

**Gebze Technical University  
Computer Engineering**

**CSE 331  
Computer Organization**

**PROJECT 2 REPORT**

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## Problem Definition and Solution

In this project, expected to design ALU. ALU is based on the fact that two 32-bit numbers produce results with AND, OR, ADD, SUBTRACT, SET-ON-LESS-THAN operations.

In this project defined 4 modules, and 1 testbench file.

Modules and definitions:

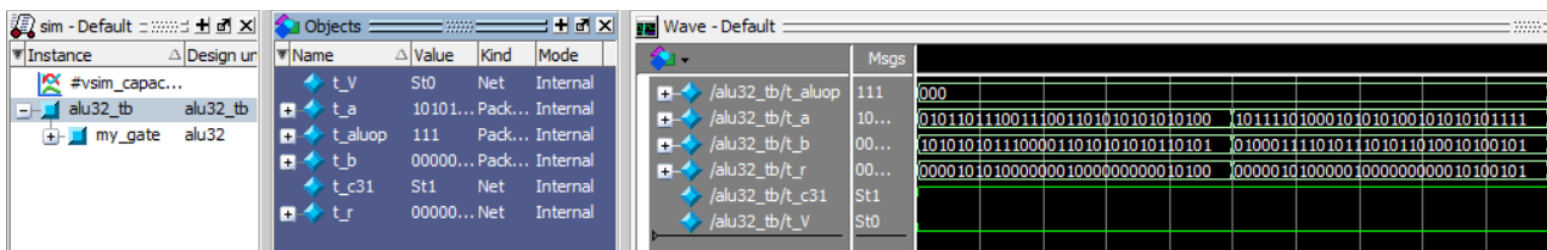
- alu32 : main file, used in testbench file. Calculates all the operations and gave us outputs.
- alu1 : alu32 file sends all the 32 bit ALU operations to alu1 and calculate results.
- mux\_4x2: alu32 file sends all the 32 bit ALU mux operations to mux\_4x2 and selects data respect to data selectors.
- xor\_2x1 : alu32 file sends all the 32 bit ALU xor operations to xor\_2x1 and calculates the result.

## More Explanation:

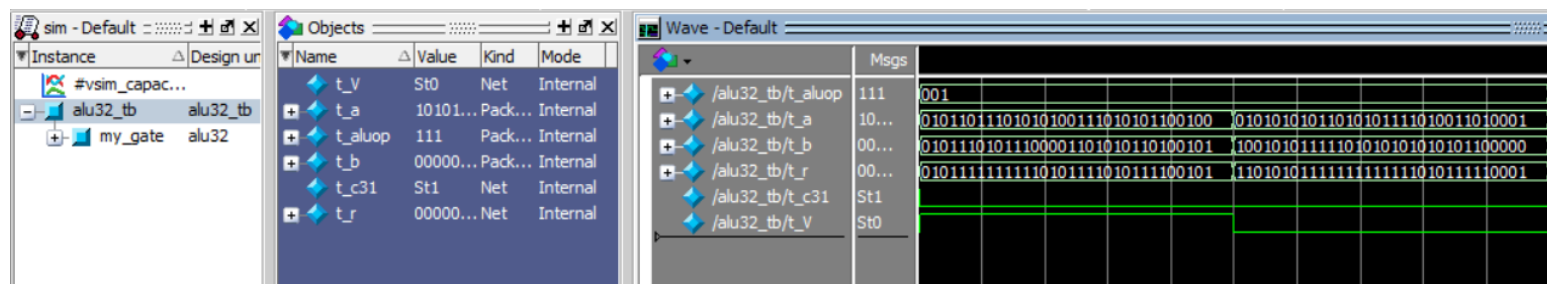
The ALU design provided in the project does not provide an accuracy for the less i input of the least significant bit. For this reason, ALU design was used for MSB given on the slides of the course. The set output of MSB is connected to less i of least significant bit. In this way, the correct result for SET-ON-LESS-THAN operation was obtained. The V output of MSB is decides if occur any overflow or not. In order for these operations to occur, the alu32 file has alu operations calculated for 32 bits, then the calculations for two outputs, V and set, were performed and accurate results were obtained.

Here is some examples and their screenshots.

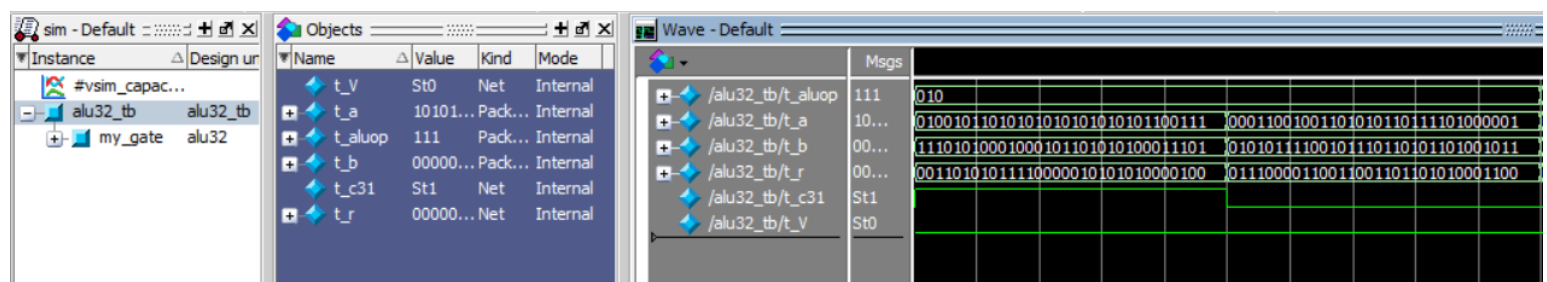
1 - 000 AND operations:



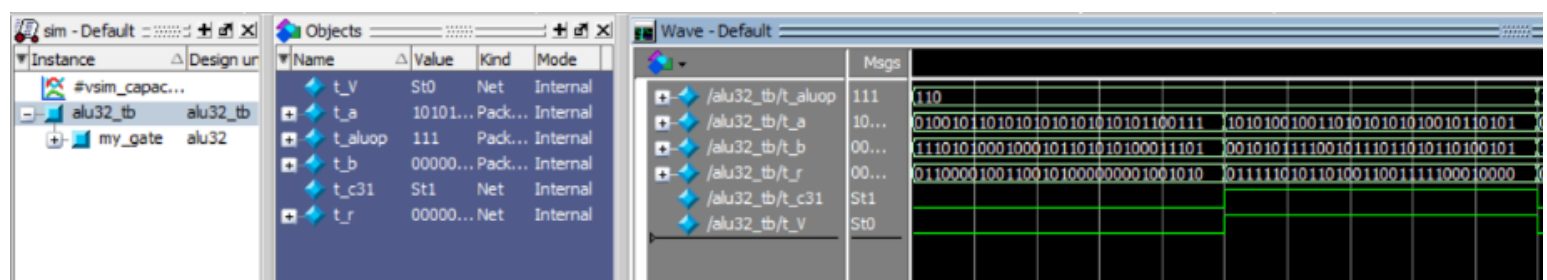
## 2 - 001 OR operations:



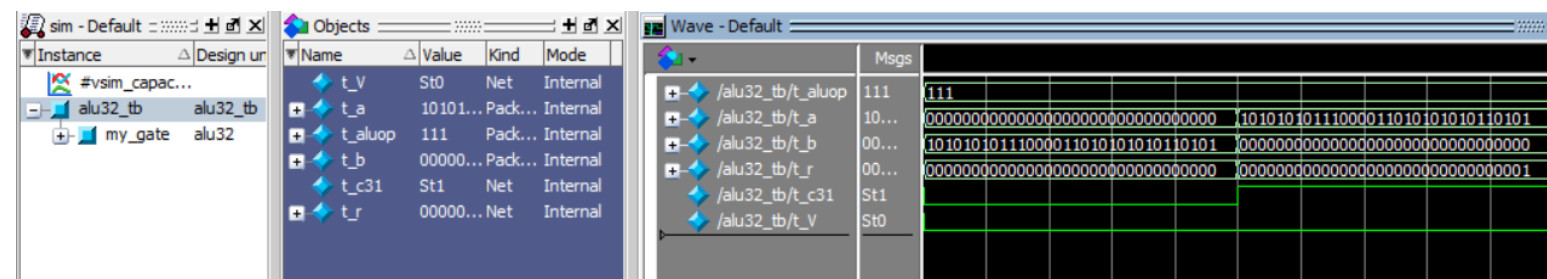
## 3 - 010 ADD operations:



## 4 - 110 SUBSTRACT operations:



## 5 - 111 SET-ON-LESS-THAN operations:



## Setup fbga :

There is an error but I could not solve this problem. I did true things until the last step. There is no hardware setup, USB-Blaster can not found any position and I could not repair this problem. I can add but I can not start. I upload my all files in this way.

