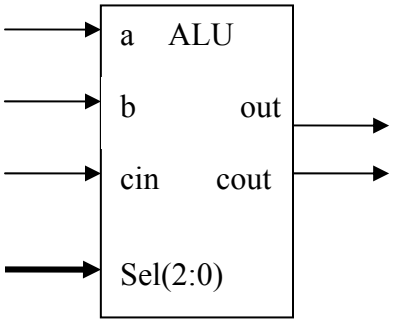
Assignment # 2
February 7th, 2007
Due: February 14th, 2007

The purpose of this assignment is to exercise structure, component hierarchy, and generic statements, and to introduce generate statements.

1 Warm-Up

This part of the assignment is intended to help you prepare for the main part of the assignment as well as create a few useful code pieces that you can use.

Create a 5-function, 1-bit ALU that has single-bit data inputs `a` and `b`, and a 3-bit select bus. S1 and S0 basically choose the function, and could be the select inputs to a 4-1 MUX for choosing which function is seen on the ALU output: `a`, AND, XOR, or Full Adder.



S2	S1	S0	Function
0	0	0	Identity (a)
0	0	1	a AND b
0	1	0	a XOR b
0	1	1	a + b
1	0	0	Identity (a)
1	0	1	a AND b’
1	1	0	a XOR b’
1	1	1	a – b

When S2 is high, the input `b` is inverted. This allows the FA to perform two’s complement subtraction. Thus, when S = b“111”, the `cin` input to the FA should be set to 1 (thereby performing `b′` + 1), i.e., subtraction.

Finally, associate two generic parameters with the ALU component: one to control `cout` delay, and one to control `out` delay.

2 Main Assignment

Now your task is to design and implement a generic ALU with ripple carry using generate statements to create an `n`-bit ALU. This component will have three generic parameters: `cout_delay`, `out_delay`, and `bit_width`. Note that the `cout` from each slice will have to be connected to the `cin` of the next most significant slice (ripple carry).
Make the default width 16 bits.

When testing the generic ALU, use a bit width of 8. Design your testbench to instantiate an ALU of this width.

3 Submission Instructions:

Your submission should include three files: your single-bit ALU component, the generic bit-width ALU component, and the testbench used to verify the 8-bit ALU. Use the following naming convention:

lastname_firstinitial_alu1.vhd
lastname_firstinitial_gen_alu.vhd
lastname_firstinitial_gen_alu_tb.vhd

Zip all three files into a compressed folder, and email to **mbales3@gatech.edu** by 9 pm on the due date. Place 4170 Assignment 2 in the subject line.