Mercury Computer Systems helps IBM bring game-changing technology to market fast.

Overview

■ ***Challenge***

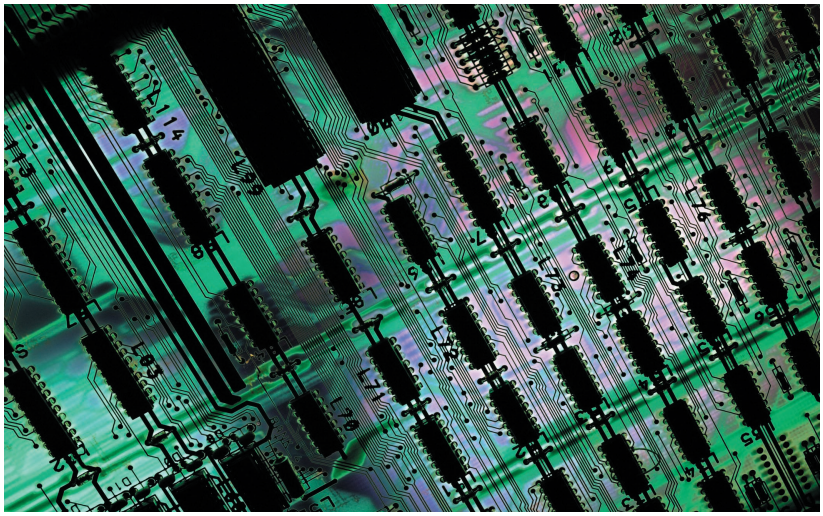
Having led the development of the groundbreaking Cell BE processor, IBM wanted to unleash its potential in new markets.

■ ***Why Become an On Demand Business?***

To bring solutions to market fast, IBM needed to effectively meld its world-class technological capabilities with the strong market knowledge of a specialized solutions provider.

■ ***Solution***

IBM Technology Collaboration Services brought IBM together with Mercury Computer Systems in a collaborative development effort that led to the creation of three new products in less than one year.



Based in Chelmsford, MA, Mercury Computer Systems offers component-level and system-level solutions that span hardware, software, silicon IP, services and systems.

■ ***Key Benefits***

- *Faster time to market through collaborative R&D and reuse of intellectual property assets*
- *Improved resource utilization by virtue of the ability to focus on core expertise*

In 2000, IBM was approached by the consumer electronics giants Sony and Toshiba to co-develop a radically new chip architecture that would provide the foundation for a quantum improvement in performance for a wide range of consumer applications. Among the most prominent – and demanding – devices targeted were gaming consoles, from which consumers have come to expect an

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>
> – Joel Radford, VP of Strategic Marketing and Alliances, Mercury Computer Systems

» **On Demand Business defined**
An enterprise whose business processes – integrated end-to-end across the company and with key partners, suppliers and customers – can respond with speed to any customer demand, market opportunity or external threat.

On Demand Benefits

- Faster time to market through collaborative R&D and reuse of intellectual property assets
- Expanded revenue opportunities by achieving breakthrough performance with a new class of products
- Bring to market game-changing, disruptive solutions in a timely manner
- Improved resource utilization by virtue of the ability to focus on core expertise
- Improved manufacturing efficiency through IBM Engineering and Technology Services product design assistance
- Improved ROI on processor-related investments by penetrating new market segments

increasingly realistic experience. To deliver this performance, IBM and its partners followed an innovative development approach that in essence brought supercomputing capabilities into the realm of compact devices. The result was the revolutionary IBM Cell Broadband Engine™ (BE) processor, with the capacity of 200 billion floating-point operations per second (GFLOPs), nearly 50 times that of the latest Pentium 4 processor. Based on IBM POWER™ architecture, it serves as the processing brains behind Sony's Playstation 3 gaming console.

Versatility the key

In addition to its performance benchmarks, the Cell processor also stands out for the way it was designed. While gaming was the catalyst to the Cell's development, its architects – from IBM Research and IBM Systems Technology Group – followed a strategy designed to maximize the processor's versatility in other areas. To achieve this, they analyzed and designed in the workload requirements of key building block areas, such as cryptography, graphics transform and lighting, physics and scientific workloads. Equally critical is the chip's vector processing architecture, which – like the scientific supercomputers it emulates – is capable of performing several operations simultaneously. It's this ability to pack tremendous power into a small form factor that makes the Cell processor a "game-changing" technology, one with the potential of opening up a whole new set of uses – until now thought impossible. It was in realizing this potential, however, that IBM faced no small challenge.

"One of Mercury's strengths is that it really understands the details of these vertical markets and the horizontal technology attributes that cut across markets. Combine this with Mercury's expertise in parallel processing programming, and it's the perfect mix to unleash the Cell's performance potential."

– Raj S. Desai, Vice President, IBM Engineering and Technology Services

The same factor that enables the Cell's breakthrough performance in gaming realism – its large-scale parallel processing capabilities – also makes it more complex to adapt to the other image processing applications for which it is well suited. One key example is medical imaging, where IBM's Cell technology has the potential to significantly improve the image quality of CT scans, MRIs and mammograms, thus enabling earlier detection and more successful treatment. Another is the ability to put supercomputer-class terrain simulation in a tank or on the dash of a Humvee. While the Cell's multi-processor architecture makes it a tight fit to these applications, the key to success is in optimizing how the chip allocates workloads to each of its eight processing engines, like an eight-person team in which no worker is idle and productivity is maximized. IBM realized that ultimately, the development of smart, highly specialized applications was the key to unleashing the Cell's full performance potential. Intent on leveraging one of the centerpieces of its intellectual property (IP) and an important strategic asset, the company looked to IBM Technology Collaboration Services (ITCS) to provide direction.

Making it happen with collaborative innovation

ITCS assessed the situation and saw a clear opportunity for collaborative innovation with a strategic partner. While IBM had the IP foundation and world-class chip manufacturing capabilities, it needed a partner with a strong knowledge of customer needs and a solid track record in specialized high-end imaging applications. Mercury Computer Systems, with a 20-year history of building advanced parallel processing solutions for the defense, medical imaging and other key industries, was the ideal fit for this role. ITCS proposed an alliance that would meld IBM's horizontal capabilities in chip development and manufacturing with Mercury's vertical market expertise in embedded applications.

More than a pooling of resources, the alliance provided the framework for truly collaborative innovation that played to the complementary strengths of Mercury and IBM for the benefit of their mutual customers. Under the alliance, IBM would provide the technology, while Mercury would translate its customers' niche market preferences into board-level specifications and develop applications to optimize overall processor performance. ITCS, as a facilitator of this collaboration, would work closely with Mercury's technical staff to bridge the gap from design to manufacture. The latter would be performed by IBM using its advanced manufacturing methods, including silicon-on-insulator processes and low capacitance dielectrics. This flexible arrangement enabled both IBM and Mercury to serve their mutual customers better than either could have done alone – the definition of synergy.

From potential to reality

For an alliance based on joint, collaborative innovation, perhaps the best indicator of success is the stream of new products that it produces. On this score, the alliance has delivered dividends for IBM, Mercury and their customers in the form of faster product development and revolutionary new products. Indeed, it will take just one year from its inception for the alliance to produce three system-level products, a fraction of the time – and cost – traditionally required to bring new products to market. The first product to come out of the alliance is the Mercury Dual Cell-Based blade server based on IBM's industry-leading BladeCenter design whose 400 GFLOPS capacity (powered by two IBM Cell BE processors) will offer unprecedented peak performance. It is targeted to Mercury customers in the industrial, medical and military market segments. Reflecting Mercury's commitment to open standards, the new system will run on the Linux® operating system platform.

Key Components

Software

- Mercury MultiCore™ Plus Advantage development environment

Hardware

- IBM Cell BE processor
- IBM BladeCenter®

Services

- IBM Technology Collaboration Services
- IBM Research
- IBM Systems Technology Group

Time frame

- First product release: 12 months

Why it matters

When IBM led the development of the Cell BE processor, it set the stage for a new level of performance across a wide range of markets and applications. But getting there required a mix of competencies not found in any one company. Translating the Cell's breakthrough potential into new products and revenue streams required a new kind of development effort, one that brought together IBM's horizontal expertise in chip design and manufacturing with a strong knowledge of specialized vertical markets. IBM Technology Collaboration Services (ITCS) enabled this when it formed and managed an alliance between IBM and Mercury Computer Systems that produced a series of innovations within its first year.

Randy Dean, VP of business and technology development, sees the benefits of Mercury's work with IBM ITCS already evident in its customer base, with the first shipments of the Mercury Cell Technology Evaluation System, and the Dual Cell-Based Blade announced in October 2005. "We are delighted to get this product to market so quickly, and the Technology Collaboration Services unit at IBM has been instrumental in making this happen," says Dean. "We are receiving interest in Cell hardware, software and related services from a wide variety of customers in semiconductor inspection, complex vehicle navigation, video applications, digital media and biotechnology, to name a few. They're eager to have access to this breakthrough blade solution."

The Cell's ability to bring the power of supercomputing to novel places is best illustrated by the Mercury PowerBlock™ 200, a toaster-sized device intended for military environments such as tanks, armored personnel carriers and Humvees. The first ruggedized device designed with the Cell processor, the PowerBlock 200 is designed to deliver the raw compute power – at 200 GFLOPS, the equivalent of 45 Intel® Pentium 4 processors – needed to give soldiers in these vehicles the ability to access and control vast arrays of deployed sensors in real time. This in turn will vastly improve their ability to detect and respond to threats, thus improving their effectiveness on the battlefield. Yet another compact Mercury offering, code-named "Turismo," is designed to boost the performance of desktop workstations, where it can be used for CAD, animation or similar applications. It packs an astounding 800 GFLOPS into a 600 cubic-inch footprint.

These products attest to both the breakthrough nature of IBM's Cell architecture and Mercury's ability to tailor it to meet highly specialized and demanding requirements. Joel Radford, Mercury's vice president of strategic marketing and alliances, sees a third ingredient to the alliance's success. "We see our success as a strong validation of IBM's collaborative innovation model," says Radford. "What we've done is conduct truly joint R&D that resulted in the launch of multiple products in the span of less than a year. That's not an easy thing to pull off, and we couldn't have done it without ITCS to bring it all together."

For more information

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