

ASSEMBLY LANGUAGE

BSSE II
CSSE 402

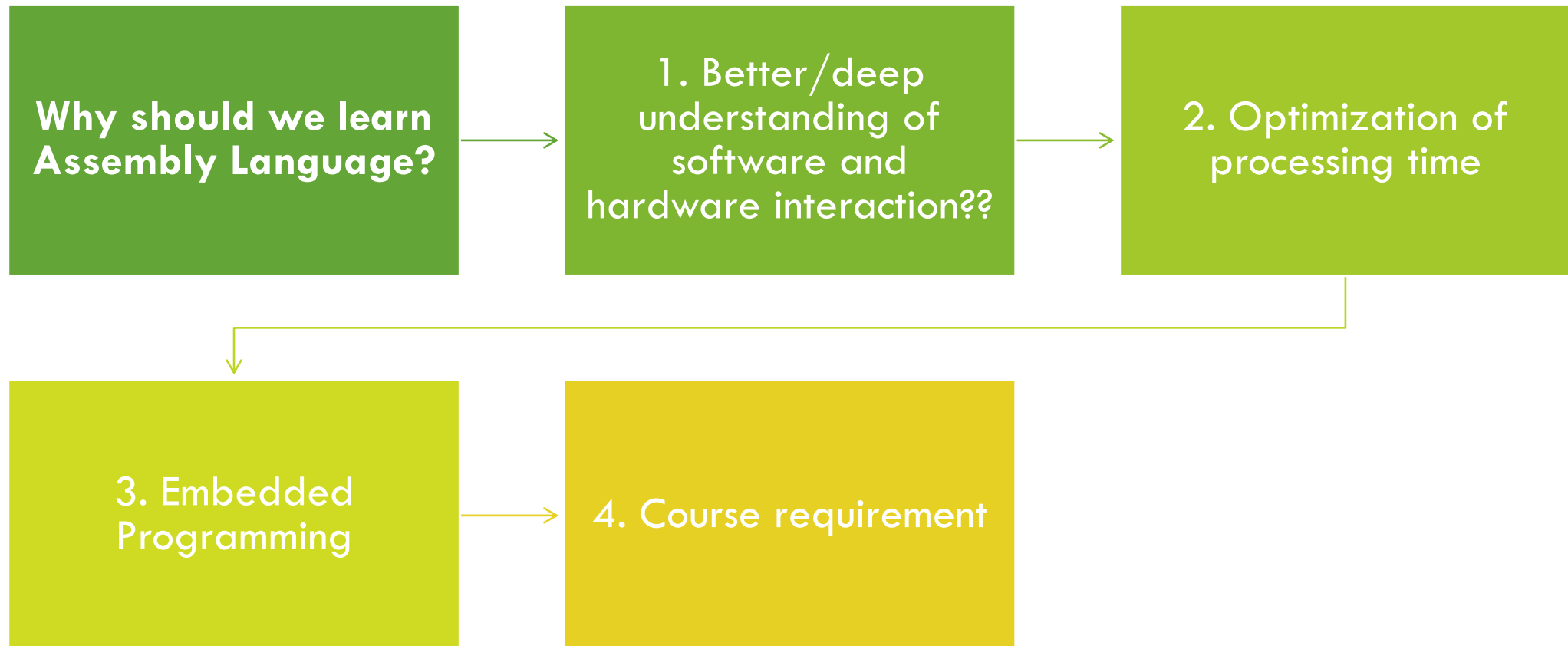
**Why should we learn
Assembly Language?**

1. Better/deep
understanding of
software and
hardware interaction??

2. Optimization of
processing time

3. Embedded
Programming

4. Course requirement

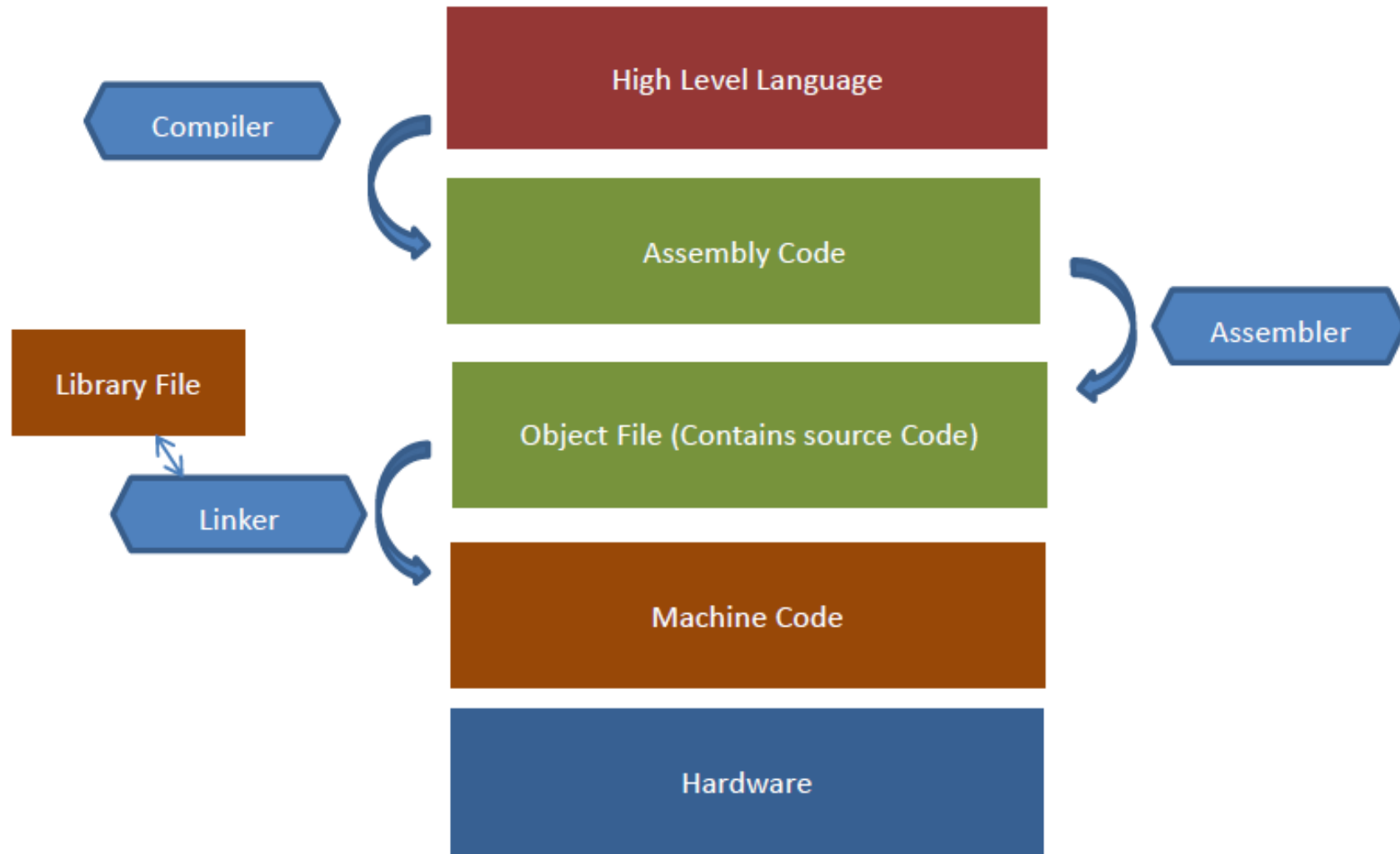



What is Assembly Language?

Developed by David John Wheeler

(to interact with machine language easier to perform task).

- 1. Computer Programming Language
- 2. Low level Programming Language
- It uses Mnemonics/keywords
- Closer to Hardware
- Time waste in compilation can reduced



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1. High level language program(C,C++, etc.), Compiler(language translator) is used to convert high level code into Assembly.
 2. Assembly code is then converted into object file by Assembler.
 3. Then object file convert into machine code. Object file is linked by linker with library file. Every system has different system properties(how is it made, attributes, etc.). This library file present in system and object file link together change into machine code which run the hardware.



Code in C, filename.c (.c extension language format)



Compile in Assembly language, extension changes to filename.asm



Assembler convert it into object file, extension changes into filename.obj



Linker link it with library file extension changes into .exe, hardware run it.

REASON



Reason was to combine machine parts to perform specific task (like switches and other components which assemble to perform task), name **Assembly**

Machine Language	Assembly Language	High level Language
It is the native language of machine	It is low level computer programming language which means it is more close to machine	It is a computer programming language that is more close to human.
Consists of 0's and 1's	Consists of a symbolic representation (i.e. Mnemonics)	Consists of English like statements
Known as machine code	Known as assembly code and also asm	There are many high level languages e.g. c, java and they are called by their names.

Assembler	Compiler	Interpreter
Translate assembly code to machine code	Translate the entire high level language code to machine code	Translate the high level code line by line (single instruction at a time) and then convert to machine code

BUSES

Buses are the wires that connect the components. (CPU, memory and input/output devices) There are three types of wires:

Address Bus: holds the address of memory location, address signals

Control Bus: Inform the memory to perform read operation, control signals


Data Bus: Holds the actual data, data signals

Execution unit (EU) executes the instructions, it contains a circuit called the arithmetic and logic unit (ALU) and registers. While, the bus Interface unit (BIU) facilitates communication between the EU and the memory or I/O circuits.

FETCH-EXECUTE-CYCLE

CPU executes the instruction with fetch-execute-cycle as;

Fetch

- 
1. Fetch an instruction from memory.
 2. Decode the instruction to determine the operation.
 3. Fetch data from memory if necessary.

Execute

1. Perform the operation on the data.
2. Store the result in memory if needed.

REGISTERS

- ❑ Records or collection of information
- ❑ Storage area inside CPU, CPU take info, process and store it.
- ❑ Fastest area present inside CPU
- ❑ Helps in Optimization of Processing time (HD file internally run on register and CPU process it)
- ❑ Understanding of Hardware and Software interaction

CPU

Hard disk

RAM

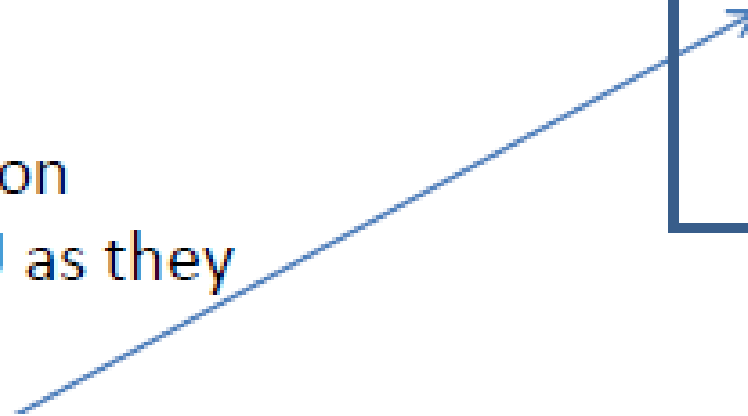
Cache

Registers

What?

Fastest storage area/location

“Quickly accessible by CPU as they are built into CPU.



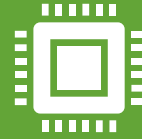
HD – Main storage- we run files present in HD.

HD file Run – RAM – Cache – Register

Register built in inside CPU, CPU quickly access information from register, program work processing time optimize.

Direct access register, time is saved , info save directly into Register because CPU extract info from here (CPU need space where it keep data to hold or remove).

CPU extract info from register through Assembly language programming.



Registers are the fastest memory locations built into microprocessor. Fast means CPU quickly access it close to CPU.



Chip by Intel 4004 in 1971, launched registered are used first time, by Federico Faggin



Following are the 14 types of registers