Section one: Reading comprehension

The pc system unit: looking In the Box

The processor, RAM, and a variety of other electronic components are Housed in the **system unit,** usually a metal and plastic upright box (the Tower), or inside the laptop's shell. In this section, we'll look inside the box at major electronic components of a computer system.

The motherboard

the motherboard, a single circuit board, provides the path through which the processor communicates with memory components and peripheral devices. Think of the processor as the pc's brain and the motherboard as the pc's central nervous system. The motherboard's **chipset** is its intelligence and controls the flow of information between system components connected to the board. The chipset is important because it determines what features are supported on the system (including types of processors and memory). In a personal computer, the following are attached to the motherboard:

- Microprocessor (main processor)
- Support electronic circuitry (for example, one chip handles input/output signals from the peripheral devices)
- Memory chips (for example, RAM and other types of memory)
- Expansion boards (optional circuit boards, such as a fax/modem)

The various chips have standard-sized pin connectors that allow them to be attached to the motherboard and, therefore, to a common electrical **bus** that enables data flow between the various system components.

Computer on a Chip: The Microprocessor

What is smaller than a postage stamp and found in wristwatches, sewing Machines, and cd players? The answer is a **microprocessor.** The processor component of personal computer systems is a microprocessor, or simply a small processor. The microprocessor is literally a 'compuer on a chip'. We use the term chip to refer to any self-contained integrated circuit. The size of chips varies from fingernail size to postage-stamp size (about 1-inch square). Microprocessor have been integrated into thousands of mechanical and electronic devices-even elevators, band saws , and ski-boot bindings. In a few years, virtually everything mechanical or electronic will incorporate microprocessor technology into its design.

The processor

The processor runs the show and is the nucleus of any computer system. Regardless of the complexity of a processor, sometimes called the **central Processing unit** or **CPU,** it has only two fundamental section: the control Unit and arithmetic and logic unit. These units work together with Random-access memory(RAM) and other internal memories to make the Processor-and the computer system-go.

the control unit. Just as the processor, or CPU, is the nucleus of a computer system, the **control unit** is the nucleus of the processor. It has three primary functions:

- To read and interpret program instructions
- To direct the operation of internal processor components
- To control the flow of programs and data in and out of RAM

During program execution, the first in sequence of program instructions is moved from RAM to the control unit, where it is decoded and interpreted by carry out the operations necessary to execute the instruction.

The processor contains high-speed working storage areas called **Registers** that can store no more than a few bytes. Because registers reside On the processor chip, they handle instructions and data at very high speeds and are used for a variety of processing functions. One register, called the **instruction register,** contains the instruction being executed. Other general-purpose registers store data needed for immediate processing. Registers also store status information. For example, the

program register contains the location in RAM of the next instruction to be executed. Registers facilitate the processing and movement of data instructions between RAM, the control unit, and the arithmetic and logic unit.

The arithmetic and logic unit. The arithmetic and logic unit Performs all computations (addition, subtraction, multiplication, and division) and all logic operations (comparisons). The results are placed in a register called the **accumulator**. A logic operation compares two pieces Of data, either alphabetic or numeric. Based on the result of the comparison, the program 'branches' to one of several alternatives sets of program instructions. **RAM**. RAM, a read and-write memory, enables data to be both read and written to memory. RAM is solid state; that is, It is electronic circuitry with no moving parts. Electrically charged points in the RAM chips represent the bits (1s and 0s) that comprise the data and other information stored in RAM. RAM is attached to the motherboard, Like the processor, and therefore to the electronic bus. It Is **volatile memory;** that is, when the electrical current is turned off or interrupted, the data are lost. In contrast to permanent storage on disk, RAM provides the processor only with *temporary* storage for programs and data.

The data in RAM are manipulated by the processor according to program instructions. A program instruction or a piece of datum is stored in a specific RAM location called an **address**. Addresses permit program instructions and data to be located, accessed, and processed. The content of each address changes frequently as different programs are executed and new data are processed.

Other High-speed Memories. Data and programs are being continually moved in and out of RAM at electronic speeds. But that's not fast enough. To achieve even faster transfer of instructions and data to the processor computers are designed with **cash memory**. Cash memory is used by computer designers to increase computer system throughput. **Throughput** refers to the rate at which work can be performed by a computer system.

Another special type of internal memory called read-only memory(ROM) cannot be altered by the user. A variation of ROM is **programmable read-only memory(PROM).** PROM is ROM into

which you, the user, can load read-only programs and data. **Flash memory** is a type of PROM that can be altered easily by the user. Flash memory is a type of PROM that can be altered easily by the user. Flash memory, a feature of new processor, I/O devices, and storage devices is **nonvolatile memory** that retains its contents after an electrical interruption. The logic capabilities of these devices can be upgraded by simply downloading new software from the internet or a vendor-supplied disk to flash memory.

A Fleet of Buses:
The motherboard includes several empty **expansion slots** that provide Direct connections to the common electrical bus. These slots let you expand the capabilities of a basic PC by plugging in a wide variety of special-functions **expansion boards**, also called **expansion cards**. These add-on circuit boards contain the electronic circuitry for many supplemental capabilities, such as extra ports and modem, or video capture capability.Expansion boards are made to fit a particular type of bus.

Section Two:Further Reading

Processor Design

Researchers in IT are continually working to create new technologies and will make processors faster and, thereby, improve system throughput.

CISC and RISC: More Is Not Always Better

Most processors in mainframe computers and personal computers have a **CISC**(complex instruction set computer) design.A CISC computer's machine language offers programmers a wide variety of instructions from which to choose(add, multiply, compare, move data and so on). Computer designers, however, are rediscovering the beauty of simplicity. Computers designed around much smaller machine language instruction sets(fewer instructions) can realize significantly increased throughput for certain applications, especially those that involve graphics (for example computer-aided design or CAD).These computers

have **RISC** reduce instruction sets computer) design. The RISC processor shifts much of the computational burden from the hardware to the software.Proponents of RISC design feel that the limitations of a reduced instructions set are easily offset by increased processing speed and the lower cost of our RISC microprocessors.

Parallel Processing:Computers Working Together

In a single processor environment, the processor addresses the programming problem sequentially from beginning to end. Today, designers are building computers that break a programming problem into pieces. Work on each of these pieces is then executed simultaneously in separate processors, all of which are part of the same computer system. The concept of using multiple processors in the same computer system is known as **parallel processing**. In parallel processing, one main processor examines the programming problem and determines what portions, if any, of the problem can be solved in pieces. Those pieces that can be addressed separately are routed to other processors and solved. The individual pieces are then reassembled in the main processor for further computation, output, or storage.The net result of parallel processing is better throughput.

Computer designers are creating mainframes and supercomputers with thousands of integrated microprocessors. Parallel processing on such a large scale is referred to as **massively parallel processing**. These superfast supercomputers have sufficient computing capacity to attack applications that have been beyond that of computers with additional computers designs. For example researchers can now simulate global warming with these computers.

Natural Networks: Wave of the Future

Most of us interact with digital computers. Digital computers are great at solving structured problems involving computations and logic operations.However, most of the challenges we face from day to day can't be solved with these capabilities. For example, several times each year we are confused with this problem: to find a pair of shoes that fits. This is a very human problem better suited to the workings of the human problem, better suited to the workings of the human brain than for digital computers. Such problems involve unstructured input and outcomes.