



FABLESS FORUM

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AN INSIDE LOOK AT FABLESS START-UPS ON THE HORIZON

CLIFF HIRSCH, PUBLISHER, SEMICONDUCTOR TIMES

More often than not, picking my favorite start-up for the quarter is not an easy task. Sometimes there are several start-ups that command my attention, and other times I find it difficult to get excited by any one start-up. That's not to say the start-up doesn't have merit. The target market may be too small, or I just can't get excited by a market sector with dozens of start-ups all chasing the same pot of gold.

The briefing with **Stretch** started much the same as many others. In fact, Gary Banta, co-founder and CEO of Stretch, asked the same question I've heard countless times, "Cliff, how do you know when you've spotted a winner?" "Oh boy," I thought, "here we go again..." And when he told me Stretch was developing a processor, I thought, "YAPS (yet another processor start-up)...yawn."

But after the second slide, my weary eyelids picked up a bit. By the third slide he had my full attention. And by the fourth slide, I think I offered him my checkbook. Why? Huge potential market. Experienced management team. Incredible performance. And, most importantly, a reconfigurable architecture that can actually be programmed using C/C++. Most of the "innovative" processor architectures I've previously seen have fallen down in the software area. A processor that's impossible to program is simply a paperweight.

Stretch was founded in March 2002 and incubated at Worldview Technology Partners while Banta was serving there as an Entrepreneur in Residence. He was joined in June 2002 by co-founder and CTO Albert Wang and Mark Williams, an expert in compiler technology. Stretch has received \$52 million in funding since February 2003 from Worldview Technology Partners, Oak Investment Partners and Menlo Ventures.

Stretch's S5000 series of software configurable processors combine the ease of software development associated with general-purpose processors (GPPs) and digital signal processors (DSPs), and the parallelism and flexibility of field programmable gate arrays (FPGAs). Stretch achieves this by embedding programmable logic entirely inside the processor architecture. The S5000 series integrates programmable logic inside the processor as uncommitted instruction logic and enables developers to automatically create application-specific instructions from their C/C++ program using C-based tools.

Every S5000 processor is powered by the Stretch S5 engine, which incorporates the 300MHz Tensilica Xtensa 32-bit RISC processor core and the Stretch Instruction Set Extension Fabric (ISEF), a software configurable data path based on proprietary programmable logic. The ISEF compute fabric can perform 100s to 1,000s of pipelined

operations per instruction and provide one or two 128-bit results.

Using the ISEF, system designers extend the processor instruction set and define new instructions using only their C/C++ code. As a result, developers get the performance of programmable logic with C/C++ development simplicity. On a Stretch S5000 processor, an entire hot spot (sequences of operations that must be repeated many times) expressed only in C/C++ is reduced to a single instruction, resulting in huge performance and productivity gains.

The S5000 software-configurable processor family debuts with three members, all based on the S5 engine, varying only in their I/O and packaging. The devices are fabricated by TSMC in 0.13µm CMOS. Prices vary from \$100 for devices targeted at telecom, networking, military and security applications to \$35 for devices targeted at consumer, multimedia and wireless applications.

A single S5000 processor can typically replace a bank of DSPs or GPPs, or a processor combined with an expensive FPGA. The 300MHz S5610 achieved the highest score in the telecomm benchmark suite from the Embedded Microprocessor Benchmark Consortium (EEMBC), beating the most powerful GPPs and DSPs such as the 720MHz TI C6416, 2GHz Intrinsic FastMath, BOPS Manta v2.0 and 1.3GHz Motorola MPC7447.

In an H.264 sub block motion estimation example, the S5000 outperformed the TI DM642, 1.2GHz AltiVec, 400MHz Equator and 300MHz Trimedia processors. In an imaging application, six GPPs and six FPGAs were replaced by one GPP and one S5000, reducing the bill of materials (BOMs) cost by a factor of five, reducing development time by a factor of four and increasing performance by 50%.

Due to its configurability, the Stretch S5000 can achieve this performance on a wide range of applications, including applications in which conventional processors do not perform well due to use of unusual data types or operations. Software-only development eliminates all the problems and costs associated with hardware and hardware/software co-development.

For all these reasons, Stretch is my "no brainer" pick for this issue. Check out the architecture, team and market size and I think you will agree. ■

About the Author

Cliff Hirsch (cliff@pinestream.com) is the publisher of Semiconductor Times, an industry newsletter focusing on semiconductor startups and their latest technology. For information on this publication visit www.pinestream.com.

Gary Banta, Co-Founder and CEO • Albert Wang, Ph.D. Co-Founder and CTO • Wayne Heideman, VP of Engineering
Tim Garverick, VP of Operations • Michael Rayfield, VP of Sales and Business Development • Reynette Au, VP of Marketing



Stretch • 777 E. Middlefield Road • Mountain View • California • 94043
T: 650.864.2700 • F: 650.623.0150 • www.stretchinc.com