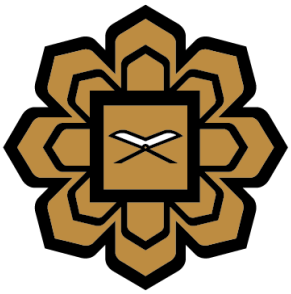

الجامعة الإسلامية العالمية ماليزيا
INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA
يونيورسيتي إسلام انتارابغسا ملايسيا
Garden of Knowledge and Virtue

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ASSIGNMENT - 02

COMPUTER ARCHITECTURE & ASSEMBLY LANGUAGE

Course: CSC-3402, **Sec:** 02

Lecturer: Dr. HAFIZAH BINTI MANSOR

Submitted by:

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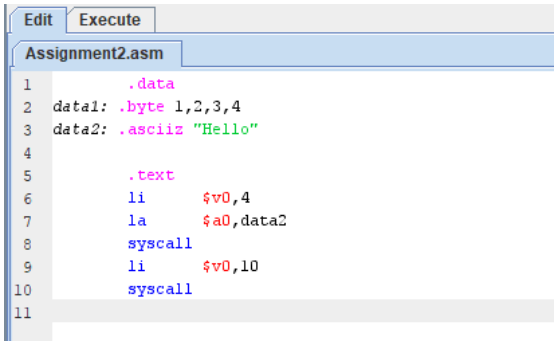

Open the (installed) MARS simulator. Open the source code “Assignment2.asm”. Save the file, then click “Run->Assemble”. Try to explore the different views including the text segment, data segment, I/O window, and registers. Then answer the followings:

1. **What is the purpose of line 1?**
   Ans: Line 1 (.data) implies all the data of our program. For instance, when we write code in C++ we declare some variable. So, in assemble language we declare the variable under .data section.

2. **What is the purpose of line 5?**
   Ans: Line 5 (.text) has all the instruction that our program needs. Basically, it works like a main function of code. Where all the action will be listed.

3. **What is data1?**
   Ans: In this code, data1 is a numeric variable, where we declared a numeric data such as 1,2,3,4. It reserves 4 bytes here.

4. **What is the difference between line 2 and line 3 in terms of the data stored in the data segment?**
   Ans: Line 2 is **numeric data type** and Line 3 is **string data type**. In Line 2 we just declared numeric data such as 1,2,3 and so on. But in Line 3 we declare string data type, such as Hello. Most important thing is for declaring numeric data, there is no need double quotation (“ “). But for string data type, there must need double quotation (“ “).

5. **Where is data1 stored? What is the address of data1?**
   Ans: data1 stored numeric data which is stored inside the data segment. The address of data 1 is 0x10010000

6. **Where is data2 stored? What is the address of data2?**
   Ans: data2 stored string variable which is also stored inside the data segment. The address of data 2 is 0x10010004

7. **What happens after line 6 is executed?**
   Ans: Line 6 there is a command **li**. It means we are giving instruction to system, load immediate. That means load the register (v0) with value of 4. Here, 4 is the system call code for print_str. The value for register **v0** will be change to 0x00000004. And pc (program counter) will change to next address 0x00400004.

8. **What happens after line 7 is executed?**

Ans: In Line 7, there is an instruction **la $a0, data2.** That means load address. where string is stored. The value for register **at** will be changed 0x10010000. And pc (program counter) will change to next address 0x00400008.

9. **What happens after line 9 is executed?**
   Ans: The system will print what is stored in data2. Which means in our code, after executing the line number 9, the system will print word **Hello.** And program will end. The value for register **v0** will be changed 0x0000000a. And pc (program counter) will change to last address which is 0x004000014.

10. **Based on the syscall services table, what are the purpose of lines 6-9?**
    Ans: Purposes of line 6 to 9.

    Line 6: The purpose of line 7 is to load the register (v0) with value of 4. Here, 4 is the service number in order to print the string. we generally use syscall service 4.

    Line 7: The purpose of line 7 is to load address into $a0 which is null terminated string register. In our case our string is stored at data2

    Line 8: The purpose of line 8 is to print to the screen.

    Line 9: It basically an instruction where stored data will print by calling the syscall. And after that the program counter will reached to the last address and terminate the program.