LAB2

**Count the number of ones in a 16-bit word**

There are two components in this assignment:

* First,in this lab, you will learn how to assemble, load, execute and debug program in LC3 simulator under the [guide](http://acsa.ustc.edu.cn/ics/downloads/LC3_unix.pdf), and **hand in a usage report**.
* Second

   you are asked to **write a program in LC-3 machine language(in '0' and '1' format)** to count the number of ones in a 16-bit word and store the number in memory.   
   Your program should assume that the word in which we are counting the number of ones is stored in memory location **x3100**.   
   Your program should count the number of ones in the word and store the result in memory location **x3101**.   
   Your program should start at memory location **x3000**.   
   **You should also write a report to explain how you solve the problem. Writing Comments for each instruction.**

**Example:** If the memory location x3100 contains the word 1101000100001011, then your program should store the value 0000000000000111 (decimal 7) in memory location x3101.

**Hint 1:** What happens when you add a number to itself? For example 0000000000001011 + 0000000000001011 = 0000000000010110.

**Hint 2:** How is bit 15 different from the other bits in a word?

**Simulator Hint:** You can test your program by setting the value of memory location x3100 before you run your program on the LC-3 simulator. On UNIX machines (Sun, Linux) you can do this by using the "Set Values" option on the menubar and selecting the "Set Register or Memory" option. On Windows machines, you can click on "Simulate" in menubar and select "Set Value". Instead, you can just press F4 and the "Set Value" dialog box will pop up.

**Notes and Suggestions:**

* The first line of your program must specify the memory address of the first instruction of your program. The LC-3 simulator will place your program starting at that address. For this assignment, you should place your program starting at **x3000** (the first line of your program should contain the bit pattern 0011000000000000).
* Please ask any TA if you have any questions.
* Look in the [Software and Documentation](http://acsa.ustc.edu.cn/ics/download.html) section for more help on how to use the simulator.