**Group-4 Presentation**

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**Best processor in January 2021**

AMD Ryzen 9 5950X

Intel Core i9-10900K

Intel Core i9-10900KF

Intel Core i9-10850K

AMD Ryzen 9 5900X

AMD Ryzen 9 3950X

Intel Core i9-10900F

Intel Core i9-10900

AMD Ryzen Threadripper 3960X

Intel Core i9-10980XE

Source: https://benchmarks.ul.com

**History of Processor**

**Intel 4004**

Introduced: November 15, 1971

Clock Speed: 740-750 kHz

Data Width: 4 Bit

Package: 16 pin DIP

Transistors: 2,25

**Intel 8008**

Introduced: April 1972

Clock Speed: 200 kHz to 800 kHz

Data Width: 8 Bit

Package: 18-pin DIP

Transistors: 3,500

**Intel 8085**

Introduced: March 1976

Clock Speed: 3, 5 and 6 MHz

Data Width: 8 Bit

Package: 6,500

Transistors: 40-pin DIP

**Intel 8086**

Introduced: June 1978

Clock Speed: 5 MHz to 10 MHz

Data Width: 16 bits

Package: 40 pin DIP

Transistors: 29,000

**Intel 80286 (The last 16 bits CPU)**

Introduced: February 1982

Clock Speed: 5 MHz to 25 MHz

Data Width: 16 bits

Package: 68-pin PLCC

Transistors: 134,000

**Intel 80386 (The first 32 bits CPU)**

Introduced: October 1985

Clock Speed: 12 MHz to 40 MHz

Data Width: 32 bits

Package: 132-pin PGA

Transistors: 275,000

**Intel 80486**

Introduced: April 1989

Clock Speed: 16 MHz to 100 MHz

Data Width: 32 bits

Package: [PGA](https://en.wikipedia.org/wiki/Pin_grid_array) (Socket 1, [2](https://en.wikipedia.org/wiki/Socket_2), [3](https://en.wikipedia.org/wiki/Socket_3))

Transistors: 1.2 Million

**Intel Pentium**

Introduced: November 1993

Clock Speed: 60-300 MHz

Data Width: 32 bits

Package: Socket 4

Transistors: 3.2 Million

**Intel Pentium Pro/ II / III /4**

Introduced: November 1985-2000

Clock Speed: 166 MHz- 3.6 GHz

Data Width: 32 bits

Package: Socket 4 - LGA 775

Transistors: 5.5-28 Million

**Intel Core i9-10850K**

20M Cache up to 5.20 GHz

20 MB Intel Smart Cache Cache

10 Cores

20 Threads

5.20 GHz Max Turbo Frequency

K-Unlocked

10th Generation

**Intel Core i9-10980XE Extreme**

20M Cache up to 5.20 GHz

24.75 MB Intel Smart Cache Cache

18 Cores

36 Threads

4.60 GHz Max Turbo Frequency

EX-Extrem performance and mega-tasking, Unlocked

## [**Ryzen™ 9 5950X s**](https://www.amd.com/en/products/cpu/amd-ryzen-9-5950x)

Graphics Model: Discrete Graphics Card Required

CPU Cores 16

Threads 32

Max Boost Clock up to 4.9GHz

Base Clock 3.4GHz

Default TDP / TDP 105W

Source: https://www.wikipedia.org/

**Source:**

***https://www.slideshare.net/sanjeevjain73550/comuputer-processor***

### **Computer processor**

1. Computer Processor
2. TABLE OF CONTENTS Introduction Working of processor Basic knowledge about processor Components of CPU What is single, double and multi core processors? Some popular brands of processor What are the future expectations about processors? conclusion
3. Introduction υ A processor or Central Processing Unit (CPU) is an electronic circuit that can execute computer programs. υ A processor is the logic circuitry that responds to and processes the basic instructions that drives a computer. υ A computer processor analyzes data and controls data flow in a computer. υ It handles the central management functions of a high-powered PC.
4. image of processor
5. Working of processor, the working of processor mainly consists four steps i.e. Fetch, Decode, Execute and Write back. These steps are discussed below:

* Fetch: During the fetch step, the processor retrieves program instructions from memory.
* Decode: In this step, the instruction is broken down into parts.
* Execute: In the execute step, CPU performs the operation implied by the program instructions.
* Write back: During the write back step, the Processor writes back the results of execution, to the computer's memory.

***https://www.it4nextgen.com/what-is-a-cpu-central-processing-unit/***

1. Basic knowledge about processor Clock speed : Clock speed is a measure of how quickly a computer completes basic computations and operations. It is measured as a frequency in hertz. Generally this speed varies 2.4-3.4 GHz. Core : A processor core is a hardware unit in the processor architecture that can execute instructions sent to it. Hyper threading : Thread are the virtual core and work like a real core inside cpu. When cores assembled with multi threads then it is known as Hyper threading technology.
2. Cache : The cache is the first block of RAM which interact between the main memory and CPU using cache controller chip. This memory helps processor to fetch instructions in quick routine and is very faster than RAM MULTI PROCESSING : Simultaneous processing with two or more processors in one computer or two or more computers processing together. PARALLEL PROCESSING : The simultaneous use of more than one cpu or processor core to execute a program or multiple computational threads
3. Components of CPU

Arithmetic and Logic Unit (ALU) : It carries out the logical, algebrical or any types calculations. Control unit : It manages the fetching, decoding and execution of the instructions. Registors : It is very fast temporary storage locations which hold data being processed, instructions being executed and addresses of the memory location to be accessed. Internal buses : Buses are used to transmit informations from one place to another.

1. What is single, double and multi core processors? Single core: Has one core to process different operations like intel Pentium. Dual core : Has two cores to process operations; able to process more information at the same time compare to single core like intel core i3 and i5. Quad core: Contains two dual core processors in one integrated circuit and generally used for multi tasking like intel core i7.
2. Image that showing cores, cache memory, I/o units arrangement inside intel i7 next geneartion processor
3. Some popular brands of processor Intel : The Intel computer processor is exclusively designed by Intel. Its latest and most popular models include Intel hyper thread technology that speed up processor speed . AMD : The AMD computer processor is exclusively made by Advanced Micro Devices, Inc. (AMD). It provides excellent performance and value. It is compatible with most off-the-shelf computer programs and applications. Some AMD Computer Processors are programmed with built-in anti- virus protection
4. INTEL head office (USA) AMD head office (USA)
5. INTEL Graphics AMD Graphics
6. What are the future expectations about processor ?
7. Tomorrow, processor will be more energy efficient than present time. They have high clock speed like 10 to 15 GHz and have 8 to 10 cores with hyper threading or new equivalent technology. Their size will be more small than today’s processors i.e. nano processor will come in place of micro processor. They will be more cheaper and reliable than compare to present time.
8. Conclusion Multi-core processors represent an important new trend in computer architecture. Decreased power consumption and heat generation also helpful. Minimized wire lengths and interconnect latencies. So this is the way how modern computing is done.
9. ANY Queries??
10. Thank you !

**PROCESSOR**

**Introducing PROCESSOR**

The processor is the logic circuitry that responses and processes the basic instructions that drive the computer. The operations in the processor are, Simple binary computations using electrical circuits. It is the brain of the computer, without which computer is just a dumb machine. The speed of a processor is measured now in MHz or GHz. All the digital devices have processors (i.e. Mobile, Smart- watches etc) Intel i7, AMD FX 8400, Snapdragon 805 are some of the new processors.

**Where does the processor live?**

The processor is placed on the motherboard, in the processor socket. On top of the processor we place the heat sink and the heat sink fan to dissipate heat from the processor.

**WHY PROCESSOR?**

It is the control centre of the computer. It carries out the computations that allow the computer to function. The circuits in CPU sends commands to other components of the computer to run programs. CPU retrieves information from the computer’s memory and conducts operations on that information. The CPU thus operates like the working memory of a person’s brain. It takes information from long term storage when it is needed for immediate processing. In this way the CPU operates as a general purpose information processor which can accommodate different types of computer from other parts of computer.

**DEVICE FUNCTIONALITY**

The basic functionality of a processor is receive input and provide appropriate output. The operational capability of the processor depends on the Motherboard and the amount of RAM present on the motherboard. It responds to and processes the basic instructions that drive a computer. OPERATIONS-FETCH, DECODE, EXECUTE.

**Various units of a processor**

The processor itself is not made as a single unit but a series of units that work together to perform various operations. Various units of a processor1.I/O unit2.Control unit3.ALU4.Registers

**INPUT/OUTPUT UNIT**

The I/O unit links the microprocessor to the rest of the circuitry of the computer. It passes program instructions and data to the registers of the control unit and arithmetic/logic unit. Interrupts are essential in I/O as they notify the CPU more efficiently than a typical data call.

**CONTROL UNIT and ALU Control Unit**

The control unit (CU) is a component of a computer's central processing unit (CPU) that directs operation of the processor.It tells the computer's memory, arithmetic/logic unit and input and output devices how to respond to a program's instructions.ALU-arithmetic and logical unitAn arithmetic logic unit (ALU) is a digital electronic circuit that performs arithmetic and bitwise logical operations on integer binary numbers.ALU is a fundamental building block of many types of computing circuits, including the central processing unit (CPU) of computers, FPUs, and graphics processing units (GPUs). A single CPU, FPU or GPU may contain multiple ALUs.

REGISTERS In computer architecture, a processor register is a small amount of storage available as part of a digital processor, such as a central processing unit (CPU). Almost all computers, load-store architecture or not, load data from a larger memory into registers where it is used for arithmetic, manipulated or tested by machine instructions.

SYSTEM CLOCK Modern PC has multiple system clocks which vibrates at a specific frequency, it is measured in MHz.Instruction is done according to the clock Pulses.

INTERNAL MEMORY CACHE CPU cache reduce the average time to access data from the main memory. Its a smaller, faster memory which stores copies of data from main memory. Most CPUs have independent caches, including instruction and data caches Data cache is usually organized as a hierarchy of more cache levels (L1, L2, etc.)

DEPENDENCIES Advanced processors need much more power supply than the rest, so the performance of it depends upon the SMPS as well. The work rate of the processor depends upon the clock speed of it. The more number of cores a processor has, the more efficiently it works.

DEPENDENCIES Contd. The communication between the processor and other components on the motherboard depends upon the chipset. Chipset is divided into two types: North Bridge - It connects the CPU to memory, level cache, the PCI express Bus and AGP. South Bridge - Handles all of the inputs & outputs to the many the many devices in the Pc

**DEPENDENCIES Contd. Processor Speed depends on:**

Registers – temp memory area Memory and computing power – RAM The bus – the highway The data bus – CPU & devices The address bus – CPU & RAM

DEPENDENCIES Contd. Processor overheating results in Processor damage and instability. Heat Sink is a passive heat exchanger that transfers the heat generated ,thereby it increases the processor efficiency. Greater RAM can make the Processor run faster.

SOCKETS" Socket is a mechanical component that provides mechanical and electrical connection between processor and printed circuit board“ A CPU socket is made of plastic, a lever or latch, and metal contacts for each of the pins or lands on the CPU

**HOW TO HANDLE A PROCESSOR?**  
NEVER touch the pins, if they bend slightly it might result in it being fried.Make sure you replace it properly in the right orientation in its socket or else you could damage it.Once you've lined up the pins and allowed the processor to drop into the socket, check to make sure that the processor is fully inserted and not sitting crookedly.

**MALE & FEMALE PROCESSOR**  
The major difference between male and female processor is the poles and holes on it .The male processor should place on female socket and vice versa .

**MANUFACTURER Processors are manufactured primarily from silicon**  
 It's true that AMD and Intel are the only major producers of processors these days. And Qualcomm leads in the market of mobile processor manufacturing.

INTEL VS AMD  When Intel produced the 8080 processor in 1974, it lay the groundwork for the x86 processors which provided the foundations for desktop PCs for nearly 30 years AMD’s largest recent innovation was its acquisition of Graphics Processing Unit (GPU) manufacturer ATI in 2006

**LATEST MARKET UPDATES**   
Intel has yet again updated its processor roadmap showcasing that they are on schedule with their upcoming products such as Skylake , Broadwell, Braswell and the new mobility cores. The next generation Core chips, built on 14nm architecture, will "be coming in second half of this year

**Evolution OF PROCESSORS**

Multi Processing computing A processor containing more than one Arithmetic Logic Unit (ALU).Performs multiple tasks simultaneously more efficiently. Multiple Processor More than one processors (CPUs) are installed on a single motherboard. Requires more power. Multi-Core Processor A single physical processor containing multiple logical segments, each acting as an individual CPU. Each logical segment is called a “CORE”

**Evolution OF PROCESSORS**

Hyper-Threading Hyper- Threading Technology uses processor resources more efficiently, enabling multiple threads to run on each core. As a performance feature, it also increases processor throughput, improving overall performance on threaded software. Features: Run demanding applications simultaneously while maintaining system responsiveness. Keep systems protected, efficient, and manageable while minimizing impact on productivity

**ADVANCED TECHNOLOGIES**

Intel Skylake The newest 6th generation processors Intel Skylake processor with 14nm Core architecture Octa-core (More cores more power) Less power consumption Better GPU support Provides output for 4K displays

<https://slideplayer.com/slide/1509789/>

**The CPU The Central Presentation Unit What is the CPU?**  
The Microprocessor Structure of the CPU Parts of the CPU Buses The Control Unit The Arithmetic Logic Unit Program counter Instruction Register Memory Data Register Memory Address Register

**What is the CPU? The CPU is short for the Central Processing Unit**  
It is the main part of the computer where instructions are processed The central processing unit includes the main memory Now a day’s most computers have more than one CPU to provide better speed

The Microprocessor Small computerised devices such as washing machines have small specialised CPUs known as microprocessors It is an integrated circuit as a single unit which includes all that the CPU needs excluding main memory

**Structure of the CPU The CPU is made up of many components such as**  
Registers (Program counter and Instruction Register) Arithmetic logic unit Control unit Buses We will now see a block diagram of the components of the CPU

**Central Processing Unit Arithmetic Logical Unit**  
Accumulator Control Unit Program Counter Instruction Register Central Memory ROM RAM Input Unit Output Backing Storage Control Bus Data Bus

BusesAll data traffic with the CPU takes place across the computer’s bus A computer bus is a set of parallel electrical tracks connecting components within a computer The width of the data bus determines the word length The width of the address bus determines how many addresses the computer can send at a time

**Control Unit (CU) The CU is considered the manager of the CPU**  
The CU’s jobs are to; decode instructions within a computer, Plan the reading and writing of data control the order in which instructions are executed control the operations performed by the ALU. In the CU you will fine two registers; Instruction Register: stores a copy of the current instruction being performed Program Counter.

**The Arithmetic Logic Unit (ALU)**  
The ALU is that part in the CPU where arithmetic and logic operations are carried out in other words all mathematical calculations. The result of the calculations are sent to the main memory The ALU is capable of performing: Addition, Subtraction, Multiplication, Division Greater Than (>), Smaller Than (<)’ Equal (=), Greater Than or Equal To (>=), Smaller Than or Equal To (<=), Not Equal (<>) AND, NOT, OR Within the ALU we will find the register known as the Accumulator. The accumulator stores the result of the current calculation.

Program Counter (PC)The program counter is sometimes known as the instruction pointer The PC indicates where the computer is in its instruction set. If the instruction set has 5 steps the PC will point to which step the computer has arrived Depending on the device the PC could hold The address of the instruction being executed, or The address of the next instruction to be executed. The program counter is automatically incremented (increased by 1) after each step (instruction cycle)

**Instruction Register (IR)**  
The instruction register (IR) is also found with the control unit The IR is used to store a copy of the current instruction being performed This instruction is stored in the for of operator and operand (covered later on)

**Memory Data Register (MDR)**  
The Memory Data Register in the central processor stores the data being transferred to and from the access store. It acts as a buffer allowing the central processor work independently without being affected by differences in operation.

**Memory Address Register (MAR)**   
The Memory Address Register in the central processor stores the address of the memory location currently in use. When the CPU is fetching data the MAR would store the address of the instruction being loaded When the instruction is being executed the address of the data being used is stored.

Main Memory The main memory is where most of the results are temporarily stored; Main memory is much faster than the hard disk this is why it is used Each result is stored in a location in the main memory and each location has an address, this way the CPU can store and retrieve information which is stored in the main memory easily and faster When the CPU writes information to the main memory two things are supplied the address section: passes through the address bus the data section: passes through the data bus

<https://www.slideserve.com/cheryl-montgomery/central-processing-unit-cpu-powerpoint-ppt-presentation>

##### Presentation Transcript

1. [**Central Processing Unit (CPU)**](https://image3.slideserve.com/6189404/central-processing-unit-cpu-l.jpg) Chapter 2
2. [**History of processor**](https://image3.slideserve.com/6189404/history-of-processor-l.jpg) PCM Chapter 3: CPU
3. [**History of processor**](https://image3.slideserve.com/6189404/history-of-processor1-l.jpg) PCM Chapter 3: CPU
4. [**History of processor**](https://image3.slideserve.com/6189404/history-of-processor2-l.jpg) PCM Chapter 3: CPU
5. [**History of processor**](https://image3.slideserve.com/6189404/history-of-processor3-l.jpg) PCM Chapter 3: CPU
6. [**CPU Packages**](https://image3.slideserve.com/6189404/cpu-packages-l.jpg) • The circuit board on which the microprocessor is mounted 4 package types LGA • Intel Socket 775 • Socket 1366 • Core i7, Core2 Duo, Core2 Quad Pentium 4 PCM Chapter 3: CPU SPGA SEC PGA Intel Motherboards use Slot 1 • Pentium II • Early Pentium III’s • Early AMD Athlons AMD Motherboards use Slot A
7. [**Dual-Core Processing**](https://image3.slideserve.com/6189404/dual-core-processing-l.jpg) • 4Ghz limit reached in 2003 • 2 CPU’s on the same chip • Dual carriageway vs single carriageway • Requires software that supports multi-threading • Athlon dual cores share the L1 cache • In 2006 Intel Core processors replaced the Pentium • Intel Core 2, Core 2 Duo, Core 2 Quad, Core 2 Extreme PCM Chapter 3: CPU
8. [**Modern Processor – Intel Pentium 4**](https://image3.slideserve.com/6189404/modern-processor-intel-pentium-4-l.jpg) • Based on new NetBurst micro-architecture • Key feature – Hyper-Pipelined Technology 20-stage pipeline PCM Chapter 3: CPU
9. [**Modern Processor – Intel Dual-Core Processor**](https://image3.slideserve.com/6189404/modern-processor-intel-dual-core-processor-l.jpg) • April 2005 – Intel Pentium Processor Extreme Edition featuring Intel dual-core processor • Boost multitasking computing power • Consists of two complete execution cores in one physical processor • Intel Centrino Duo mobile technology ◊ Intel laptop platform PCM Chapter 3: CPU
10. [**Modern Processor – Intel Dual-Core Processor**](https://image3.slideserve.com/6189404/modern-processor-intel-dual-core-processor1-l.jpg) PCM Chapter 3: CPU
11. [**Modern Processor – Intel Core 2 Quad Processor**](https://image3.slideserve.com/6189404/modern-processor-intel-core-2-quad-processor-l.jpg) • Latest tech for desktop PC • Based on the new Intel Core micro-architechture • Delivers 4 complete execution core within a single processor • 4 processors on the same chip PCM Chapter 3: CPU
12. [**Modern Processor – Intel Core i7**](https://image3.slideserve.com/6189404/modern-processor-intel-core-i7-l.jpg) • i7-920 = 2.66 Ghz - €286.50 • i7-940 = 2.93 Ghz - €557.52 • DDR3 800/1066 PCM Chapter 3: CPU
13. [**Modern Processor – Intel i7 Extreme**](https://image3.slideserve.com/6189404/modern-processor-intel-i7-extreme-l.jpg) • i7-965 = 3.2Ghz • DDR3 800/1066 • €1000.44 from dabs.ie on 26/05/09 PCM Chapter 3: CPU
14. [**Modern Processor – Current AMD Desktop Processors**](https://image3.slideserve.com/6189404/modern-processor-current-amd-desktop-processors-l.jpg) • Sempron • Athlon • Athlon X2 • Athlon 64 X2 • Athlon 64 FX • Phenom X3 • Phenom X4 • Phenom II X3 • Phenom II X4 • Opteron PCM Chapter 3: CPU
15. [**Modern Processor – Athlon64 X2**](https://image3.slideserve.com/6189404/modern-processor-athlon-64-x2-l.jpg) • First dual-core Windows compatible 64 bit processor • Up to 3Mb cache • L3 cache in Black Edition • Socket AM2 or AM2+ • Can run 32 bit windows applications • Can also run other 64 bit applications • Microsoft Vista comes in 32bit or 64bit • From PC1600 to PC3200 DDR RAM PCM Chapter 3: CPU
16. [**Modern Processor – AMD Athlon 64 X2 Dual Core**](https://image3.slideserve.com/6189404/modern-processor-amd-athlon-64-x2-dual-core-l.jpg)• Consist of two Athlon 64 cores joined together on one die with additional control logic • Perform calculation on two streams of data ◊ increasing efficiency and speed • Notebook processor ◊ Turion 64 Mobile, Mobile Athlon 64, Athlon 64, Mobile Athlon XP-M and mobile Sempron PCM Chapter 3: CPU
17. [**Athlon 64 FX**](https://image3.slideserve.com/6189404/athlon-64-fx-l.jpg) • Designed for power users and gamers • 2304Kb cache • 2 x AMD Athlon 64 FX dual-core processors • Double the amount of high-speed on die cache • Runs both 32-bit and 64-bit software PCM Chapter 3: CPU
18. [**Modern Processor –Phenom X3 & X4**](https://image3.slideserve.com/6189404/modern-processor-phenom-x3-x4-l.jpg) Phenom X3 Phenom X4 • 64 bit Triple Core processor • Socket AM2+ • 2.4Ghz • L1, L2 and L3 cache (total = 2Mb) • 64 bit Quad Core processor • Socket AM2+ • 2.3 Ghz, 2.6 Ghz • L1, L2 and L3 cache (total = 2Mb) PCM Chapter 3: CPU
19. [**Modern Processor –Phenom II X4 & X3**](https://image3.slideserve.com/6189404/modern-processor-phenom-ii-x4-x3-l.jpg) Phenom II X4 Phenom II X3 • 64 bit Quad core processor • Works with socket AM3 • 2.6, 2.8, 3.2 Ghz • L1, L2 and L3 cache (6Mb or 8Mb) • 64 bit Triple core processor • Works with socket AM3 • 2.5, 2.6, 2.8 Ghz (2 Mb) • L1, L2 and L3 cache PCM Chapter 3: CPU
20. [**AMD Quad Core Processors**](https://image3.slideserve.com/6189404/amd-quad-core-processors-l.jpg) PCM Chapter 3: CPU Servers and workstations PCs
21. [**CPU Bus Brain Teasers**](https://image3.slideserve.com/6189404/cpu-bus-brain-teasers-l.jpg) The Pentium processor has a 32 bit address bus The Pentium processor has a 64 bit data bus The AMD Athlon 64 has a 64 bit address bus PCM Chapter 3: CPU The AMD Athlon 64 has a 64 bit data bus
22. [**General Notes**](https://image3.slideserve.com/6189404/general-notes-l.jpg) • Pentium 4 has a 32 bit address bus giving a maximum of 232 or 4Gb of addressable RAM • The Athlon 64 has a 64 bit address bus • AMD’s have a much bigger CPU cache meaning that a 1.8 Ghz AMD processor runs as fast as a 3.0 Ghz Intel processor PCM Chapter 3: CPU
23. [**Processor Container**](https://image3.slideserve.com/6189404/processor-container-l.jpg) Type: Socket and Slot Slot PCM Chapter 3: CPU ZIF socket with the release lever on the left ZIF socket with the release lever on the right Note: LIF socket would look the same as shown above, but without the lever.
24. [**Processor Container: Socket**](https://image3.slideserve.com/6189404/processor-container-socket-l.jpg) Socket exist in 2 forms: • ZIF – Zero Insertion Force • LIF – Low Insertion Force. • Problem of LIF socket is that you could easily break a pin on the processor during installation • ZIF socket has a lever to either tighten or loosen the socket's connectors thus allowing the processor to be inserted or removed easily with "zero force"). PCM Chapter 3: CPU
25. [**Type of processor socket and slot**](https://image3.slideserve.com/6189404/type-of-processor-socket-and-slot-l.jpg) PCM Chapter 3: CPU
26. [**AMD Socket 462**](https://image3.slideserve.com/6189404/amd-socket-462-l.jpg) • AKA Socket A • Athlon • Ahlon XP • Duron • Sempron PCM Chapter 3: CPU
27. [**PCM Chapter 3: CPU**](https://image3.slideserve.com/6189404/slide27-l.jpg) Left: Socket AM2+ Processor Right Socket AM3 Processor
28. [**Cooling System: Air Cooling**](https://image3.slideserve.com/6189404/cooling-system-air-cooling-l.jpg) • Chips and disk drives get hot, and we need to transfer heat away from them to stop their temperature rising too high. • The heat flows from the device (which is at a high temperature) to the nearby air (which is at a lower temperature).  However, as the surrounding air warms up, the rate of flow decreases. PCM Chapter 3: CPU
29. [**Cooling System: Heat Sink**](https://image3.slideserve.com/6189404/cooling-system-heat-sink-l.jpg) • The rate of heat transfer depends upon the size of the contact area between the device and the nearby air. •  A heat sink attaches to a device and increases its surface area with fins made of metal (which conducts heat very well).  Heat sinks are a form of passive cooling. PCM Chapter 3: CPU
30. [**Cooling System: Thermal compound**](https://image3.slideserve.com/6189404/cooling-system-thermal-compound-l.jpg) • The contact point between the device and the heat sink will never be perfectly smooth.  This will reduce the contact area and limits the amount of heat that may be transferred to the heat sink. • Thermal compound (also called thermal paste or heat sink compound) goes between the device and the heat sink, filling microscopic pores in the contact area.  The paste conducts heat well, ensuring that the heat sink dissipates as much heat as possible. • The paste dries out over time so it is advisable when removing a heat sink to clean off all old paste with isopropyl alcohol (IPA) and apply new paste when re-mounting. PCM Chapter 3: CPU
31. [**Cooling System: Fans**](https://image3.slideserve.com/6189404/cooling-system-fans-l.jpg) • Fan is use to move new (cool) air into the vicinity of devices (and moving old (warmer) air away). By doing this we can maintain a temperature difference, ensuring a high heat transfer rate. Because it requires power this is called active cooling. • A large fan spinning at low speed will give the same air flow as a small fan at high speed.  Air flow is measured in cubic metres or feet per second. • Fans produce noise (measured in dB — a lower dB rating is quieter).  Smaller fans tend to produce more noise because they need to spin faster. PCM Chapter 3: CPU
32. [**Cooling System: Fans (Cont.)**](https://image3.slideserve.com/6189404/cooling-system-fans-cont-l.jpg) • Cheaper fans use lubricated rings called sleeve bearings.  The lubricant on these can dry up (especially at high temperatures), leading to failure.  They also perform poorly if the fan is not horizontal. • Better fans use ball bearings.  These can work at a higher range of temperatures and are more durable.  They also generate less noise. Fluid bearings and magnetic bearings are very quiet indeed. PCM Chapter 3: CPU
33. [**Cooling System: Liquid Cooling**](https://image3.slideserve.com/6189404/cooling-system-liquid-cooling-l.jpg) • Water transfers heat away more efficiently than air, so some PCs now use it as their primary coolant • Cold water flows from the radiator to the CPU water block (which is attached to the CPU with thermal compound); the warmed water then flows through the pump back to the radiator.  The fan blows air across the radiator's fins, cooling the water by transferring the accumulated heat to the air and out of the case. • Further water blocks can be connected in the loop, absorbing heat from hard drives, the north bridge and the graphics card. PCM Chapter 3: CPU
34. [**Cooling System: Liquid Cooling**](https://image3.slideserve.com/6189404/cooling-system-liquid-cooling1-l.jpg) PCM Chapter 3: CPU
35. [**Processor Configuration**](https://image3.slideserve.com/6189404/processor-configuration-l.jpg) • Automatic or manual (motherboard jumper setting or BIOS) • Terminology • FSB • Clock Multiplier • System Clock • Clock Speed • Clock Cycle PCM Chapter 3: CPU
36. [**FSB**](https://image3.slideserve.com/6189404/slide36-l.jpg) • Also known as processor bus or memory address bus. • This bus is used primarily by the processor to pass information to and from cache or main memory and the North Bridge of the chipset. • The processor bus in a modern system runs at 66MHz, 100MHz, 133MHz, 200MHz, 266MHz, 400MHz, 533MHz, 800MHz, or 1066MHz and is normally 64 bits (8 bytes) wide. PCM Chapter 3: CPU
37. [**Clock Multiplier**](https://image3.slideserve.com/6189404/clock-multiplier-l.jpg) • A processor feature, which allows the CPU to runs faster than the motherboard clock speed (FSB). PCM Chapter 3: CPU
38. [**System Clock**](https://image3.slideserve.com/6189404/system-clock-l.jpg) • Definition – A small quartz circuit used to control the timing of the computer’s operations • Function • As a timer that times the processing operations of the computer. Not used to keep the time of day • Generates regular, electronic pulses (or ticks) that set the operating pace of the components in the system unit • A clock cycle is equivalent to single tick. The faster the system clock, the more instructions the processor can carry out in second • The speed of the system clock is measured by the number of ticks per second. PCM Chapter 3: CPU
39. [**System Clock**](https://image3.slideserve.com/6189404/system-clock1-l.jpg) • Why is the system clock important? • The computer operating speed is tied to the speed of the system clock. A processor can execute an instruction in a given number of clock cycles. • A the system clock’s speed increase, so do the number of instructions a processor can carry out in a second • Megahertz (MHz) – million of cycles per second • Gigahertz (GHz) – billion of cycles per second PCM Chapter 3: CPU
40. [**System Clock**](https://image3.slideserve.com/6189404/system-clock2-l.jpg) • The source of a computer's timing signals. • It synchronizes every operation of the CPU Clock speed – refers to the number of pulses per second generated by an oscillator that sets the tempo for the processor. Clock speed is usually measured in MHz (megahertz, or millions of pulses per second) or GHz (gigahertz, or billions of pulses per second). 1MHz PCM Chapter 3: CPU
41. [**Clock cycle**](https://image3.slideserve.com/6189404/clock-cycle-l.jpg) • is the time between two adjacent pulses of the oscillator that sets the tempo of the computer processor • Number of pulse in 1 second is known as clock speed PCM Chapter 3: CPU T1 – 1 clock cycle T2 – another clock cycle
42. [**Configuration formula**](https://image3.slideserve.com/6189404/configuration-formula-l.jpg) CPU Speed = raw FSB x Clock Multiplier Example 1: We have a Pentium 4 2.4GHz and a motherboard with a FSB 400 MHz. Note:Intel Pentium 4 architectures allow it to process four (4) instruction per clock cycle. Clock Multiplier = CPU Speed / raw FSB = (2.4 x 1000) / (400 / 4) (i) and (ii) = 2400 / 400 = 6 PCM Chapter 3: CPU
43. [**Configuration formula**](https://image3.slideserve.com/6189404/configuration-formula1-l.jpg) Motherboards Setting – FSB 400MHz and Clock Multiplier is 24 Example 2: We have a Pentium 4 2.4GHz and a motherboard with a FSB 533 MHz Clock Multiplier = CPU Speed / raw FSB = (2.4 x 1000) / (533 / 4) = 2400 / 133 (i) = 18 (ii) Motherboards Setting – FSB 533MHz and Clock Multiplier is 18 PCM Chapter 3: CPU
44. [**Example 3: We have an Athlon XP 2400+ and a motherboard with**](https://image3.slideserve.com/6189404/slide44-l.jpg) a FSB 266 MHz Note: AMD Athlon architectures allow it to process two (2) instructions per clock cycle Clock Multiplier = CPU Speed / raw FSB = (2 x 1000) / (266 / 2) = 2000 / 133 (i) = 15 (ii) Motherboards Setting – FSB 266MHz and Clock Multiplier is 15 PCM Chapter 3: CPU
45. [**1 hertz (Hz)**](https://image3.slideserve.com/6189404/slide45-l.jpg) = 1 cycle per second 1 megahertz (MHz) = 1 million cycles per second PCM Chapter 3: CPU 1 gigahertz (GHz) = 1 billion cycles per second
46. [**Overclocking**](https://image3.slideserve.com/6189404/overclocking-l.jpg) PCM Chapter 3: CPU
47. [**BIOS/CMOS**](https://image3.slideserve.com/6189404/bios-cmos-l.jpg) PCM Chapter 3: CPU

**Computer Processor/Microprocessor/Processor:**

* A processor or Central Processing Unit (CPU) is an electronic circuit that can execute computer programs.
* A computer processor analyses data and controls data flow in a computer.
* It is the brain of the Computer.

**CPU Functions:**

* To perform Arithmetic calculation operations.
* To perform logical operations.
* To control functions of other hardware components.
* To fetch the data and program instructions from main memory RAM
* To decode the program instructions
* To operate on the data as per program instructions.
* To store the processed data in to the RAM.
* To continuously execute instruction/machine cycle.

**How the processor Works:**

* **Fetch:** The processor retrieves program instructions from memory.
* **Decode:** The instruction is broken down into parts.
* **Execute:** CPU performs the operation implied by the program instructions.
* **Write back:** The Processor writes back the results of execution, to the computer's memory.

**Basic knowledge about processor**

**Clock speed:** Clock speed is a processor is how fast the processor can do the tasks while executing a program. It is measured as a frequency in Megahertz (MHz) or Gigahartz (GHz).

MHz: One million clock ticks every second

GHz: One billion clock ticks every second

[**Clock cycle**](https://image3.slideserve.com/6189404/clock-cycle-l.jpg) is the time between two adjacent pulses of the oscillator that sets the tempo of the computer processor. Number of pulse in 1 second is known as clock speed.

**Core:** A processor core is a hardware unit in the processor architecture that can execute instructions sent to it.

**Hyper threading:** Thread are the virtual core and work like a real core inside CPU. When cores assembled with multi threads then it is known as Hyper threading technology.

**Cache:** High speed memory. It interacts between CPU and main memory.

**RAM Multi Processing:** Simultaneous processing with two or more processors in one computer or two or more computers processing together.

**Parallel Processing:** The simultaneous use of more than one CPU or processor core to execute a program or multiple computational threads

**Components of CPU**

* **Input/output unit:** The I/O unit links the microprocessor to the rest of the circuitry of the computer.
* **Arithmetic and Logic Unit (ALU):** It carries out the logical, algebraical or any types calculations.
* **Control Unit:** It manages the fetching, decoding and execution of the instructions.
* **Registors:** It is very fast temporary storage locations which hold data being processed, instructions being executed and addresses of the memory location to be accessed.
* **Internal buses:** Buses are used to transmit information’s from one place to another.

**What is single, double and multi core processors?**

* **Single core:** Has one core to process different operations like intel Pentium.
* **Dual core:** Has two cores to process operations; able to process more information at the same time compare to single core like intel core i3 and i5.
* **Quad core:** Contains two dual core processors in one integrated circuit and generally used for multi-tasking like intel core i7.

**Sockets:** Socket is a mechanical component that provides mechanical and electrical connection between processor and printed circuit board.

**Instruction Register (IR):** The IR is used to store a copy of the current instruction being performed. This instruction is stored in the for of operator and operand.

**Memory Data Register (MDR):** The Memory Data Register in the central processor stores the data being transferred to and from the access store.

**Memory Address Register (MAR):** The Memory Address Register in the central processor stores the address of the memory location currently in use

**Cooling System:** Chips and disk drives get hot, and we need to transfer heat away from them to stop their temperature rising too high.

* Air Cooling
* Heat Sink
* Thermal compound
* Fans
* Liquid Cooling