

2018 Stifel Cross Sector Insights Conference Confirms Trends to Data-Centric Systems

Summary

During the 2018 Stifel Cross Sector Insights Conference we heard many presentations and panel discussions that point to the ongoing trend toward data-centric systems and away from compute or CPU centric systems. We viewed privately held network solutions provider, Netronome, presentation as an excellent explanation of how the cost of transistors is now increasing following +50 years of cost declines or the end of Moore's Law. Heterogenous architectures are coming into the data center to accelerate and off-load work from the main CPU. Nvidia's GPU efforts over the past +10 years have clearly paid off. We see a new generation of network processors that may gain similar adoption as data-centric systems. The network processors can accelerate network functions such as encryption, TCP/IP and packet prioritization. We view these data-centric systems as positive for memory suppliers, high performance network providers and high core-count processor providers.

Key Points

At the conclusion of Stifel's first annual Cross Sector Insight Conference, we came away with increased conviction regarding several trends for our coverage universe. Below we highlight our key takeaways from the conference, as well as related announcements during the week.

Data Center Demand is Strong and Architectures are Evolving: We had many discussions regarding end-market data center demand and found unanimous agreement that demand remains quite strong, especially from hyperscale cloud companies, with no indications of deceleration. New workloads including AI, Machine Learning, and more advanced data analytics, combined with the slowing of Moore's Law, are driving new architectures that are increasingly memory-centric and offload compute tasks from the CPU to reduce CPU utilization.

Offloading is Essential to New Workloads: Netronome, a privately held company, highlighted the need for heterogenous computing with a few large cores alongside many small cores. With much smaller application specific cores, systems can use 15 cores at the same performance level as a single large core which drives 15x performance at the same cost. We believe Smart NICs from Netronome and Mellanox (MLNX, Buy, \$85.90) allow flexibility for data center architects as the NICs address all networking tasks, allowing the CPU to fully address the application requirements.

AMD EPYC Processors Well Aligned with Data Center Trends: Increasingly, we see the importance of CPUs to address larger amounts of memory. We believe this is a key advantage of AMD's (AMD, Buy, \$16.34) EPYC processor which can address up to 2TB of memory and 40TB of NVMe storage in the HPE ProLiant DL325 Gen10 server. This single socket server is designed to compete with dual socket alternatives while providing a lower total cost of ownership.

SMART Global Holdings Increases AI Exposure: As AI and Machine Learning are particularly memory intensive workloads, we believe SMART Global Holdings' (SGH, Buy, \$42.05) move to acquire Penguin Computing reflects an opportunity for SMART to more directly address these market with its specialty memory products. We expect this acquisition will give SMART an increased role in the HPC, AI, and Machine Learning markets where we believe products such as Everspin's (MRAM, Buy, \$9.00) nvNitro could be applied.

Semiconductor End Market Growth Remains Diverse: Microchip (MCHP, Buy, \$101.98) continued to point to strong end-market demand with customers concerned primarily with overall system performance, and buying 8-bit, 16-bit, and 32-bit microcontrollers based on specific product needs. Microchip, as well as Everspin, indicated strong demand and long product lifetimes in the automotive and industrial markets. Everspin indicates these markets are driving strong Toggle MRAM demand while the company's STT-MRAM ramps.

Pricing as of 6/15/2018.

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Last week, we hosted a number of companies at Stifel's first annual Cross Sector Insight Conference in Boston. We believe the discussions at the conference emphasized many of the trends we have been highlighting recently. In particular, we maintain our conviction that evolving data center architectures are shifting the focus for improved performance away from the CPU and to other accelerators including GPUs, FPGAs, ASICs and network processors. These new systems have increased access to memory driving demand for DRAM, NAND Flash, and emerging memory technologies such as MRAM, in our view. Additionally, demand for semiconductors, particularly for the automotive and industrial sectors, remains strong. We believe these growing market segments represent increased end-market diversification which is generating stronger industry growth and dampening the semiconductor cycles.

In a presentation, Netronome, a privately held SmartNIC networking solutions provider, described the impact of evolving workloads and the slowing of Moore's Law. The company believes that this drives a greater need for heterogeneous computing combining a few large cores and many small cores. Heterogeneous computing is needed because the computational requirements continue to increase as the cloud scales, and AI and Machine Learning are used to analyze more data. While CPU improvement has slowed though, the cost per transistor has begun to increase. The company stated that in 2002, transistors were ~2.6mn/dollar, which steadily increased to ~20mn/dollar in 2012. However, that decreased to ~19mn/dollar in 2015, and Netronome believes that downward trend has continued. As a result, lower geometry nodes are providing a smaller footprint and lower power requirements, but the cost/unit is increasing, making the efficient use of processor cores essential to economic scaling of solutions.

Netronome believes that networking coprocessors and other coprocessors are an efficient solution to slowing CPU improvement, and sees significant investment in this product development. Management stated that because application specific cores are much smaller in the use of silicon, it can use 15 cores at the same performance level as a single large core, driving 15x more performance at the same cost. Netronome's Smart NICs process network data which removes the need for data to move through the CPU and memory which reduces the load on the general processor. We believe Smart NIC solutions from Netronome and Mellanox are a key factor in evolving data center architectures that are increasing the importance of coprocessors, memory, and efficient interconnects while reducing the importance of the CPU.

We believe that the recent AMD EPYC-based HPE ProLiant DL325 Gen10 server provides an example of the shift to increased memory importance in server architecture. The system has access to up to 2TB of memory and up to 40TB of NVMe storage. As a result, according to HPE, the system delivers more performance than a leading dual-socket competitor at a lower price, resulting in 25% better price performance. For virtualization, HPE stated that the ProLiant DL325 has 27% lower cost per VM than the leading dual-processor competitor which reduces total cost of ownership as the higher memory content allows the single-processor server to address workloads that previously required a dual-processor server.

In a webcast noting the one year anniversary of the EPYC launch, AMD noted that at similar total prices, its single socket enterprise-class solutions provide better performance than dual-socket Intel solutions, and can also provide 20% - 30% total cost of ownership benefit due to power considerations.

With Moore's Law slowing and greater challenges from the limits of physics, AMD pointed to its multi-chip module (MCM) as being the key differentiator to its improved competitive position, and is convinced that MCM is the most effective path forward. Management stated that the 7nm process from their partners, TSMC and GLOBALFOUNDRIES, is comparable, or has a slight advantage, compared to Intel's 10nm process. Given Intel's 10nm delays and AMD's plan to sample its 7nm EPYC2 in the second half of 2018 with production in 2019, they believe this will represent the first time, perhaps ever, that AMD will compete with manufacturing parity.

While not attending the Stifel Cross Sector Insight Conference, we believe SMART Global Holding's acquisition of Penguin Computing which was announced on June 11, reflects the demand for specialized server solutions for AI, Machine Learning, and unique workloads. We view Penguin's strategy of designing specialized server solutions as being complementary to SMART's specialized memory solutions that address areas of need that don't make sense for larger suppliers. We believe that SMART's integration of Penguin could provide opportunities for the company to include its specialized memory products in Penguin's server solutions, including nvNitro, the MRAM-based accelerator that SMART sells through its partnership with Everspin.

Also addressing higher data center system requirements, Mellanox noted a strong demand for higher performance interconnects and remains confident the company can maintain its leadership position in 25G+ Ethernet adapters. Management upgraded their expectations for their Ethernet NIC business to grow at "25% ++" compared to the previous expectations of "25% +" in 2018 compared to 2017. Additionally management expects InfiniBand to grow in the high single digits or even double digits in 2019 with additional storage design wins in addition to HPC and AI. Mellanox' Bluefield processor provides the multi-core small CPU and network interface on one device. We see this as another example of new processors coming into data center architectures that off-load the main CPU workloads.

In our view, Microchip's presentation provided further evidence that the company has executed a soft landing from the extended lead times it saw last year. We expect Microchip's lead times and book to bill ratio will be within a normal range for its June-ending quarter. Additionally, the company addressed investors' concerns about the company's microcontroller portfolio. Microchip is increasing its market share for 16-bit and 32-bit microcontrollers, but expects continued growth, albeit at a slower rate, from 8-bit microcontrollers, where the company has the leading market share. While some investors are concerned about Microchip's limited ARM portfolio, which it acquired through Atmel, the company doesn't see this concern from its customers. According to the company, its customers realize the products work well, and are more concerned with features and platform support than the underlying architecture.

Both Microchip and Everspin indicated strong product demand from the automotive and industrial end markets, and noted that these markets provide sticky designs, that can generate revenue over several years. We view this as a sign of strong end market diversity for Microchip, and a steady source of revenue for Everspin. Everspin addresses these markets through its Toggle MRAM products, which continue to grow at a steady rate while the company ramps its STT-MRAM products. Management noted that STT-MRAM remains on track with its 256Mb product in mass production while the 1Gb product is expected to be in mass production in 2019.

Also presenting during the conference, CEVA, which focuses on DSP IP licensing, noted progress in the 5G infrastructure buildout, noting it had licensed its technology to three of the top five 5G base station vendors. CEVA noted that of its lead customers, ZTE is currently in production while Nokia expects to go into production in the second half of 2018. We expect continued industry urgency in transitioning to 5G as it will be used to enable more IoT devices including AI at the edge and next generation mobile handsets.

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Advanced Micro Devices, Inc. (AMD) as of June 15, 2018 (in USD)

09/27/2016 6.54 H:6.80	01/31/2017 10.37 H:8.00	05/01/2017 13.62 H:11.00	07/26/2017 14.76 H:13.00	04/04/2018 9.77 B:13.00	04/26/2018 11.04 B:14.00	05/31/2018 13.73 B:17.00
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*Represents the value(s) that changed.
 Buy=B; Hold=H; Sell=S; Discontinued=D; Suspended=SU; Discontinued=D; Initiation=I

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Microchip Technology Inc. (MCHP) as of June 15, 2018 (in USD)

08/04/2015 42.79 B:53.00	02/03/2016 42.32 B:54.00	05/04/2016 48.42 B:60.00	08/08/2016 56.63 B:64.00	11/07/2016 62.23 B:68.00	11/29/2016 66.03 B:70.00	02/07/2017 69.62 B:77.00	04/06/2017 73.52 B:83.00	05/09/2017 76.45 B:88.00	06/05/2017 84.51 B:89.00	06/06/2017 85.19 B:91.00	08/03/2017 80.68 B:94.00
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11/06/2017 95.36 B:100.00	03/06/2018 96.57 B:112.00	05/08/2018 90.65 B:116.00
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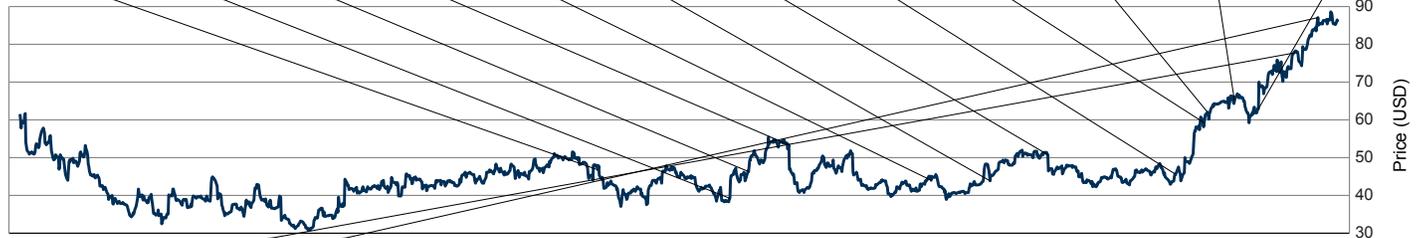
*Represents the value(s) that changed.
 Buy=B; Hold=H; Sell=S; Discontinued=D; Suspended=SU; Discontinued=D; Initiation=I

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Mellanox Technologies, Ltd. (MLNX) as of June 15, 2018 (in USD)

07/22/2015 46.98 B:75.00	01/27/2016 39.38 B:80.00	02/23/2016 46.40 B:84.00	04/20/2016 53.54 B:85.00	11/10/2016 44.15 B:72.00	02/02/2017 43.95 B:58.00	04/26/2017 50.90 B:56.00	10/25/2017 45.80 B:53.00	12/06/2017 59.35 B:70.00	12/11/2017 62.05 B:74.00	01/18/2018 65.10 B:80.00	02/21/2018 62.95 B:94.00
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04/17/2018 77.80 B:100.00	05/17/2018 87.05 B:111.00
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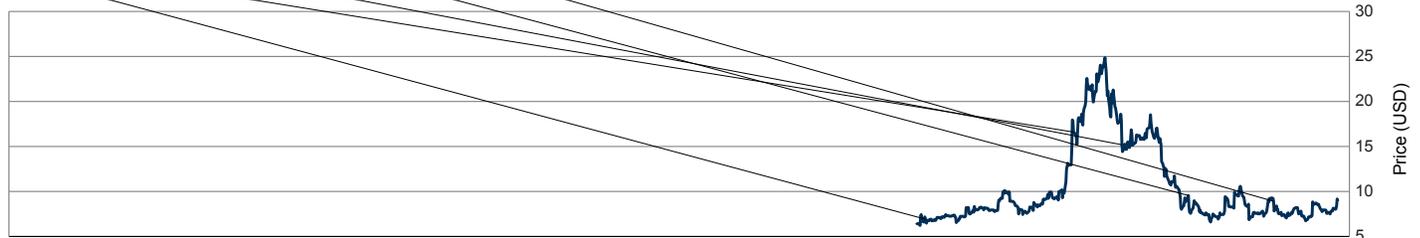
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Everspin Technologies, Inc. (MRAM) as of June 15, 2018 (in USD)

11/02/2016 6.98 I:B:11.00	06/02/2017 16.64 B:19.00	08/10/2017 15.23 B:18.00	11/13/2017 9.62 B:15.00	03/15/2018 9.01 B:13.00
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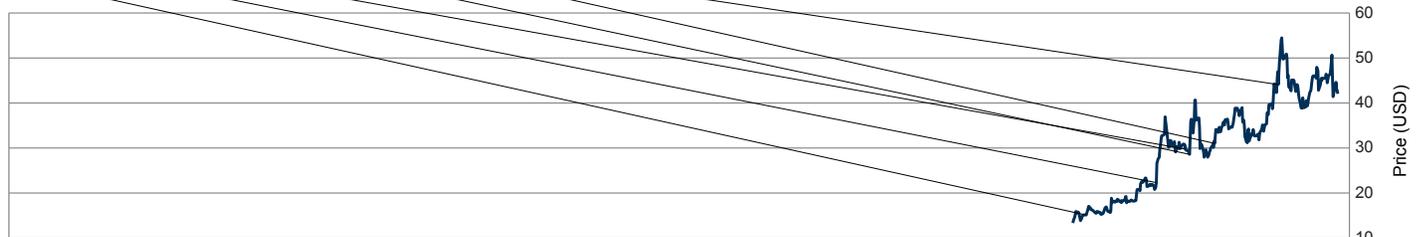
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SMART Global Holdings, Inc. (SGH) as of June 15, 2018 (in USD)

06/19/2017 15.30 I:B:27.00	09/28/2017 22.50 B:32.00	11/09/2017 29.82 B:35.00	11/15/2017 28.70 B:40.00	12/21/2017 31.11 B:47.00	03/22/2018 44.07 B:56.00
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*Represents the value(s) that changed.
 Buy=B; Hold=H; Sell=S; Discontinued=D; Suspended=SU; Discontinued=D; Initiation=I

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