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
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
The Internet Changed the Data Center Workload

**Compute Workload in the Data Centers of the Past**
- Few in number
- Large, complex, interrelated
- Easy to schedule; compute resources fully occupied

**THE INTERNET CHANGED EVERYTHING**

**Compute Workload in Today’s Data Center**
- Huge in number (millions of users, ubiquitous access; iPhone, netbooks)
- Are small, simple, independent (mail, search, social networking)
- Bursty traffic; servers often in low utilization/idle
  (Google reports average CPU utilization of 17-20%, Uptime Institute between 5 and 25%)
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 \( \frac{2}{3} \)

CPU Power \( \frac{1}{3} \)

Building a New Architecture

Using an Efficient CPU
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
The SeaMicro SM10000 Replaces An Entire Rack of Traditional Equipment

- 1 System
- 10 Rack Units
- ¼ The Power
- 1/6 The Space
- ¼ The Weight

60 1 RU dual socket quad core servers
64 SATA/SSD Disks
4 Rack Switches
4 Terminal Servers
Basic Load Balancer
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

The SM10000-64HD
- 1 x 1GbE NIC per socket
- Up to 64 disks shared by 384 sockets

The SM10000-64
- 2 x 1GbE NIC per socket
- Up to 64 disks shared by 256 sockets

SeaMicro ASIC
Dual Core Intel CPU + Chipset
SeaMicro ASIC
Intel Atom + Chipset

SeaMicro: Proprietary and Confidential
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:**
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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%

<table>
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<tr>
<th>Volume Server</th>
<th>SeaMicro</th>
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<tbody>
<tr>
<td>Operational Expense</td>
<td>Lower Operational Expenses</td>
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<tr>
<td>Space: Op Ex</td>
<td>1/6 The Space</td>
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<tr>
<td>Power: Op Ex</td>
<td>1/4 The Power</td>
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<tr>
<td>Networking Cap EX</td>
<td>Less Networking</td>
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<tr>
<td>Volume Server Cap Ex</td>
<td>Same Purchase Cost</td>
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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