Improving the Performance of a Central Processing Unit by Changing the Size of its Transistors and by Increasing Core Count

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Abstract

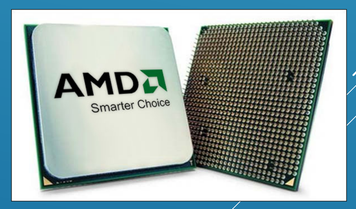
This research project was over the ability to increase the performance of a CPU, central processing unit, by altering the size of the transistors in the CPU. This was done by altering the Verilog Code, a programming language which is commonly used to implement code to design CPUs, to change the innards of a CPU. The final completed code for a CPU is then tested by a Verilog Code commonly referred to as a Test Bench. Once the new code had been stimulated by the Test Bench, it was then determined whether the new code was able to improve the speed of a CPU, or if it caused a number of implications that caused it to be less effective. However, this isn't the only way to improve the speeds of a CPU, you can also create more cores, via hyper threading, or by simply adding more cores. Hyper threading is the process of parallel computation, or doing two tasks at once. When a CPU has hyper-threading, it is the same as having 1 real CPU core, and 1 virtual CPU core. The other way is to physically create more cores, which will allow for more raw computation to be done. Both are approaches that are taken by industry. Intel primarily works in hyper-threading, while AMD, Advanced Micro Devices, utilizes more physical cores. In this research project, the approach of shrinking the transistor size and adding more physical cores is used.

Introduction

The CPU is the most important part of a computer, it is the brain and logic of every computer we have, from a full laptop to a small phone or calculator. Trying to get CPUs to go faster has been a constant research topic since the creation of the CPU. Researchers are constantly making improvements upon older models to make them better, faster, and more efficient. In theory, shrinking the size of transistors will allow for more to be put on a chip, which then allows for faster speeds, without causing major issues with other parts of the chip. But not only is the approach of transistor sizes taken, but there is also a race between the two major companies making CPUs, Intel and AMD, to have more cores, whether physical or virtual. This race is the main driving point for the innovation of new CPUs. Every year new versions are being released, from Intel's newest Haswell processors, to AMD's new Bulldozer processors. This competition between the two is the main driving point for the innovation of CPUs, along with the want to have a faster and better processor.

Methodology

The methodology for increasing the performance of a CPU comes down to what is done with the Verilog Code to be implemented. By changing different parts of the Verilog Code, such as the different modules from the top x64 module, to the x2 module. By changing the varying components you can change how the CPU is created, or by adding more modules, you can create more cores. This is then tested by stimulating the varying parts of the Verilog code with a Test Bench, which will show whether any improvements were made, or if it was unable to properly run.



Results

At this time there are no definitive results, the research is still ongoing and will take more time to obtain conclusive results. The expected results are that there will be an improvement in the speed and performance of the CPU after changing parts of the Verilog code, but as of now, that has not yet been accomplished.

Impact

The impact of the results might not save lives, but they are still important nonetheless. By having faster and better CPUs other researchers will be able to accomplish more research, whether it be simulation running, number crunching, and other CPU intensive tasks, then more can be done to increase the standard of living of society. Just think of how many of todays devices are powered by a CPU. Nearly everyone has a CPU in their pocket, if they have any mobile device, and that is just the start of where CPUs are found. So the results from research such as this, and others, will impact the lives of millions of people.

Acknowledgements

I would like to give a special thanks to Dr. Stine, of the ECEN Department. He took me under his wing even though I am just a first year freshman, and he has cooperated with me, even when I fall behind on our schedule, or fail to communicate in a timely manner. Thank you so much Dr. Stine, and I'm excited to keep working with you.
I would also like to thank Mr. O'Neill for providing me with this opportunity, which has allowed me to begin research so early, so I can hopefully begin to contribute to future research.