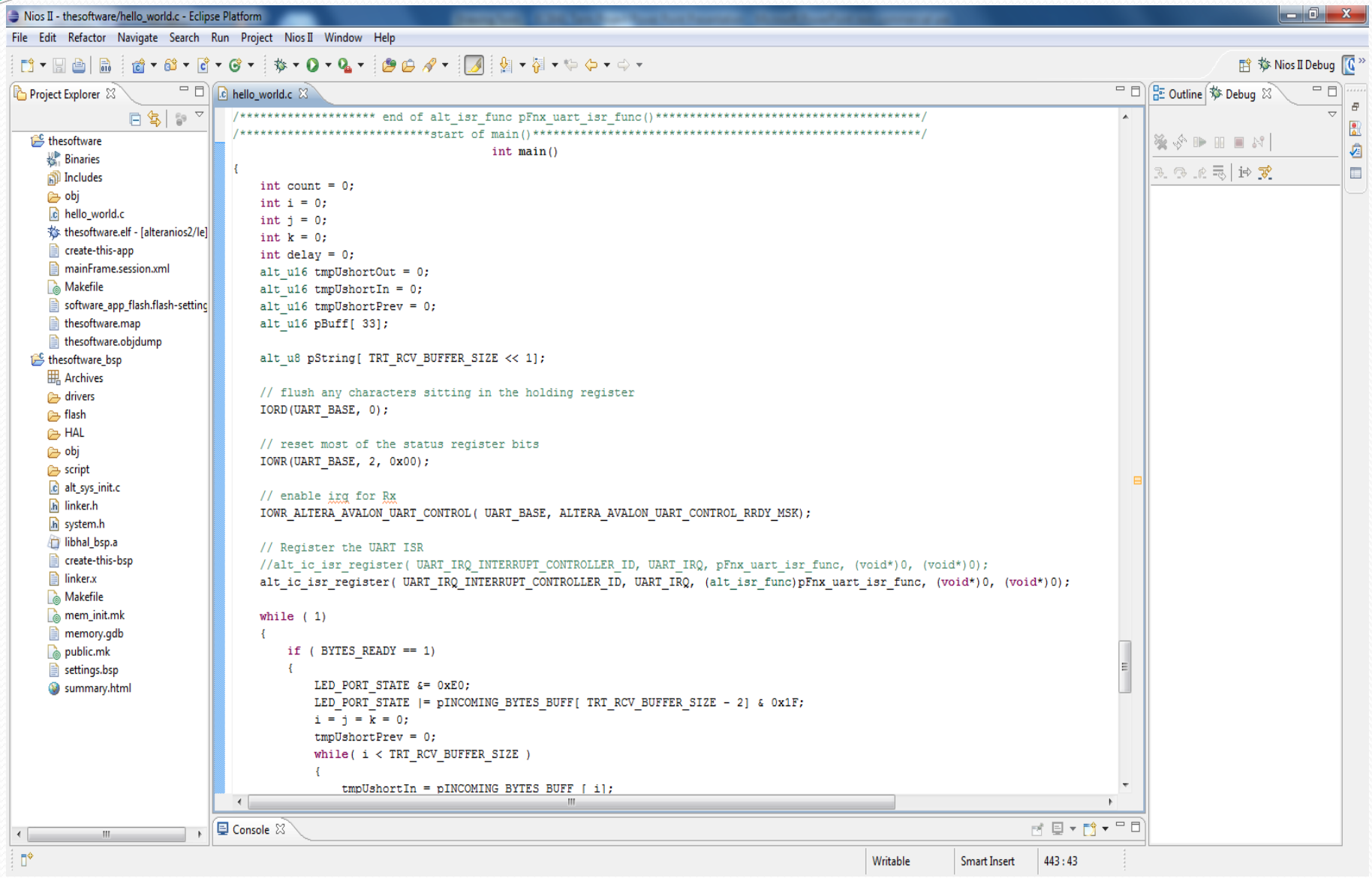
Nios II Hardware Design Using SOPC Builder



Building the Nios II Processor Software

- Start Nios II C/C++ Software project using Eclipse
- Add the Nios II embedded C code for
  - UART communication
  - Toggling the LED
  - Processing input output data
- Build the project
- Download it the external CFI flash memory
- Develop windows RS232 GUI to control the Nios II Processor.
- Test the FPGA integrated hardware and software design

Building the Nios II Processor Software



Demonstration

THANK YOU