REPORT REPRINT

Arista goes Barefoot, taking steps toward a programmable network

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26 JUNE 2018

The company's latest switches use chips from Barefoot Networks, a startup hoping to challenge Broadcom in the white-box networking market. Arista is using Barefoot's Tofino chip to create templated switches: systems that are preprogrammed for jobs such as network address translation. It's an intriguing win for Barefoot, which itself is an intriguing startup.

451 Research®

Arista has begun shipping the 7170 line of switches, which are based on Barefoot Networks' Tofino chips. The chips, competitors to Broadcom's Trident and Tomahawk products, are programmable, providing a flexibility that Ethernet switches haven't previously had. Arista is applying this programmability to create 'profiles' – variations of the 7170 that can handle specific functions – with the twist that profiles can be swapped out via simple software uploads.

Arista's goal is scalability. As networks grow, entire routers can be installed for purposes such as DDoS detection or network address translation. Arista says the 7170 can handle those situations while still performing its duties as a switch, essentially removing a box from the network. Barefoot has a more ambitious story about the future of SDN, but Arista's plans so far are more surgical: It's using Barefoot's programmability to create niche switches, admitting that these will be premium products.

THE 451 TAKE

Barefoot has big ambitions about the next wave of SDN, but that's not what this is about. Arista is taking advantage of Barefoot's programmability to create what's essentially a line of niche switches all based on the same hardware – the trick being that the 7170 can change roles via software uploads. It's about scaling the network, and that's particularly important to Arista because the company would like to keep its foothold with hyperscale customers (particularly Microsoft Azure) and needs to keep its switches elevated above commodity white-box alternatives. The deal is nonetheless noteworthy for Barefoot. Chinese giants Alibaba, Baidu and Tencent have said they will build switches using Barefoot's chips, but Arista provides a less opaque customer reference. And Arista, which has long been dependent on Broadcom's switch chips, is showing it's eager to explore alternatives – first from Cavium (which powers Arista's 7160 line) and now from Barefoot.

CONTEXT: ARISTA

Arista has depended on the merchant market for its switching chips, buying mostly from Broadcom. This is not unusual because Broadcom's Trident and Tomahawk product lines enjoy a market share that exceeded 90% in recent years, according to The Linley Group.

It's therefore not surprising that Arista is working with Broadcom's competitors. No one enjoys being dependent on one vendor – but beyond that, the newer chips offer variations on the idea of programming a switch or a network. Arista's first step in this direction came late in 2016 with the 7160 family, based on the XPliant chip from Cavium.

CONTEXT: BAREFOOT

Barefoot Networks is trying to initiate SDN's second act by making Ethernet switches more programmable at the hardware level. The chip startup was founded in 2013 by Nick McKeown, the Stanford professor who helped kick off the current SDN movement. McKeown was also a founder of Nicira Networks, which is now the basis of VMware's NSX product.

McKeown feels this first round of SDN didn't go far enough, because the Ethernet chips available – Broadcom's, specifically – don't offer enough freedom to be truly programmable. Barefoot's answer is the Tofino chip, which competes with Broadcom's high-end Tomahawk line and is programmed using a new open source language called P4. Tofino began shipping in volume in November 2017.

Barefoot has raised more than $150m. Its latest funding was an $80m series C round that included Alibaba and Tencent. Those two companies and Baidu have announced plans to deploy Tofino-based switches – and Arista has now begun shipping Tofino-based switches as well. Barefoot is one of a handful of chip companies challenging Broadcom in networking – Cavium, Centec, Innovium and Mellanox are a few others – but Broadcom remains the dominant player by far.

TECHNOLOGY

The 7170 is shipping in a 2RU form factor, supporting 64 100Gbps ports. (In terms of the number of ports supported, the Tofino chip is on par with Broadcom's Tomahawk 2.) A half-sized 7170, with 32 ports of 100Gbps, is due to ship in the third quarter of 2018.

The 7170 takes advantage of the P4 language, which lets users program a switch by changing the rules for forwarding packets. But Arista stresses that the 7170 uses the EOS operating system, the same software found in the rest of the company's portfolio. The P4 language is used to describe the pipeline – the series of steps involved in processing a packet – which EOS then executes.

STRATEGY

Using the programmability of Tofino, Arista plans to offer preconfigured 'profiles' of the 7170. For example, the box could be set up to run DDoS screening or network address translation (NAT) in-line while still acting as a leaf or spine switch, avoiding the need to add another appliance (such as a specially configured router) to the network. Another possibility is to program the switch to perform deep packet inspection and report statistics about the traffic it sees.

These profiles are simply software patches, so any given 7170 could be flipped from one profile to another via software upgrades. Arista says this code-switching takes less than 100 milliseconds. This could add flexibility to a network without adding a lot of complexity because switches could be assigned new specialties on the fly. For sophisticated customers using lots of profiles, there could be ancillary benefits in terms of inventory and sparing.

Arista will offer preconfigured profiles, which will be written by the company and vetted to make sure they don't interfere with EOS. Customers will be welcome to write their own profiles, but Arista expects these cases to be in the minority.

The 7170 is a premium product because it costs more and consumes more power than Arista's other systems. (At $1,200 per 100Gbps port, the 7170 sells for roughly 20% more than a switch based on Broadcom's Trident.) It is therefore is not meant to displace either of those designs. Neither does it displace Arista's R-series, which targets internet-scale routing and requires deep memory buffers that Barefoot's chips lack.

CUSTOMERS

Arista says the 7170 has customers in the 'high single digits,' primarily cloud providers. The company isn't naming names, but we'll point out that Microsoft Azure is one of Arista's oldest customers and still represents a good chunk of the vendor's revenue (16% in calendar 2017). Arista also hopes to market the 7170 to service providers and to the financial services vertical.

COMPETITION

Cisco and Juniper remain Arista's top competition, and both have ideas about adding intelligence to the network. Cisco's Network Intuitive program (aka intent-based networking) aims to automate network configuration but so far applies to a fraction of the portfolio. Juniper is likewise pursuing intent-based networking and, after hiring Bikash Koley from Google to be CTO, has declared a mission to simplify the network.

Cisco and Juniper still favor in-house ASICs for their switches and routers, but that stance is softening, with both companies now using Broadcom chips in some products. Barefoot had a display at the recent Cisco Live conference, emphasizing Tofino's ability to deliver real-time telemetry. In March, Cisco added a P4 runtime to IOS-XR, the operating system in its service-provider routers. Juniper, meanwhile, supports P4 across its entire portfolio, letting customers use an API to program the switching ASICs.

In a separate direction, Netronome has been applying P4 to the network interface cards (SmartNICs) that attach to servers. This provides network programmability in a disaggregated environment where servers are doing the networking themselves, without switches or routers present.

SWOT ANALYSIS

STRENGTHS

Arista's technological reputation is solid, and it has proven that merchant silicon can power a competitive, high-end switch.

WEAKNESSES

Arista's approach is well suited for engineers, but Cisco holds the upper hand in marketing. For the mainstream enterprise market, this matters. Expect Cisco's Network Intuitive to dominate the conversation around programmability and intent-based networking.

OPPORTUNITIES

Chip startups beyond Barefoot are eager to challenge Broadcom and infuse programmability into the network. Arista, having grown up on the merchant silicon model, is in good position to try as many new ideas as it can stand.

THREATS

Cisco and Juniper have woken up to network programmability, open source software and even white-box switching. Separately, the white-box model has the potential to skim top-line revenue from all the traditional switch/router vendors, including Arista.