

CALU16:

This chip is a 16bits chip which contains all functions that mentioned in the question sheet, and the 7th pin is multiply.

The Hwaresimulator use two's complement, therefore it is complex for multiply between negative numbers.

My method is :

- * Change negative number into positive number and do the multiply.
- * Check the signal of the result and decide whether to change the result into its opposite (for example, if two multipliers contain negative and positive numbers at the same time, the result should be negative).

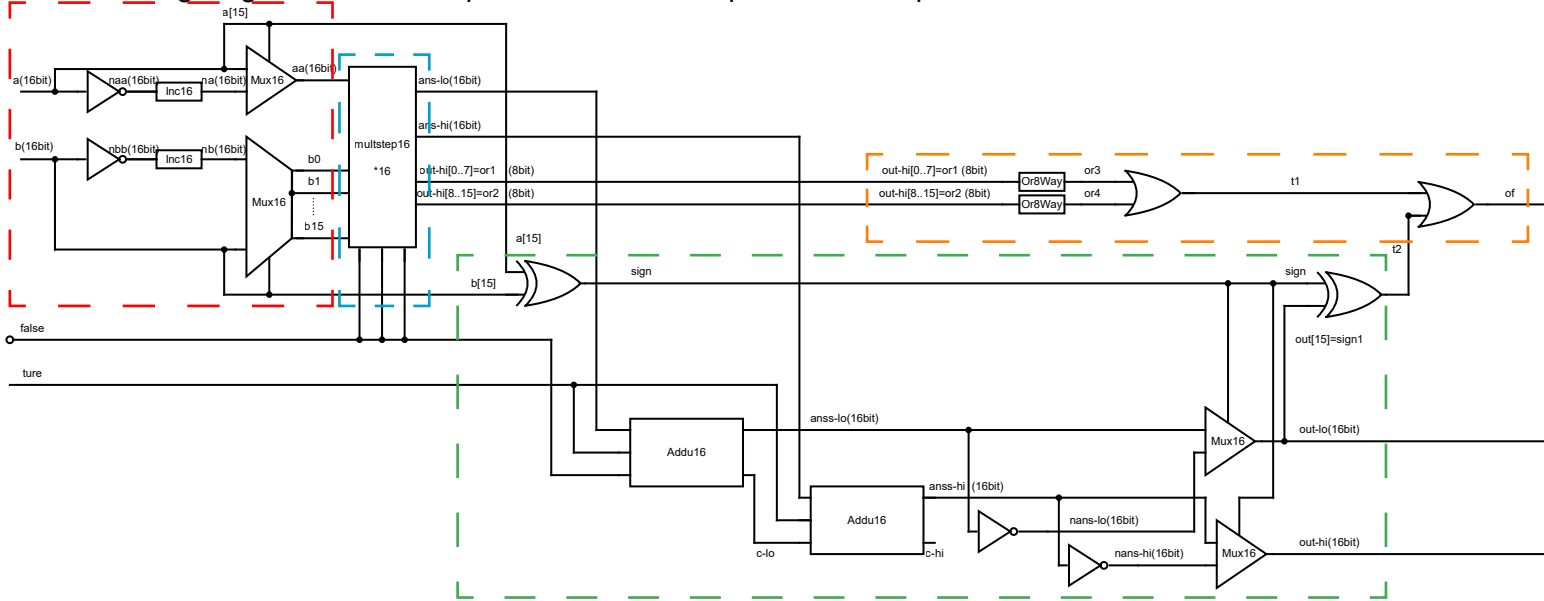
In order to get the negative number, my method is:

- * Put result into 'Not16' gate.
- * Use 'Add16' chip plus the result with A 16-bits bus full of 1 (false, 111.....1, which same as plus -1 or minus 1).

I choose to check the overflow when the result is still a positive number. The way I deal with overflow-checking is:

- * Build two 16-bits bus, one is 'hi' and the other is 'lo', treat them as a 32-bits bus. For two 16-bits multipliers, the result is up to 32-bits, therefore register 'hi' will never overflow.

The following diagram is the main part of Mult16.HDL, please scale up to 200 %.



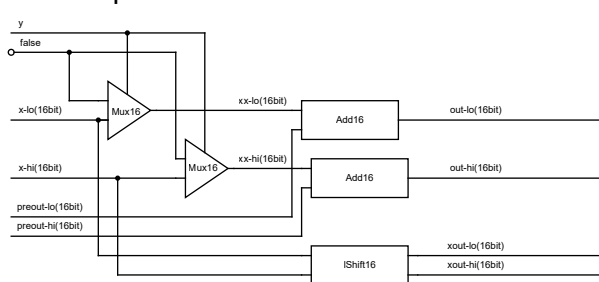
if the input number is negative, change it to positive

main part of multiply, build by 16 MultStep16 gate

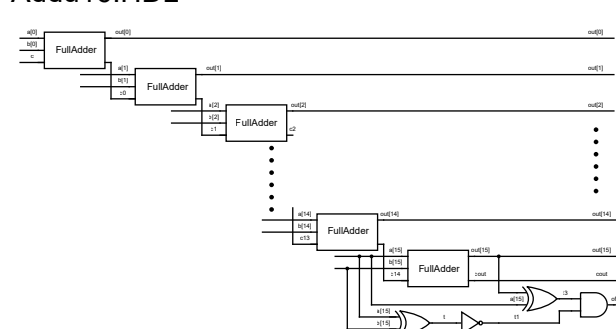
if two multipliers contain negative and positive numbers at the same time, change the result into negative

check overflow

MultStep16.HDL



Addu16.HDL



IShift16.HDL

