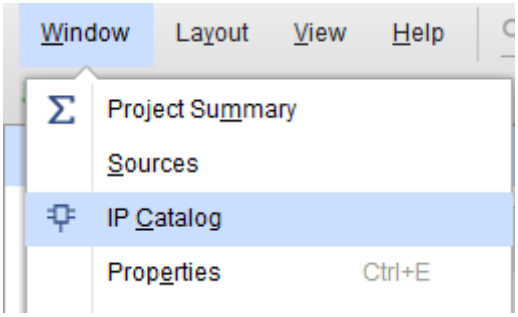
How To Change the Frequency of your CPU

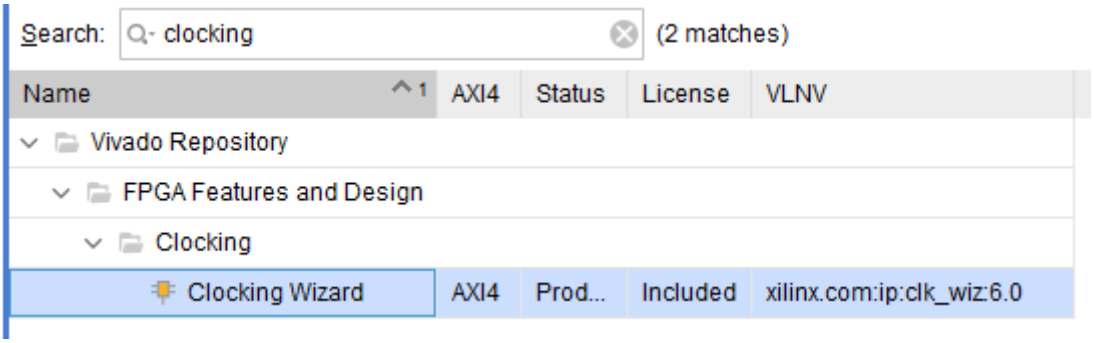
You may have heard of 'overclock' , which can squeeze out more performance of your Intel or AMD CPU. We can do the same to our own CPU by changing the frequency of the clock.

You need to modify some parameters in riscv_top.v and add a new Clock_wiz module generated automatically by Vivado.

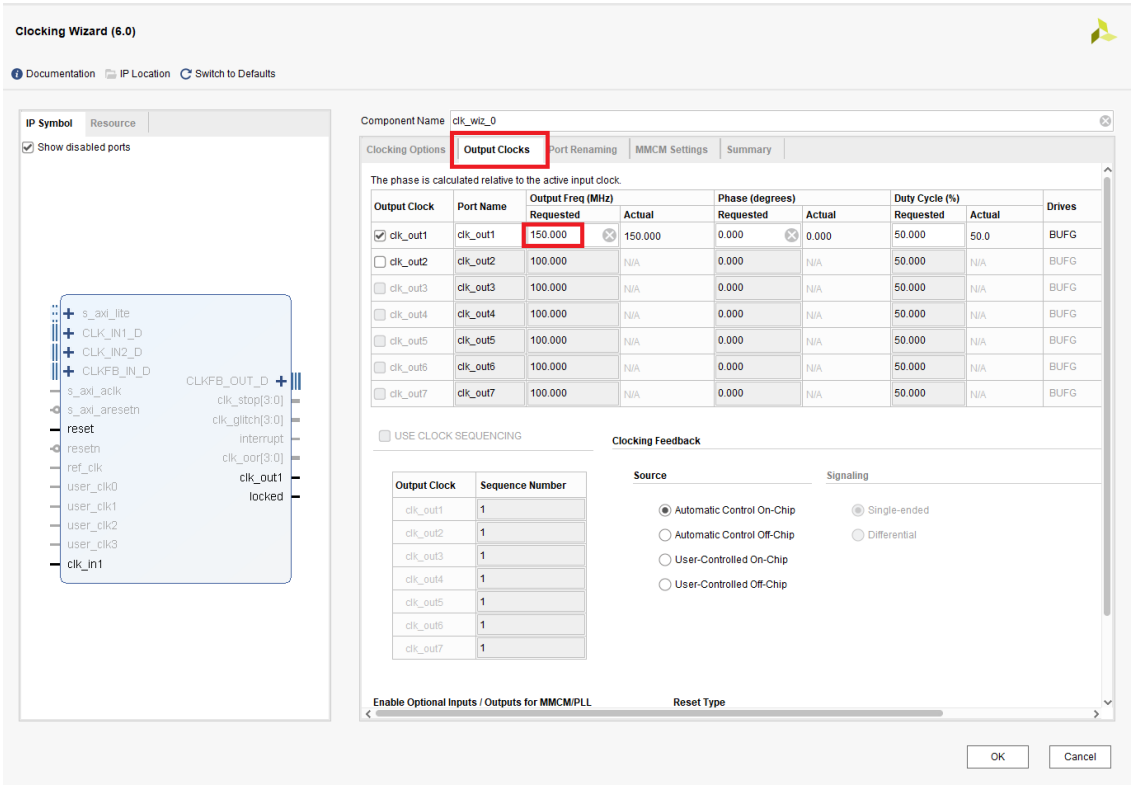
1. Choose IP Catalog



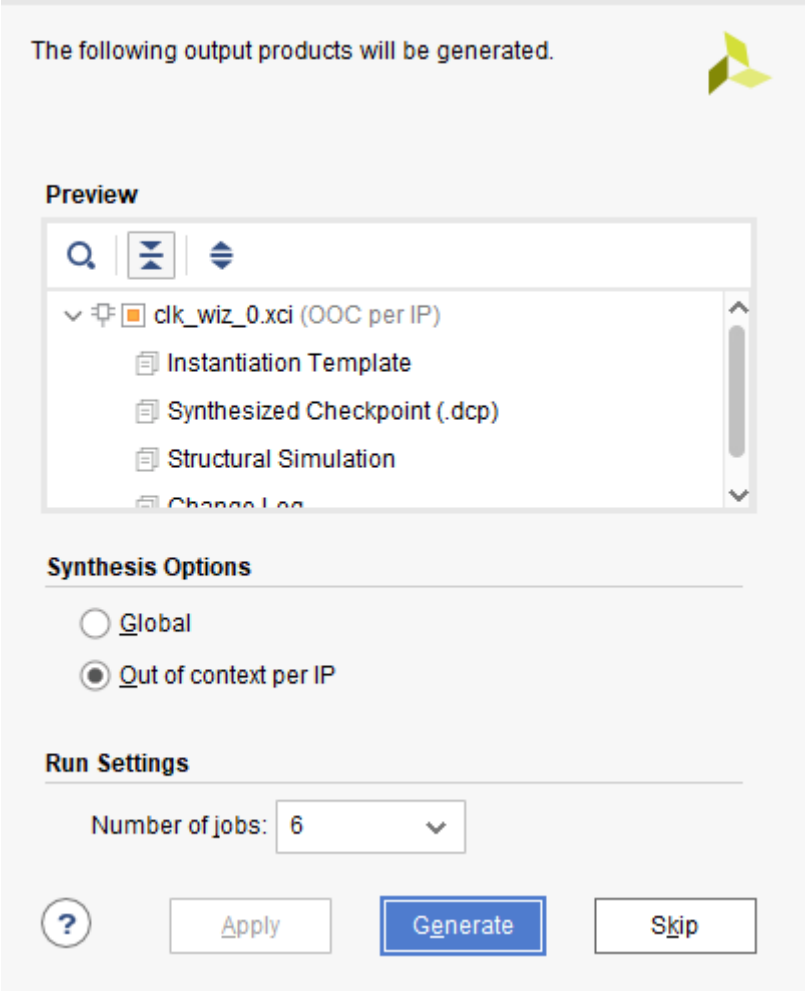
2. Find Clock Wizard



3. Choose the frequency you want to change to, 150mhz as an example



Then press OK and generate output products



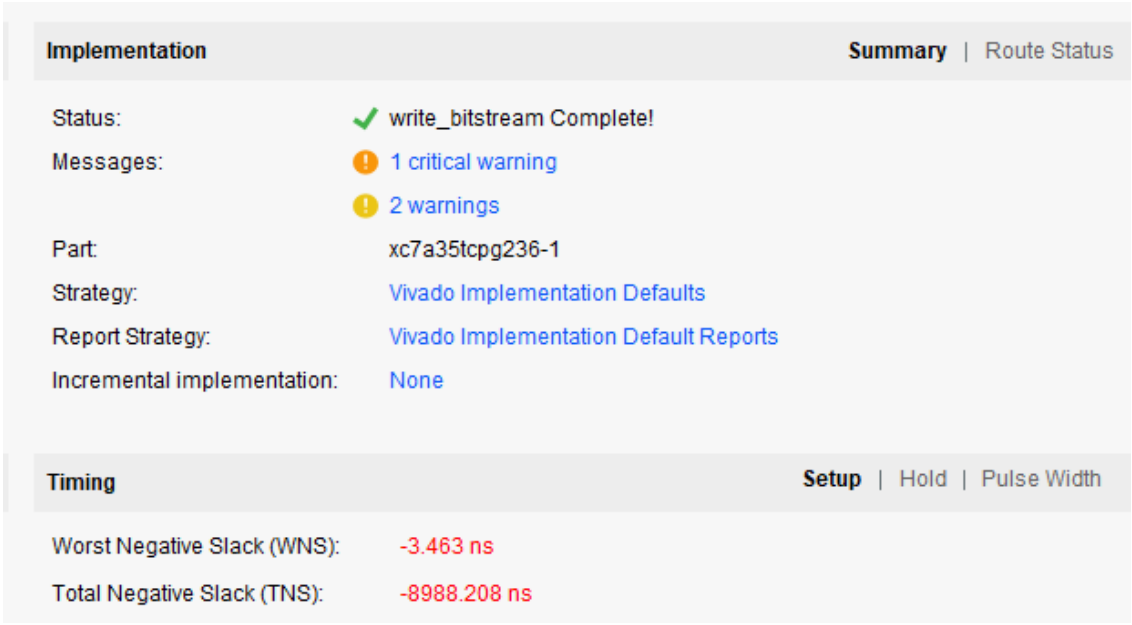
4. Add clkwizard module in riscv_top.v

   Once Clk_wiz module is generated, you should add an instance of this module in riscv_top.v

```
localparam SYS_CLK_FREQ = 150000000;
localparam UART_BAUD_RATE = 115200;
localparam RAM_ADDR_WIDTH = 17;             // 128KiB

reg rst;
reg rst_delay;

wire clk;

// assign EXCLK (or your own clock module) to clk
//assign clk = EXCLK;
wire locked;
clk_wiz_0 NEW_CLOCK(
    .reset(btnC),
    .clk_in1(EXCLK),
    .clk_out1(clk),
    .locked(locekd)
);
```

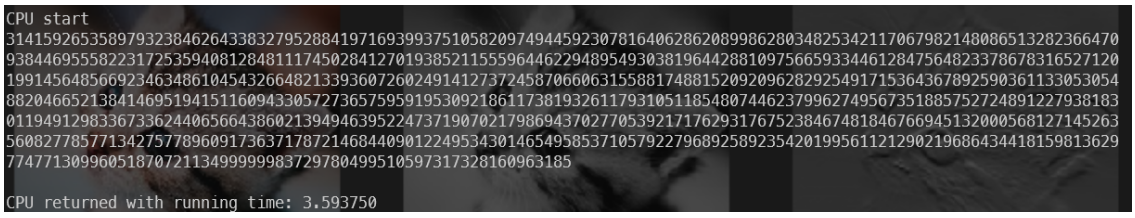
Remember to modify the SYS_CLK_FREQ the same as the frequency in Clk_wizard module

5. Generate bitstream as normal

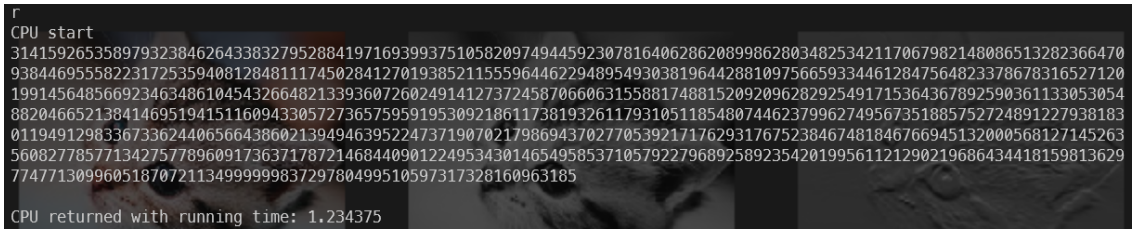


You may find the timing is negative and thus leads to a critical warning, but sometimes you can still run your CPU on FPGA, so just try.

6. Improvement as an example



pi at 100 mhz


r
CPU start
3141592653589793238462643383279528841971693993751058209749445923078164062862089986280348253421170679821480865132823664709384469555822317253594081284811174502841270193852115559644622948954930381964428810975665933446128475648233786783165271201991456485669234634861045432664821339360726024914127372458706606315588174881520920962829254917153643678925903611330530548820466521384146951941511609433057273657595919530921861173819326117931051185480744623799627495673518857527248912279381830119491298336733624406566438602139494639522473719070217986943702770539217176293176752384674818467669451320005681271452635608277857713427577896091736371787214684409012249534301465495853710579227968925892354201995611212902196864344181598136297747713099605187072113499999837297804995105973173281609631 85

CPU returned with running time: 1.234375

pi at 200 mhz