ACS Applied Computer Science

THE UNIVERSITY OF WINNIPEG

APPLIED COMPUTER SCIENCE

ACS-2906-00
Computer Architecture and System Software

Fall 2024

Assignment 3

Due date: Noevember 24th, 11:59 pm **Total marks: 40**

Assignment Files:

The file Assignment3_handout.zip contains the following files:

- 8086_instruction_set.html: This is a a reference of the 8086 instruction set containing all of the instructions you will need for this assignment
- A3Q*.asm: Template file for each question
- debug.exe: This is the debugger used in class. (You have to add the exe extension)
- Input and Output (I O) in 8086 Assembly Language.htm: This is a reference for IO operations
- INT_21_DOS_Function_Dispatcher: This is a reference to all of the DOS functions available to your assembly program.
- Intel_Defined_CPU_Exception_Table: Not really needed for this assignment. Basically, FYI.
- link.exe: Program linker (You have to add the exe extension)
- masm.exe: Program compiler (You have to add the exe extension)

Compiling and running your code:

All three of the source code files included in the handout can be compiled and executed. To execute your program, perform the following steps from the command line:

1. masm *progNam*.asm (hit enter at the subsequent prompts). Verify that there were no errors or warnings.
2. link *progNam* (hit enter at the subsequent prompts). Verify that there were no errors or warnings.
3. *progNam*.exe

Questions

1) Convert binary to unsigned int

Problem: Convert a binary string to decimal. Accept buffered user input in the form of a 16-bit binary string. Convert to **unsigned** integer and print to the screen. If the user enters less than 16 bits, you may pad the binary number with zeros on the left.

Hint: To print the numbers, you have to modify the *print_int.txt* example file (the file is on Nexus). That version uses division for 8 bits, but you need division using 16 bits for this assignment.

Sample Execution:

```
Enter a 16-bit binary number: 1001111001011100
The decimal unsigned integer equivalent is 40540.

Enter a 16-bit binary number: 01100
The decimal unsigned integer equivalent is 12.
```

2) Convert binary to signed int

Problem: Convert a binary string to decimal. Accept buffered user input in the form of a 16-bit binary string. Convert to **signed** integer and print to the screen. If the user enters less than 16 bits, or inputs illegal character, return an error message and prompt for input again.

Sample Execution:

```
Enter a 16-bit binary number: 1001111001011100
The decimal signed integer equivalent is -24996.

Enter a 16-bit binary number: 11001011100
Error! Please enter exactly 16-bits: 1001111001011100

Enter a 16-bit binary number: 110/\^01011100
Error! Illegal characters detected. Please enter a 16-bit binary number:
1001111001011100
The decimal signed integer equivalent is -24996.
```

Evaluation

10 marks will be awarded for correctly converting to unsigned int and signed int (*i.e.* 10 marks each). 10 marks are for implementing error messages in Problem 2. The remaining 10 marks are style points based on subjective evaluation of the quality of your solutions and your comments (another 10 marks each).

Hand in instructions

Include your name and student number in all files. Comment, comment, comment! **Up to 5 marks will be deducted for students that do not follow instructions or submit poorly formatted work**. Submit your submission through Nexus. Only submit your .asm files and ensure they will compile before submission.