**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

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**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* Business Department explains its role by saying, "lucille* is a CG renderer that takes advantages of the parallel processing capabilities of the M* 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.

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."

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