Computer Organization

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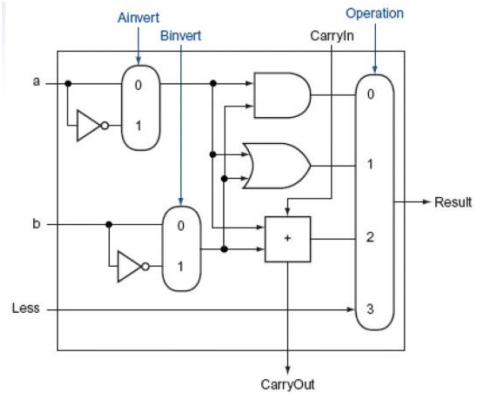
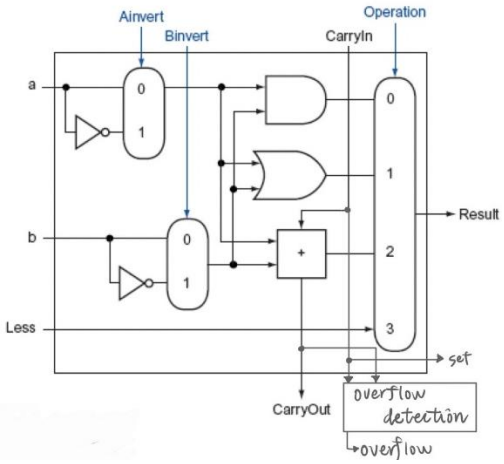
Architecture diagrams:

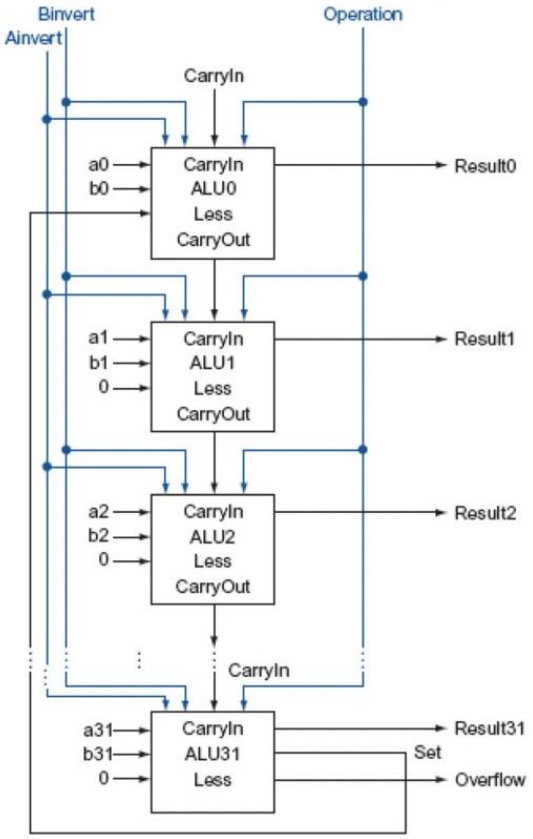
ALU_top



ALU_btm



32 bit ALU



Hardware module analysis:

ALU_top :

1. A、B invert : 分別判斷 src1 和 src2 的值需不需要 inverse ->得 a,b

2. 用 src 判斷完 inverse 的 a,b 根據 operation 判斷 result :

   - ✧ 00 : result <= (a==1 && b==1)
   - ✧ 01 : result <= (a==1 || b==1)
   - ✧ 10 : result <= FullAdder 以(a,b,cin)輸入計算的結果
   - ✧ 11 : result <= less

3. Carry out : 使用 full adder 時的 carry out

ALU_btm :

在 ALU_top 上外加 overflow detector、set :

1. Overflow <= (carry in != carry out)

2. Set <= full adder 運算結果

ALU

結合 31 個 ALU_top, 1 個 ALU_btm

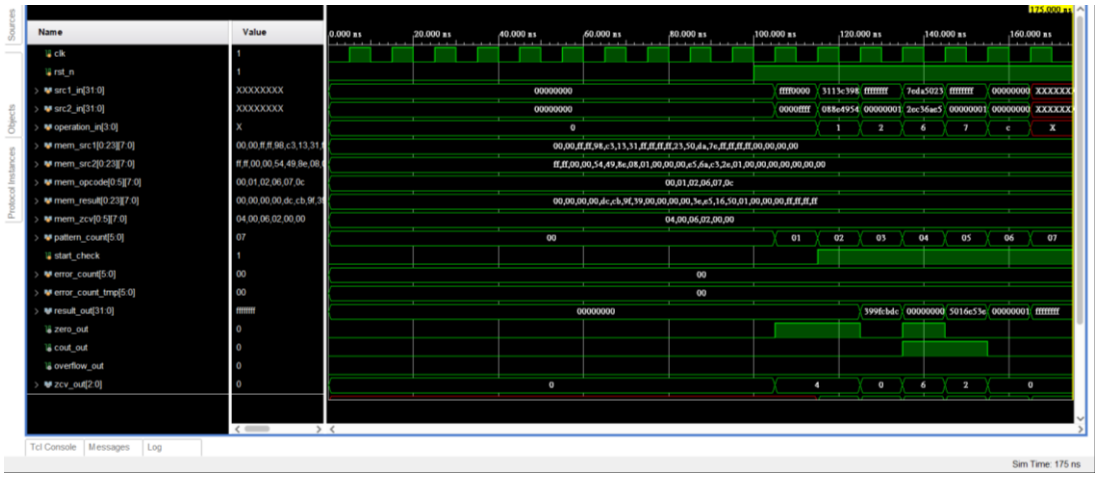
ALU Action	Name	ALU Control Input
And	And	0000
OR	Or	0001
Add	Addition	0010
Sub	Subtraction	0110
Nor	Nor	1100
Slt	Set less than	0111

ALU control input :
[3] = A_invert
[2] = B_invert
[1:0] = operation
Zero <= (result ==32'b0)? 1: 0;

Cout <= add 或 sub 時 alu_btm 的 cout

Overflow <= add 或 sub 時 alu_btm 的 overflow

Experiment result:



Problems you met and solutions:

Vivado 無法加入並開啟檔案，後來搜尋到可以透過將設定 text editor 中的 syntax checking 設定為 vivado 就可以順利處理檔案

Summary:

覺得對 module 連接的應用更理解了