SeaMicro

The Data Center Computer Platform

Revolutionizing Data Center Economics

- Solve the data center's most important problems: power and space

- Servers that use ¼ the power and 1/6 the space of today's best in class server

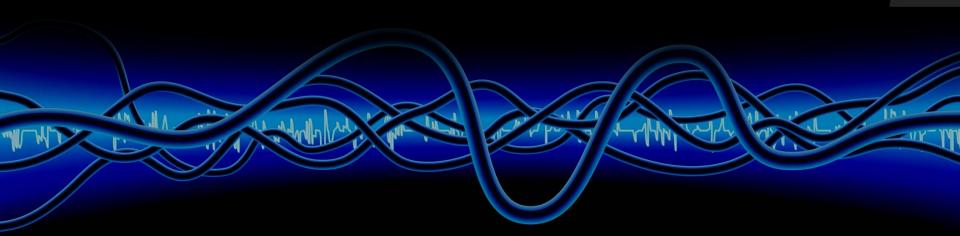- Plug and play: require no modifications to software

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About SeaMicro

- Founded in July 2007
- Based in Sunnyvale, CA
- $60 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

Power –
The Issue in the Data Center

- Power is the largest Op-Ex item for an Internet company; >30% of Op Ex

- Google says the power to operate servers costs more than servers purchase price

- Volume servers consume 2.5% of the electricity in the US—More than $5 Billion dollars per year

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The Internet Changed
the Data Center Workload

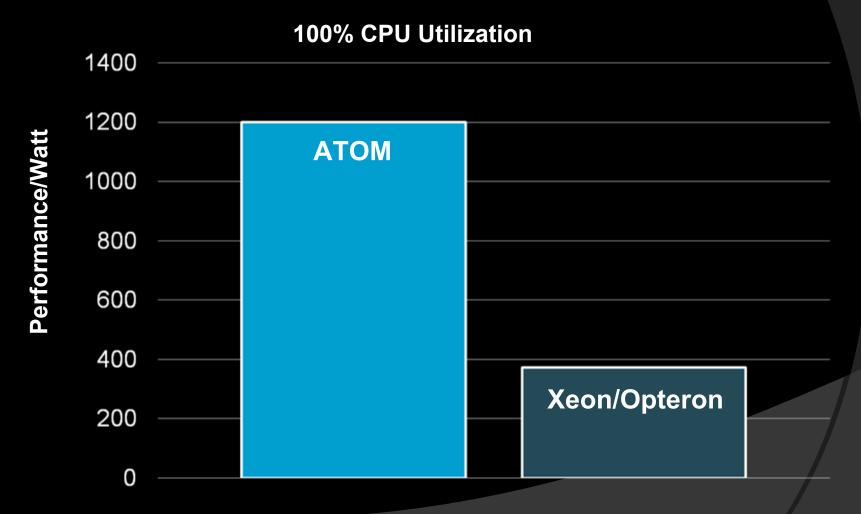| Compute Workload in the Data Centers of the Past	THE INTERNET CHANGED EVERYTHING	Compute Workload in Today's Data Center
Few in number		Huge in number (millions of users, ubiquitous access; iPhone, netbooks)
Large, complex, interrelated		Are small, simple, independent (mail, search, social networking)
Easy to schedule; compute resources fully occupied		Bursty traffic; servers often in low utilization/idle (Google reports average CPU utilization of 17-20%, Uptime Institute between 5 and 25%)

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Servers Failed to Adapt to the Changing Workload Creating the Power and Space Issues

- Volume servers are inefficient at small simple workloads

- Volume servers are extremely inefficient when running at low CPU utilization

- The power issue is caused by the mismatch between workload and legacy server architecture

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

100% CPU Utilization
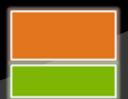

* Performance = IPC x MHz

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Power Reduction Beyond CPU

Volume Server Power Breakdown

Everything else
$2/3$

CPU Power
$1/3$

Building a New Architecture

Using an Efficient CPU

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Reducing Power and Space by 75%

Market Insight

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

SeaMicro Technology

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

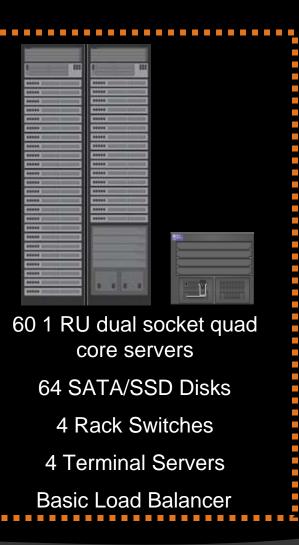Supercomputer style fabric
- Links hundreds of mini motherboards

Integrate Switching, Load balancing and Terminal server into the system

Where Does the Technology Reside?

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

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The SeaMicro SM10000 Replaces
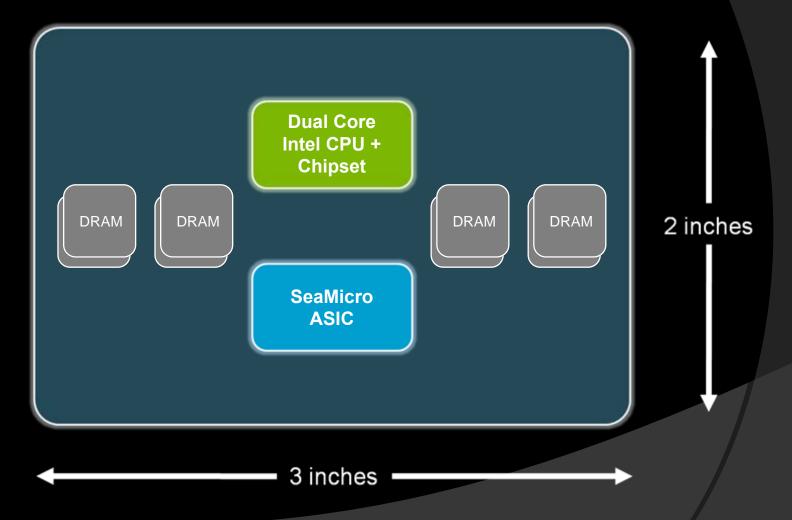# An Entire Rack of Traditional Equipment

60 1 RU dual socket quad
core servers

64 SATA/SSD Disks

4 Rack Switches

4 Terminal Servers

Basic Load Balancer

The SeaMicro SM10000

1 System

10 Rack Units

¼ The Power

1/6 The Space
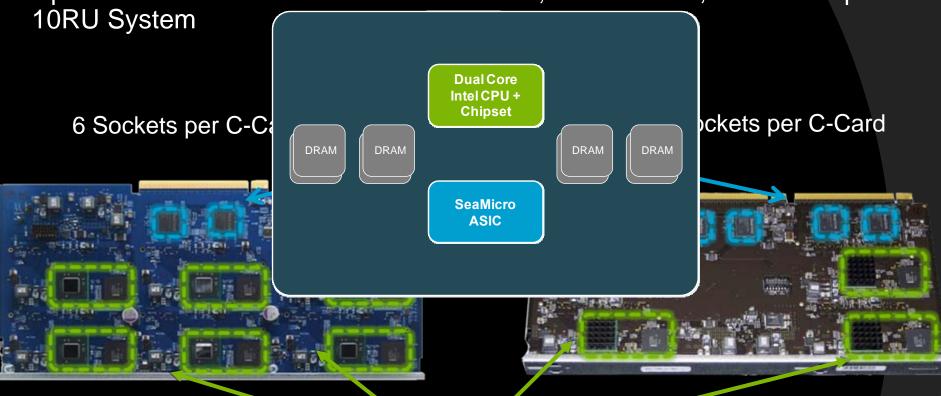
¼ The Weight

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

The Highest Density X86 Servers Ever Made
Up to 6 Dual Core Servers in 5 x 11 Inches; 384 Sockets, 768 Cores per 10RU System

6 Sockets per C-Card

Dual Core
Intel CPU +
Chipset

DRAM DRAM

DRAM DRAM

SeaMicro
ASIC

ckets per C-Card

The SM10000-64HD

The SM10000-64

- 1 x 1GbE NIC per socket
- Up to 64 disks shared 384 sockets

Intel Atom + Chipset

- 2 x 1GbE NIC per socket
- Up to 64 disks shared by 256 sockets

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SM10000 Product Family Overview

SM10000-64HD Specifications

- 384 Dual Core Sockets
  - 768 x 1.6GHz Intel x86 64 bit Cores
- 1.5 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:
  - 3.5 KW under typical workloads

SM10000-64 Specifications

- 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

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Reduces Total Cost of Ownership

- ◉ Consolidated discrete server resources
  - Eliminates top of rack switch
- ◉ Built in out-of-band console access
  - Eliminates terminal server and IPMI networking infrastructure
- ◉ SeaMicro load balancing functionality
  - Extends the life of or eliminates load balancer hardware

Reduces TCO By More Than 80%

Volume Server

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Operational Expense

Space: Op Ex

Power: Op Ex

Networking Cap EX

Volume Server Cap Ex

✓ Lower Operational Expenses

✓ 1/6 The Space

✓ ¼ The Power

✓ Less Networking

✓ Same Purchase Cost

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SeaMicro in Summary

- Easy to adopt and manage
  - Requires no changes to software
  - Requires no changes to management infrastructure
- Produces massive TCO savings
  - Uses ¼ the power for the same compute
  - Takes 1/6 the space for the same compute
  - Simplifies operation and deployment
  - Reduces Cap EX by extending the life of existing facilities
  - Has wide ranging applications

Thank You