REDUCED INSTRUCTION SET COMPUTERS

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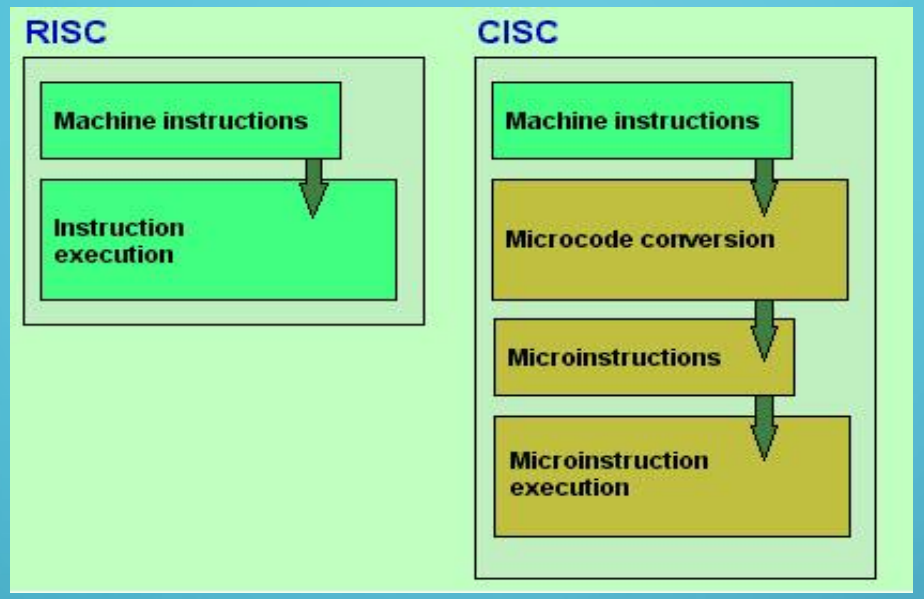
WHAT IS A REDUCED INSTRUCTION SET COMPUTER (RISC)?

- RISC is a type of microprocessor that attempts to be a fast and efficient architecture by having a smaller and simpler list of instructions.
- In a RISC processor, each instruction is simpler and therefore does less, but each instruction can be executed in a single cycle.
- RISC is great for portable devices due to the higher efficiency using up less energy.
- The ARM architecture is the most popular type of RISC processors, used in cell phones, game consoles, minicomputers such as the raspberry pi, and the Apple M1 computers.

RISC COMPARED TO COMPLEX INSTRUCTION SET COMPUTERS (CISC)

- CISC processors are built to understand a large and complex list of instructions so less code needs to be written.
- Each individual instruction can do more but takes longer than a single cycle to execute.
- CISC is used by the x86 architecture which powers most general-purpose home computers and laptops, as well as modern game consoles.

DIFFERENCES AT A GLANCE



RISC

- Software focus (compilers do most of the work)
- Instructions are single cycle
- Heavy memory usage due to more code
- Less addressing modes
- Register to Register design

CISC

- Hardware focused (doing as much with the circuitry as possible)
- Instructions can be multiple cycles
- Less memory usage due to less code
- More, complex, addressing modes
- Memory to memory design

MULTIPLICATION IN BOTH

RISC

`LOAD A, V1

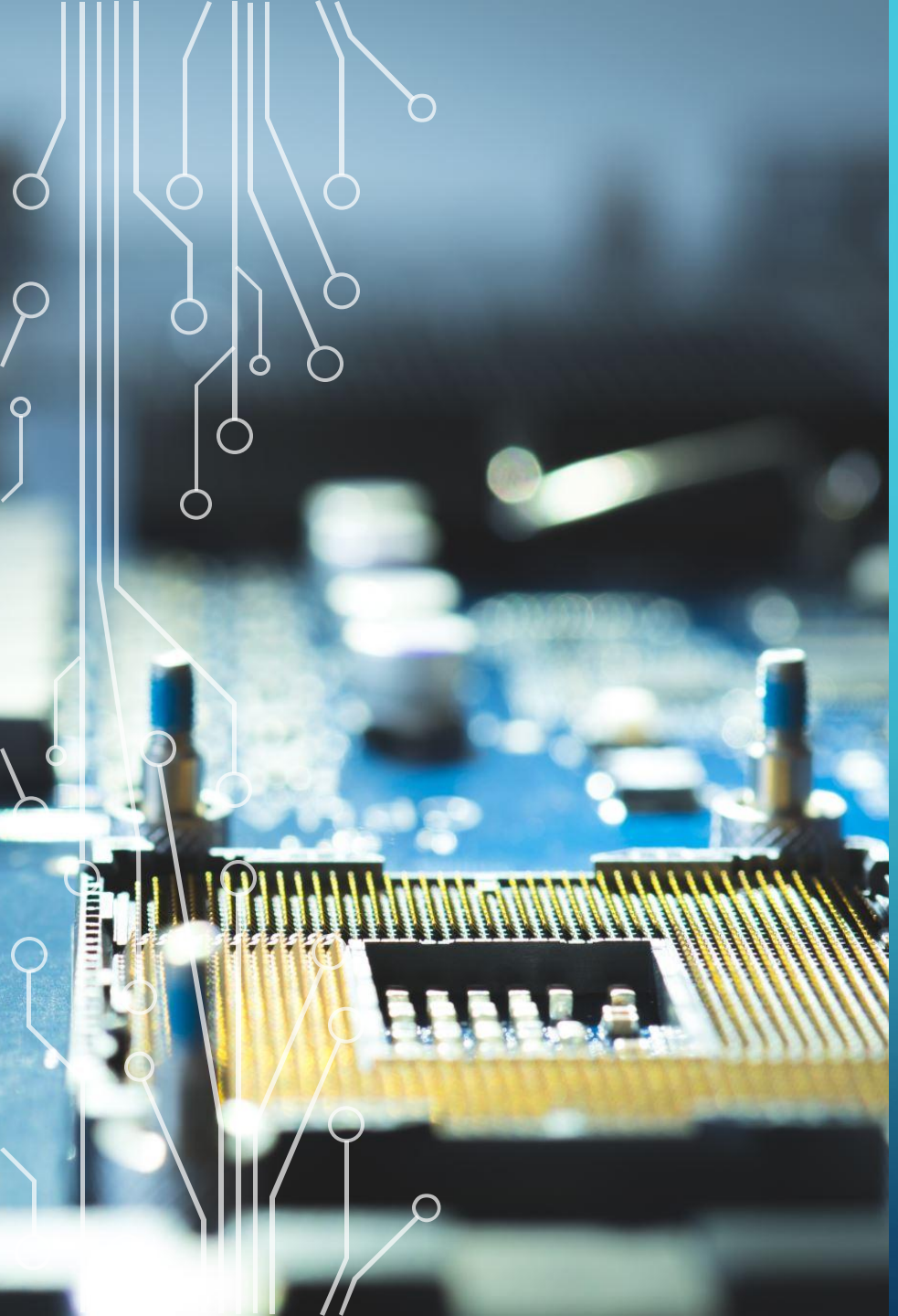
LOAD B, V2

PROD A,B

STOR V1, A

CISC

`MULT V1, V2`



LESS IS MORE

- Despite needing more instructions to do the same amount of work, RISC CPUs have started to show their advantages over CISC in efficiency.
- CISC CPUs, specifically x86, are loaded with transistors to handle all the instructions that it can do; Intel and AMD are pushing to be able to fit more on a single CPU for more power.
- Memory is less costly and more available than it was 30 years ago, along with improved compilers this makes RISC more and more viable.

WHY IS CISC STILL SO PREVALENT?

- Backwards compatibility has always been very important for the x86 architecture so software from years ago can still work.
- Despite the inefficiencies, Intel has had the money and resources to keep pushing CISC CPUs further despite how complex they were becoming. AMD has also made big improvements to lowering the size of the transistors used on their processors.
- So much software is designed to run on X86, including Windows, that consumers are less willing to change.
- Despite this, RISC processors are starting to turn up more, such as in Apple's new computers, replacing Intel.

TO WRAP UP

- RISC processors are simpler and have a minimal set of instructions.
- RISC processors are considered by many to be faster and more efficient than the more popular CISC processors.
- CISC processors continue to remain relevant due to backwards compatibility and the push by both Intel and AMD.
- RISC processors are now becoming more used thanks to memory availability and improved compilers.

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