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THE EDITORIAL VIEW

A Tale of Two Companies

By Tom R. Halfhill {5/27/08-02}

Silicon Valley is buzzing over the final fates of two fabless-semiconductor companies: Montalvo Systems and P.A. Semi. One went bust, and the other was mysteriously acquired by Apple. The only industry gossip that wagged more tongues this spring was Yahoo's frigid response to Microsoft's takeover bid.

The Montalvo drama unfolded first. In mid-April, Montalvo disbanded its workforce—nearly 300 people, mostly engineers. They abruptly ceased all work on their unfinished x86-compatible microprocessor, and the company sold its remaining assets to Sun Microsystems.

We're not pleased to say we're not surprised. Frankly, we were never optimistic about Montalvo. It looked like Transmeta 2.0, except Transmeta actually shipped a few million processors, enjoyed a brief flash of fame, and eventually wrangled a cash settlement from Intel that allows Transmeta to survive, at least in skeletal form. (See *MPR 12/26/07-01*, "Transmeta's Second Life.")

Montalvo, in contrast, is a smoking crater. After burning through almost all the money raised from investors—an estimated $74 million—Montalvo scratched to find severance pay for its idled employees. Perhaps some of that pay came from Sun, which quickly snapped up Montalvo's assets.

Sun hasn't disclosed the amount paid for those assets, saying the deal won't affect earnings per share. Industry scuttlebutt says the price was north of $10 million and that assets included Montalvo's intellectual property (IP), several engineers, and Montalvo's pending patent applications. (*Microprocessor Report* was unable to find any patents already issued to Montalvo in the U.S. Patent and Trademark Office database.) Sun's eagerness suggests keen interest in Montalvo's technology. However, *MPR* doubts that Sun intends to finish the x86 project and compete with Intel's PC processors—unless Sun goes really crazy and buys AMD, too.

From Stealth Mode to Death Mode

Things didn't always look bad for Montalvo. The company was founded in 2000 as MemoryLogix; one cofounder was former *MPR* analyst Peter Song. At Microprocessor Forum 2002, MemoryLogix revealed that it was developing a synthesizable, low-power x86-compatible processor core for licensing to the embedded market. Dubbed the MLX1, it was supposed to combine x86 compatibility with ARM-like power efficiency—an interesting differentiation. The MemoryLogix MLX1 was scheduled to debut in 3Q03. (See *MPR 11/11/02-02*, "MemoryLogix Makes Tiny x86.")

Instead, MemoryLogix changed strategies. New management raised big money from investors and adopted the fabless-semiconductor business model. Renamed Montalvo Systems, the company hired a much larger engineering staff and began developing a multicore x86-compatible processor to compete with Intel's PC processors.

Former *MPR* editor-in-chief Peter Glaskowsky joined Montalvo at about that time. (Full disclosure: three years ago, I declined an offer to join Montalvo as well.) MemoryLogix was renamed Montalvo Systems, supposedly after Villa Montalvo, the historic mansion near Silicon Valley where Transmeta emerged from stealth mode in 2000.

Perhaps the new name was a bad omen. My February 2000 report on Transmeta's public debut is worth quoting, because it applies equally well to Montalvo: "Like moths drawn to a flame, semiconductor startups seem to find the bright but dangerous glow of the x86 market irresistible. Never mind that companies as resourceful as AMD, Centaur, Cyrix, IBM, National Semiconductor, and Rise have all charred their wings in the fires of competition with Intel. More than 120 million x86 chips were sold in the profitable PC market last year [2000], casting off a warmth that lures newly hatched companies from the darkness. The latest newcomer to emerge from its cocoon is Transmeta." (See *MPR 2/14/00-01*, "Transmeta Breaks x86 Low-Power Barrier.")

Unlike Transmeta, Montalvo never emerged from its cocoon. It proceeded straight from stealth mode to death mode. The engineers slaved to finish their design, but the company evidently ran out of money before the engineers ran out of problems. When Montalvo tried to raise more funds, no investors came to the rescue.

It's highly unlikely that Sun will revive the x86 project as it stood at Montalvo. More likely, Sun is interested in the broader technology that Montalvo developed while working on its multicore design. One rumor is that Sun wants to add x86 compatibility to SPARC server processors, much as Intel built x86 compatibility into Itanium server processors. We don't think Sun needs to imitate Intel in this way. Adding complexity to SPARC would only worsen Sun's spotty track record for delivering new processors on time, and Itanium is not the industry's best example to imitate.

Intel Is Too Formidable

Likewise, we doubt that any new startups will follow the examples of Transmeta and Montalvo. *MPR* believes it has become almost impossible for a startup to directly challenge Intel on its home turf of PC processors. The odds tilt too heavily in Intel's favor. Intel has commanding market share, vast engineering resources, entrenched business relationships with all major PC vendors, and the best high-volume chip-fabrication technology in the world. Even a relatively large competitor like AMD has trouble competing with Intel. Yes, AMD occasionally finds a chink in Intel's armor, as it did when Intel unwisely bet on Itanium. But Intel is relentless and doesn't stay down for long.

Even when a small startup like Transmeta succeeds in developing an innovative processor that has some edge over Intel's processors, that cutting edge is extremely difficult to sustain. Intel hurls superior resources at the challenger and, after another chip generation or two, regains either parity or superiority. The challenger can't keep up.

Additional advantages in Intel's favor are the notorious complexity of the x86 architecture and the numerous patents and trade secrets protecting it. Creating a 100%-compatible clean-room clone of the x86 is very difficult—technically and legally. The task has become even more difficult in recent years as the x86 architecture has gained extensions for virtualization, 64-bit integer processing, and 128-bit media processing.

Our opinion on this matter was reinforced last March, when I toured Intel's verification labs in Austin. Naturally, Intel's guided tour was meant to impress, and it did. I walked through two floors of lavishly equipped and heavily staffed labs—all devoted to verifying early silicon of the new Atom microprocessor. For a startup to duplicate these facilities would require enormous effort and investment. And remember, Intel finds this degree of effort and investment necessary even after inventing the x86 architecture and designing hundreds of x86 processors over the past 30 years. No startup can match Intel's institutional knowledge and experience.

Despite Montalvo's collapse, our friend Glaskowsky believes it's still possible for a startup to confront Intel in the PC-processor market. He predicts someone will try again and will find investors willing to assume the risk. But with all due respect to our former colleague, we think Montalvo's demise and Transmeta's exodus from the chip business will discourage such long shots, at least in the foreseeable future.

Indeed, we worry about the continued health of AMD and of VIA Technologies' Centaur subsidiary. AMD is the last x86 vendor daring to fight Intel head-on with PC and server processors, while VIA has been trying to carve out a niche for low-cost, low-power x86 processors. Both companies are laboring to survive, despite a market in which x86 processors are in high demand. Meanwhile, Intel is expanding its dominion by introducing lower-power x86 chips, like the new Atom. (See *MPR 4/7/08-01*, "Intel's Tiny Atom.")

Wanted: A Licensable x86

However, we still like the original MemoryLogix idea of a licensable, synthesizable, x86 processor core for the embedded market. If Intel succeeds in asserting that x86 compatibility is vital for advanced smartphones and mobile Internet devices (MID), developers will need x86-based SoCs that are highly integrated and optimized for specific systems. Standard-part microprocessors can't serve all those needs.

Intel, of course, doesn't license processor cores to chip developers, preferring instead to sell standard parts. Although Intel plans to introduce some Atom-based ASSPs, those chips are being designed for systems (such as MIDs) that Intel hopes will achieve huge volumes. If the volumes don't materialize, Intel may not be able to justify making the ASSPs, because Intel needs volume to sustain its massive capital investments in captive fabs.

Just because Intel considers particular lines of business unattractive doesn't mean other companies can't profitably exploit those niches. If chip developers could license up-to-date x86 cores that match the capabilities of other licensable processor cores, the x86 could succeed in those niches, no matter what Intel does. From small niches do valuable new markets arise. In addition to developing highly optimized x86 SoCs, other companies could promise customers longer availability and a more attentive business relationship than

Intel does. (We've made these points before; see *MPR 7/31/06-01*, "Intel's Embedded Future.")

Therefore, the original MemoryLogix plan to make a licensable x86 processor core still looks viable. Certainly, it's more viable than making standard parts to compete directly with Intel's PC processors. To avoid the expense of creating and verifying a new x86 core from scratch, perhaps someone could adapt the existing x86 cores from AMD or VIA. Licensing only the processor cores, not the x86 architecture, may avert legal entanglements with Intel.

Critics point out that IP licensing doesn't generate the large revenues typical of fabless-semi manufacturing. That's true. But can a fabless-semi startup generate large revenues by flinging itself on Intel's sharpest sword? We don't think so. IP licensing might be the only remaining door into the x86 market.

Apple Acquires P.A. Semi—But Why?

Shortly after Montalvo Systems died, Apple surprised everyone by acquiring P.A. Semi for $278 million in cash. P.A. Semi was a high-profile startup led by star chip architects Dan Dobberpuhl and Jim Keller, whose resumés include the DEC Alpha and StrongARM processors. P.A. Semi unveiled its new PWRficient processors, based on the Power Architecture, in 2005. (See *MPR 10/25/05-01*, "P.A. Semi: New Blood for Power.")

Apple's acquisition encouraged broad speculation, because neither party had much to say in public. Apple official statement: "Apple buys smaller technology companies from time to time, and we generally don't comment on their purpose or plans."

One popular theory (fomented by *Forbes*) suggested that Apple will use P.A. Semi's PWRficient chips instead of Intel's Atom in future iPhones, possibly condemning Atom to stillbirth. We discount that theory. Existing PWRficient processors dissipate too much power for a mobile device like the iPhone, which runs just fine on lower-power ARM-based chips. (The dual-core PWRficient PA6T-1682M typically draws 5W to 13W at 2.0GHz; a single-core, slower version optimized for low power would obviously be more suitable.) Besides, Apple has said nothing about using Atom in iPhones, and Intel doesn't need that design win to make Atom a success.

Others speculated that Apple might reject Intel with more-extreme prejudice. What if Apple kicked Intel's x86 processors out of the Macintosh and reintroduced Power-based Macs? Although Apple CEO Steve Jobs is famously inscrutable, we deem it highly unlikely that Apple would revert to the Power Architecture solely because of the P.A. Semi acquisition. It's been only two years since Apple began switching from Power to x86, so a reverse switcheroo would surely confound Mac software developers. Proponents of this theory argued that developers could write software for *both* platforms and deliver the compiled code in Universal Binary format; the installer would load the appropriate executable files on the target machine. (See *MPR 6/27/05-01*, "Apple Drops PowerPC for Pentium.")

A variation of that theory was that Apple might retain the x86 in desktop Macs while using P.A. Semi's PWRficient chips in Mac notebooks or XServe blade servers. The idea of permanently bridging a computer platform across two entirely different CPU architectures intrigues some people. However, in an interview with *The Wall Street Journal*, Jobs threw cold cider on the idea of reviving Power-based Macs. "I wouldn't lose too much sleep over that," Jobs said. "We're very happy with Intel."

Instead, Jobs noted that Apple has frequently collaborated with other companies on custom chips for Macs, iPods, and iPhones, so Apple can make good use of P.A. Semi's engineers, particularly for low-power chips in portable products. The implication was that Apple bought P.A. Semi for its well-regarded design team. Certainly, that was a motivation. Nevertheless, we suspect there's more to the story.

Did P.A. Semi and Apple Sign a Prenup?

When we first heard about P.A. Semi several years ago, our first reaction was "Oh, no, not another Exponential!" Long-time *MPR* readers may recall the debacle of Exponential Technology, which developed a PowerPC-compatible processor intended for Apple Macs and the Mac clones that briefly appeared in the 1990s. Unfortunately for Exponential, which tried to revive bipolar logic, the chip's power consumption was too high for the time (85W at 533MHz). After Apple decided not to buy the chips, Exponential burned out in 1997. (See *MPR 10/28/96-01*, "Exponential's PowerPC Blazes.")

Any subsequent startup hoping to develop microprocessors for Apple would be wise to obtain some kind of written commitment from Apple first. Indeed, after Exponential fizzled, such a commitment would seem almost necessary to raise the tens of millions of dollars needed to develop a leading-edge microprocessor. The founders of P.A. Semi aren't dummies. *MPR* doesn't know if they obtained a legally binding commitment from Apple, but without one, they were taking a big chance.

Apple announced its switch from the Power Architecture to x86 in mid-2005, only months before P.A. Semi emerged from stealth mode with its PWRficient processors. At the time, it was widely assumed that Apple was P.A. Semi's primary prospective customer, so Apple's new strategy appeared to doom the startup. But P.A. Semi survived. If Apple bought P.A. Semi solely for the design team, $278 million seems high. The company had only about 150 people. And it doesn't seem likely that Apple wants to enter the fabless-semi business by continuing to develop and manufacture PWRficient chips.

So our theory is that P.A. Semi convinced Apple to sign a secret prenuptial agreement at the very beginning. The prenup might have committed Apple to use P.A. Semi's processors or provided for compensation if Apple didn't use them. In 2005, when Apple jilted the Power Architecture to

shack up with Intel, P.A. Semi might have been the abandoned partner, negotiating behind the scenes to enforce the prenup. In this scenario, Apple's acquisition of P.A. Semi could be, at least in part, a private settlement.

Mollifying P.A. Semi's Customers

Certainly, Apple is taking on responsibilities that don't appear to mesh with its benign consumer products. After Apple announced the acquisition, P.A. Semi's customers began wailing. It turns out that P.A. Semi had more customers than anyone suspected—and some are defense contractors, which expect components to remain available for many years, even decades.

Among the P.A. Semi customers named in news stories and company press releases are Extreme Engineering Solutions (military), Curtiss-Wright Controls Embedded Computing (military/aerospace), Lockheed Martin (military/aerospace), Mercury Computer Systems (signal-processing and image-processing servers), NEC (storage servers), Performance Technologies (communications), Raytheon (military/aerospace), Splitted-Desktop Systems (set-top boxes, Internet services), and Themis Computer (military/aerospace).

Does Apple intend to continue developing, manufacturing, and supporting PWRficient processors for these customers for years to come? Will Apple soon introduce an iBomb? We think not.

More likely, Apple will find some other company to assume responsibility for those customer relationships, perhaps by restrictively licensing P.A. Semi's IP. There are companies that specialize in keeping milspec chips available almost indefinitely. There are even companies that specialize in cloning discontinued chips. (One is Innovasic Semiconductor; see *MPR 4/23/07-01*, "Embedded Systems Conference Highlights.")

We're not saying that Apple can't make good use of P.A. Semi's design talent. As Apple expands its consumer-product line, it will definitely need lower-power processors and optimized SoCs. P.A. Semi's engineers can design those chips for Apple, or at least help third-party suppliers design them. But for $278 million, Apple could have hired plenty of top-shelf chip designers without taking on P.A. Semi's baggage. That's why we think there's more to this acquisition than meets the eye.