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# Research topic: Intel Xeon Microprocessor

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## 1 Abstract

In this research, we present an performance evaluation of a 256-core cluster based on the Intel Xeon Processor E5-2680. This is the new version of Sandy Bridge processor for server and workstation market. It employs an integrated memory controller, dual Intel Quick Path Interconnect (QPI) port and integrated PCIe 3.0 controller. We assessed these architectural enhancements using the High Performance Computing Challenge (HPCC) benchmarks and NAS Parallel Benchmarks (NPB). For Interconnect analysis we have used the Net-PIPE performance evaluator. We compare and contrast the results of a cluster based on the Intel Xeon E5-2680 with a cluster based on Intel Xeon 5680 Processor and another cluster based on Intel Xeon 5570 Processor.

Index Terms—Intel Xeon E5-2680; benchmarking; multicore; clusters;

## 2 Introduction

An Intel Xeon processor is one of Intel's state-of-the-art central processing units (CPU). The Intel Xeon processors are definitely power processors. They have a large number of cores, and they also have special features that make them great for running intensive programs and mission-critical tasks. Many Supercomputer applications are unable to achieve good sustained performance due to memory bandwidth issue. The Sandy Bridge development team responded with a new architecture implemented in the Intel Xeon E5-2600 family. This new processor has been used to build a 256-core cluster with Fourteen Data Rate (FDR) Infini Band (IB) 14Gb/s data rate per lane. The architecture is a revolutionary product from several perspectives.

# 3 Advantages Of The Research

1. Intel Xeon is practically built for workstation computers.
2. The large number of cores and advanced RAM functions give it enough processing power and speed to handle the most intensive creative applications, from computer-aided design (CAD) to 4K video editing to 3D rendering.

# 4 Features

Xeon processors are based on the same architecture as regular desktop-grade CPUs, but have advanced features such as support for ECC memory, higher core counts, more PCI Express lanes, support for larger amounts of RAM, larger cache memory and extra provision for enterprise-grade reliability, availability and serviceability (RAS) features responsible for handling hardware exceptions through the Machine Check Architecture. They are often capable of safely continuing execution where a normal processor cannot due to these extra RAS features, depending on the type and severity of the machine-check exception (MCE).

# 5 The problems

Our research question is : How can we understand the internal structure and mechanism of Intel Xeon Processor more effectively?
We selected Intel Xeon Processor for the following reasons:

Xeon is a brand of x86 microprocessors designed, manufactured, and marketed by Intel.The Xeon brand has been maintained over several generations of IA 32 and x86 processors. Older models added the Xeon moniker to the end of the name of their corresponding desktop processor, but more recent models used the name Xeon on its own. The Xeon CPUs generally have more cache than their desktop counterparts in addition to multiprocessing capabilities. Xeon processors have always had popularity among some desktop users (video editors and other power users), mainly due to higher core count potential, and higher performance to price ratio vs. the Core i7 in terms of total computing power of all cores. Since most Intel Xeon processors lack an integrated GPU, systems built with those processors require a discrete graphics card or a separate GPU if computer monitor output is desired.

# 6 Motivation

Most applications in the world have not been structured to exploit parallelism. This leaves a wealth of capabilities untapped on nearly every computer system. Such applications can be extended in performance by a highly parallel

device only when the application expresses a need for parallelism through parallel programming. Since most applications have not yet been structured to take advantage of the full magnitude of parallelism available in any processor, understanding how to restructure to expose more parallelism is critically important to enable the best performance on processors. This restructuring itself will generally yield benefits on most general-purpose computing systems, a bonus due to the emphasis on common programming languages, models, and tools that span these processors. I refer to this bonus as the dual-transforming-tuning advantage.

# 7 Proposed methodology

The Intel Xeon processors are definitely power processors. They have a large number of cores, and they also have special features that make them great for running intensive programs and mission-critical tasks. Arguably the most important of these features is error-correcting code memory.

# 8 Evaluation effectiveness

Xeon processors are simply not worth it for gaming. They are extremely expensive, designed for demanding computing tasks, and have their own sockets. Ultimately, they are much more powerful than what is required from games, making them an overall bad investment for a gaming PC

# 9 Importance

Intel Xeon is practically built for workstation computers. The large number of cores and advanced RAM functions give it enough processing power and speed to handle the most intensive creative applications, from computer-aided design (CAD) to 4K video editing to 3D rendering

# 10 Limitations of the research

• More expensive at most performance levels.
• No integrated graphics in models that end in 0, 1, also no Quick Sync Video on these models.
• Locked multiplier (like other non-K CPUs).
• No model is as fast as the i7 4790K.