



SEAMICRO

SeaMicro Low Power Server

DOE-ITP Information and
Communications Technology 2011
Portfolio Review

Gary Lauterbach CTO, DOE Project PI

About SeaMicro

- Founded in July 2007
- Based in Santa Clara CA
- \$40 Million from leading venture capitalists and strategic partners
 - Khosla Ventures
 - Draper Fisher Jurvetson
 - Crosslink Capital
 - Leading strategic investors



- \$9.3 Million DOE grant for Energy Efficient Information and Communication Technologies
 - The largest given to a server company
 - Second only to the \$9.9 million given to Yahoo!
 - More than IBM, HP, Dell, Cisco, Alcatel

DOE Program Update

March 2011

- ◎ SeaMicro Low Power Server Program
- ◎ Principal Investigator:
 - Gary Lauterbach, SeaMicro CTO
- ◎ Business Contact:
 - Andrew Fetter, Sr. Manager Finance
- ◎ Project start date:
 - Funding started November 25, 2009
- ◎ Project Status
 - Ongoing
- ◎ Project type
 - Commercialization of technology

Project Objectives and Goals

- ⦿ Research, develop, and commercialize technology to reduce by 75% the power used by volume servers
- ⦿ Accelerate product availability by 12 months
 - Accelerate development
 - Accelerate quality-assurance
- ⦿ Accelerate market adoption
 - Reduce cost;
 - Expand market reach beyond internet workloads on volume servers
 - ⦿ Volume servers working on less-common workloads and
 - ⦿ Mid-range and high-end servers.

Project Background

- ⦿ Data centers consume more than 1.5% of the total electricity in the United States.
- ⦿ In the data center, volume servers account for 68% of the power consumed
- ⦿ SeaMicro has identified volume servers' inefficiency and developed technology to eliminate these shortcomings.
- ⦿ Resulting in a server that uses 75% less power and takes 75% less space than the best available server on the market.

Approach, Results, Deliverables

Market Insight

SeaMicro Approach

Servers are not aligned with the fastest growing workload

Small simple CPUs improve computer/unit power

More efficient CPUs are not enough, must reduce the power used by “everything else”

Can consolidate discreet networking components to further reduce power and cost

New system architecture

- Single box cluster compute
- CPU independent; X86, ARM, etc.

The most efficient CPU:
Intel's Atom

Patented CPU I/O
Virtualization Technology

- Removes 90% of the components
- Shrinks motherboard to size of a credit card

Supercomputer style fabric

- Links hundreds of mini motherboards

Integrate Switching, Load balancing and Terminal server into the system

Where Does the Technology Reside?

- New server architecture
- SeaMicro ASICs & FPGAs
- SeaMicro System Software

Approach, Results, Deliverables



40 1 RU dual socket quad
core servers

64 SATA/SSD Disks

2 Rack Switches

2 Terminal Servers

Basic Load Balancer

The SeaMicro SM10000



1 System

10 Rack Units

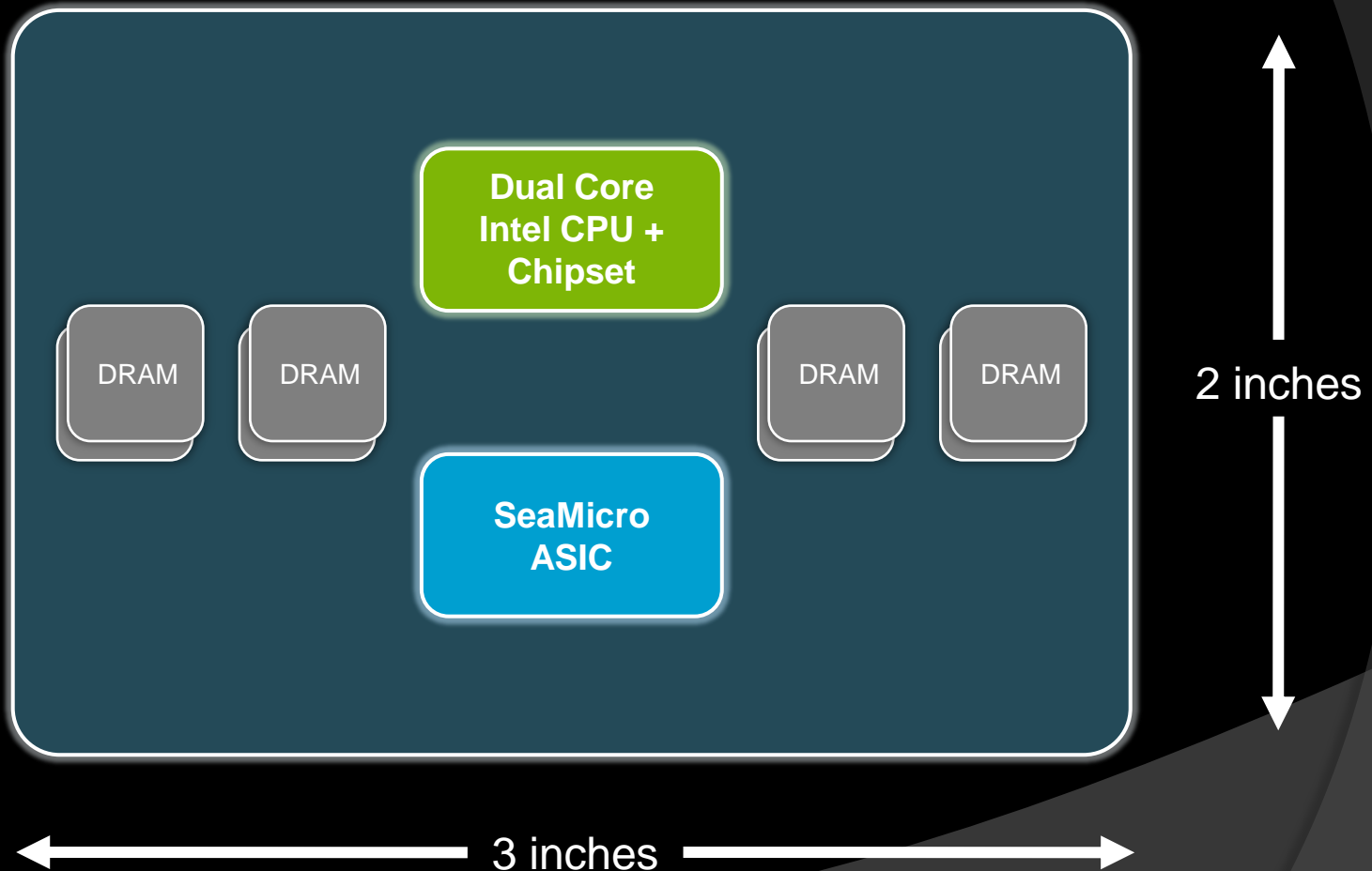
$\frac{1}{4}$ The Power

$\frac{1}{4}$ The Space

$\frac{1}{3}$ The Weight

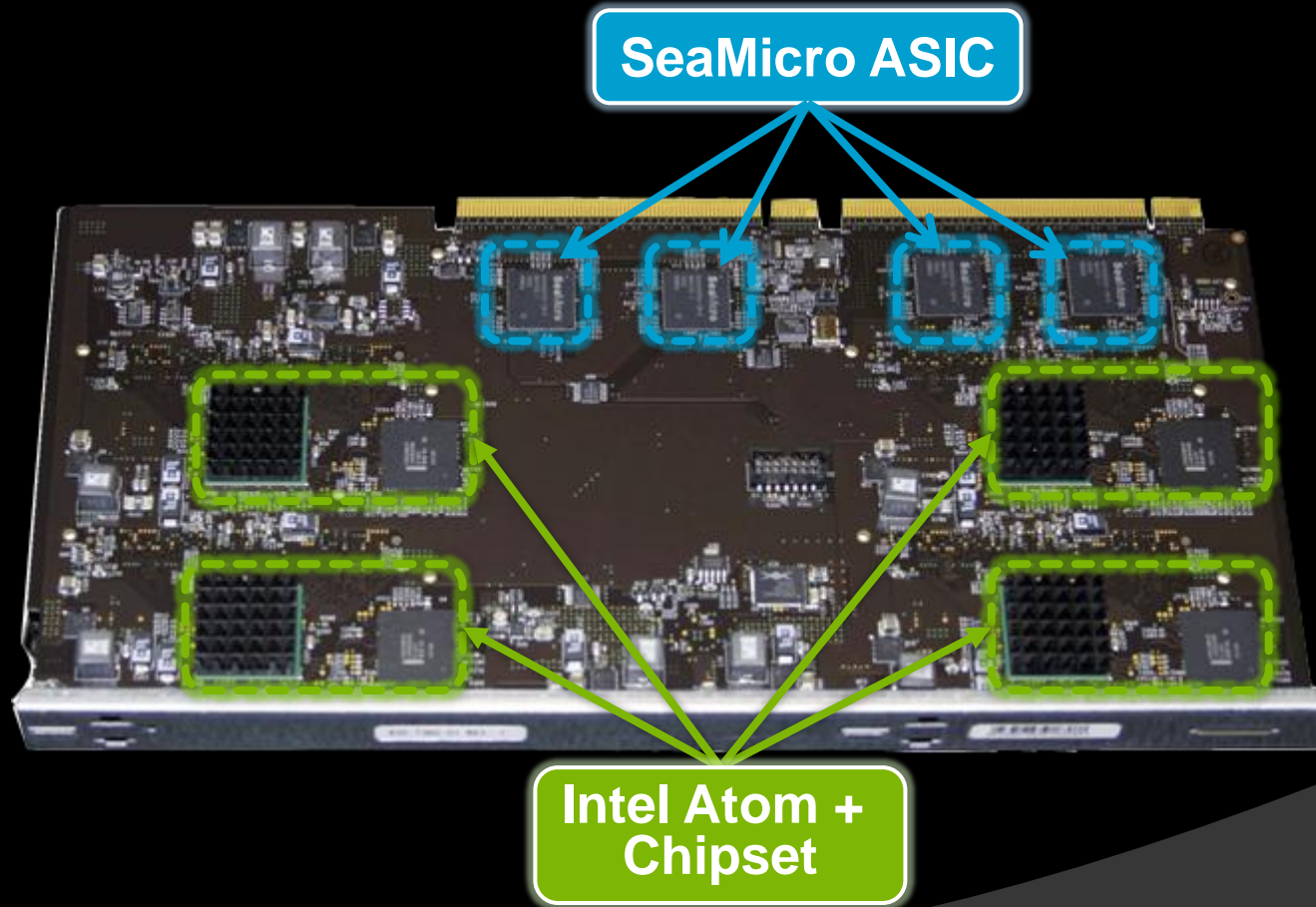
Game Changing Technology

A Server The Size of A Credit Card: only 3 components, Intel's ATOM, SeaMicro ASIC + DRAM



The Highest Density X86 Server

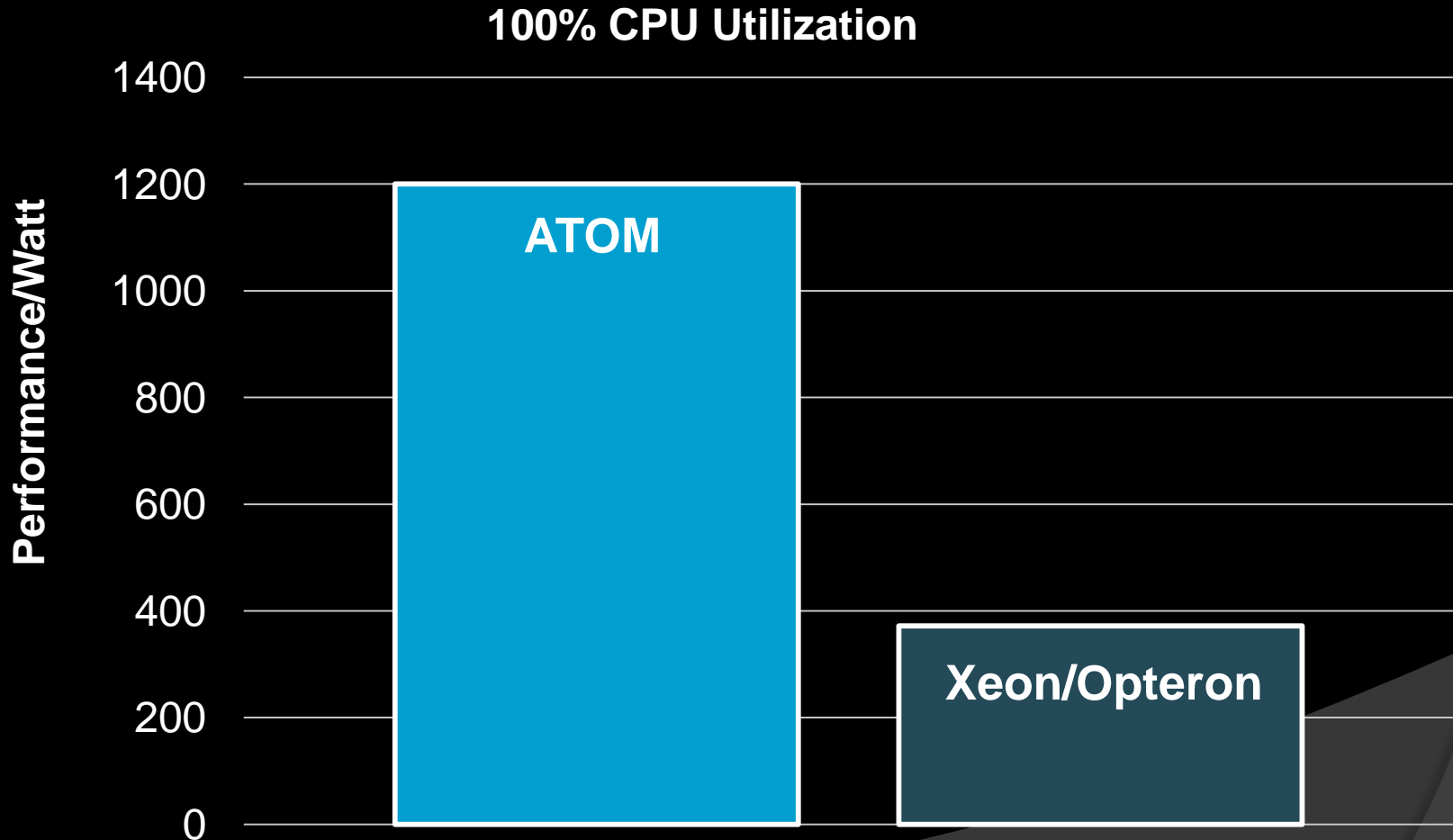
4 Dual Core Servers in 5 x 11 Inches



Energy Savings

- Use more efficient CPU
- Invent technology that eliminates components and reduces the non CPU portion of the server's power draw

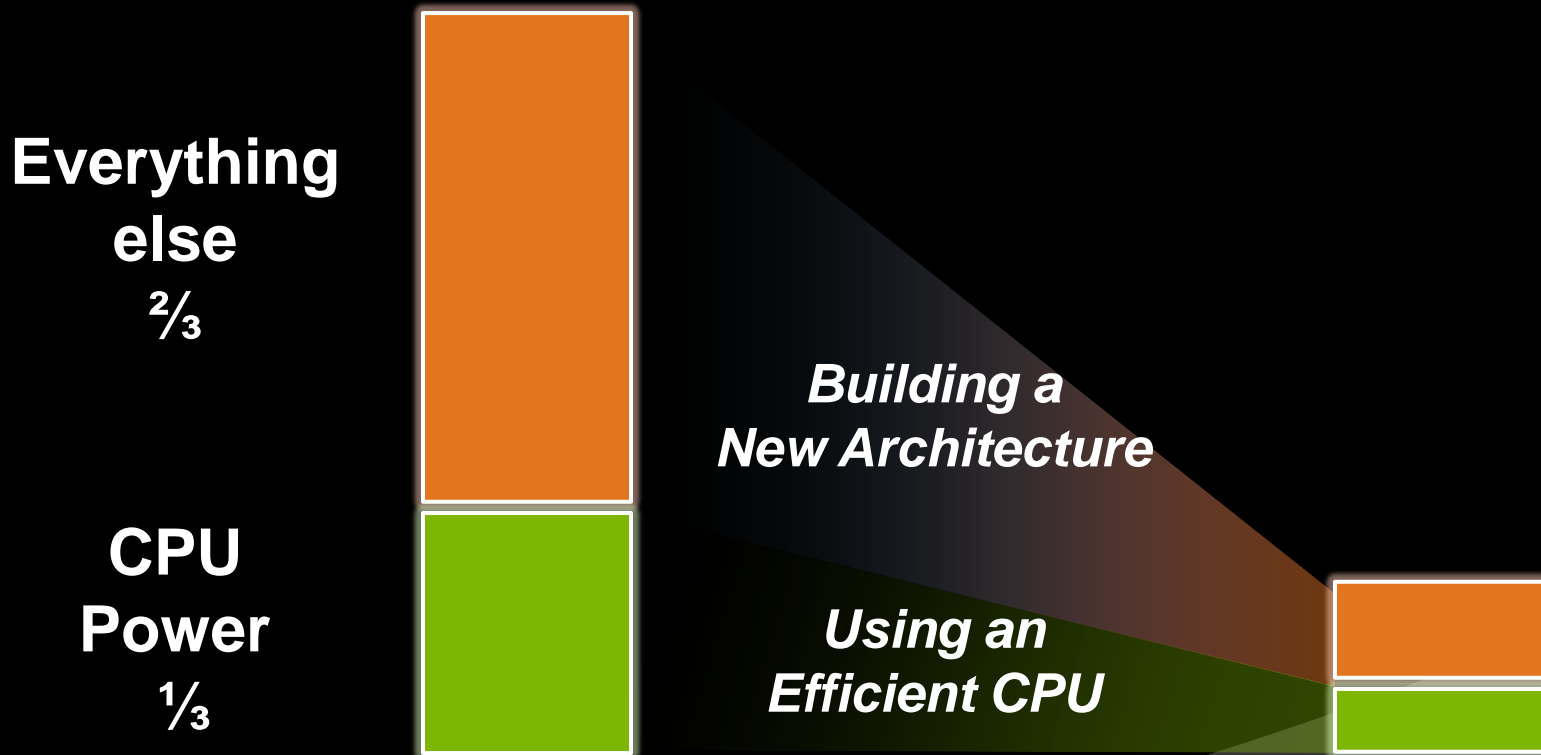
Small CPUs 3.2 X More Efficient Than Large CPUs For Internet and other highly partitioned workloads



* Performance = IPC x MHz

Power Reduction Beyond CPU

Volume Server Power Breakdown



The SM10000 Family: 512 Atom Cores

An entire rack of functionality in 10 RU

- 256 Dual Core Sockets
 - 512 x 1.6Ghz Intel x86 64 bit Cores
- 1 Terabyte DRAM (4GB per Socket)
- 0 - 64 SATA SSD/Hard Disks
- 1.28 Terabit fabric interconnect
- Up to 64 x 1GbE and/or 16 x 10 GbE uplinks
- “Fail in place” architecture
- Hot swappable, fans, disk, power supplies, compute, Ethernet, and storage cards
- Runs off the shelf OS and applications
- Power Consumption:
 - 2.5 KW under typical workloads



Estimates of Energy Savings

- 75% reduction in power per unit compute
- At the national server level
 - Traditional volume server uses 200 W
 - Saves $200W * 0.75 = 150 W$ per server
 - Volume server market is 6 million units / yr
 - Saving opportunity 900 million watts / yr
- Other vendors and component vendors have started to respond by reducing the power used in their parts
- Virtuous cycle has been set in motion
- SeaMicro technology also allows servers to be manufactured in the US
- All other major server vendors manufacture abroad

SM10000-64 versus HP DL360 G7

Apache Performance Results

	SeaMicro	HP
System Configuration	SM10000-64 256 x Dual Core 1.66GHz Atom processors	HP DL360 G7 Dual Socket Quad Core Xeon L5630 2.13GHz
Systems Under Test	1	45
Apache Throughput/Sec	1,005,056	1,005,120
Apache Request File Size	16KB	16KB
System Power	2,490W	10,090W
Space consumed in Racks	10 RU	45 RU

SM10000-64 versus HP DL360 G7

Apache Test Summary and Conclusion

Measured power and space under an Apache workload

- ⦿ Power Results
 - To do the same work
 - SM10000-64 consumed 2.49 KW
 - HP DL360 G7 consumed 10.09 KW
 - SM10000-64 uses <1/4 the power
- ⦿ Space Results
 - To do the same work
 - SM10000-64 required 10 rack units
 - HP DL360 G7 required 45
 - SeaMicro uses <1/4 the space

New Jobs Created

- 45 high paying jobs at SeaMicro in Santa Clara, CA
- 25 Jobs at SeaMicro's manufacturing partner NBS, in Santa Clara, CA
- Hiring plans at SeaMicro under success scenario
 - 2011, 50 additional employees in
 - 2012, 100 additional employees
 - 2013, 200 additional employees
- Success scenario manufacturing job created
 - 2011, 20 additional employees
 - 2012, 100 additional employees

What remains to be done

- ⦿ Continued cost reduction
- ⦿ Software features
- ⦿ Complete 10 Gigabit hardware
- ⦿ Continued system quality assurance

Project Status

- ◎ Phase 1 complete
 - Delivered system to market
 - Proven technology in customer deployments
 - Demonstrated 75% reduction in power usage
- ◎ Phase 2 underway
 - Expanding addressable market with new hardware
 - Adding features in software
 - Cost reducing the to improve rate of adoption

SeaMicro in the Press



Andrew Feldman, chief of the start-up SeaMicro, with a card containing eight servers, which are smaller than a credit card.
 By ASHLEE VANCE
 Published: June 20, 2010

SANTA CLARA, Calif. — Is this Silicon Valley or Hogwarts School of Witchcraft and Wizardry?

Over the last 18 months or so, this question has become tougher to answer as a flood of products with names like Voldemort, Hadoop or Cassandra have appeared on the scene.

EE Times
 FREE Webinar
 CPU-to-CPU
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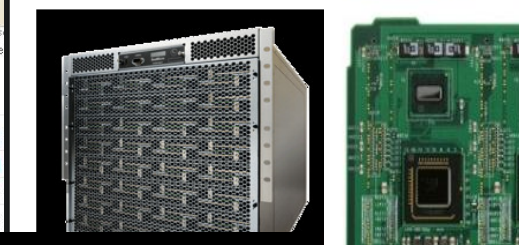
Startup SeaMicro packs 512 Intel Atoms in server
 SM10000 seen as first in wave of Atom, ARM-based servers

cnet news
 Latest News CNET River Webware Crave Business Tech Green

Start-up launches DOE-backed green server

WSJ BLOGS
Digits
 Technology News and Insights
 JUNE 14, 2010, 12:07 AM ET
SeaMicro Tries to Rethink the Int

Article Comments (4)
 By Don Clark
 Not many people start computer companies pricing making other businesses seem much unusual way.



FAST COMPANY
 TECHNOLOGY DESIGN ET

Google's Power-Hog
SeaMicro's Super-E
 BY KIT EATON Mon Jun 14, 2010



Start-up launches DOE-backed green server

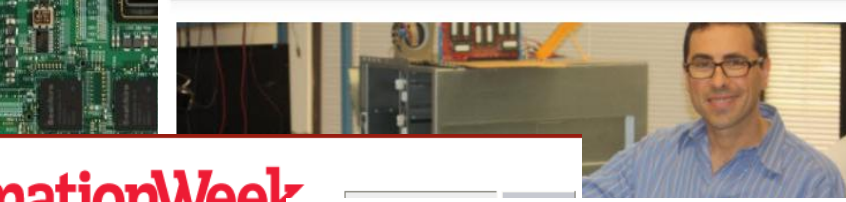
HP Officejet - Save 50% on your color prints
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PCWorld News Reviews How-To
SeaMicro's Cloud Server Sports 512 Atom Processors
 Agam Shah, IDG News Jun 13, 2010 9:20 pm

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Startup Builds Power-Efficient Servers With Netbook Chips
 By Priya Ganapati June 14, 2010 | 7:00 am | Categories: Notebooks

VentureBeat Interpreting Innovation
 Jeep THE ALL-NEW 2011 JEEP GRAND CHEROKEE
 MAIN MOBILEBEAT GREENBEAT GAMESBEAT DEALSBEAT

SeaMicro drops an atom bomb on the server industry
 June 13, 2010 | Dean Takahashi



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SeaMicro Intros Server With 512 Atom Processors

The 10U rack-mount server uses 75% less power and space than other servers, says the company.
 By Antone Gonsalves
 InformationWeek
 June 14, 2010 03:17 PM

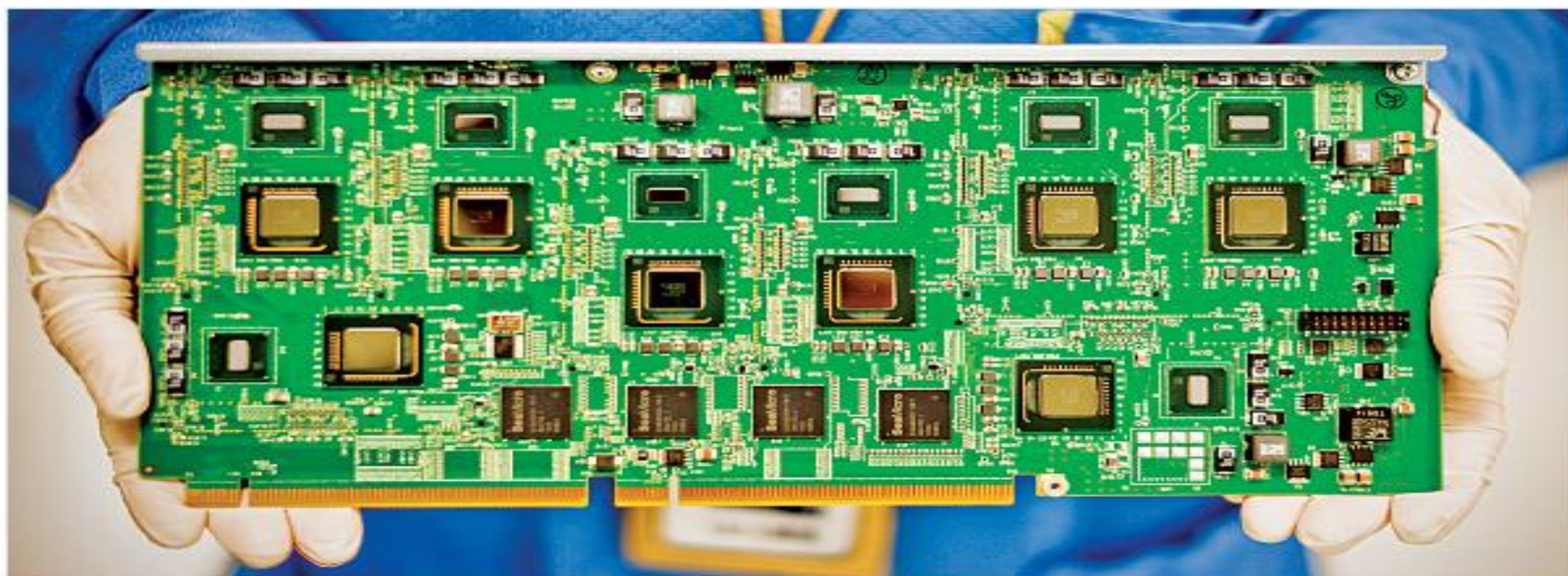
SeaMicro Uses Intel Atom Chip in Server Architecture
 By Jeffrey Burt
 2010-06-14
 Article Rating: ★★★★★ / 2
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TECHNOLOGY February 24, 2011, 5:00PM EST

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SeaMicro's Silicon Valley Computers

Bucking the offshoring trend, SeaMicro manufactures its power-sipping servers locally, betting on superior speed and flexibility



A motherboard for one of SeaMicro's enterprise computers Mark Richards For Bloomberg Businessweek

By [Ashlee Vance](#)

A break in the space-time continuum must have opened up in Santa Clara, Calif. For there sits the headquarters of SeaMicro, a computer company that actually manufactures computers in Silicon Valley. How 1980 of them.

BW MAGAZINE

[The Cloud: Battle of the Tech Titans](#)

After ITP-Sponsorship

- ⦿ Since receiving the ITP Grant SeaMicro raised \$15 million additional from leading VCs to further fuel growth
- ⦿ SeaMicro now has
 - Happy customers
 - Salespeople
 - Distribution partners around the world
 - Critical mass in engineering
- ⦿ SeaMicro will raise additional funds in 2011
 - Seek additional grant funding
 - Raise additional venture funding
 - Partner with strategic partners and research institutions

Value Proposition to Customers

- Uses $\frac{1}{4}$ the power of traditional servers
- Takes $\frac{1}{4}$ the space of traditional servers
- Plug and Play—requires no modifications to your existing infrastructure.
- Reduces total cost of ownership by more than 75%

Summary

- Since receiving DOE funds SeaMicro
 - Hired 45 people and our manufacturing partner hired 25
 - Delivered product to market ahead of schedule
 - Met the goal of reducing power by 75% per unit compute
 - Won customers in the US and abroad
 - Won press coverage for low power approach
 - Won press coverage for manufacturing in the US
 - Program ahead of schedule on all fronts