Lab 02: Variables in Assembly Language

EE222: Microprocessor Systems

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Contents

1 Assembly Coding

1.1 Design Problem

Write a program that calculates the following expression, using registers

$$A = (A + B) - (C + D)$$

Assign integer values to the EAX, EBX, ECX and EDX registers. Also look up rules of the MOVADD and SUB instructions before writing the program.

1.2 x86 Assembly Code

Assuming the values of A, B, C and D be 5, 6, 2 and 3 respectively.

```
TITLE AddTwoProgram

INCLUDE Irvine32.inc
.code
main PROC

;assigning values
    mov eax, 5
    mov ebx, 6
    mov ecx, 2
    mov edx, 3

    ;aritherematci operations
    add eax, ebx
    add ecx, edx

    sub eax,ecx

    ;output
    Call DumpRegs
    exit

main ENDP
END main
```

1.3 Code Execution

```
Microsoft (R) Incremental Linker Version 6.00.8447
Copyright (C) Microsoft Corp 1992-1998. All rights reserved.

 Volume in drive C has no label.
 Volume Serial Number is 2079-53BB

 Directory of c:\Masm615

02/19/2018  01:32 AM               211 test.asm
02/19/2018  01:33 AM            28,708 test.exe
02/19/2018  01:33 AM            29,584 test.ilk
02/19/2018  01:33 AM            13,373 test.lst
02/19/2018  01:33 AM             3,418 test.obj
02/19/2018  01:33 AM            91,136 test.pdb
               6 File(s)        166,430 bytes
               0 Dir(s)  132,455,768,064 bytes free
Press any key to continue . . .

c:\Masm615>test

  EAX=00000006  EBX=00000006  ECX=00000005  EDX=00000003
  ESI=00000000  EDI=00000000  EBP=0012FF94  ESP=0012FF8C
  EIP=0040102F  EFL=00000206  CF=0  SF=0  ZF=0  OF=0


c:\Masm615>
```

1.4 Analysis

Registers	Hexadecimals	Decimals
EAX	00000006	6
EBX	00000006	6
ECX	00000005	5
EDX	00000003	3

Hence execution has been verified.

2 x86 Operation Modes

2.1 Real Mode

An operating mode of all x86-compatible CPUs. Real mode is characterized by a 20-bit segmented memory address space (giving exactly 1 MB of addressable memory) and unlimited direct software access to all addressable memory, I/O addresses and peripheral hardware.
Real mode provides no support for memory protection, multitasking, or code privilege levels.

- The Real mode lets Operating System access only first 1 MB of memory.
- DOS operates only in Real addressing mode.

2.2 Protected Mode

Also called protected virtual address mode, is an operational mode of x86-compatible central processing units (CPUs). It allows system software to use features such as virtual memory, paging and safe multi-tasking designed to increase an operating system's control over application software

- The Protected mode lets Operating System access more memory (4 GByte for 32-bit mode) as well as first 1 MB of memory.
- Windows operate in Protected addressing mode.