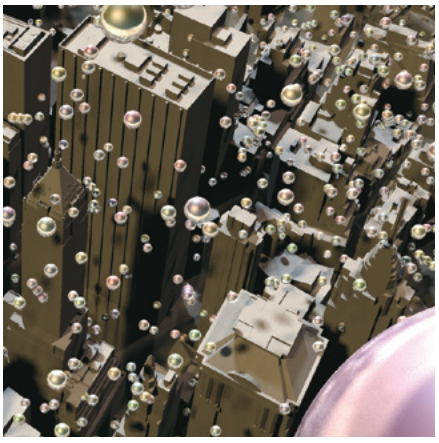
Installation Case Study
Intel® Parallel Studio XE
Development environment for lucille* high-speed renderer

Intel® Parallel Studio XE Boosts Performance and Productivity Through More Efficient Development of High-Speed CG Renderer



Issues

- Programmer productivity
- Program performance
- High-quality program development

Solution

- Intel® Parallel Studio XE (Intel® C++ Composer XE, Intel® VTune™ Amplifier XE, and Intel® Inspector XE)
- lucille* global illumination renderer (Fixstars Corporation)

Benefits of installation

- High-performance and high-quality development of high-speed renderer
- Greater development efficiency
- Reduced development workload

Fixstars Corporation

Headquarters:
Gate City Ohsaki West Tower 18F,
1-11-1 Ohsaki, Shinagawa-ku, Tokyo
Established: August 8, 2002
Capital:
210,550,000 yen
Business activities:
Multi-core software development
http://www.fixstars.com/

Intel® Parallel Studio XE helps deliver better application performance

Intel® Parallel Studio XE Adopted as Development Platform for High-speed Renderer

Fixstars Corporation is a total solution provider for multi-core systems, including multi-core software, development services, and system configuration. Its business operations are focused on fields that demand a high level of computer performance, including derivatives pricing and other financial simulation; medical imaging used in X-ray CT, MRI, and other diagnostic machines; computer vision systems that use image processing to distinguish between prime and sub-prime products in manufacturing; and CG rendering used in applications such as product design and the production of digital content.

As a developer of services that use multi-core processors, the company has selected Intel® Parallel Studio XE as the development platform for its lucille* high-speed renderer targeted at the CG rendering market. Intel® Parallel Studio XE bundles together Intel® compilers, analysis tools, and other development software. Fixstars supplies this high-quality, high-performance renderer primarily to users in the manufacturing and content production industries.

The lucille* renderer incorporates a global illumination algorithm and can generate, at high speed, CG images that mimic the behavior of light rays. Senior Director Daichi Furusaka of the M^3 Business Department explains its role by saying, "lucille* is a CG renderer that takes advantages of the parallel processing capabilities of the M^3 software platform we developed for multi-core, multi-node, and multi-architecture applications. By using multiple CPU cores and multiple servers, it can render realistic 3D images quickly. The software is helping images become more realistic and is being adopted in fields at the leading edge of CG imaging, including product design and digital content production."

Assessment of Automatic Vectorization and Bottleneck Analysis

Fixstars started using Intel® software development products for lucille* in 2007. They were among the first to adopt Intel® Parallel Studio XE when it was released in 2010, and have continued to use it ever since for program development in a multi-core environment. Currently, they use Intel® C++ Composer XE to build the lucille* code, Intel® VTune™ Amplifier XE for performance analysis, and Intel® Inspector XE for detection of memory leaks.

When asked about the benefits of using Intel® C++ Composer XE, Mr. Furusaka referred to "the performance enhancements provided by optimization options of Intel software

Intel® Parallel Studio XE Underpins Performance of Applications that Demand High Speed

development products", and made the comments quoted below.

"Intel® C++ Composer XE is equipped with functions not available in other compilers, including computational routines in the source code being implemented as inline calls or expanded using built-in functions. A report option specifies where in the source code changes need to be made to increase speed, making it a vital function for optimizing programs and getting them to run faster. Another factor behind our choice of this software is the development time savings made possible with the automatic vectorization function that converts scalar code to Streaming SIMD Extensions (SSE) or Advanced Vector Extensions (AVX)."

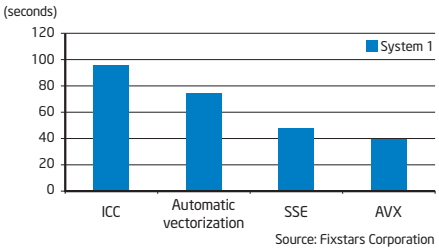
Intel® VTune™ Amplifier XE, meanwhile, helps identify bottlenecks in applications, providing analysis reports that can be used to make program improvements for faster execution speed. "Use of Intel® VTune™ Amplifier XE gives us a visual indication of ways to improve speed. Nowadays, programming simply would not be possible without Intel® VTune™ Amplifier XE," said Mr. Furusaka.

Fixstars uses Microsoft* Visual Studio* (VS) for Windows* development, writing their programs in the C and C++ language. When installed alongside VS, tools such as Intel® C++ Composer XE and Intel® VTune™ Amplifier XE are incorporated into VS as add-ons, something that can be achieved without any complex procedures. Operations are also very simple, with the tools able to be invoked for compilation, performance testing, or other tasks simply by clicking an icon on the VS tool bar.

Performance Improved 2.5 Times over Scalar Version of Renderer

The benefits of using Intel® Parallel Studio XE show up as productivity improvements for lucille*. Currently, the base program for lucille* can be compiled quickly using the Intel® C++ Composer XE optimization options. In the case of complex and intricately patterned programs, however, hand tuning is used for optimization.

"Using Intel® C++ Composer XE for basic vectorization significantly reduces the amount of work required for development. Basic processing can be completed quickly, allowing us to focus our efforts on tuning complex patterns and encouraging high-quality program development throughout," said Mr. Furusaka.



Source: Fixstars Corporation

Fixstars conducted trials to determine compiler performance for lucille*. "Compared to the non-vectorized scalar version of lucille*," said Mr. Furusaka, "the results showed that using Intel® C++ Composer XE to perform automatic vectorization improved performance by approximately 1.3 times, and use of SSE improved it by 2 times. When hand tuning was used to incorporate AVX, the performance improvement relative to the scalar version increased to 2.5 times."

The Intel® VTune™ Amplifier XE performance analysis functions help improve productivity. "The filter function (provided as a standard feature) can be used to conduct multifaceted analyses, including memory cache efficiency and the performance of individual threads or CPU cores, simplifying the process of identifying bottlenecks that was so difficult using past development systems," said Mr. Furusaka. This demonstrates the growing stature of Intel® VTune™ Amplifier XE as a tool like no other. Meanwhile, use of Intel® Inspector XE to identify memory leaks helps maintain high quality.

Major Boost in Image Quality Achieved Through More Efficient Editing

Fixstars aims to continue increasing the speed of lucille* in conjunction with the arrival of new microarchitecture processors such as the Intel® Xeon® processor E5 and next-generation Haswell processor (development codename). When it comes to processor extension instruction sets such as the SSE, AVX, and AVX2 instruction sets, they have also shown a commitment to keeping up with new technology for increasing performance. To sum up, Mr. Furusaka expressed his expectations for Intel by saying, "Compiler performance holds the key to future program development. This requires comprehensive tools that are able to get the maximum performance out of processors."

Intel intends to continue supporting Fixstar's multi core business through the development of products that enhance application performance.

For more information on Intel® Parallel Studio XE, please visit the following web site.
http://intel.ly/sw-dev-tools

Daichi Furusaka
Senior Director
M³ Business Department, Fixstars Corporation

When used on compatible microprocessors, Intel® compilers will not necessarily achieve the same level of optimization as achieved on Intel microprocessors. This includes optimization for the Intel® Streaming SIMD Extensions 2 (Intel® SSE2), Intel® Streaming SIMD Extensions 3 (Intel® SSE3), and Intel® Supplemental Streaming SIMD Extensions 3 (SSSE3) instruction sets, as well other optimization. Intel assumes no responsibility for the provision, functions, or effects of optimization on microprocessors not made by Intel. The microprocessor-specific optimization performed by this product is intended solely for Intel microprocessors. Certain optimization that is not specific to the Intel® microarchitecture is reserved for use with Intel microprocessors. For more information about the specific instruction sets to which this disclaimer applies, please refer to the user reference guides for the respective products.

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