FROM MULTICORE TO MANY-CORE: ARCHITECTURES AND LESSONS

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ABSTRACT

Modern multicore and many core processors exhibit multilevel of parallelism through wide range of architectural features such as SIMD for data parallel execution or threads for core parallelism. The exploitation of multilevel parallelism is therefore crucial for achieving superior performance on current and future processors.

By the applicability of Moore's law, the jump from multicore to many-core involves state of the art processes.
By this transition it may remove the problems faced by developers and database administrators.

This paper talks about the switch over form multicore to many-core architectures advantages and disadvantages for this process, explicit parallelism, single thread performance and pipeline architectural comparisons.

INTRODUCTION

A **multi-core processor** is an integrated circuit (IC) to which two or more processors have been attached for enhanced performance, reduced power consumption, and more efficient simultaneous processing of multiple tasks (*see* parallel processing). A dual core set-up is somewhat comparable to having multiple, separate processors installed in the same computer, but because the two processors are actually plugged into the same socket, the connection between them is faster.

A **many-core** is a high-end multicore processor is to be designed to support high end parallel computing and processing comprising of a number of multiple processing core. Many-core processor is used extensively. Multicore processor widely used across many application domains, including digital signal processing, high end computing and graphical applications.

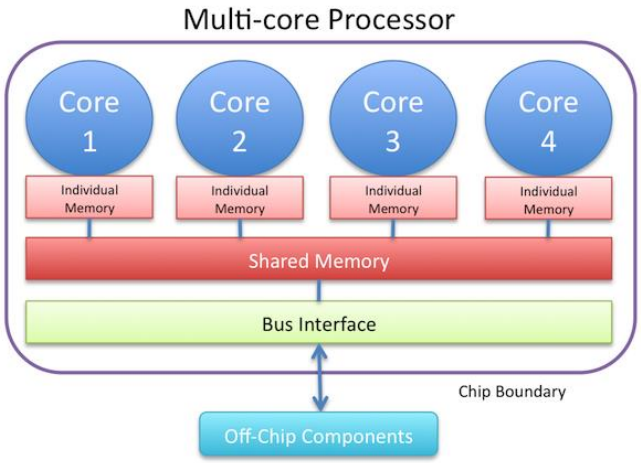
The multicore processor comprises of two or more cores or computational/processing units that operate in parallel to read and execute instructions. These multiple processing units or cores are fabricated on a single die. So, it's also called a Chip Multiprocessor (CMP).

The basic difference between multicore and many-core is that manycore system will only run efficiently with software that is designed with multiple cores in mind where as single thread software will be extra slow in such equipment's.

SWITCHING OVER FROM MULTICORE TO MANYCORE

Many-core processors are different from multicore processors by being optimized for a higher degree of explicit parallelism and for higher through put at the expense of latency also a slow thread performance is observed.

On a border level the categorisation of multi core processer is so designed to support both serial and parallel code and place more emphasis on single thread processing. This causes runtime resources figuring out parallelism. They are used in systems where they have evolved over time lapse from single core processors. They usually have a handful of cores (2,4,8), and can be complemented by a manycore accelerator.



A major drawback causing limiting of multicore processors is CACHE COHERENCY. Manycore processors easily bypass this issue by using methods like read-only/non-coherent caches. A manycore processor uses network on a chip phenomenon and gives software the opportunity to optimise the tasks.

GPUs may be considered a form of manycore processor with multiple processing core units and suitable for highly parallel code.

Maximizing the usage of the multi-core processors requires adjustments with OS and support and to existing application software. The ability of multicore processors to increase application performance relies on the use of multiple threads.

ADVANTAGES OF MULTICORE

The good processing speed of the multicore processors is due to the multiple cores which operate simultaneously on instructions, at lower frequency than the single core. At the same clock frequency, the multicore processor will process more data than the single core processor.

In addition to this, multicore processors deliver high performance and handle complex tasks at a comparatively lower energy or lower power as compared with a single core, which is crucial factor in appliances such as mobile phones, laptop etc. which operate on batteries.

Also, since the cores are fabricated close to each other on the same chip, the signals travel shorter distance between them due to which there is less attenuation of signals. Since the signals don't attenuate much, more data is transferred in a given time and there is no need of repeating the signals

CHALLENGES OF MULTICORE PROCESSOR

So far, we have seen the benefits of multicore technology but there are some problems that arise when more cores are added.

The various challenges that are faced with the addition of new cores are power and temperature issues, the level of parallelism in the application or algorithms, interconnect issues etc.

ADVANTAGE OF MANYCORE

For the processing part, having a higher core processor is always better if software supports it. Generally, a dual-core or quad-core processor is more than enough power for a basic computer user.

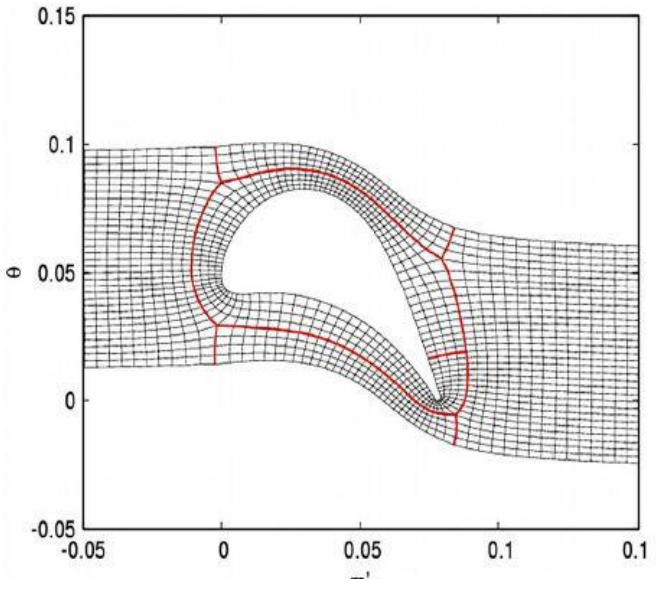
Majority of consumers will see no benefits from going beyond four processor cores as there is so little non-specialized software that can take gain the best use case for multi-core processors relates to machines that performs complex tasks like video editing, high-end gaming, or science and math programs.

DISADVANTAGE OF MULTICORE

- They do not work at twice the speed as a normal processor. They get only 60-80% more speed.
- The speed that the computer works at depends on what the user is doing with it.
- They cost more than single core processors.
- They are more difficult to manage thermally than lower-density single-core processors.
- Not all operating systems support more than one core.
- Operating systems compiled for a multi-core processor will run slightly slower on a single-core processor

DISADVANTAGE OF MANYCORE

They actually do not run at two times the speed as a normal functioning processor. They get only 60-80% more speed. The speed that the process depends on what the user is working on. They always cost more than single core processors and they are more difficult to manage thermally. Not all operating systems support more than one core and operating systems designed for a multi-core processor will run marginally slower on a single-core processor.



CONCLUSION

In the upcoming years the trend will move toward multicore processors more and more.

The reason for this is that they are faster than single core processors and they can

be still improved. But in the future, there is also some application of single core processors because not every system needs fast processors.

Therefore, the multicore processors and the manycore processors will take the trend, offering high end performance in nearly all tasks and programmes.

REFERENCES

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