



Broadcom Trident 4 Delivers Disruptive Economics for Enterprise Data Center and Campus Networks

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First-to-ship 7nm compiler-programmable switch provides up to 12.8 terabits per second of bandwidth

SAN JOSE, Calif., June 11, 2019 (GLOBE NEWSWIRE) -- Broadcom Inc. (NASDAQ: AVGO) today announced sampling of its StrataXGS® Trident 4 BCM56880 switch series, delivering the industry's highest Ethernet switching performance combined with compiler-programmable packet processing and telemetry. Offering bandwidths of 2.0 to 12.8 terabits per second (Tb/s), the Trident 4 brings dramatic cost and power savings and new levels of network availability and runtime flexibility throughout the enterprise network infrastructure.

Enterprises have traditionally operated in a closed ecosystem, burdened with high network hardware and software costs and high power usage due to complex multi-chip switch ASIC solutions. In contrast, operators of many large data centers work in an open ecosystem using merchant silicon solutions to lower system cost and power consumption. With the introduction of Trident 4, Broadcom is leveling the playing field by enabling enterprises to utilize merchant silicon-based systems throughout their networks, from campus access and aggregation to data center top-of-rack and spine.

A key feature of Trident 4 that enables these benefits is the ability to scale from 2.0 to 12.8 Tb/s on monolithic 7nm, fully programmable silicon implementations with full enterprise-class functionality. No switch silicon has previously provided this combination of bandwidth levels, flexibility, and robust concurrent functionality. The high bandwidth of 12.8 Tb/s allows collapsing of multi-chip systems into a single chip, greatly reducing cost, power, and the complexity of system software while also improving system reliability. The groundbreaking, compiler-programmable architecture provides flexibility in both packet forwarding and telemetry, future-proofing networks, providing superior visibility, and accelerating innovation. Unique to Trident 4, this programmability is provided while maintaining a high degree of feature concurrency. This allows the same architecture with the same network operating system (NOS) and hardware programming to be used throughout the network, dramatically improving operational consistency.

Systems utilizing Trident 4 will have a rapid path to market since the device is pin-compatible with Tomahawk® 3. This enables the reuse of existing high-volume hardware systems. Further, Trident 4 offers easy software migration from previous Tomahawk and Trident systems by providing the option for two sets of software interfaces: the widely-deployed SDK6 APIs and also the logical table-based APIs offered with SDKLT.

In addition, Trident 4 offers a new unique benefit for enterprise networks: runtime programmability. While compile-time programmability allows high-level protocols, forwarding behavior, and telemetry frameworks to be defined when the system is first booted, runtime programmability allows numerous functions to be updated while the switch is in operation, with no down time, and no dropped packets. For example, access control policy tables, size and type of telemetry metadata, packet trace, and packet drop can all be modified with no disturbance to packet flow. The result is a dramatic reduction in operational complexity, higher network flexibility, and higher network availability.

Trident 4 Highlights

- Single scalable switch architecture from 12.8 Tb/s to 2 Tb/s
- Comprehensive, concurrent feature set
- Compiler-programmable packet processing
- Flexibility to implement advanced network functionality such as DDoS protection, application load balancing, and large-scale NAT
- Advanced instrumentation including programmable in-band and streaming telemetry
- Industry-leading packet buffer and database sizes
- 7nm monolithic implementation

"Trident 4 is delivering a 4x increase in bandwidth versus its predecessor Trident 3 in less than two years," said Ram Velaga, senior vice president and general manager of the Switch Products Division at Broadcom. "Consistent, industry-leading innovation and execution by Broadcom is disrupting the economics of how networks are built today. We are thankful for our engineering team and strong partner ecosystem for helping bring these products and solutions to the market at a price/performance that is a fraction of the current systems."

Availability

Broadcom is now shipping the Trident 4 BCM56880 devices to qualified customers.

Further information on the BCM56880 and related software can be found online at:

<https://www.broadcom.com/products/ethernet-connectivity/switching/strataxgs/bcm56880-series>

NPL Programmability

Trident 4 is programmed using the NPL high-level language. For more information on NPL, please visit <http://nplang.org/>.

Industry Quotes

Mike Satterlee, Vice-President of Engineering, AT&T Labs:

"AT&T is committed to white box solutions that disaggregate hardware and software, and take advantage of merchant silicon packet processing technology. These white box platforms efficiently meet the growing network requirements of our diverse enterprise customers. Trident 4's rich,

concurrent functionality aligns with our vision of delivering efficient enterprise and cloud capabilities through an open ecosystem, which enables AT&T's engineering team to build a highly-resilient and flexible global network."

Liu Ning, Director of System Department, Baidu:

"Baidu has deployed several generations of the Trident product family. With each generation of new silicon, Broadcom has successfully integrated more features for cloud applications and enterprise customers. By building a bridge between cloud and enterprise, Broadcom has enabled a world-class Ethernet switch ecosystem for Baidu to choose from."

Ravi Amanaganti, Vice President and General Manager, IBM Cloud:

"Broadcom's latest addition to the Trident family, Trident 4, is a perfect fit for our current infrastructure that is already utilizing the Trident product family. Trident 4 offers an impressive combination of scale, programmability, and telemetry features. The rich feature-set, along with the flexible architecture, enables IBM to provide differentiated platforms to serve our enterprise data center customers."

Yuval Bachar, Principal Engineer, Global Infrastructure Architecture & Strategy, LinkedIn Corporation:

"At LinkedIn, we have successfully deployed several generations of Broadcom's cutting-edge Ethernet switching technology. Trident 4's capacity, programmability, and flexible architecture will enable a broad high touch, deeper buffers, and lookup capabilities ecosystem. This broader ecosystem will offer more choices for LinkedIn, as we continue to build-out our next generation of infrastructure with 12.8T switches as a baseline building block."

Wade Shao, Director, Network Architecture Center, Tencent:

"Trident 4 is the perfect solution for applications such as load balancing, security, and NAT. Tencent is pleased to see the rich portfolio of telemetry features and NPL programmability, and we are planning to take full advantage of the new functionalities integrated in Trident 4."

John McCool, Chief Platform Officer, Senior Vice President of Engineering and Operations, Arista Networks:

"The Arista 7050X and 7300X Series running EOS® provide a broad range of solutions for Enterprises and virtualized datacenter environments, powered by multiple generations of the Broadcom Trident architecture. Trident 4 delivers runtime programmability for comprehensive telemetry packaged in a range of performance options from 2.0T to 12.8T that provide compelling options for networks of all sizes to reap the benefits of merchant-silicon based solutions from the wiring closet to the campus core and beyond, with reduced complexity compared to legacy solutions."

Tom Burns, SVP & GM, Dell EMC Networking & Solutions:

"Dell EMC has brought its best-in-class Open Networking solutions to the market working together with Broadcom on every generation of its switch silicon from Trident to Tomahawk. We share the vision of a scale-out, converged, highly automated networking infrastructure that has now taken a new level of reality with the launch of programmable Trident 4 switch silicon. Trident 4 gives us an ability to deploy a unified solution from Enterprise access to ToR to spine - scaling from 2Tbps to 12.8Tbps on the same programmable architecture."

Brendan Gibbs, Vice President of Service Provider Product Management, Juniper Networks:

"We are excited to offer Broadcom's Trident 4 in Juniper Networks' switching product line to provide higher-density and higher-performance systems for data center and campus networks. We look forward to enabling the new Trident 4 compiler-programmable packet processing and programmable instrumentation with industry-leading Junos OS to deliver flexible, yet simple-to-operate solutions at scale, for our service provider and enterprise customers."

Liu Zhongdong, President and CEO, Ruijie Networks:

"Ruijie is dedicated to providing a broad portfolio of advanced networking equipment to our Enterprise customers. Broadcom's Trident 4, being the first 7nm switch silicon and having tremendous flexibility in packet processing and instrumentation, will help Ruijie continue its leadership position. The fact that Trident 4 can support a large set of Enterprise features concurrently with large, fungible databases means that Ruijie can provide customers with switches and routers that can be used throughout their networks."

Devesh Garg, CEO, Arccus, Inc.:

"The large databases and feature concurrency offered by Trident 4 are an ideal fit for ArcOS®, our industry-leading, microservices-based networking software solution powering next-gen infrastructure. ArcOS has been future-proofed with many architectural advancements to take advantage of the 4x bandwidth scalability and compiler-programmable pipeline in Trident 4 to enhance our customers' overall experience across a wide-range of networking deployments."

Partho Mishra, VP of Product and Engineering, Cumulus Networks:

"Trident 4's comprehensive and concurrent feature set and bandwidth scalability continue to extend Cumulus' reach into the enterprise market segment. The advanced programmable streaming and in-band telemetry features will enable us to provide our customers with more advanced automation and instrumentation tools that are integrated into NetQ, our highly scalable modern network operations toolset. We've worked closely with Broadcom for several years and are looking forward to this latest version of Trident as we continue to collaborate on providing open networking solutions to enable organizations to modernize their data centers."

Allen Cheng, GM of LAN/MAN Business Unit, Alpha Networks:

"Alpha is thrilled to work closely with Broadcom on Trident4 – the industry's first 7nm Ethernet switch silicon! Alpha is excited to work on industry leading technology that Broadcom's Trident4 brings, encompassing cutting edge SerDes, programmability and switching bandwidth. Alpha is committed to quickly bring to market Trident4 whitebox and OEM platforms to drive next generation Enterprise & Campus Data Center networks."

CC Lee, President, Accton Technology Corporation:

"We are excited to see the industry's first 7nm Ethernet switch silicon. Trident 4's pin-compatibility with Tomahawk 3 will allow Accton to quickly bring multiple systems to market. Trident 4's bandwidth scalability and rich feature set enables Accton to deliver a broad portfolio of solutions spanning from Enterprise data center to campus."

Steven Dorwart, Vice President, Service Provider Solutions, Celestica:

"Celestica has always been proud to work with market leaders like Broadcom to enable the latest technology for the networking industry and our customers. The power and cost-per-gigabit savings the Trident 4 family delivers will usher in a new era of networking that allows network operators unparalleled network visibility and telemetry. Celestica looks forward to leveraging Trident 4 to bring market-leading networking solutions to market."

Jeff Chen, General Manager, Delta Networks Infrastructure, Delta Electronics Inc.:

"As Broadcom's premier networking ODM provider, Delta is focused on delivering on the numerous benefits of the new Trident4 family of switches. The new Trident4 architecture enables Delta to build a healthy, vibrant ecosystem of programmable whitebox platforms spanning from single digit multi-Terabit solutions up to 12.8T to the market. It is a privilege for Delta to continue our close partnership with Broadcom switching team and continue mutual success in the networking industry."

Jack Tsai, President of Enterprise Business Group, Inventec:

"Inventec continues to work with leading Data Center technology providers and we recognize Broadcom's continued leadership in driving the ever increasing demands of Network bandwidth and flexibility in Enterprise and Campus Data Centers. Inventec is excited to bring Broadcom Trident4 based Ethernet switch platforms to market and continue the rich Ethernet switching portfolio and ecosystem that Broadcom XGS switching technology enables."

Mike Yang, Senior Vice-President, Quanta Computer Inc. and President, Quanta Cloud Technology:

"Quanta is very pleased to add Trident 4 to our existing ethernet switch product portfolio. Trident 4's programmability, concurrent feature set, and flexible architecture enables Quanta to provide a diverse selection of platforms for enterprise data customers and campus customers."

About Broadcom

Broadcom Inc. (NASDAQ: AVGO) is a global technology leader that designs, develops and supplies a broad range of semiconductor and infrastructure software solutions. Broadcom's category-leading product portfolio serves critical markets including data center, networking, enterprise software, broadband, wireless, storage and industrial. Our solutions include data center networking and storage, enterprise and mainframe software focused on automation, monitoring and security, smartphone components, telecoms and factory automation. For more information, go to www.broadcom.com.

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