Multi-Microprocessor Systems

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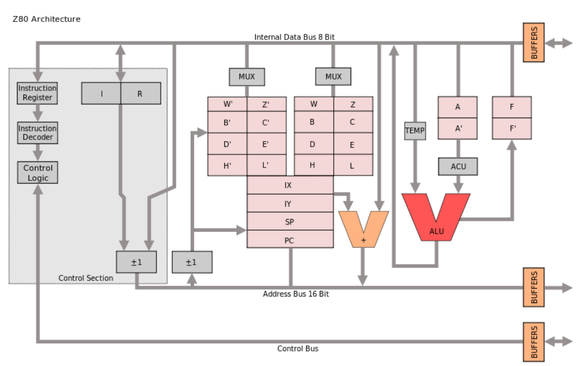
Abstract This paper briefs on evolution of multi-microprocessor followed by introducing the technology and its blessings in today worlds .The paper concludes by particularization on the challenges presently sweet faced by multi-microprocessors and the way the business is making an attempt to deal with these problems Rapid and continuing advances in large-scale integrated (LSI) semiconductor technology have leads to considerable speculation on ways to exploit microprocessors for building computer systems. Microprocessors are being applied very successfully where small amounts of computing power ate needed, such as in calculators, instrument controllers, intelligent terminals, and more recently in consumer goods and games; but it remains an open problem to design a commercially viable multiple-microprocessor structure. A variety of organizations have been proposed for such systems, and this article begins with an overview of this spectrum.

Multi-microprocessor system: A microprocessor incorporates the functions of a computer's central processing unit (CPU) on a single integrated circuit (IC), or at most a few integrated circuits.All modern CPUs are microprocessors making the micro- prefix redundant. The microprocessor is a multipurpose, programmable device that accepts digital data as input, processes it according to instructions stored in its memory, and provides results as output. It is an example of sequential digital logic, as it has internal memory. Microprocessors operate on numbers and symbols represented in the binary numeral system.

The integration of a whole CPU onto a single chip or on a few chips greatly reduced the cost of processing power. The integrated circuit processor was produced in large numbers by highly automated processes, so unit cost was low. Single-chip processors increase reliability as there are many fewer electrical connections to fail. As microprocessor designs get faster, the cost of manufacturing a chip (with smaller components built on a semiconductor chip the same size) generally stays the same.

Before microprocessors, small computers had been implemented using racks of circuit boards with many medium- and small-scale integrated circuits. Microprocessors integrated this into one or a few large-scale ICs. Continued increases in microprocessor capacity have since rendered other forms of computers almost completely obsolete (see history of computing hardware), with one or more microprocessors used in everything from the smallest embedded systems and handheld devices to the largest mainframes and supercomputers Z80 Microprocessor: The internal arrangement of a microprocessor varies depending on the age of the design and the intended purposes of the microprocessor. The complexity of an integrated circuit is bounded by physical limitations of the number of transistors that can be put onto one chip, the number of package terminations that can connect the processor to other parts of the system, the number of interconnections it is possible to make on the chip, and the heat that the chip can dissipate. Advancing technology makes more complex and powerful chips feasible to manufacture.



A minimal hypothetical microprocessor might only include an arithmetic logic unit (ALU) and a control logic section. The ALU performs operations such as addition, subtraction, and operations such as OR, AND. Each operation of the ALU sets one or more flags in a status register, which indicate the results of the last operation (zero value, negative number, overflow, or others). The control logic section retrieves instruction operation codes from memory, and initiates whatever sequence of operations of the ALU requires to carry out the instruction. A single operation code might affect many individual data paths, registers, and other elements of the processor.

As integrated circuit technology advanced, it was feasible to manufacture more and more complex processors on a single chip. The size of data objects became larger; allowing more transistors on a chip allowed word sizes to increase from 4- and 8-bit words up to today's 64-bit words. Additional features were added to the processor architecture; more on-chip registers speed up programs, and complex instructions could be used to make more compact programs. Floating-point arithmetic, for example, was often not available on 8-bit microprocessors, but had to be carried out in software. Integration of the floating point unit first as a separate integrated circuit and then as part of the same microprocessor chip, sped up floating point calculations

Special-purpose designs:- A microprocessor is a general purpose system. Several specialized processing devices have followed from the technology. Microcontrollers integrate a microprocessor with peripheral devices in embedded systems. A digital signal processor (DSP) is specialized for signal processing. Graphics processing units may have no, limited, or general programming facilities.

32-bit processors have more digital logic than narrower processors, so 32-bit (and wider) processors produce more digital noise and have higher static consumption than narrower processors. So 8-bit or 16-bit processors are better than 32-bit processors for system on a chip and microcontrollers that require extremely low-power electronics, or are part of a mixed-signal integrated circuit with noise-sensitive on-chip analog electronics such as high-resolution analog to digital converters, or both.

When manufactured on a similar process, 8-bit micros use less power when operating and less power when sleeping than 32-bit micros.

However, some people say a 32-bit micro may use less average power than an 8-bit micro, when the application requires certain operations, such as floating-point math, that take many more clock cycles on an 8-bit micro than a 32-bit micro, and so the 8-bit micro spends more time in high-power operating mode.

Embedded applications:- Thousands of items that were traditionally not computer-related include microprocessors. These include large and small household appliances, cars (and their accessory equipment units), car keys, tools and test instruments, toys, light switches/dimmers and electrical circuit breakers, smoke alarms, battery packs, and hi-fi audio/visual components (from DVD players to phonograph turntables). Such products as cellular telephones, DVD video system and HDTV broadcast systems fundamentally require consumer devices with powerful, low-cost, microprocessors. Increasingly stringent pollution control standards effectively require automobile manufacturers to use microprocessor engine management systems, to allow optimal control of emissions over widely varying operating conditions of an automobile. Non-programmable controls would require complex, bulky, or costly implementation to achieve the results possible with a microprocessor.

A microprocessor control program (embedded software) can be easily tailored to different needs of a product line, allowing upgrades in performance with minimal redesign of the product. Different features can be implemented in different models of a product line at negligible production cost.

I. INTRODUCTION

The advent of low-cost computers on integrated circuits has transformed modern society. General-purpose microprocessors in personal computers are used for computation, text editing, multimedia display, and communication over the Internet. Many more microprocessors are part of embedded systems, providing digital control over myriad objects from appliances to automobiles to cellular phones and industrial process control.

The first microprocessors emerged in the early 1970s and were used for electronic calculators, using binary-coded decimal (BCD) arithmetic on 4-bit words. Other embedded uses of 4-bit and 8-bit microprocessors, such as terminals, printers, various kinds of automation etc., followed soon after. Affordable 8-bit microprocessors with 16-bit addressing also led to the first general-purpose microcomputers from the mid-1970s on.

Since the early 1970s, the increase in capacity of microprocessors has followed Moore's law; this originally suggested that the number of components that can be fitted onto a chip doubles every year. With present technology, it is actually every two years, and as such Moore later changed the period to two years.

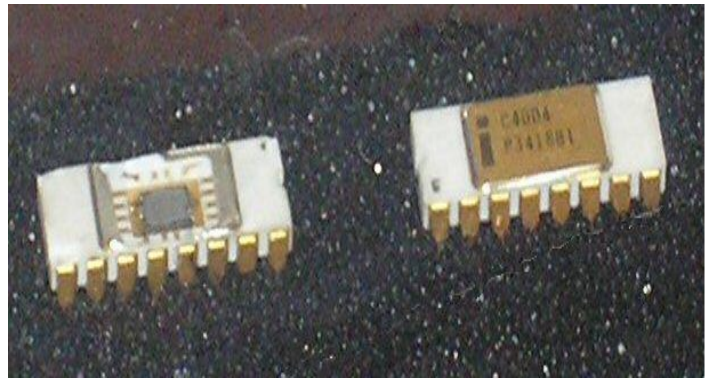
II. CADC

In 1968, Garrett AiResearch (which employed designers Ray Holt and Steve Geller) was invited to produce a digital computer to compete with electromechanical systems then under development for the main flight control computer in the US Navy's new F-14 Tomcat fighter. The design was complete by 1970, and used a MOS-based chipset as the core CPU. The design was significantly (approximately 20 times) smaller and much more reliable than the mechanical systems it competed against, and was used in all of the early Tomcat models. This system contained "a 20-bit, pipelined, parallelmulti-microprocessor".

TMS 1000:-The Smithsonian Institution says TI engineers Gary Boone and Michael Cochran succeeded in creating the first microcontroller (also called a microcomputer) and the first single-chip CPU in 1971. The result of their work was the TMS 1000, which went commercial in 1974.TI stressed the 4-bit TMS 1000 for use in pre-programmed embedded applications, introducing a version called the TMS1802NC on September 17, 1971 that implemented a calculator on a chip.

A computer-on-a-chip combines the microprocessor core (CPU), memory, and I/O (input/output) lines onto one chip. The computer-on-a-chip patent, called the "microcomputer patent" at the time, U.S. Patent 4,074,351, was awarded to Gary Boone and Michael J. Cochran of TI. Aside from this patent, the standard meaning of microcomputer is a computer using one or more microprocessors as its CPU(s), while the concept defined in the patent is more akin to a microcontroller.

III. INTEL 4004



The 4004 with cover removed (left) and as actually used (right).

The Intel 4004 is generally regarded as the first commercially available microprocessor, and cost $60. The first known advertisement for the 4004 is dated November 15, 1971 and appeared in Electronic News. The project that produced the 4004 originated in 1969, when Busicom, a Japanese calculator manufacturer, asked Intel to build a chipset for high-performance desktop calculators. Busicom's original design called for a programmable chip set consisting of seven different chips. Three of the chips were to make a special-purpose CPU with its program stored in ROM and its data stored in shift register read-write memory. Ted Hoff, the Intel engineer assigned to evaluate the project, believed the Busicom design could be simplified by using dynamic RAM storage for data, rather than shift register memory, and a more traditional general-purpose CPU architecture. Hoff came up with a four–chip architectural proposal: a ROM chip for storing the programs, a dynamic RAM chip for storing data, a simple I/O device and a 4-bit central processing unit (CPU). Although not a chip designer, he felt the CPU could be integrated into a single chip, but as he lacked the technical know-how the idea remained just a wish for the time being.

IV. CONCLUSION

Power and frequency limitations determined on single core implementations have made-up the entranceway for multi-core technology and can be the trend within the trade moving forward. But the whole performance outturn will be completed only if the challenges multi-core processors facing these days area unit totally self-addressed

Advantags of multi microprocessor system:-

The proximity of multiple CPU cores on the same die allows the cache coherency circuitry to operate at a much higher clock-rate than is possible if the signals have to travel off-chip. Combining equivalent CPUs on a single die significantly improves the performance of cache snoop (alternative: Bus snooping) operations. Put simply, this means that signalsbetween different CPUs travel shorter distances, and therefore those signals degrade less. These higher-quality signals allow more data to be sent in a given time period, since individual signals can be shorter and do not need to be repeated as often.

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