Introduction

Course Code: Course Title:

Dept. of Computer Science
Faculty of Science and Technology

Lecturer No:	**1(a)**	**Week No:**	**1**	**Semester:**	**Spring 21-22**
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Lecture Outline

1. Understand the computer Architecture, and the relation between the architecture on the software.
2. Understand the vision in understanding 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, and requires writing and understanding programs at multiple levels.

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. That can 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. Emu86 is an educational IDE for assembly program development. You can download the latest student version of EMU86 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 emu86 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.

EMU8086 Source Editor

- The source editor of EMU86 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 Emul8086 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."

EMU8086 Source Editor (Cont)

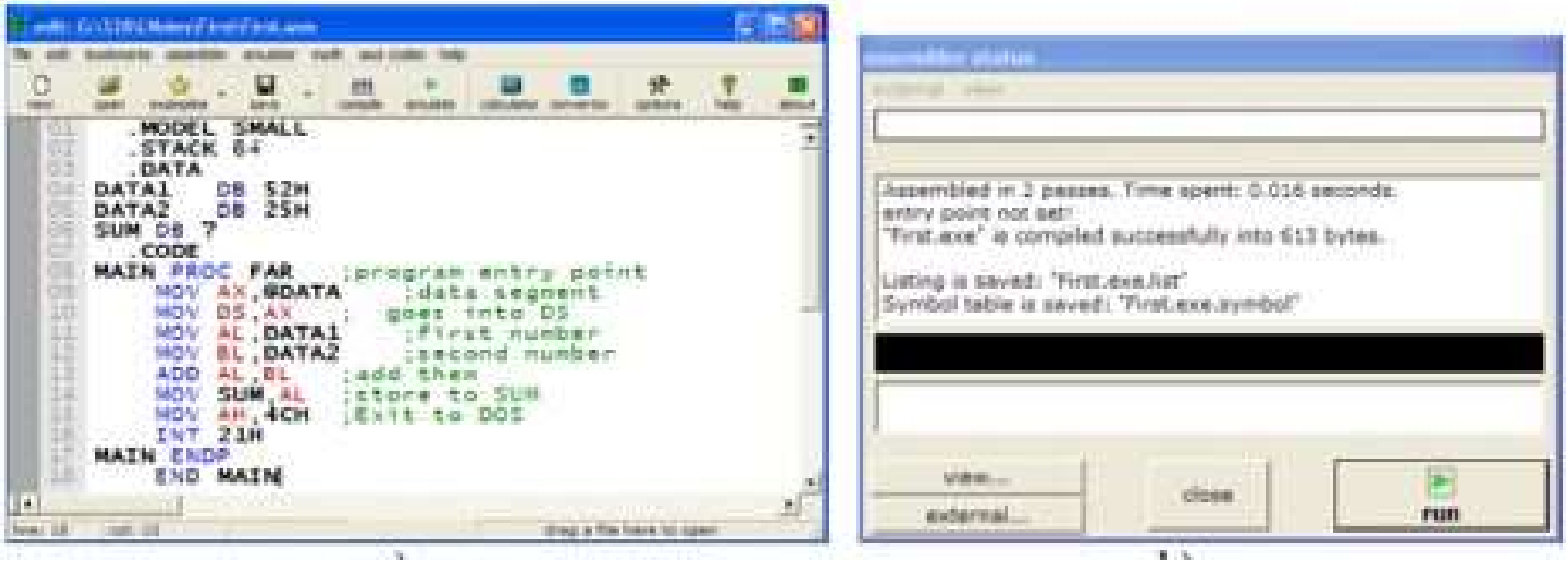

Figure 1. **a)** EMU8086 Source Editor, and **b)** assembler status report windows.

EMU8086 Source Editor (Cont)

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

Examples in Emu8086

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 Emu8086

Step 1: Use emu8086 to make the calculations following

1. 10100101b = ?(10)
2. $1234\text{h} = ?(10)$
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.

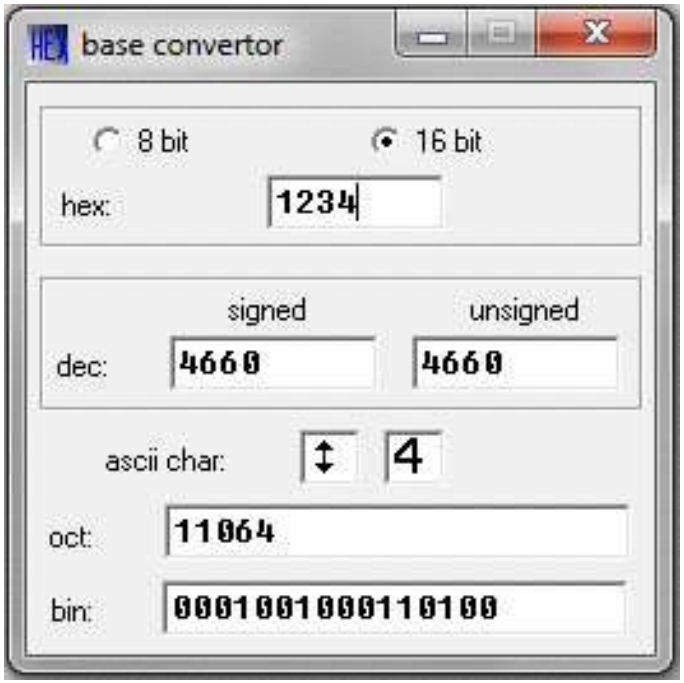

Figure 3: Base Convertor window

Use EMU8086 to evaluate an expressions
Evaluate : OFFFFh *10h +OFFFFh

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. Is it same or not ? Please explain clearly.

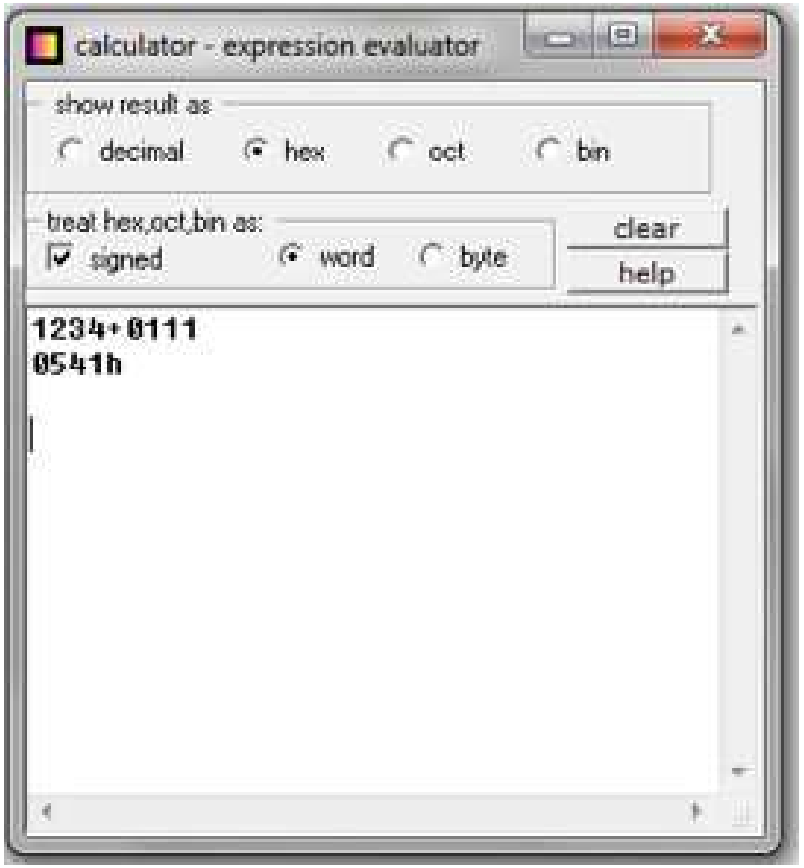

Figure 4: Multi Base Calculator window with a sample expression

Initialize the internal registers of the 8ox86 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. Please 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‟

```
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

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- 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.