Day - 15

Embedded Systems Programming

MICROPROCESSOR LANGUAGE

- **Assembly language** is a low-level programming language that is used to program microprocessors.

- Each microprocessor has its **own unique** assembly language, used to communicate directly with its hardware.

- To **simplify** programming across different processors, the **C language** was developed as a common, high-level language.

MICROPROCESSOR LANGUAGE

- When a program is written in C, a **compiler** translates it into assembly language specific to the microprocessor being used.

- An **assembler** then converts this assembly code into machine language, which the microprocessor can directly understand and execute.
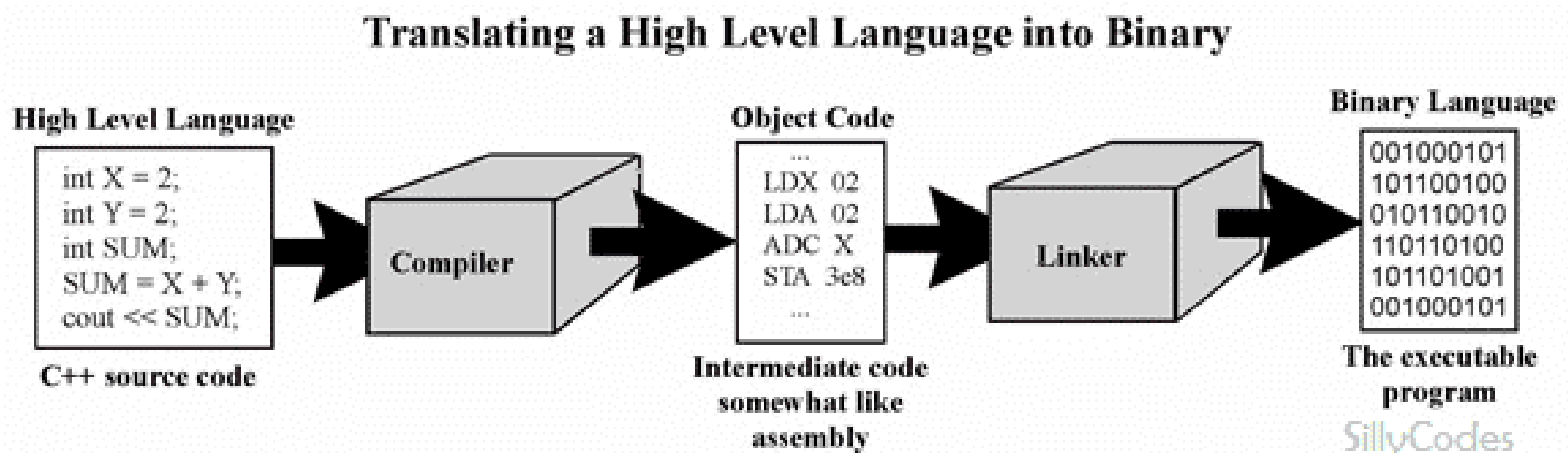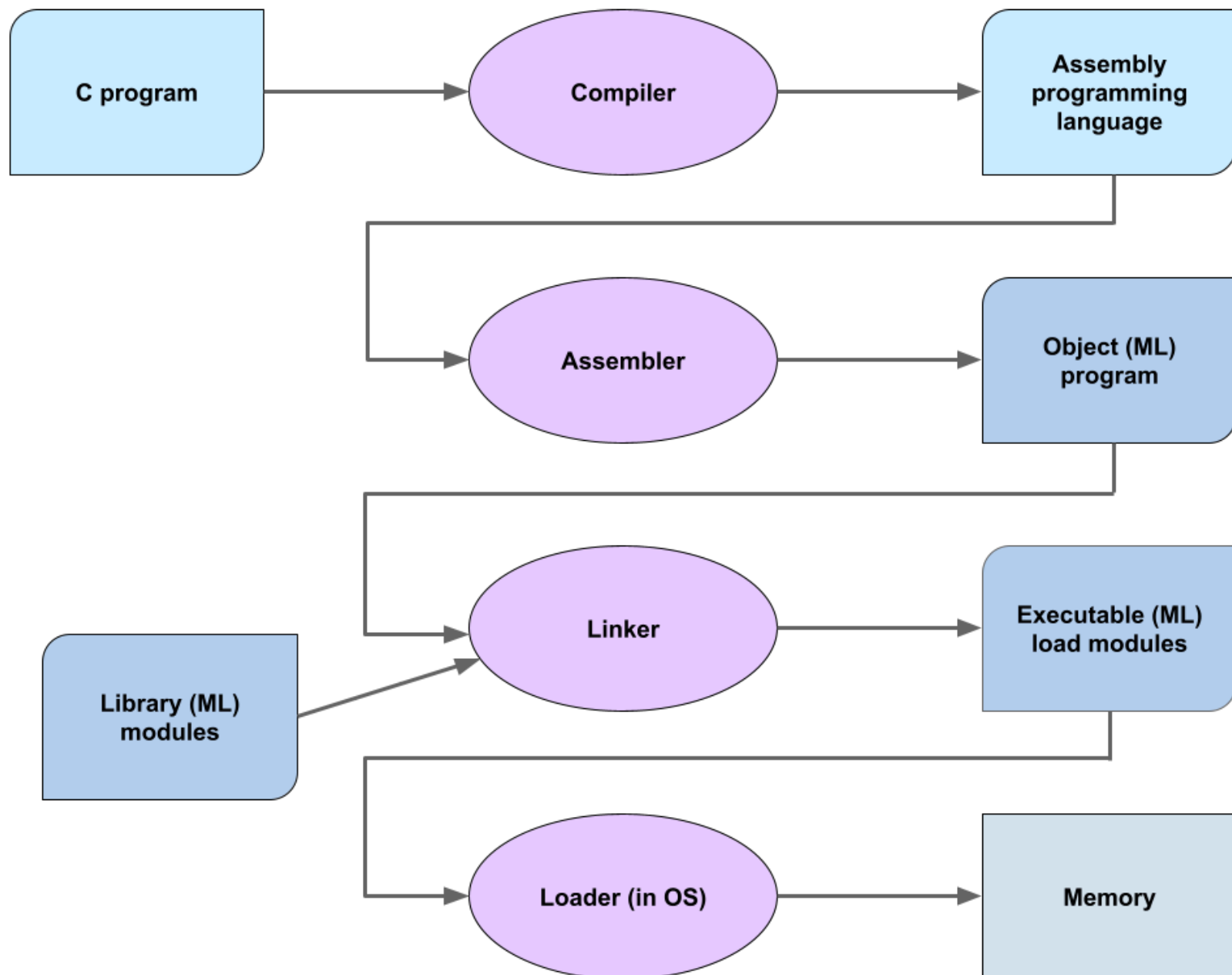
Translating a High Level Language into Binary

High Level Language		Object Code		Binary Language

int X = 2;
int Y = 2;
int SUM;
SUM = X + Y;
cout << SUM;
	Compiler	...
		LDX 02
		LDA 02
		ADC X
		STA 3e8
		...
			Linker	001000101
				101100100
				010110010
				110110100
				101101001
				001000101

C++ source code		Intermediate code somewhat like assembly		The executable program

SillyCodes

Diagram showing that a compiler and linker are both responsible for converting high-level languages to machine code.

MICROPROCESSOR LANGUAGE

```
C program → Compiler → Assembly programming language
                              ↓
              Assembler → Object (ML) program
                              ↓
Library (ML) modules → Linker → Executable (ML) load modules
                              ↓
                    Loader (in OS) → Memory
```

MICROPROCESSOR LANGUAGE

Example Assembly code Snippet:

ld R0, 512

- **ld:** This stands for **"load**." It's an instruction that tells the CPU to load data into a register.
- **R0:** This specifies the target register where the data will be loaded. In this case, it is the register R0.
- **512:** This is the immediate value to be loaded into the register R0. In this example, the number 512 is being loaded.

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