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(RISC vs. CISC Architectures)

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Abstract

In this report, I will talk about a set of instructions for computer architecture, in particular the definition of CISC and the definition of RISC, in addition to an introduction that contains some of the comprehensive definitions and at the end a table that contains the differences between them
I conclude that RISC needs more RAM, whereas CISC has an emphasis on smaller code size and uses less RAM overall than RISC. Many microprocessors today hold a mix of RISC- and CISC-like attributes, however, such as a CISC-like ISA that treats instructions as if they are a string of RISC-type instructions.

1. Introduction

Until the mid-eighties in the previous century, the dominant trend in the world of processors CPUs was to build processors with more complex orders and more numbers, which makes programming easier, but in the meantime another completely opposite trend emerged which is the pursuit of building processors with very simple and limited orders that will enable them to be implemented At very high and unprecedented speeds, besides speed in execution, there is a positive side that some believe is more important, that as long as the orders are simple, the number of transistors needed will be less and the

complexity of the design of CPUs has become less, which means a lower cost in production and development with the emergence of that generation of orders Border which was named RISC.

In fact, the old trend with the most numerous and complex commands was called CISC to distinguish it from the new generation.

In order to mention the thing in its place, we must mention that CISC technology was and still is extremely popular, as it facilitates the task of programmers in general, which enables the development of programs at a higher speed and lower cost, and this is in fact the biggest strength of this technology. {1}

2. RISC (reduced instruction set computer)

RISC (reduced instruction set computer) is a microprocessor that is designed to perform a smaller number of types of computer instructions so that it can operate at a higher speed (perform more millions of instructions per second, or MIPS).

RISC (**reduced instruction set computer)** is a microprocessor that is designed to perform a smaller number of types of computer instructions so that it can operate at a higher speed (perform more millions of instructions per second, or MIPS). Since each instruction type that a computer must perform requires additional transistors and circuitry, a larger list or set of computer instructions tends to make the microprocessor more complicated and slower in operation.

John Cocke of IBM Research in Yorktown, New York, originated the RISC concept in 1974 by proving that about 20% of the instructions in a computer did 80% of the work. The first computer to benefit from this discovery was IBM's PC/XT in 1980. Later, IBM's RISC System/6000, made use of the idea. The term itself (RISC) is credited to David Patterson, a teacher at the University of California in Berkeley. The concept was used in Sun Microsystems' SPARC microprocessors and led to the founding of what is now MIPS Technologies, part of Silicon Graphics. A number of current microchips now use the RISC concept.

The RISC concept has led to a more thoughtful design of the microprocessor. Among design considerations are how well an instruction can be mapped to the clock speed of the microprocessor (ideally, an instruction can be performed in one clock cycle); how "simple" an architecture is required; and how much work can be done by the microchip itself without resorting to software help. Besides performance improvement, some advantages of RISC and related design improvements are: A new microprocessor can be developed and tested more quickly if one of its aims is to be less complicated.

Operating system and application programmers who use the microprocessor's instructions will find it easier to develop code with a smaller instruction set.

The simplicity of RISC allows more freedom to choose how to use the space on a microprocessor.

Higher-level language compilers produce more efficient code than formerly because they have always tended to use the smaller set of instructions to be found in a RISC computer. {2}

RISC Processor:

It is known as Reduced Instruction Set Computer. It is a type of microprocessor that has a limited number of instructions. They can execute their instructions very fast because instructions are very small and simple.
RISC chips require fewer transistors which make them cheaper to design and produce. In RISC, the instruction set contains simple and basic instructions from which more complex instruction can be produced. Most instructions complete in one cycle, which allows the processor to handle many instructions at same time.
In this instructions are register based and data transfer takes place from register to register {3}

3.CISC (complex instruction set computer or computing)

The term "CISC" (complex instruction set computer or computing) refers to computers designed with a full set of computer instructions that were intended to provide needed capabilities in the most efficient way. Later, it was discovered that, by reducing the full set to only the most frequently used instructions, the computer would get more work done in a shorter amount of time for most applications. Since this was called reduced instruction set computing (RISC), there was now a need to have something to call full-set instruction computers - thus, the term CISC.

The PowerPC microprocessor, used in IBM's RISC System/6000 workstation and Macintosh computers, is a RISC microprocessor. Intel's Pentium microprocessors are CISC microprocessors. RISC takes each of the longer, more complex instructions from a CISC design and reduces it to multiple instructions that are shorter and faster to process {4}

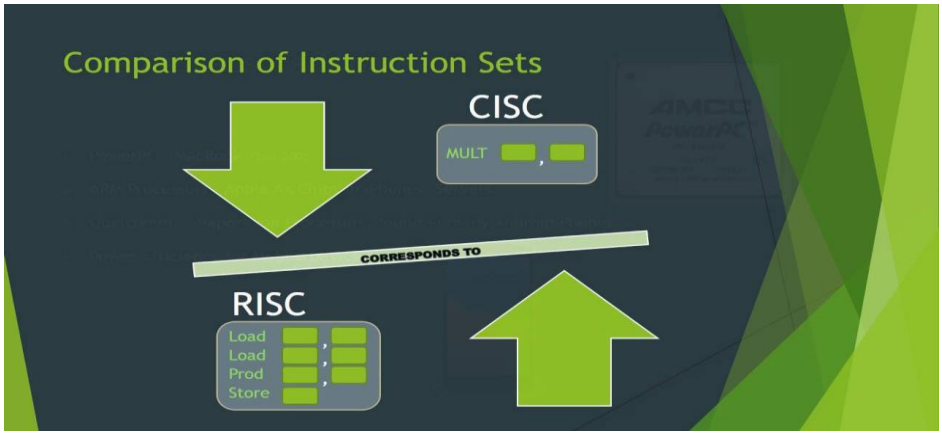
CISC Processor :

- It is known as Complex Instruction Set Computer.
- It was first developed by Intel.
- It contains large number of complex instructions.
- In this instructions are not register based.
- Instructions cannot be completed in one machine cycle.
- Data transfer is from memory to memory.
- Micro programmed control unit is found in CISC. {5}

The Disadvantages

The CISC is an abbreviation for "complex instruction set computer" and "used by most" desktop computers and a large number of commands. The instruction set can reach 3000 or more orders sometimes and the primary motivation behind using the CISC is Reducing the general cost of computers by making programming - the most expensive component of any computer system - more accessible and less costly. This is summed up by applying a simple principle, which is to transfer complexity from the world of software to the world of hardware Note that the greater the number of available commands, the greater the ease of programming in a large way, but in return increases the complexity in building the processor, where you will need a complex translation unit called the small code unit inside the same processor available on the number of large commands, and it will take from additional within the translation unit the small code unit until Interpretation, which means a slowdown in performance due to the complexity of the order entered, where the implementation of a single order needs between 4 to 20 processing cycles.

4.Discussion



Figuer1.Comarison of Instruction sets.

Difference Between CISC and RISC

Some major differences between CISC and RISC architectures are listed in Table {6}

Architectural Characterstics	Complex Instruction Set Computer(CISC)	Reduced Instruction Set Computer(RISC)
Instruction size and format	Large set of instructions with variable formats (16-64 bits per instruction).	Small set of instructions with fixed format (32 bit).
Data transfer	Memory to memory.	Register to register.

CPU control	Most micro coded using control memory (ROM) but modern CISC use hardwired control.	Mostly hardwired without control memory.
Instruction type	Not register based instructions.	Register based instructions.
Memory access	More memory access.	Less memory access.
Clocks	Includes multi-clocks.	Includes single clock.
Instruction natur	Instructions are complex.	Instructions are reduced and simple.

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