RISC and CISC

REDUCED INSTRUCTION SET COMPUTER

COMPLEX INSTRUCTION SET COMPUTER

INTRODUCTION

❑ RISC – Reduced Instruction Set Computer

❑ RISC is a type of microprocessor architecture that utilizes

▪ a small, highly-optimized set of instructions

▪ rather than a more specialized set of instructions.

The instruction set is the hardware language that tells the processor what to do.

❑ The main alternative for RISC is CISC ,which stands for complex instruction set computer.

❑ CISC is the older approach, that came about to maximize performance of earlier computer's. Where instructions were executed sequentially.

BACKGROUND AND HISTORY

❑ RISC approach developed as a result of development in 1970's

  - increase in memory size

  - decrease in cost

  - advanced compilers

❑ In late 1970's IBM was the first to start.

❑ In 1980 , David Patterson ,began the project that gives this approach RISC.

❑ After some years ,Stanford MIPS was developed.

CHARACTERSTICS OF RISC

❑ **Simplified instructions** , taking 1 clock cycle.

❑ Large no. of **general purpose registers**.

❑ **Circuit** is much **simpler**.

❑ Fast to decode.

❑ Fast to execute.

❑ **Pipelining**- fetching of next instruction while previous instruction executes.
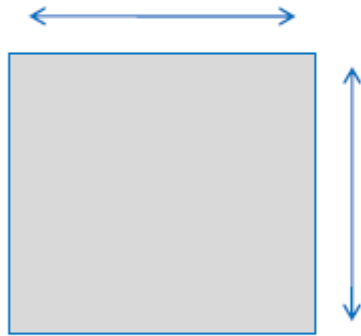
INSTRUCTION

CISC

- Complex Instructions.

- ADD AX,[BX + SI + 600H]

- Many operations in single instruction.

RISC

- Simpler or reduced instructions.

- LOAD R1, addresss1

  LOAD R2, address2

  ADD R1, R2

  STORE address1, R1
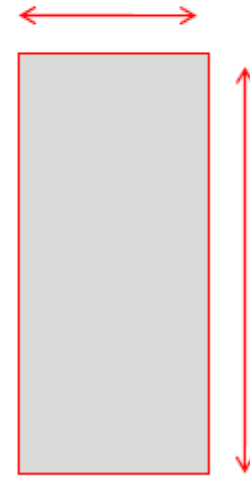
- One instruction one operation.

REGISTERS AND ADDRESSING MODE

CISC

- Fewer register.

- These registers are designed for special purposes.

- CISC designs provide a large number of addressing modes.

RISC

- Large number of registers.

- Here registers are identical so any register can be used for any purpose.

- RISC designs have single addressing modes.

CISC

- Slower to execute.

- Difficult to decode.

- Instruction size varies in different instructions.

- Complex circuit design.

RISC

- Faster execution.

- Easy to decode.

- Same instruction size in every instructions.

- Circuit design is simpler.

RISC & CISC CONVERGENCE

With time and developments, it was observed that the line of distinction between two hardware began to blur.

In fact two hardware seem to have adopted the strategies of the other.

- CISC - now executes more than one instruction within a single clock.

- This also allows CISC chips to make use of pipelining.

- With other technological improvements, it is now possible to fit many more transistors on a single chip.

- RISC - incorporate more complicated, CISC-like commands.
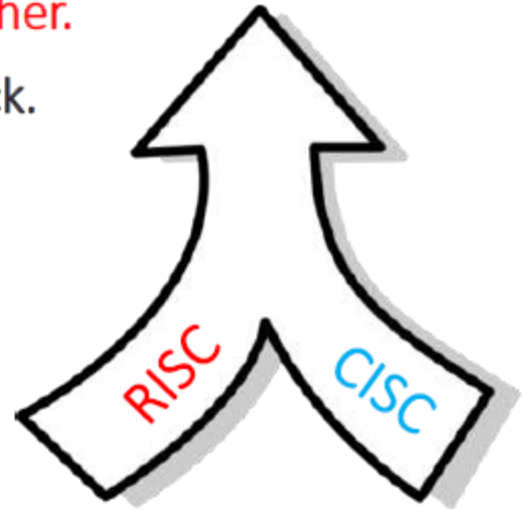
RISC APPLICATIONS

LOW END & MOBILE SYSTEM

- **ARM ARCHITECTURE**
  - Android based systems/ Apple iPhone/ Nintendo GBA etc.

- **MIPS line**
  - in PlayStations, Nintendo 64 etc.

- **Atmel AVR**
  - Xbox handheld controllers to BMW cars

HIGH END RISC & SUPERCOMPUTING

- **MIPS**
  - used in embedded system in routers, used by Digital Equipment Corporation etc.

- **IBM'S Power Architecture**
  - In many IBM's supercomputers, workstations etc.

- **Alpha**
  - In Single-board computers, Servers & Supercomputers from Digital Equivalent Cooperation etc.