Adapting to Thrive in a New Economy of Memory Abundance

Processing technology has eclipsed memory technology for the past six decades, but processor-centric architectures are reaching their terminal efficiency. We can reboot computing on the basis of abundant memory enabled by emerging device physics, which will make computation, communication, and memory more efficient. This approach also provides a unique opportunity to address novel security threats with modern, systemic solutions.

Moore’s Law kept up with data creation in the traditional economy

The end of scaling at just the wrong time ...

8B × 20B × 100B × 1T
People Mobile Devices Social Infrastructure Apps
Systems of Record ➔ Systems of Engagement ➔ Systems of Action

Hardware + software stack

Insight
Analytics and Visualization
Exabyte-scale algorithms
Million-mode management
Operating systems and programming models

Data
Efficient hardware

Processor/Centric Computing
Memory/Driven Computing

Performance demonstration – similarity search

From offline to decision time

- Millions of images
- Searches per minute

<table>
<thead>
<tr>
<th>Disk-based</th>
<th>In-memory</th>
<th>Simulated MDC</th>
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<tbody>
<tr>
<td>1200</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>6</td>
<td>0.1</td>
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Performance demonstration – similarity search

Buying speed with persistent memory

- 25 orders more speed
- 10X orders of performance
- 25X more capacity

Graph analytics time machine

Massive memory and fast fabrics to ingest all data

“What are the emerging new behaviors in my network?”

Fast graph databases and the ability to look at large data change over time

What if we could pre-compute an almost infinite set of “what ifs”?

Optimization over a large search space in real time becomes realistic

Machine Learning that can keep up with the now

Training up-to-date deep neural networks in minutes, not weeks

“Tell me the latest news on the severe weather.”

Write code for our Fabric-Attached Memory Emulation for The Machine. The Fabric-Attached Memory Emulation is designed to get you started writing code for the Memory-Driven Computing architecture of The Machine on your laptop, before the hardware is even ready.

https://github.com/FabricAttachedMemory

IEEE Rebooting Computing Responds to White House Nanotechnology Grand Challenge: “Sensible Machines” That are Smaller, Faster, and Lower Power


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