IBM and Gedae:
Providing high performance and simplified development for multi-core signal and data processing applications

IBM and Gedae Inc. deliver a revolutionary method of developing high-performance multi-core applications for signal and data processing. With more than 50 years of deep engineering expertise, IBM offers Cell Broadband Engine™ (Cell/B.E.) multi-core technology, an innovative and powerful microprocessor architecture for new levels of energy efficiency and performance. Gedae, a technology leader in automating software development technology for the aerospace and defense industry, delivers the Gedae software development environment for multithread applications, helping to simplify complex multi-core application development.

The challenge

Signal and image processing systems are often used for life-critical applications, such as radar, air traffic control and weather forecasting. Response time for these applications is critical. Multi-core processor technology promises breakthrough performance and energy efficiency for modern signal, image and data processing applications. But even the most experienced developers can struggle with programming for multi-core applications. Many rely on von Neumann architecture-based programming platforms for parallelizing and vectorizing code.

About Gedae

The mission of Gedae Inc. is to quickly deploy the most advanced processor technology available, by automating software development. Modern systems often rely on implementing system complexity in software. Gedae can simplify development, build applications and explore architectures using simulations or real hardware — without having to rewrite existing code.

To help companies adapt to multi-core architectures, IBM and Gedae have created an alliance around Cell/B.E. technology. Our combined approach, integrating hardware, software and services, can deliver one of the most flexible, high-performance development environments on the market today. The result is a unique combination of assets, expertise and innovation designed specifically to address critical applications in signal and processing for aerospace and defense.

Cell Broadband Engine Processor for high performance

Developed by IBM in collaboration with Sony and Toshiba, the revolutionary Cell/B.E. multi-core processor addresses many of the recent hurdles encountered by companies using traditional architectures. An extension of the 64-bit IBM Power Architecture, theoretical peak performance is 210 GFlops (single precision) at 3.2 GHz with an internal bus of 360 GBps of bandwidth.

The processor offers a dense computing architecture with heterogeneous parallelism. It has 241 million transistors and a total size of 235 mm. The processor has a general purpose PowerPC™ CPU, called the Power Processor Element (PPE), which runs the OS and manages the eight Synergistic Processor Elements (SPE). Each SPE runs at 25 GFLOPS and is highly tuned for stream processing and SIMD instructions.

Gedae software for simplified development

Gedae helps to simplify the complexities of programming multi-core signal and data processing applications by providing a development environment with tools to define and implement threads.

Gedae automates the most complex and tedious parts of the development process to maximize efficiency. Developers can specify the functionality of an application and map it to hardware architecture in a fraction of the time previously required. Gedae accommodates user control of automation. Developers observe the behavior of an application and adjust the processing mapping, interprocessor communications, granularity, buffering, memory mapping, thread management and executable structure.

Gedae also helps optimize the development process by building code that can be as efficient as hand-coded applications. It provides the tools to ease development, improve productivity, increase the pool of qualified developers, and reduce the development cycle and lifetime maintenance costs.

Optimizing the development process

Figures 1 and 2 illustrate the development process before and after Gedae.

In Figure 1, systems engineering provides the specification of the system and software, and the development team is responsible for the complexity of the system. The compiler has no knowledge or awareness of the multi-processor target. As a result, multiple threads of execution are required. The development team must be aware of and accommodate the target architecture.

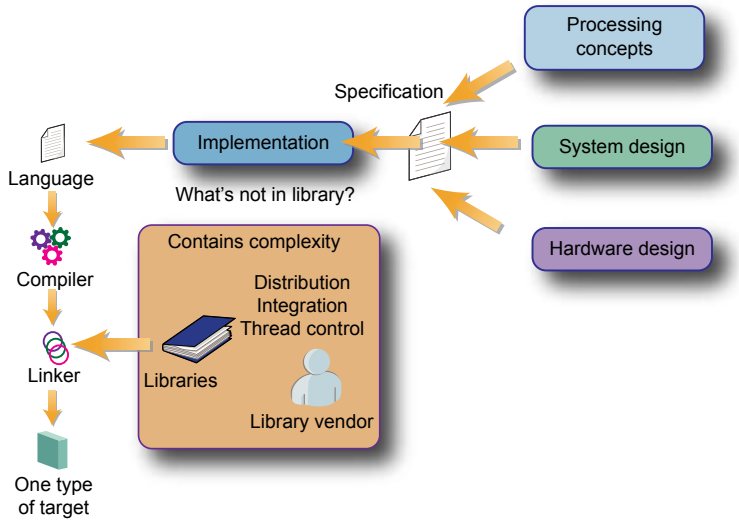

Figure 1: Software development with von Neumann compilers

In Figure 2, the Gedae compiler handles the complexity. Because the Gedae compiler is aware of the multi-processor, as well as the multi-core and memory architecture of the target, it automatically customizes the software to that architecture. As a result, it's easy to port applications among processors. The Gedae language provides the compiler with information to automatically perform complex tasks, including threading the application, planning memory and implementing the distribution of the software across multiple cores.

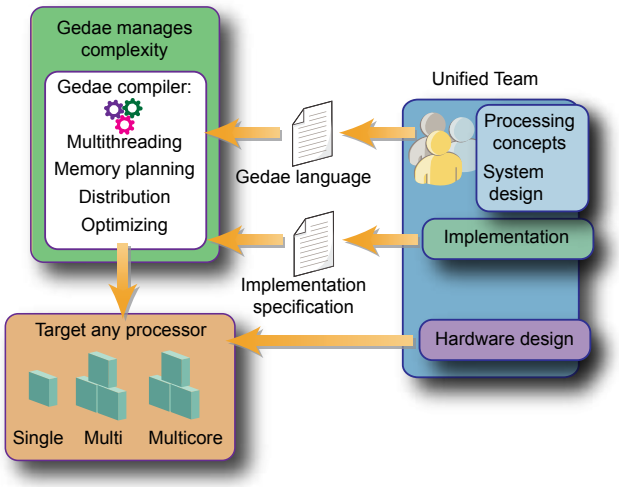

Figure 2: Gedae development

Benefits of the IBM and Gedae collaboration

By choosing the Cell/B.E. multi-core processor and Gedae as your application development environment, you gain a powerful combination.

The Cell/B.E. processor offers the potential for increased performance for a broad variety of applications. Systems based on the breakthrough microprocessor can provide unique capabilities for applications requiring high-performance computation for imaging, security, visualization, surveillance and more.

To take full advantage of the capability of the Cell/B.E. processor, developers can use the Gedae environment to:

- *Unify the development process*
- *Speed the development process*
- *Improve the efficiency of implementation*
- *Create portable applications*
- *Create future-proof applications*
- *Enable less-specialized developers to build applications that use Cell/B.E. effectively*

Customer snapshot: SELEX Sensors and Airborne Systems

In 2001, SELEX (then BAE SYSTEMS Avionics) chose Gedae as the software development environment for the company's Eurofighter CAPTOR Tranche II radar.

SELEX has engaged Gedae to support evaluation of Cell/B.E. processor for military and commercial RADAR programs.

"SELEX recognized at the start of the CAPTOR Tranche II program that it needed a way to reduce the complexity of development and ease the through-life maintenance of software for advanced military systems," said David B. Wilson, CEng FIET, Engineering and Projects Director, SELEX Sensors and Airborne Systems. "Gedae has proven effective in that capacity."

About IBM Global Engineering Solutions

IBM Global Engineering Solutions (IBM GES)has proven technology and engineering expertise available across the globe to solve complex design, development and delivery challenges. In addition, we have a track record of developing integrated, secure solutions that meet the performance needs you and your customers demand. Working together with your team, IBM GES helps you guide the right investments toward a successful and on-time innovation result.

How to get started

Find out how IBM and Gedae Inc. can simplify your development process and power your applications. Consider the five-point plan:

1. *Identify the applications that can be accelerated with the Cell/B.E. processor*
2. *Create a proof-of-concept to quantify costs versus benefits, including performance, flexibility, hardware consolidation, lines of code and overall effort.*
3. *Compare the programming skills of your organization to those of multi-core engines.*
4. *Understand how Gedae can streamline development and simplify programming.*
5. *Initiate an education and training session from both IBM and Gedae.*

For more information, about IBM and Cell/B.E. processor

- *Speak to an IBM Specialist at 1-877-IBM-ACCESS (1-877-426-2223)*
- *Or visit ibm.com/technology*

For more information about Gedae, visit www.gedae.com and initiate an evaluation.

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