Lab 08: An LED blinker

In this lab, we'll implement a simple LED blinker in our Basys3 board, exploiting the modules we designed in Lab 7.

The `LED_Blinker` module has the following interface

Port	Direction	Type	Width
`clk`	in	`std_logic`	1
`sw`	in	`std_logic_vector`	4
`led`	out	`std_logic_vector`	4

The design should make the LEDs blink, when the corresponding switch is high.

The four leds should blink with a different frequency

- `led(0)` should blink every 5s
- `led(1)` every 1 s
- `led(2)` every 100 ms
- `led(4)` every 10 ms

The input switch signals should go first through a debouncer filter, before being connected to the LEDs.

Exercise

1. Create the Vivado project

1. Go to `~/labs/lab08` and start Vivado
2. Create a new Vivado project, called `LED_Blinker` (RTL Project)
3. In the `Add Sources` window, click on `Add Files` and import `src/counter.vhd`, `src/debouncer.vhd` and `src/led_blinker.vhd`.
4. In the `Add Constraints` window, click on `Add Files` and import `src/Basys3.xdc`
5. In the `Default Part` select the `Basys3` from the Boards tab.
6. Click on Finish

2. Code the LED blinker

Open the `led_blinker.vhd` and implement the design functionalities, following the instructions in the comments of the file.

3. Generate the bitstream and load it to the Board

Run the Vivado flow by clicking on Generate Bitstream. If everything goes well, open the hardware manager and load your firmware to the board.

Play with the switches and check that your design works properly.

4. Optional exercise

Extend the design, to use the `sw4` as an enable signal. If set to high, the LEDs blink as expected, otherwise they are all off.