

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.

Copyright © 2006 R.M. Laurie 1

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)

Copyright © 2006 R.M. Laurie 2

Software = Computer Programs

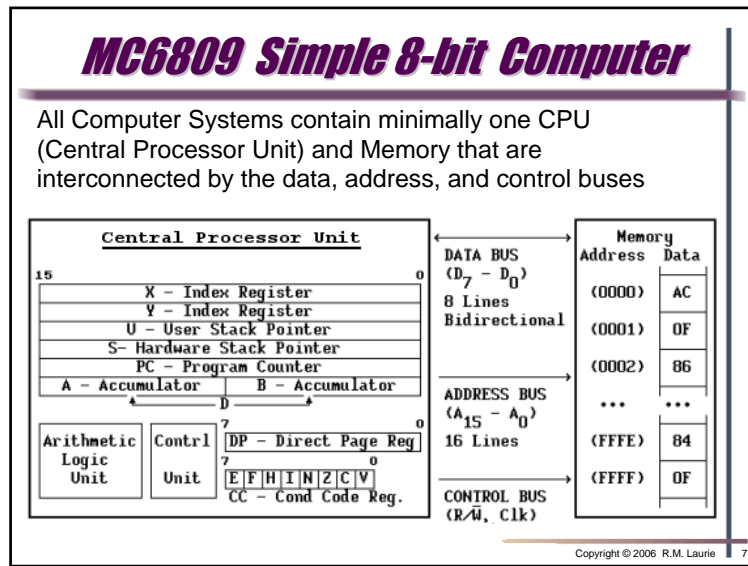
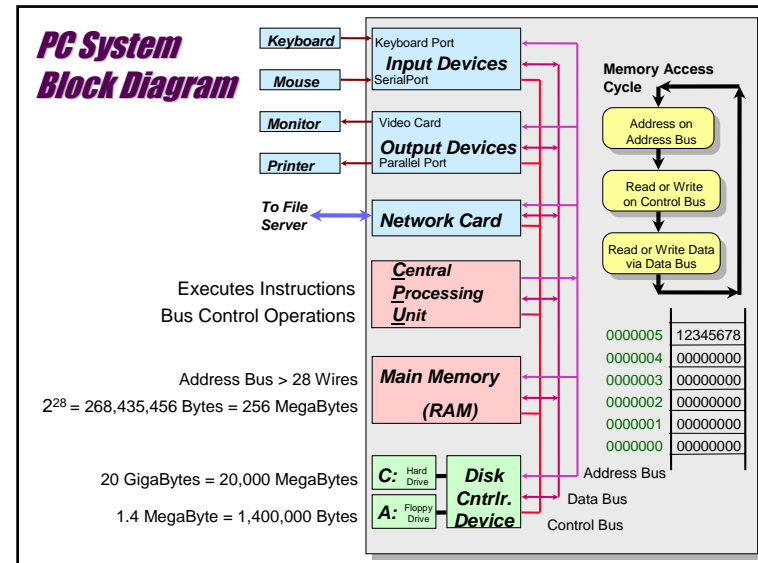
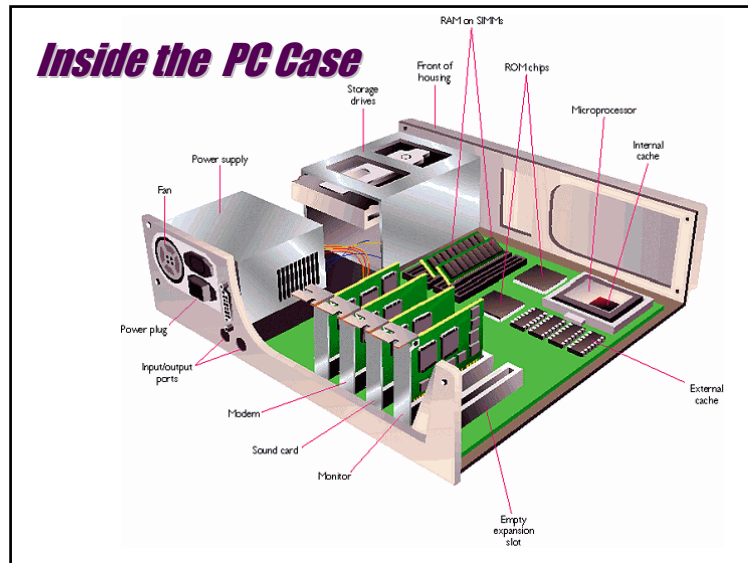
- ❖ **Program:** A set of step by step instructions that direct the computer to do a task that you want it to do and produce the results you want.
- ❖ **Programming Language:** A set of rules that instructs the computer what operations to perform.

Copyright © 2006 R.M. Laurie 3

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

Copyright © 2006 R.M. Laurie 4



- ### 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

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	

Copyright © 2006 R.M. Laurie 9

Second Generation: Assembly Language

Address	Instructions	Data	Assembly Language
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

Copyright © 2006 R.M. Laurie 10

Third Generation: High-Level Language

```

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 << ".m.\n\n";
    return 0;
}
    
```

Copyright © 2006 R.M. Laurie 11

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** utilize an interpreter to execute programs
 - ◆ Excellent *portability*

Copyright © 2006 R.M. Laurie 12

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.

Copyright © 2006 R.M. Laurie 13

Common Object Oriented Languages

- ❖ **C++**: 1985, Compiled language
 - ◆ Added keywords to C so that could be used as **Object Oriented Programming** language
 - ◆ **OOP** focus is objects (nouns) instead of tasks (verbs)
- ❖ **Java**: 1994, Pseudo-Compiled language
 - ◆ Simplified **Object Oriented Programming** language
 - ◆ Supports **Networking and Security**
 - ◆ Supports **Multithreaded** for multitasking.
 - ◆ Compiler generates **Bytecode** which runs on **JVM**
 - ◆ Achieves **OS and CPU Independence**
- ❖ **Microsoft C#** : 1998, Uses .Net Framework
 - ◆ Much closer to Java than C++ and pseudo compiled
 - ◆ For Windows only products using Common Language Runtime (CLR like JVM)

Copyright © 2006 R.M. Laurie 14

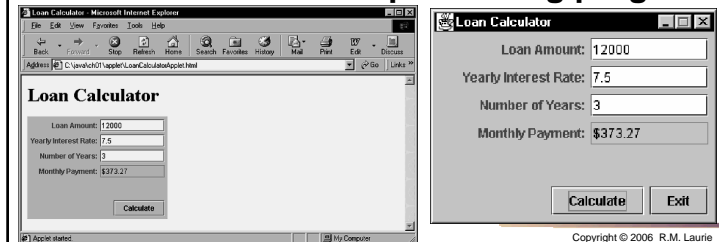
Java Features

- ❖ **Simple** – Concise and cohesive features
- ❖ **Secure** – Creating Internet applications
- ❖ **Portable** – Any computer with JVM
- ❖ **Object Oriented** – Supports Philosophy
- ❖ **Robust** – Strictly typed and run-time checking
- ❖ **Multi-threaded** – Concurrent processing support
- ❖ **High performance** – Java bytecode is optimized for high speed execution
- ❖ **Distributed** – Designed with network and Internet support in mind
- ❖ **Dynamic** – Verifies and resolves access to objects at run time

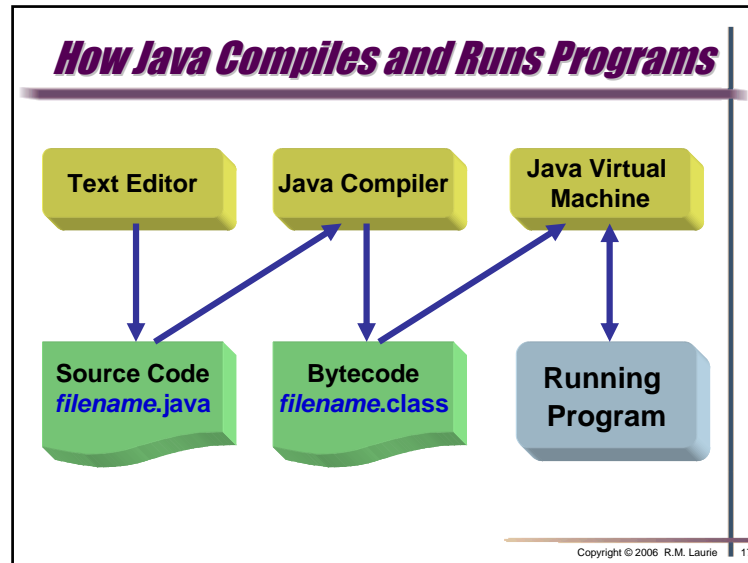
Copyright © 2006 R.M. Laurie 15

Applications, applets, and servlets

- ❖ **Application** = Program that runs under OS utilizing Java Virtual Machine
- ❖ **Applet** = Program that runs within a web browser after retrieved from the Internet
- ❖ **Servlet** = Server-side processing program



Copyright © 2006 R.M. Laurie 16



Java Programming Tools

- ❖ **DrJava**
 - ◆ Light weight Integrated Development Environment
 - ◆ More Features than a text editor
 - ◆ Freeware available at <http://drjava.org>
 - ◆ Can Install to C: Drive or a USB drive
- ❖ **Software Development Kit**
 - ◆ J2SE(TM) Development Kit 5.0 Update 6 (Ver 1.5)
 - ◆ Textbook CD [jdk-1_5_0_06-windows-i586-p.exe](#) (60 MBytes)
 - ◆ Latest version available at java.sun.com
- ❖ **Java Documentation**
 - ◆ Java API (Application Programmers Interface)
 - ◆ Textbook CD [jdk-1_5_0-doc.zip](#) (44 MBytes)
 - ◆ Latest version available at java.sun.com
 - ◆ Unzip to C:\Program Files\Java\jdk1.5.0_06 folder
 - ◆ **doc** sub-folder will be created

Copyright © 2006 R.M. Laurie 18