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THE SIGNAL: High Hopes for Low-Power Compute Innovators

By Robert Armstrong

The challenge for corporate data centers was once simply maximizing processing muscle per dollar. Today it's more often computing capacity per watt that matters. For the startups that are addressing this new priority, the race is on to gain scale or sell out to bigger players.

The amount of information that enterprises generate has exploded, and processing capacity has become cheap. The limit is no longer computer power; it's power, period. This is not just a matter of big electricity bills: With increasing frequency, the limit is literally the amount of power available.

This has created an opportunity for startups and small companies in an area traditionally dominated by the largest IT firms. Young firms such as SeaMicro Inc., Tiler Corp. and Schooner Information Technology Inc. -- each based in California -- are backed by smart venture capitalists and have recently raised capital. San Jose-based Tiler even added chip-maker Broadcom Corp. among its newest batch of investors three months ago.

At some point, these companies will either seek a public listing or attract buyer interest.

Both the big data center appliance vendors, from Hewlett-Packard Co. to IBM Corp. to Dell Inc., and big chip-makers like Intel Corp., have product lines that were developed when energy was a secondary concern. As they adjust their offering for a power-conscious world, little companies that treat low power as a starting point have a chance to take share.

There are basically three types of innovation that lower power consumption. The total data center can be redesigned for efficiency; servers and other appliances can be rethought; and chips can be built with energy in mind.

Big firms, particularly Cisco Systems Inc. and International Business Machines, have led the way in rethinking the data center as a whole -- how the various appliances and the associated infrastructure can be redesigned to work as a power-efficient unit.

At the server level, though, small companies are getting footholds in a market where HP, IBM and Dell account for three-quarters of the market.

Santa Clara-based SeaMicro -- which counts Khosla Ventures, a VC firm started by a Sun Microsystems co-founder, among its investors -- makes a server that is essentially many small servers tied together using network-style technology. This has two advantages.

First, as single microprocessors get faster, power consumption and heat grow faster than compute speed. As long as the parts work together properly, a multi-node machine, in which each sub-processor is smaller, is intrinsically more efficient.

Second, servers now are increasingly deployed to manage Internet traffic. This is largely a matter of handling many small, externally-generated information requests, in contrast to "big compute" processing functions, like database analysis. A multi-node server does this kind of work more efficiently, by devoting small bits of computing power to small tasks, rather than having a bulldozer doing the work of a shovel.

Interestingly, SeaMicro is not running its server on the x86 chips from Intel or Advanced Micro Devices that most servers use. Instead, they are using Intel's Atom, a power-thrifty chip designed for use in smartphones and netbooks.

Schooner Information Technology, a Sunnyvale-based startup backed by Menlo Ventures among others, sells an IBM server that has custom software built into it. This hardware/software package is designed to run the popular database management system MySQL much more efficiently. The company says one Schooner appliance replaces eight to 10 standard servers, radically reducing power demand.

At the chip level, there are even more low-power innovators. Tiler is doing at the level of the chip what SeaMicro is doing at the server level: linking together many small, efficient units of computing power -- this time cores on a chip, rather than chips in a server.

The advantage of these multi-core chips over the competition's is that they were specifically designed to work together in parallel. The result is savings in both space and power. Tiler has just announced that Quanta Computer Inc., an investor in Tiler and a huge laptop OEM, will release a server based on Tiler chip architecture.

Two older companies, ARM Holdings and MIPS Technologies Inc., have been designing low-power chips for years, U.K.-based ARM predominantly for wireless devices and California-based MIPS for home products like TVs and set-top boxes. Now that power has become a factor for enterprise computing, ARM and MIPS chips are finding their way into the data center. Marvell Technology Group has announced an ARM chip-based server; Smooth-Stone Inc., an Austin, Texas-based startup, is releasing another. Cavium Networks, of Mountain View, Calif., is reporting very strong sales of its MIPS-based Oteon chip to customers in enterprise switching, routing, and network security.

The pressure on the upstart chip makers is intense. The big chip makers, especially AMD, are also innovating to lower power consumption, and have the advantage of being standard in an industry where familiarity and interoperability is crucial.

Indeed, all of these small firms need to add customers rapidly and raise capital for growth -- or partner or merge with the big players -- because enterprise computing will, ultimately, remain a scale business. The opportunity for low-power experts to challenge the incumbents will not last long.