Agilio® vRouter Software

ACCELERATING SERVER-BASED NETWORKING FOR CONTRAIL VROUTER

Overview and Benefits of Contrail Networking

Contrail is a scale-out, standards-based virtual networking solution that seamlessly integrates with physical routers and switches to eliminate the challenges of private/ public cloud networking. The solution primarily targets cloud networking in the form of private clouds, infrastructure as a service (Iaas), and virtual private clouds (VPCs) as well as network functions virtualization (NFV) in service provider networks.

A key use case for Contrail is overlay networking, which addresses the physical networking challenges associated with rapid configuration, provisioning, automation, and overall scalability in today's data center networks. Contrail includes a logically centralized but physically distributed controller, and data plane vRouter that resides on each compute node within the data center. The Contrail vRouter is responsible for extending data center networking to the server and managing overlay networking. Virtual overlay networks are created on top of the physical underlay network. In Contrail, the tunnels for overlay networks are created with MPLS over GRE, MPLS over UDP, or VXLAN encapsulations.

### Agilio vRouter Scales Up Server-Based Networking

Netronome has provided the ability to accelerate Contrail vRouter and preserve valuable CPU cycles through offload of the Contrail vRouter datapath to Netronome's SmartNICs. The vRouter lookup tables are mirrored to the SmartNIC through the use of the Agilio vRouter software. This solution improves the vRouter performance for VNFs and VMs to 20-30Mpps with Agilio which enables drastic improvements to cloud workloads' performance as well as increases the network traffic performance and efficiency by up to 5X. Netronome's Agilio vRouter provides the ability for servers to scale-up through increasing vRouter datapath performance while at the same time saves on the number of deployed servers increasing effective server output and decreasing data center TCO.

KEY BENEFITS

- Offload and acceleration of Contrail vRouter
- High-performance vRouter datapath supporting 20-30Mpps
- Uses only one core for vRouter datapath offloading x86 CPU cores
- Reclaimed CPU cores from vRouter offload allows more VMs and VNFs to be deployed per server
- Native networking I/O performance to VMs and VNFs through the use of SR-IOV
- Hardware independence and VM mobility via XVIO

CONTRAIL NETWORK AUTOMATION AND CONFIGURATION ARE NOT DISRUPTED WITH AGILIO, MAKING THE USER EXPERIENCE IDENTICAL TO SOFTWARE-ONLY DEPLOYMENTS. USERS WILL EXPERIENCE A 5X GAIN IN PERFORMANCE AND EFFICIENCY WITH AGILIO-ACCELERATED VROUTER PLATFORMS OVER SOFTWARE-ONLY SOLUTIONS.

Figure 1. Agilio vRouter Offload Architecture
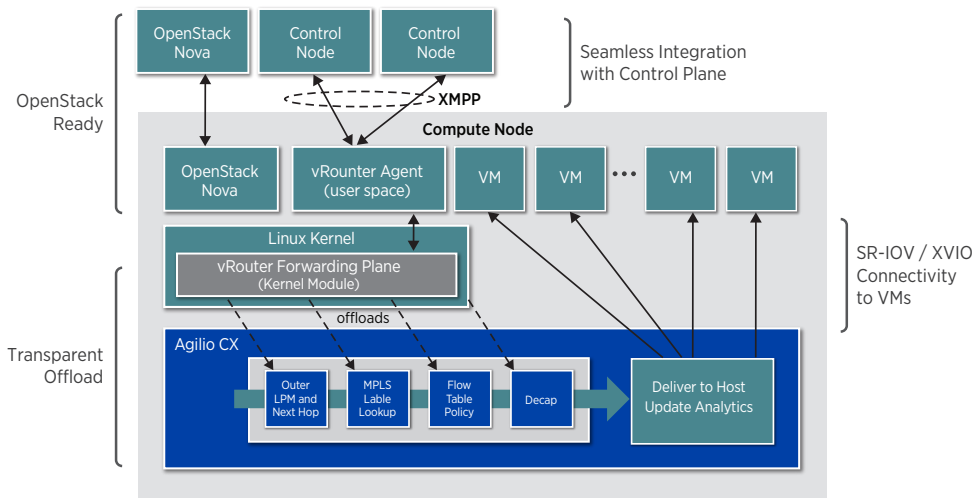
THE AGILIO VROUTER ARCHITECTURE WORKS TRANSPARENTLY WITH OPENSTACK AND CONTRAIL WHILE OFFLOADING THE VROUTER DATA PLANE TO INCREASE PERFORMANCE AND REDUCE CPU UTILIZATION.

Seamless Integration with Contrail

The Agilio adapters and software will transparently receive configuration directly from the vRouter datapath hosted in the kernel. As a result, the vRouter function- ality, configuration, and control channels are completely preserved. This transpar- ent offload allows the Agilio solution to integrate with the Contrail controller and vRouter subsystems seamlessly.

The common tunneling configurations that Agilio vRouter supports for L2 and L3 overlay networking include MPLS over GRE, MPLS over UDP, and VXLAN. This is accomplished by offloading and accelerating lookups and actions for several Con- trail vRouter tables such as Next Hop, interface tables, IPV4/v6 FIBs, L2 forwarding and flow tables among others.
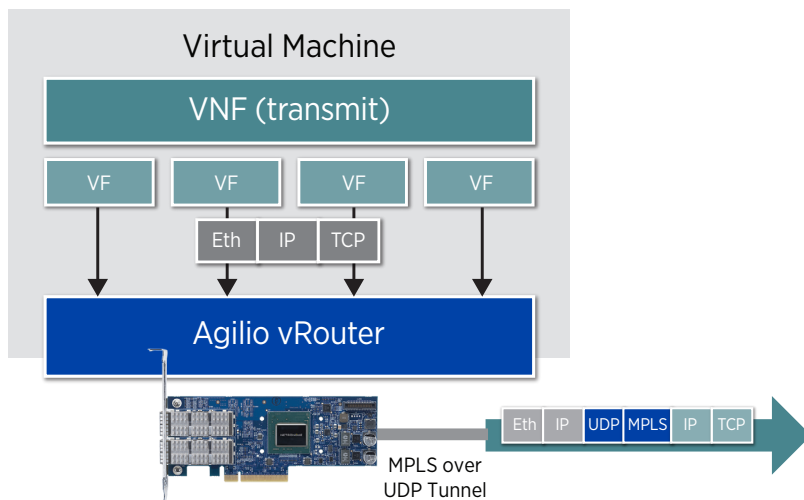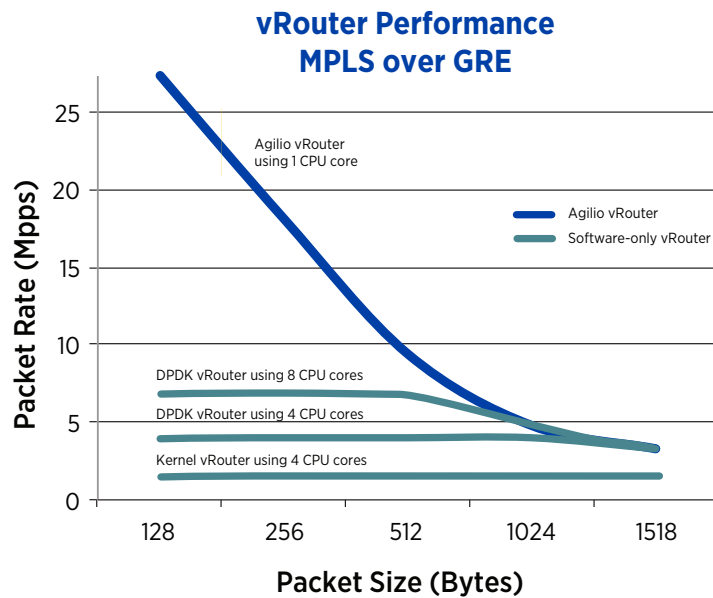

Figure 2. Encapsulated for Overlay Networking

Summary and Benefits

The Agilio vRouter solution allows operators to more fully utilize compute platforms through offloading the data plane from the x86 cores which allows Contrail users to take advantage of the Agilio performance gains while retaining their pre-existing Contrail architecture. The control plane (XMPP) configuration for the vRouter data plane remains the same, and OpenStack management is unchanged. Network automation and configuration are not disrupted with Agilio, making the user experience identical to software-only deployments while increasing performance over software-only vRouter implementations.

**vRouter Performance
MPLS over GRE**

Agilio vRouter
using 1 CPU core

— Agilio vRouter
— Software-only vRouter

DPDK vRouter using 8 CPU cores
DPDK vRouter using 4 CPU cores
Kernel vRouter using 4 CPU cores

Packet Rate (Mpps)

Packet Size (Bytes)

VERSION 1.0 FEATURES AND SPECIFICATIONS

Contrail vRouter Offload

- Version 3.0.3
- Offload vRouter kernel/user space datapath
- Acceleration via exact match flow cache
- Fastpath forwarding of traffic between specified vRouter virtual ports
- Transparent offload via vRouter fallback and datapath hooks
- vRouter statistics
- Match/Action Offload
- Tunnel Support:
  - MPLS over UDP
  - MPLS over GRE
  - VXLAN
- Ethernet, IPv4/v6 for L2/L3 overlays
- IP multicast acceleration
- Complete configuration via Contrail

Advanced Features

- DPDK v2.2 and later
- Live VM migration
- Link bonding to bond up to 8 physical links
- TCP/UDP/IP checksum offloading for both inner and outer packet headers
- TCP Large Segment Offload (LSO)
- RX/TX VLAN insertion / removal
- Basic NIC mode for non-vRouter accelerated configs
- Link Aggregation with LACP
- Traffic mirroring at ingress and egress
- OpenStack Integration

Networking I/O

- 60 datapath VFs, 60 netdevs, or 60 DPDK PMD instances
- SR-IOV
- Express Virtio (XVIO)
- VM live migration
- L3/L4 RX and TX checksum offloads (inner and outer headers)
- NIC stats via Ethtool
- Jumbo frame support

Operating Systems

- Ubuntu 14.04, CentOS/RHEL 6/7, Linux Kernels 3.13 – 3.19
- KVM hypervisor
- RHEL, Ubuntu, Centos, and Free BSD and Juniper FreeBSD as guest OSs

Supported Platforms

- Agilio CX dual-port 10GbE SmartNIC
- Agilio CX dual-port 25GbE SmartNIC
- Agilio CX single/dual-port 40GbE SmartNIC
- Agilio LX dual-port 40GbE SmartNIC
- Agilio LX single-port 100GbE SmartNIC
- PCIe expansion for each of the Agilio LX SmartNICs
- 4x10GbE Breakout cables for 40GbE interfaces
- 10x10GbE Breakout cables for 100GbE interfaces

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