10G vRouter Primed for NFV

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When I first started learning about network function virtualization (NFV) and software defined networks (SDNs), I assumed that there was an inherent limitation in servers that would restrict the types and location of NFV. Needless to say, then, that I've been surprised by results achieved by the Vyatta group of Brocade. Maybe I was naïve, but what they achieved blows my mind—as we used to say in the '60s.

The essence of this CRS is to explore how Vyatta and its vRouter product line provide a proof point for the role of servers in NFV, delivering amazing capacity and function with multicore general-purpose processors. In fact, the Vyatta vRouter can perform at "line rate" of a 10GE interface because it cleverly split its router code between the control plane and data plane functions, and places them in different cores of the Intel processor. The splitting of control plane from data plane was a key element that increased the throughput of the Vyatta vRouter from 1G to 10G, according to their tests.

THE CHALLENGES OF NFV

For a long time now, I've discounted general-purpose servers, thinking that they were not capable of performing any heavy duty network functions, and that they should be relegated to places in the network that are closer to broadband consumers—where latency and some delay wouldn't matter much. I also thought it would be difficult to use servers and NFV where VPNs for important corporate customers are concerned, or where quality of service (QoS) is vital—such as 1) the evolved packet core (EPC) for mobile subscriber management, and 2) broadband remote access server (BRAS)/broadband network gateway (BNG) environments, which are used to authorize users and ensure they receive the right services. Bottom line, I knew servers were getting more powerful, but I really didn't think their throughput would be powerful enough to handle network functions for traffic at 10G line rate.

Consider some of the network functions that are being moved from specialized hardware appliances to software for NFV: Ethernet switching (for directing traffic among VMs within a physical server, which might include service chaining), mobile packet core nodes, content delivery networking, tunneling gateway elements, traffic analysis, service assurance, signaling, application optimization, and security functions. If you put these network functions on Intel x86-based servers, there are legitimate concerns about speed and latency. In addition, the location where the virtualized functions are placed in the network could introduce latency or slow the network flows—and the software network function (compared to the hardware version) could itself introduce latency that would impact the flow of traffic.

VYATTA—PROVING MY INITIAL ASSUMPTIONS WRONG

But after speaking with Vyatta, it appears my initial assumptions about using servers for NFV have been proven wrong. Vyatta, which was acquired by Brocade about a year ago, has several prominent customers—including Amazon AWS—that are using the vRouter to do real network functions. Initially, I thought that scale was going to be an issue for servers, and Vyatta's early 5400 vRouter seemed to prove my point since it could only handle a Gig E flow at line rate. But then Vyatta introduced the 5600 vRouter, which takes advantage of Intel multi-core processors to achieve 10x performance.

The Vyatta 5600 vRouter can be installed on any standard x86 server and is not a full edge router, but does have a number of functions such as dynamic routing, policy-based routing, stateful firewall, VPN support, and traffic management. Vyatta divided the software to make parallel use the multicore processors—re-architecting the software so the control plane runs on 1 core, while multiple instances of the data plane could run on the other cores. Using a quad-core processor, 3 instances of line traffic can run on 3 cores with 1 core dedicated to the control plane—and in this way, the 5600 can run 10G of traffic through a single processor. Vyatta used a number of newly added built-in functions available with the Intel processor.

NFV: ONLY FOR THE NETWORK EDGE?

Most operators believe that NFV is most appropriate at the edge of the network, where customers are being served. They are hesitant to leverage NFV for routers at aggregation locations where there are higher traffic volumes, because they believe that edge routers and core routers can quickly respond to network problems. But these operators also see the benefit of using NFV for BRAS/BNG fixed subscriber management, as well as mobile packet core functions for 3G and EPC for LTE. Operators say basic router functions must stay on a router, but the ancillary functions that have been added to routers over the years are fair game to move to NFV servers. So, routers in the future will become less complex in the way they are configured—skip the BRAS and firewall functions.

So, where should operators put virtualized network functions? There are a few choices, including on x86 servers next to network equipment, at a nearby mini data center, or even a remote major data center, or on x86 processors embedded in network equipment.

If latency matters, it makes the most sense to put the NFV functionality on processors embedded in network equipment, or in a server farm located in the same room as the routers or, for example, the mobile packet core equipment. If the function isn't latency sensitive, or the traffic is not aggregated, or the customer experience isn't as critical, it could easily reside in a remote data center.

BOTTOM LINE

Can virtual routers run on general-purpose processors at any speeds, and deliver performance that is comparable to a hardware router? Well, if you consider the accomplishments of the Vyatta vRouter (with a limited number of the functions usually found on routers), the answer is clearly yes.

The success of NFV depends on ensuring that operators can leverage its benefits anywhere within the network, whether it's at the edge or deeper in the network at traffic aggregation points. The fact that Vyatta's multicore approach is enabling the virtual router to perform at a line rate of a 10GE interface tells me that NFV can be used effectively in more locations in a carrier network than I first thought. This performance delivered by virtual routers and flexibility to leverage them in various parts of a carrier's network will be extremely beneficial as networks scale.

As always I welcome your feedback.

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