SOLUTION BRIEF

Communications Service Providers
Broadband Network Gateway

Microservices Boost Performance of vBroadband Network Gateways

Traditionally, broadband network gateways (BNG) have been very hard to virtualize without using white box switches to meet data plane performance requirements. Now, Mettle Networks'* NFV BNG can deliver to performance needs using Intel® Xeon® processor-powered servers for both data plane and control plane.

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Introduction

Broadband network gateways (BNGs) are a critical element in telecom networks, terminating an access connection and applying security and connectivity services to that data before forwarding the packets to the communication service provider's (CommSP) backbone network. This functionality requires significant processing power in order to maintain wire-speed data throughput, which has been hard to do in virtualized BNGs. To overcome these challenges, Mettle Networks,* an Intel® Network Builders ecosystem partner, has created a pure, cloud native BNG that delivers the requisite performance.[1]

Performance Challenges of Virtualized BNGs

Service providers are utilizing network functions virtualization (NFV) to cost-effectively meet the need to update and scale networks for growing data traffic created through increased use of cloud services, increased internet video watching, more powerful mobile computing devices, and other factors. NFV reduces the cost of networking by replacing specialized fixed-configuration systems with virtual network functions (VNFs) running on Intel® Xeon® processor-powered general-purpose servers.

Many network systems have been readily adapted to virtualization, including routers, customer premises devices, load balancers, virtual private networks, and others. However, virtualizing a BNG has proven difficult, with first-generation systems unable to achieve key throughput and connectivity metrics. Some second-generation systems have met the metrics that CommSPs require, but only with a hybrid solution that augments a virtualized server with white box Ethernet switches to boost data throughput. This adds cost and complexity to the solution.

Mettle Networks has created a second-generation virtualized BNG that can provide the data plane performance needed in today's networks utilizing only a virtualized server.[1] To achieve high packet throughput performance, Mettle Networks uses a runtime tracing compiler that dynamically optimizes hot executable traces for faster performance. Additionally, the network device driver itself runs in user space on dedicated CPU cores, which helps to achieve more deterministic performance. Mettle Networks' NFV BNG uses this approach as well as the performance of Intel Xeon processors to achieve 2 mpps of packet throughput in tests of a single BNG instance running on a single core.[1]

Mettle Networks' High Performance NFV BNG Architecture

Mettle's NFV BNG is designed as a true cloud-native NFV system with both control plane and data plane running on a virtualized server. The system follows the reference model developed by Open CORD* for Central Office Re-architected as a Datacenter (CORD) implementations.

Mettle's version of the reference model includes a virtual router (vRouter) with a data plane that uses a runtime tracing compiler and a network driver that runs on user space for very fast performance. This allows development of network functions in user space, bypassing the OS kernel for very high performance.

Mettle Networks' NFV BNG has a container-based, microservices architecture that is designed for automated operation, scale-out and scale-in, and self-healing that ensures that the customer experience is not affected in case of an unexpected microservice failure or performance degradation.

Mettle's NFV BNG is a cloud-native implementation of a BNG function chain. Microservices are containerized with Docker* and orchestration of VNF components is done with Open Baton.*

Automated, unmanned operation has been a major design objective of Mettle's NFV BNG. The system co-operates with the auto-scale engine of Open Baton to scale-out and scale-in, responding to network loads in real time. Thus, it maintains high subscriber experience and service quality. It scales in when network load recedes and frees up resources without any manual intervention.

The self-healing features that are built into the NFV BNG offload traffic from a deteriorated microservice and migrate the traffic over to a less loaded one or spin up a new instance if needed. The Intel Xeon processor-based servers in the cloud and the VNFs are deployed with no single-point-of-failure to achieve the required high availability.

Support for each of the BNG services and access protocols such as PPPoE, IPoE and QinQ, traffic shaping, policy enforcement capabilities, and AAA functions are implemented as microservices. Each of these virtual functions is implemented in a service function chain that provides flexibility and scalability.

Mettle's NFV BNG utilizes OpenFlow* as a software defined networking (SDN) controller to steer traffic through the microservices. The centralized controller's global view of the network allows it to steer traffic around congestion or non-performing microservices for fault resilience.

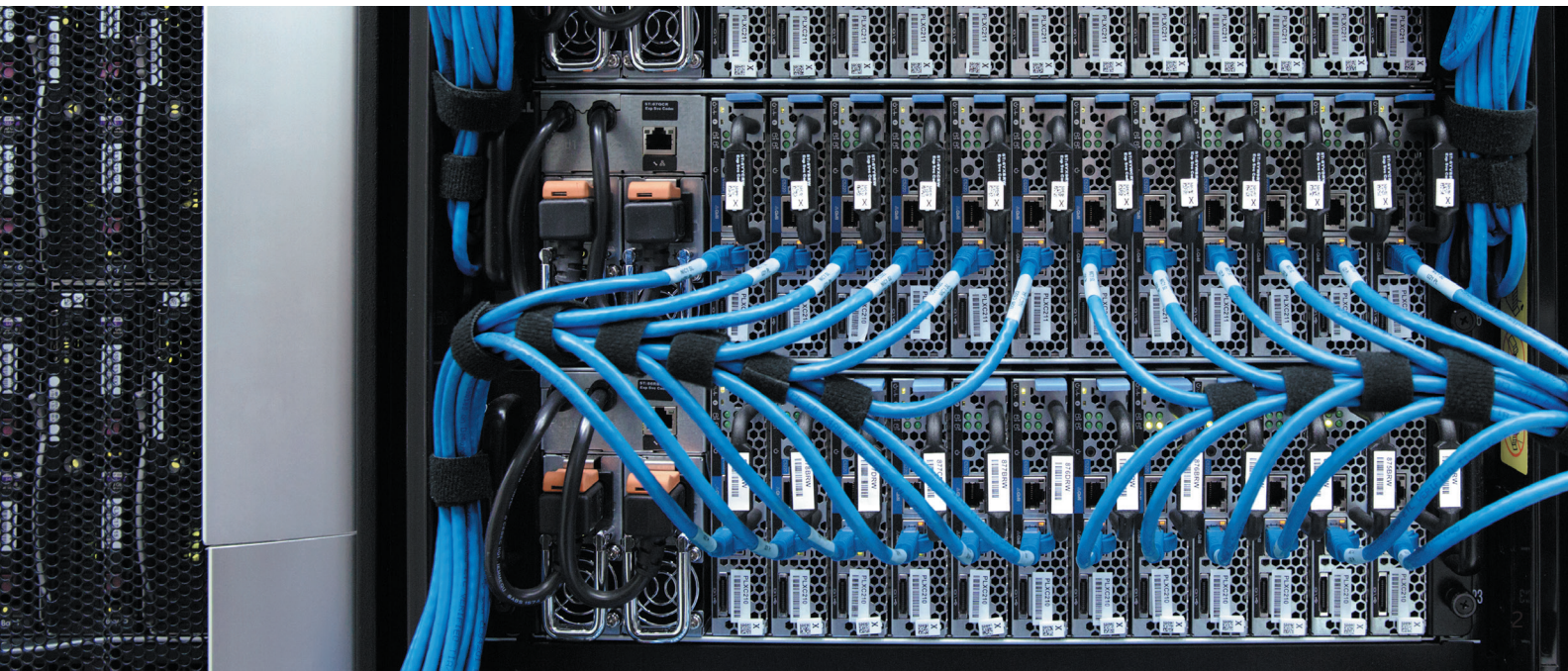
Managing the life cycle of each of the microservices is important, and the Mettle NFV BNG leverages Open Baton for its management and orchestration (MANO) functionality. With Open Baton, services can be launched, moved, expanded, or minimized depending on customer demand. At end of life, the service can also be shut down remotely.

Another critical technology for BNG performance is single root input/output virtualization (SR-IOV), a PCI Special Interest Group* specification. SR-IOV allows direct connection between a PCI Express (PCIe)* resource, most notably network interface cards, and a processor core over a virtualized infrastructure. With SR-IOV in the BNG, traffic can be directed to a specific microservice for processing.

Optimized for Intel® Xeon® Processor-based Servers

The Mettle vBNG is optimized to run on servers and appliances powered by Intel Xeon processors. These include Intel Xeon Scalable processors, which feature new technology for compute, network, and storage workloads. This processor family is based on an entirely new processor architecture with the scalability to deliver workload-optimized performance in NFV applications.

The Mettle Networks' NFV BNG also leverages Intel® Advanced Vector Extensions 512 (Intel® AVX-512). Intel AVX-512 is an instruction set that can accelerate performance for computational workloads and usages such as cryptography and data compression, which are important for the BNG function.



Conclusion

With Mettle Networks' NFV BNG, operators can implement a purely commercial off-the-shelf (COTS) server-based BNG without using white box switches for the data plane services. Other virtual BNGs rely on switches for performance because of the high-performance processing that needs to be done to each packet in real time. But the use of a runtime tracing compiler along with a microservices architecture allows Mettle's NFV BNG to reach performance targets that equal or exceed what CommSPs expect from legacy systems. Mettle's fully COTS-based implementation provides CommSPs with the flexibility and scalability promised by NFV.

About Mettle Networks

Mettle Networks is an IP networking products company. With its disruptive products based on SDN/NFV and programmable networking, it helps CommSPs to fast track their transformation from a technology-focused model to a more user-centric service delivery model. Mettle Networks' SDN/NFV products are available to CommSPs across the globe that are fast adopting transformation.

About Intel® Network Builders

Intel Network Builders is an ecosystem of infrastructure, software, and technology vendors coming together with communications service providers and end users to accelerate the adoption of solutions based on network functions virtualization (NFV) and software defined networking (SDN) in telecommunications and data center networks. The program offers technical support, matchmaking, and co-marketing opportunities to help facilitate joint collaboration through to the trial and deployment of NFV and SDN solutions. Learn more at http://networkbuilders.intel.com.

[1] Tests conducted by Mettle Networks. Configurations: Server with an Intel Xeon processor E5-2620 v4 running at 2.10 GHz with 16 GB RAM. The tests utilized Cisco* TRex* for driving traffic/measuring performance metrics.

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