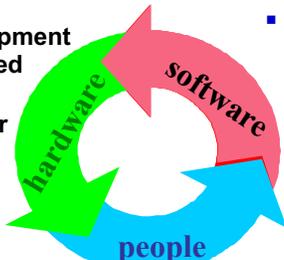


The Computer System

- The equipment associated with a computer system.





- The set of instructions that tell a computer what to do.



- Use the power of the computer for some purpose.

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Brief History of Computers

- ❖ **Mechanical Calculators** increase speed and accuracy of numerical computations
 - ◆ **Abacus** over 5,000 years ago (+/-)
 - ◆ **Adding machines** and **cash register** (+/-) 1800's
 - ◆ **Slide rules** (x/+) 1800's
 - ◆ **Bomb sites** and **ballistic sites** (x/+/+/-) 1900's
- ❖ **Electronic Computers** developed since 1945
 - ◆ **ENIAC** (Electronic Numerical Integrator and Calculator)
 - ◆ Weight 33 tons, power 175 kw, 17,000 vacuum tubes,
 - ◆ 5k (+/-) per second, but sometimes **hardware bugs**
 - ◆ **IBM** sold 100's of **vacuum tube** computers in 1950's
 - ◆ Computers used for for business accounting and research
 - ◆ Machine Language and Assembly Language programs

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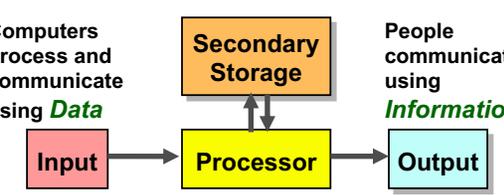
Electronic Semi-Conductor Computers

- ❖ **AT&T Bell Labs** developed **Transistors** 1950's
 - ◆ AT&T developed computers for telephony switches
 - ◆ Programmed in Assembly Language (2nd generation)
- ❖ **IBM and DEC** computers (transistors) 1960's
 - ◆ Magnetic Core memory and Magnetic storage
 - ◆ High Level Languages developed (3rd generation): FORTRAN and COBOL
- ❖ **Microprocessors** and **Integrated Circuits**
 - ◆ Personal Computing developed small and cheap
 - ◆ Hard drives and floppy diskettes
 - ◆ Apple, Microsoft & IBM
 - ◆ High Level Languages BASIC, C, C++

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Hardware = Physical Computer

Computers process and communicate using **Data**



People communicate using **Information**

- ❖ **Input** receives data (keyboard, mouse)
- ❖ **Processor** processes data (CPU, RAM Memory)
- ❖ **Output** produces information (Monitor, Printer)
- ❖ **Secondary storage** (Hard Drive, CD)

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Software = Computer Programs

- ❖ **Program:** A set of step by step instructions that direct the computer to do a task that you want it to do and produce the results you want.
- ❖ **Programming Language:** A set of rules that instructs the computer what operations to perform.



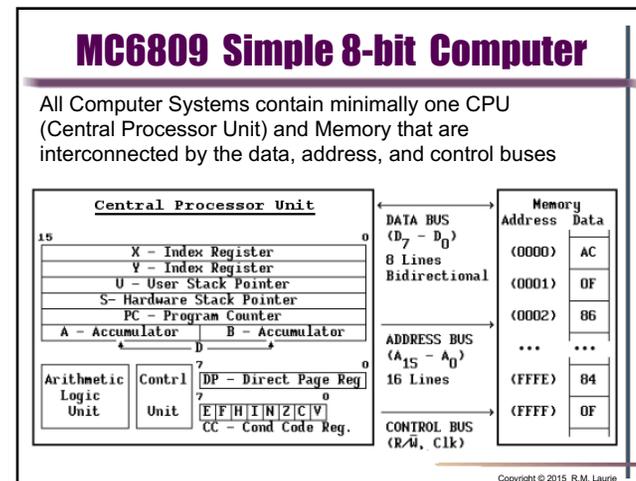
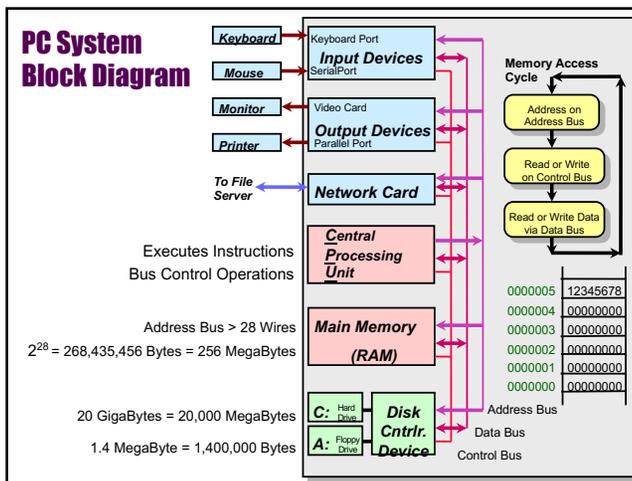
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People = End Users & Programmers

- ❖ **End User's**
 - ◆ Utilize computer resources
 - ◆ Utilize software applications
- ❖ **Programmers**
 - ◆ **Analyze** a problem and create a solution algorithm
 - ◆ **Code** the solution algorithm into a specific programming language
 - ◆ **Verify** program works using known test data



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Programming Language Generations

- ❖ **1st = Machine Language**
 - ◆ Actual bits that CPU processes
- ❖ **2nd = Assembly Language**
 - ◆ Each assembly instruction corresponds to one machine code instruction
 - ◆ Requires an **assembler** to convert assembly source code to machine code
- ❖ **3rd = High-level Language**
 - ◆ Uses human words for keywords
 - ◆ Abstract and general purpose
 - ◆ Requires a **compiler** or **interpreter** to run
 - ◆ Compiles for different CPU's

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First Generation: Machine Language

- ❖ **Lowest level programming language because it represents data and program instructions as binary 0/1. Generally, hexadecimal is used for human interaction.**
- ❖ **All programming languages are eventually converted into machine language.**
- ❖ **Will be run on only one type of CPU**

0000	
...	
D000	86
D001	12
D002	8B
D003	0C
D004	B7
D005	D1
D006	00
D007	BB
D008	D1
D009	10
D00A	B7
D00B	D1
D00C	01
...	
FFFF	

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Second Generation: Assembly Language

Assembly Program is assembled to machine code by Assembler

Address	Instructions	Data	Assembly Language Program
D000	86	12	LDA #\$12
D002	8B	0C	ADDA #\$0C
D004	B7	D100	STA \$D100
D007	BB	D110	ADDA \$D110
D00A	B7	D101	STA \$D101
D00D	8B	1E	ADDA #\$1E
D00F	B7	D01B	BCC \$D019
D012	86	00	LDA #\$00
D014	B7	D110	STA \$D110
D017	23	D007	BRA \$D007
D01A	3F		SWI

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Third Generation: High-Level Language C++

```

int main(void)
{
    int nEntry = 1, nHour, nMinute;
    char cAM = 'a';
    cout << "Enter the the 2400 hour time \n>";
    cin >> nEntry;
    nMinute = nEntry % 100;
    nHour = nEntry / 100;
    if(nHour > 12)
    {
        nHour = nHour - 12;
        cAM = 'p';
    }
    cout << nHour << ":";
    if(nMinute < 10) cout << '0';
    cout << nMinute << "' << cAM << ".\n\n";
    return 0;
}
    
```

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Historical Development of HLL

- ❖ **FORTRAN**: 1957, Compiled language, Developed for engineering and science applications.
- ❖ **COBOL**: 1959, Compiled language, Developed for business applications.
- ❖ **BASIC**: 1965, Interpreted language, Easy to program, Personal non-production applications; Resurrected by Microsoft in DOS and Visual Basic.
- ❖ **Pascal**: 1971, Compiled language, Developed at ETH Switzerland and used by higher education to teach **Structured Programming** methodologies.
- ❖ **C**: 1975, Compiled language, **Procedural Oriented** (verbs), Highly efficient fast programs, Usually eliminated need for assembly language programming. Structured programming.
- ❖ **ADA**: 1980, Compiled language, Developed as common HLL for Military applications; First to support **Multitasking**, concurrent execution of applications. Structured programming.

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High-Level Languages to Machine Code

- ❖ **Compiler**
 - ◆ Converts **HLL Source Code** into **Machine Code** file
 - ◆ Compiler targets **only one type CPU**
 - ◆ Intel: x86, 386, 486, Pentium 1-4
 - ◆ Motorola: 68k, Power PC, 68HC11
 - ◆ Compiler targets **only one type OS**
 - ◆ Microsoft: DOS, Windows
 - ◆ Unix, Linux, Solaris OS, Apple Macintosh, CPM
- ❖ **Interpreter**
 - ◆ Executes **HLL Source Code** line by line directly
 - ◆ **Scripting Languages** such as **JavaScript, Python, Ruby, or BASIC** utilize an interpreter to execute programs
 - ◆ Excellent **portability**

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Historical Development of HLL

- ❖ **C++**: 1985, Compiled language, Added keywords to C so that could be used as an **Object Oriented Programming** language, **OOP** focuses on object (nouns) rather than tasks (verbs).
- ❖ **Java**: 1993, Pseudo-Compiled language generates **bytecode** which runs on any **Java Virtual Machine** to achieve **OS and CPU Independence**; Developed as a simplified **Object Oriented Programming** language that supports **Networks, Security, and Multithreaded** for multitasking.
- ❖ **JavaScript**: 1995, Interpreted language that utilizes interpreter in web browser; **Object-based**; Similar syntax to Java, C/C++; Very secure: Available for both **client** and **server scripting**. Utilizes HTML/XHTML and CSS for output. JavaScript is usually embedded in an html document.

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