

Intel Core i7 Processor

Vishwas Raja¹, Mr. Danish Ather²
BSc (Hons.) C.S., CCSIT, TMU, Moradabad¹
Assistant Professor, CCSIT, TMU, Moradabad²
vishwasraja007@gmail.com
danishather@gmail.com

Abstract—The Intel Core i7 processor is the latest in cutting edge processor with fastest, intelligent, multicore technology for the desktop PC and for Laptop PCs also. Intel Core i7 processor delivers four complete execution cores within a single processor, delivering unprecedented performance and responsiveness in multi-threaded and multi-tasking business and home use environments.

Over clocking the core i7 processors also seems to be easier. Servers will also likely benefit greatly from using an i7 - the memory bandwidth is simply insane. Core i7 is first processor using Nehalem Micro-architecture, with faster, intelligent, multi-core technology that applies processing power where it's needed most, new Intel Core i7 processors deliver an incredible breakthrough in PC Performance. They are the best desktop processor family on the planet. It is the combination of Intel Turbo Boost technology and Intel Hyper-Threading technology, which maximizes performance to match our workload.

Keywords-

- i7
- Turbo Boost
- Hyper-Threading
- Resource Optimization

1. Intel Core i7 Processor

With faster, intelligent multi-core technology that applies processing power dynamically when needed most, the new Intel® Core™ i7 processors deliver an incredible breakthrough in PC performance. They're the best desktop processors on the planet.

Intel Unveils All New 2010 Intel Core Processor Family Mainstream processors now offer Intel(R) Turbo Boost Technology, automatically adapting to an individual's performance needs First 32 nanometer processors and first time Intel is mass-producing a variety of chips at mainstream prices at start of new manufacturing process,

reflecting last year's \$7 billion investment during economic recession Intel(R) Core(TM) i5 processors are about twice as fast as comparable existing PCs for visibly faster video, photo and music downloading experience Historic milestone: select processors integrate graphics directly on processors; also include Intel's second generation high-k metal gate transistors Beyond laptops and PCs, processors also target ATMs, travel kiosks, digital displays.



2. FEATURES OF INTEL CORE i7 PROCESSORS

A. New Platform Architecture

An Intel microarchitecture for a single processor system included three discrete components a CPU, a Graphics and Memory Controller Hub (GMCH), also known as the north bridge and an I/O Controller Hub (ICH), also known as the south bridge. The

GMCH and ICH combined are referred to the chipset. The older Penryn architecture, the front-side bus (FSB) was the interface for exchanging data between the CPU and the north bridge. If the CPU had to read or write data into system memory or over the PCI Express bus, then the data to traverse over the external FSB.

The new Nehalem microarchitecture Intel moved the memory controller and PCI Express controller from the north bridge to the CPU die, reducing the number of external data bus that the data to traverse. These changes help increase data-throughput and reduce the latency for memory and PCI Express data transactions. These improvements make the Core i7 family of processors ideal for test and measurement applications such as high-speed design validation and high-speed data record and playback.

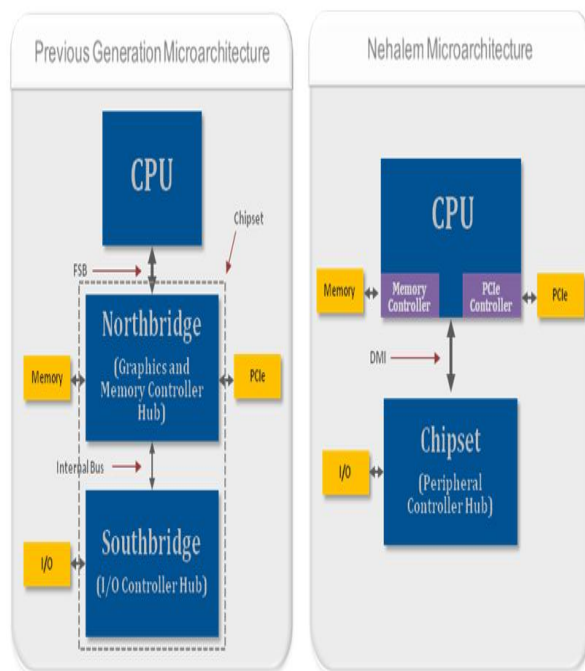


Figure1: The higher-level architectural differences between the previous generation and

the new Nehalem microarchitecture for Single-processor systems.

B. Higher-Performance Multiprocessor Systems with QPI

Not only was the memory controller moved to the CPU for Nehalem processors, Intel also introduced a distributed shared memory architecture using Intel Quick Path Interconnect (QPI). QPI is the new point-to-point interconnects for connecting a CPU to either a chipset or another CPU. It provides up to 25.6 GB/s of total bidirectional data throughput per link. Intel's decision to move the memory controller in the CPU and introduce the new QPI data bus an impact for single-processor systems. However, this impact is much more significant for multiprocessor systems.

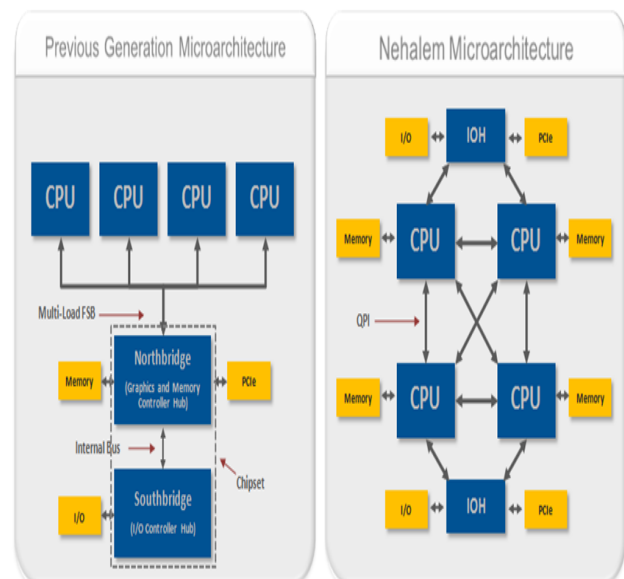


Figure2: The higher-level architectural differences between the previous generation and the new Nehalem microarchitecture for multiprocessor systems.

C. CPU Performance Boost via Intel Turbo Boost Technology

To provide a performance boost for lightly threaded applications and to also optimize the processor power consumption, Intel introduced a new feature called Intel Turbo Boost. Intel Turbo Boost is an innovative feature that automatically allows active processor cores to run faster than the base operating frequency when certain conditions are met. Intel Turbo Boost is activated when the OS requests the highest processor performance state. Turbo Boost is Intel's terminology for overclocking CPUs, allowing them to run faster than their base clock speed. Both Core i7 and i5 processors support Turbo Boost.

D. Improved Cache Latency with Smart L3 Cache

Cache is a block of high-speed memory for temporary data storage located on the same silicon die as the CPU. If a single processing core, in a multicore CPU, requires specific data while executing an instruction set, it first searches for the data in its local caches (L1 and L2). If the data is not available, also known as a cache-miss, it then accesses the larger L3 cache. Exclusive L3 cache, if that attempt is unsuccessful, then the core performs cache snooping searches the local caches of other cores – to check whether they have data that it needs. Attempt also results in a cache-miss it then accesses the slower system RAM for that information. The latency of reading and writing from the cache is much lower than that from the system RAM, therefore a smarter and larger cache greatly helps in improving processor performance.

This feature provides improvement for the overall performance of the processor and is beneficial for a variety of applications including test, measurement and control. Each physical processor may contain several processor cores and a shared collection of subsystems that are referred to as "uncore".

Specifically in Intel Core i7 processor the uncore provides a unified third-level cache shared by all cores in the physical processor, Intel Quick Path Interconnect links and associated logic.

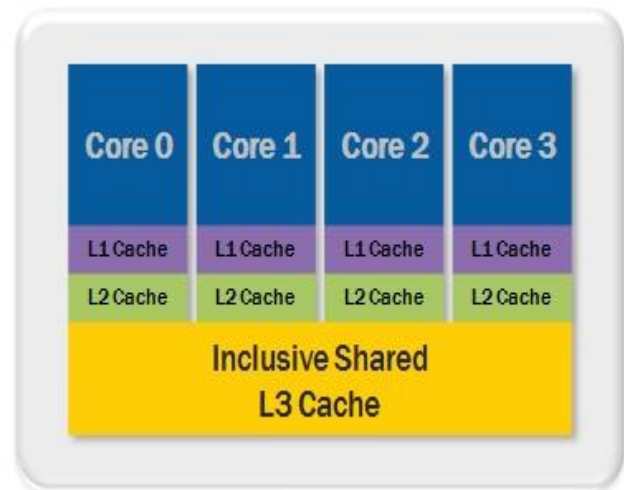


Figure 3: The Core i7 processor offers better cache latency for increased performance.

E. Optimized Multithreaded Performance through Hyper-Threading Intel introduced Hyper-Threading Technology on its processors in 2002. Hyper-threading exposes a single physical processing core as two logical cores to allow them to share resources between execution threads and therefore increase the system efficiency (see Figure 5). Because of the lack of OSs that could clearly differentiate between logical and physical processing cores, Intel removed this feature when it introduced multicore CPUs. With the release of OSs such as Windows Vista and Windows 7, which are fully aware of the differences between logical and physical core, Intel brought back the hyper-threading feature in the Core i7 family of processors. Hyper-Threading Technology benefits from larger caches and increased memory bandwidth of the Core i7 processors, delivering greater throughput and responsiveness for multithreaded applications. Intel Hyper-Threading

increases CPU performance for multithreaded tasks and is helpful for multitasking when several applications are running simultaneously. As discussed above, all Core i7 processors and mobile i5 processors support hyper-threading.

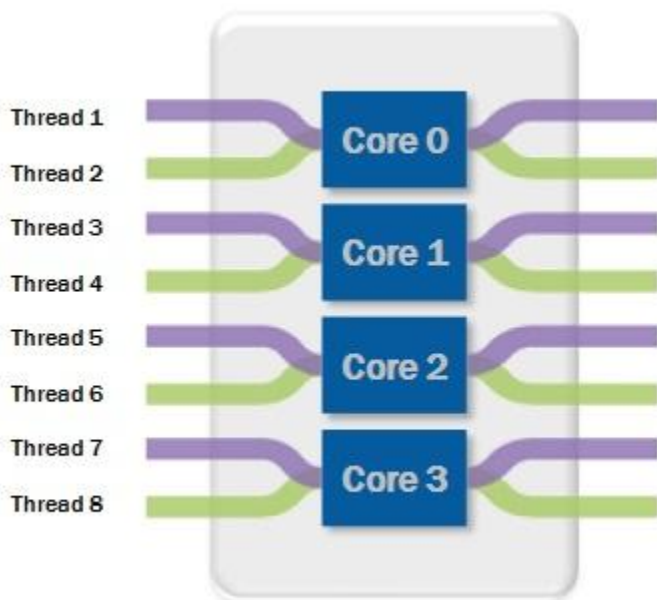


Figure 4: Hyper-threading allows simultaneous execution of two execution threads on the same physical CPU core.

3. ADVANTAGES OF INTEL CORE i7 PROCSSOR

The Core i7 is Intel's current most powerful processor, most have clock speeds or GHz just below the absolute best Core 2 Duo processor or higher than the Core 2 Duo and unlike the best Core 2 Duo processors have larger cache (the larger the cache, the faster the processor can work), 4 physical processing cores instead of 2 and with hyper-threading 4 cores plus 4 virtual cores so almost like having 8 cores in one computer. Obviously the major difference is the amount of processing cores, the more cores your computer, the more things you can do at once on your computer but overall

the i7 kills the Core 2 Duo in terms of performance. Now that does come at a price, i7 processors require DDR3 RAM which is more expensive than the DDR 2 you can get away with Core 2 Duo's, it requires more expensive motherboards and if you're buying an i7 to really take advantage of it expensive graphics cards and large power supplies are necessary as well.

4. DISADVANTAGES OF INTEL CORE i7 PROCSSOR

Talking about the two laptop makers above, I don't see that very good Integrated Graphics is going along with the Core i7. Just something in an Nvidia GeForce 9800GT mobile GPU (Graphics Processing Unit) . But that's purely a disadvantage of the laptop makers, and not a disadvantage of the Intel Core i7. As for 'talking' about the Intel Core i7 as a whole and its new technology, it depends on what you wish to do with a computer. The Intel Core i7 is a quad core processor. Intel also brought back HT, Hyperthreading Technology. In the old Pentium 4 processors that had HT, the Operating System, (WinXP is an example of an O/S. Not trying to insult your intelligence), saw the Pentium 4 as having TWO processor cores. One was a physical, real, processor core. The other was a virtual core. If two threads are being used by EACH core of an Intel Core i7, the O/S 'sees' it as having EIGHT processor cores.

5. CONCLUSION

The Core i7 family of processors based on the Intel Nehalem microarchitecture offers many new and improved features that benefit a wide variety of applications including test, measurement and control. Engineers and scientists can expect to see processing performance gains as well as increases in memory and data throughput when comparing this microarchitecture to

previous microarchitectures. Intel Core i7 processor is Intel's first CPU designed based on Nehalem micro architecture. This processor is ideal for computer 3D games, multitasking and multi-threading applications. The main thing to remember is that i7 CPUs are at the high end of the product line, i5 CPUs are in the middle, and i3 CPUs are entry level. The Intel Ark is one way to, and it allows you to select multiple CPUs to compare side by side. Additionally, if you are in the market for a new computer based on these CPUs, our sales staff is always happy to answer questions at sales@pugetsystems.com. This gives you a decent starting place to look for a CPU based on what you will be using your computer for, but you will likely need to look at the individual specs for multiple CPUs to determine which is actually the right fit for you. While there are a few things that the i3/i5/i7 naming scheme tells you, it is really no substitution for actually looking at the specifications of individual CPUs.