Exercise 11: Testing of PWM on DE0

Please work in groups of 2

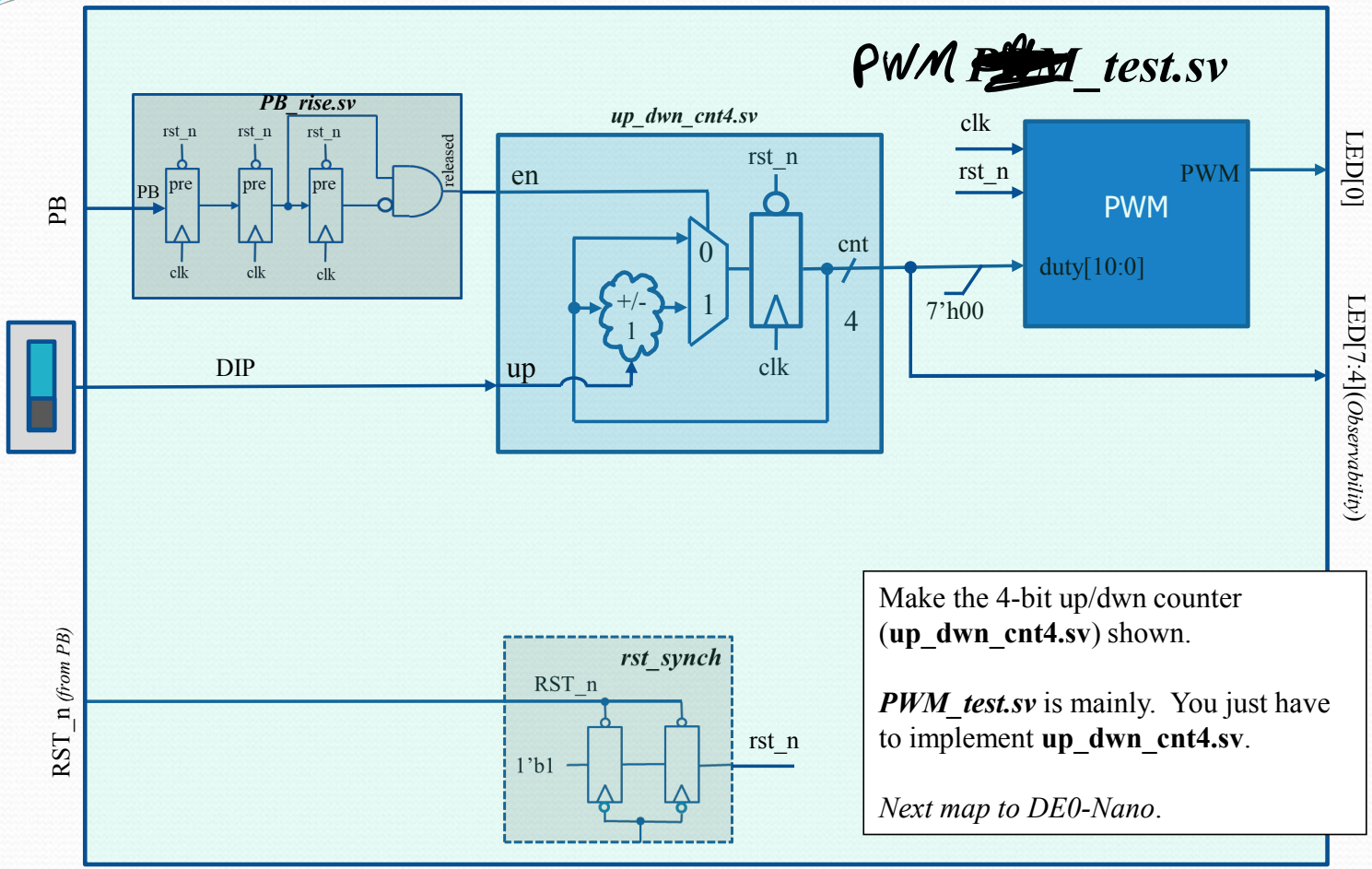
- In Exercise07 you coded **PWM11.sv** which has the interface shown below.

Signal:	Dir:	Description:
clk	in	50MHz clock
rst_n	in	Active low asynch reset
duty[10:0]	in	Duty cycle (indicates level to drive the eBike motor)
PWM_sig	Out	Output to the mtr_drv block

- Now you are going to build a test wrapper (**PWM_test.sv**) for this that will be mapped to a DE0-Nano board and used to test it.
- The test wrapper (**PWM_test.sv**) will contain a 4-bit up/down counter that is enabled by the signal from **PB_rise.sv** (which you just made in Ex10).
- The 4-bit counter is connected to bits [10:7] of **duty[10:0]**. Bits [6:0] being 0.
- The ***up*** vs ***dwn*** control is hooked to a dip switch on the DE0 board
- If the counter is counting up it will start at 0000 and initially count up with every push of a button (coming from **PB_rise.sv**) and simply roll over when it hits a full count. If it is counting down it simply rolls from 0000 to 1111.

Exercise 11 (Testing of PWM11):

Please work in groups of 2, Check off with instructor, TA, or UGSA



Make the 4-bit up/dwn counter (**up_dwn_cnt4.sv**) shown.

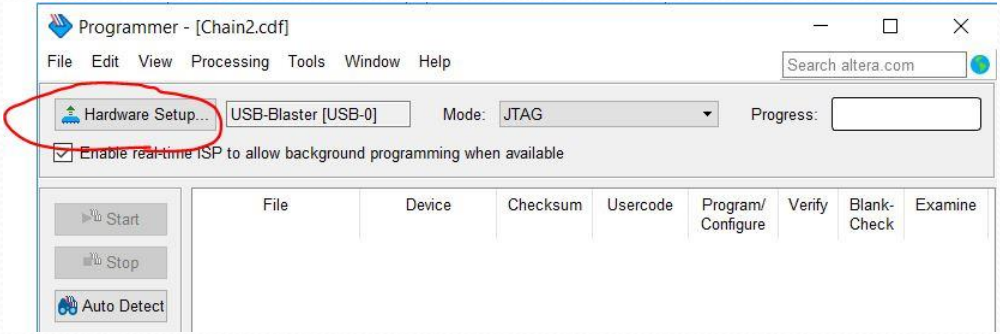
PWM_test.sv is mainly. You just have to implement **up_dwn_cnt4.sv**.

Next map to DE0-Nano.

Exercise 11 (Testing of PWM11) (Mapping to DE0):

- Download **PWM_test.qpf** (Quartus Project File) and **PWM_test.qsf** (Quartus Settings File) from the website and store in your Exercise11 directory

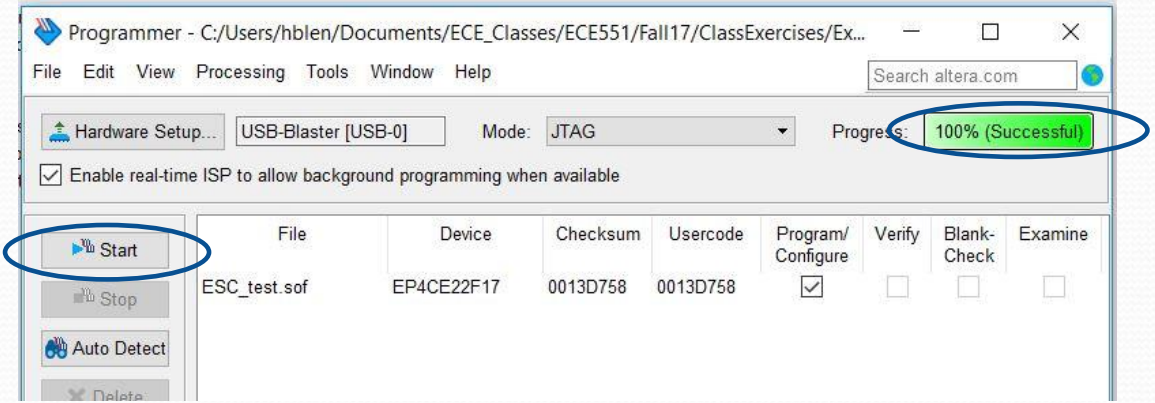
- Open up Quartus
  - Do a: **File → Open Project** and open up the **PWM_test.qpf**
  - Compile the design and fix any errors
  - Plug in a DE0-Nano Board.
  - Do a: **Tools → Programmer** and check that the USB Blaster shows up (see below) (you may have to wait a while on these CAE machines for it to enumerate)



Might have to go under "Hardware Setup" to get it to choose USB-Blaster

Exercise 11 (Testing of PWM11) (Mapping to DE0):

- Program the DE0-Nano



- Hit “Start” and look for 100% Success
- See next page for mapping of functions to DE0-Nano

Exercise 11 (Testing of PWM11) (Mapping to DE0):