

Emulator 8086

Course Title: Computer Organization & Architecture



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Lecture Outline



1. Understand the computer architecture and the relation between the architecture on the software.
2. Understand the programs behavior on the computing systems.
3. Understand the abstract topics more precisely by using some simulators to simulate different models of processors and emulators to practice Assembly Language Programs.
4. Understand the basic systems principles of pipelining and caching.

IDE



- An integrated development environment (IDE) is a software application that provides comprehensive facilities to computer programmers for software development.
- An IDE normally consists of a source code editor, build automation tools, and a debugger.
- IDEs are designed to maximize programmers' productivity.
- IDEs present a single program in which all development is done.
- This program typically provides many features for authoring, modifying, compiling, deploying and debugging software.
- An advantage of IDE is that code can be continuously parsed while it is being edited, providing instant feedback when syntax errors are introduced.
- IDE can help to speed learning a new programming language and its associated libraries.
- Microsoft Visual Studio, Net-beans, CodeBlocks, Emu8086, Eclipse are some popular IDEs.

EMU8086 IDE



- An Integrated Development Environment (IDE) provides a convenient environment to write a source file, assemble and link it to a -.COM or -.EXE file, and trace it in both source file, and machine code.
- Emu8086 is an educational IDE for assembly program development.
- We can download the latest student version of Emu8086 from the web page www.emu8086.com.
- It is a Windows program, and will run by dragging an -.ASM, -.OBJ, -.LST, -.EXE , or -.COM file into the emu8086 shortcut icon.
- By this action, asm or lst files will start the 8086 assembler source editor, while obj and exe files starts the disassembler and debugger units.

EMU 8086 Source Editor



- The source editor of Emu8086 is a special purpose editor which identifies the 8086 mnemonics, hexadecimal numbers, and labels by different colors as seen in Figure 1.
- The **compile** button on the taskbar starts assembling and linking of the source file.
- A **report window** is opened after the assembling process is completed.
- Figure 2 shows the emulator of 8086 which gets opened by clicking on **emulate** button.
- Emu8086 environment contains templates to generate command and executable files.
- Another benefit of Emu8086 is its emulation of a complete system, including the floppy disk, memory, CPU, and I/O ports, which raises opportunity to write custom bios and boot programs together with all other coding of a system.
- Moreover, its help is quite useful even for a beginner of asm programming.

EMU 8086 Source Editor



```
01 .MODEL SMALL
02 .STACK 64
03 .DATA
04 DATA1 DB 52H
05 DATA2 DB 25H
06 SUM DB 7
07 .CODE
08 MAIN PROC FAR ;program entry point
09     MOV AX,@DATA ;data segment
10     MOV DS,AX ;goes into DS
11     MOV AL,DATA1 ;first number
12     MOV BL,DATA2 ;second number
13     ADD AL,BL ;add them
14     MOV SUM,AL ;store to SUM
15     MOV AH,4CH ;Exit to DOS
16     INT 21H
17 MAIN ENDP
18 END MAIN
```



Figure 1. **a)** EMU8086 Source Editor, and **b)** assembler status report windows.

EMU 8086 Source Editor

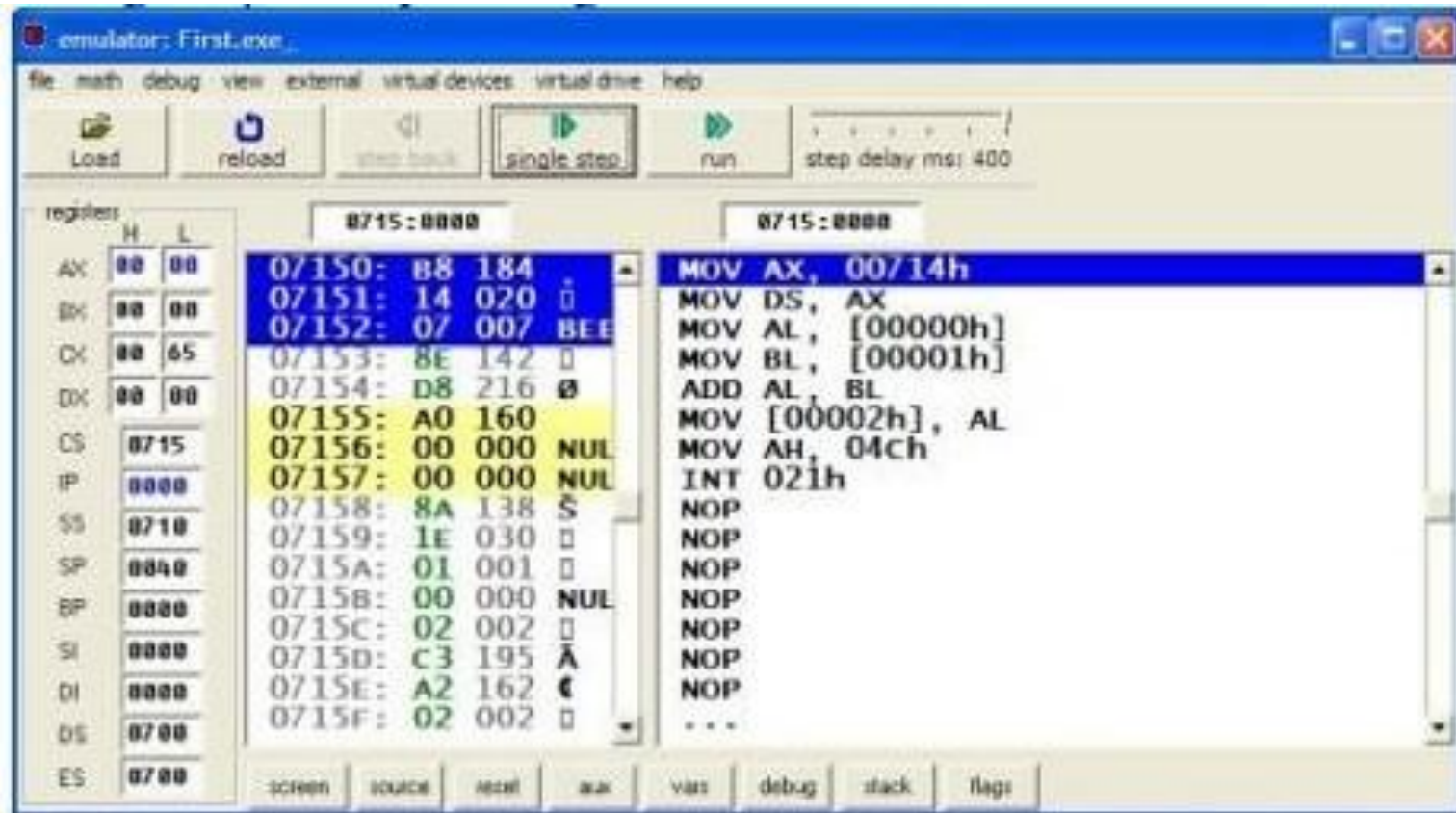


Figure 2 first.exe in the emulator window of EMU8086 debugging environment

Opt-in Examples in Emu 8086



- Look at “Code Examples”
- After opening one of the code samples, then press ‘emulate’, then ‘run’.
- Also try these :
 - a) add
 - b) subtract
 - c) mov
 - d) exchange

Assemble and execute instructions in Emu 8086



Step 1: Use emu8086 to make the following calculations.

1. $10100101b = ?(10)$
2. $1234h = ?(10)$
3. $39 = ?(H)$

Procedure



1. First , do whole calculations manually.
2. Choose “Math” and specify “Base Convertor” in emu8086.
3. Enter one of the numbers like in the Figure 3.
4. compare your results with the results “base convertor” produced.

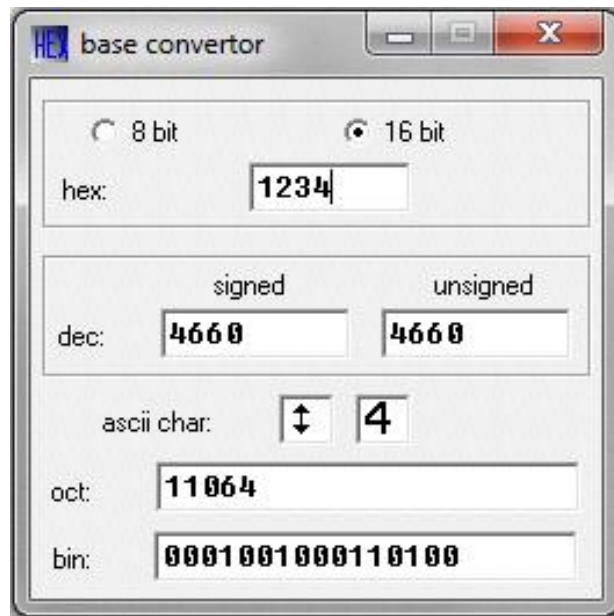


Figure 3: Base Convertor window

Use EMU8086 to evaluate an expressions

Evaluate : $\text{OFFFh} * 10\text{h} + \text{OFFFh}$



1. First , do whole calculations manually.
2. Choose “Math” and specify “Multi Base Calculator” in emu8086.
3. Enter the expression like in the Figure 4.
4. Compare your results with the results “base convertor” produced.
5. Is it same or not? Explain clearly.



Figure 4: Multi Base Calculator window with a sample expression

Initialize the internal registers of the 8086 as follows:



- (AX) = 0000H
- (BX) = 0001H
- (CX) = 0002H
- (DX) = 0003H
- (SI) = 0010H
- (DI) = 0020H
- (BP) = 0030H
- (DS) = 0B60H
- Then, verify the initialization by displaying the new content of register.
- Put a check if you can verify it.

Writing and Running Assembly Code in Emu8086



- In this part, we are entering Assembly language world. Let's say "Hello World"

```
org 100h
jmp start

msg:      db      "Hello, World!", 0Dh, 0Ah, 24h

start:    mov     dx, msg
          mov     ah, 09h
          int     21h

          mov     ah, 0
          int     16h

ret
```



References

- Assembly Language Programming and Organization of the IBM PC, Ytha Yu and Charles Marut, McGraw Hill, 1992. (ISBN: 0-07-072692-2).
- https://www.tutorialspoint.com/assembly_programming/index.htm



Books

- Assembly Language Programming and Organization of the IBM PC, Ytha Yu and Charles Marut, McGraw Hill, 1992. (ISBN: 0-07-072692-2).
- Essentials of Computer Organization and Architecture, (Third Edition), Linda Null and Julia Lobur
- W. Stallings, “Computer Organization and Architecture: Designing for performance”, 67h Edition, Prentice Hall of India, 2003, ISBN 81 – 203 – 2962 – 7
- Computer Organization and Architecture by John P. Haynes.