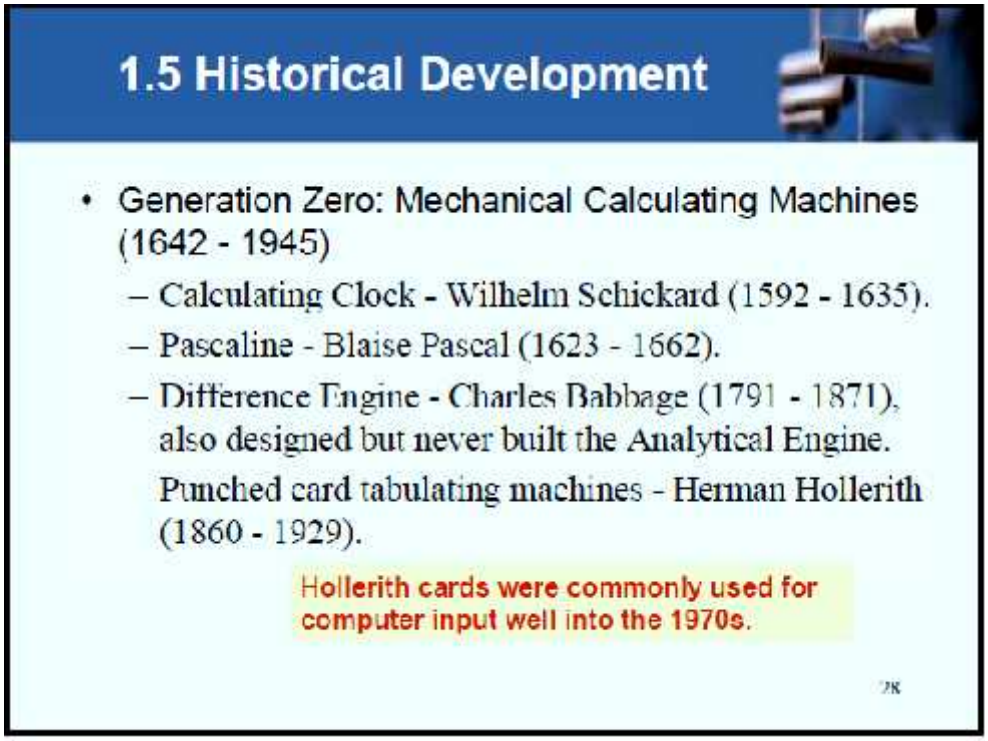
WEEK-4

1.5 Historical Development

- To fully appreciate the computers of today, it is helpful to understand how things got the way they are.
- The evolution of computing machinery has taken place over several centuries.
- In modern times computer evolution is usually classified into four generations according to the most important technology of the period.



1.5 Historical Development

- The First Generation: Vacuum Tube Computers (1945 - 1953)

– Atanasoff Berry Computer (1937 - 1938) solved systems of linear equations.

John Atanasoff and Clifford Berry of Iowa State University.

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1.5 Historical Development

- The First Generation: Vacuum Tube Computers (1945 - 1953)

Electronic Numerical Integrator and Computer (ENIAC)

John Mauchly and J. Presper Eckert

– University of Pennsylvania, 1946

The first *general-purpose* computer.

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1.5 Historical Development

- The First Generation: Vacuum Tube Computers (1945 - 1953)
  - IBM 650 (1955)
    Phased out in 1969.

The first *mass-produced* computer.

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1.5 Historical Development

- The Second Generation: Transistorized Computers (1954 - 1965)

  - IBM 7094 (scientific) and 1401 (business)
  - Digital Equipment Corporation (DEC) PDP-1
    Univac 1100
  - . . . and many others.

DEC PDP-1

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1.5 Historical Development

- The Third Generation: Integrated Circuit Computers (1965 - 1980)
  - IBM 360

    DEC PDP-8 and PDP-11

    Cray-1 supercomputer

    . . . and many others.


IBM 360


Cray-1

1.5 Historical Development

- The Fourth Generation: VLSI Computers (1980 - ????)
  - Very large scale integrated circuits (VLSI) have more than 10,000 components per chip.

    Enabled the creation of microprocessors.
  - The first was the 4-bit Intel 4004.

    Later versions, such as the 8080, 8086, and 8088 spawned the idea of "personal computing."


Intel 4004

1.6 The Computer Level Hierarchy

• Computers consist of many things besides chips.

• Before a computer can do anything worthwhile, it must also use software.

• Writing complex programs requires a “divide and conquer” approach, where each program module solves a smaller problem.

• Complex computer systems employ a similar technique through a series of virtual machine layers.

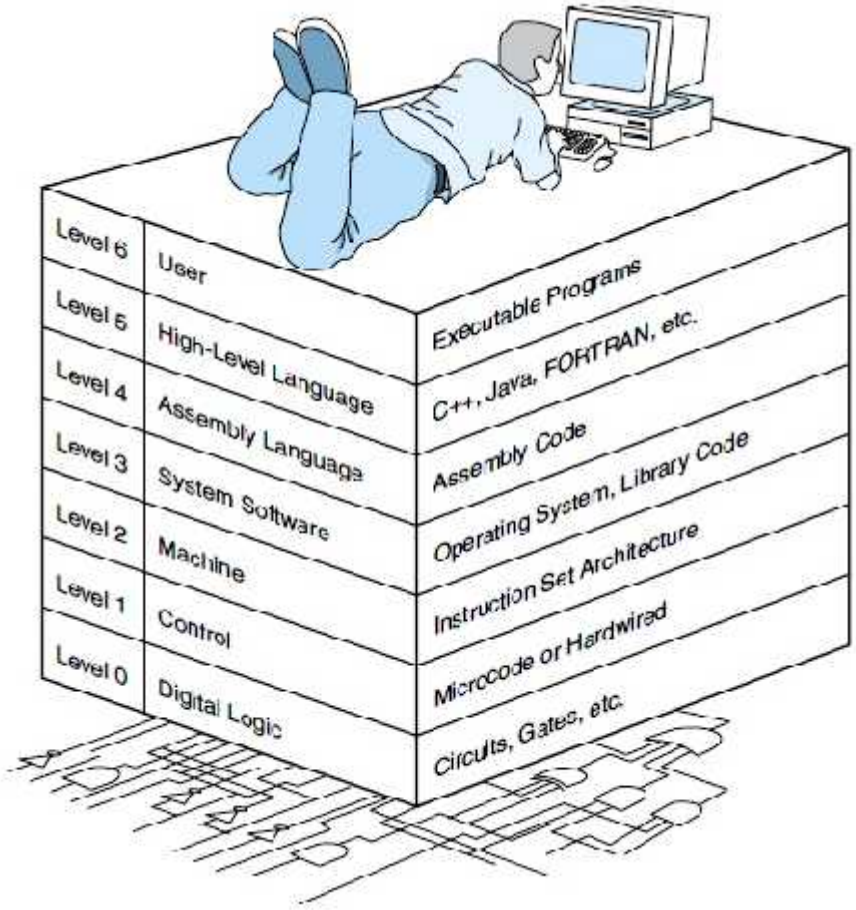

FIGURE 1.1 The Abstract Levels of Modern Computing Systems

• Level 6: ***The User Level:***

– Program execution and user interface level.

-The level with which we are most familiar.

• Level 5: ***High-Level Language Level:***

– The level with which we interact when we write programs in languages such as C, Pascal, Lisp, and Java.

• Level 4***: Assembly Language Level:***

-Acts upon assembly language produced from Level 5, as well as instructions programmed directly at this level.

• Level 3: ***System Software Level:***

– Controls executing processes on the system.

– Protects system resources.

– Assembly language instructions often pass through Level 3 without modification.

• Level 2: ***Machine Level:***

– Also known as the Instruction Set Architecture (ISA) Level.

– Consists of instructions that are particular to the architecture of the machine.

– Programs written in machine language need no compilers, interpreters, or assemblers.

- Level 1: ***Control Level:***
  - A *control unit* decodes and executes instructions and moves data through the system.
  - Control units can be *micro programmed* or *hardwired*.
  - A micro program is a program written in a low level language that is implemented by the hardware.
  - Hardwired control units consist of hardware that directly executes machine instructions.
- Level 0: ***Digital Logic Level:***
  - This level is where we find digital circuits (the chips).
  - Digital circuits consist of gates and wires.
  - These components implement the mathematical logic of all other levels.