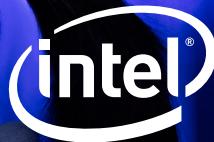


SOLUTION BRIEF

Communications Service Providers
Network Functions Virtualization Infrastructure



Intel and IP Infusion* Deliver Deterministic NFV Performance

VirNOS* solution combines Intel performance technology with proven control plane to offer stable performance.



Introduction

In network functions virtualization (NFV)-based services, CPU resource interruptions and dropped packets can impact service levels and customer satisfaction. It's important to have both very high network throughput along with stable performance levels. With its new VirNOS NFV operating system, IP Infusion, an Intel® Network Builders ecosystem member, has leveraged its proven control plane technology combined with Intel processor, virtualization, and networking technologies to deliver both.

Challenge

Just as communications service providers (CommSPs) and large data center operators are starting to adopt NFV-based network functions, they are starting to understand more about the impact of deterministic network performance. Deterministic performance—as measured by variation in throughput, latency, jitter, or packet delay—continues to be a challenge in the development of communications services based on virtual network functions (VNFs).

Performance determinism can be well controlled in a single-function appliance with a dedicated ASIC. But in a virtualized system, multiple applications utilize the NFV infrastructure (NFVI) at any one time. NFVI resources must be dynamically allocated to meet the changing needs of VNFs.

As customers move NFV-based services to production networks, there are some applications where non-deterministic NFV performance is a challenge. For these applications, IP Infusion has developed its VirNOS NFV operating system.

Solution

VirNOS is a comprehensive virtual networking solution for NFV deployments. VirNOS runs on top of standard hypervisors (VMware,* KVM*) and open source operating systems to provide a complete NFV control plane, data plane, and a wide range of built-in networking services including layer two and layer three switching, multiprotocol label switching (MPLS) routing, security tunneling, and software defined networking functionality.

The software is based on the company's ZebOS* network operating system, which provides control plane services that deliver highly deterministic networking performance. The control plane functionality of ZebOS supports more than 200 network protocols and is used by hundreds of router and networking companies in the highest performance network equipment. NFV deployments with multiple VNFs can result in contention for compute resources, which can cause packet drops. IP Infusion has engineered the control plane and the networking applications to support highly deterministic functionality for NFV deployments with multiple VNFs.

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VirNOS is also integrated with the Data Plane Development Kit (DPDK), a library of drivers for fast packet processing. DPDK is a Linux Foundation* Project for which Intel is among the leading members.

The VirNOS data plane is extremely modular, featuring flexible NFV infrastructure for both control plane (NFVI-C) and for the user plane (NFVI-U). The NFVI-U offers hardware abstraction and packet handling services, with plug-in modules for SDNs and different network cores. On top of that, IP Infusion has introduced VNFs as a Service, allowing the user to customize IP/MPLS switching and routing services as well as VxLAN and NvGRE services. For SDN environments, VirNOS also features OpenFlow* switching alongside the IP capabilities via an OpenFlow Agent and connectivity to a centralized OpenFlow controller.

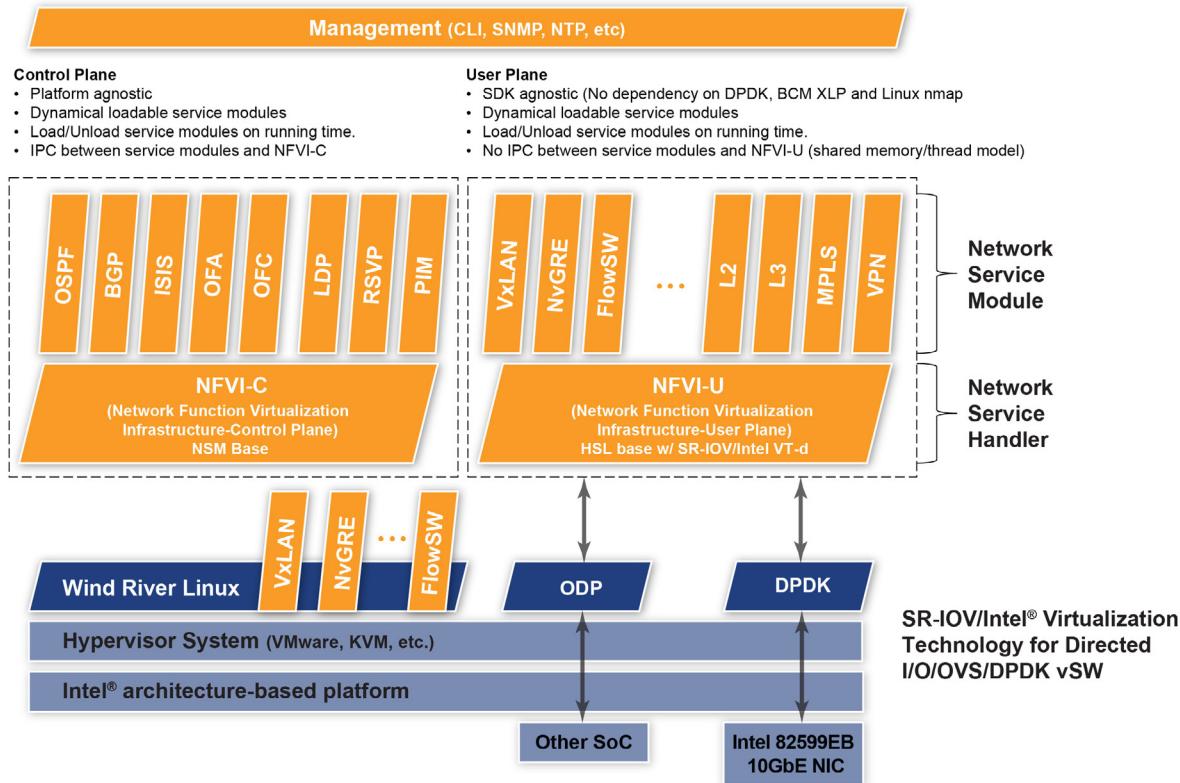


Figure 1. VirNOS module overview demonstrating the flexible NFVI options.¹

The NFVI-C supports all the leading IP/MPLS/OpenFlow routing and signaling protocols (OSPF, BGP, ISIS, OFA, OFC, MPLS, LDP, RSVP-TE, and PIM) in dynamic loadable modules for agile service deployment.

VirNOS features an innovative multiple performance mode for growing networks. For new network services with few users, VirNOS can be deployed in “tiny” mode, which can deliver 10 Gbps of total throughput utilizing an Intel® Xeon® processor E3-1240 CPU with 1 Gb of RAM.² This performance mode can then be updated through three additional levels—low, middle, and high performance—with the same software instance if the hardware resources are available. In high-performance mode, VirNOS networking services can be provided at 10 Gbps per network interface regardless of the number of network interfaces.²

VirNOS offers three levels of IP security (IPsec) performance that leverages Intel technology for high speeds. In software mode, VirNOS can offer up to 2.4 Gbps of IPsec throughput per CPU core.² By speeding up the encryption/decryption processing using Intel® Multi-Buffer Crypto for IPsec technology built into Intel architecture processors, that IPsec rate nearly doubles to 5.4 Gbps.² And for even higher performance, VirNOS can offload this processing onto the Intel® QuickAssist Technology hardware-based compression/decompression PCIe card.

Depending on the application, VirNOS can be used on a range of servers built on Intel Xeon processor E3, Intel Xeon processor E5, and Intel Xeon processor E7. This deployment flexibility means VirNOS can be deployed on entry-level servers powered by the Intel Xeon processor E3, cloud servers powered by Intel Xeon processor E5, or scalable data center servers powered by the Intel Xeon processor E7.

VirNOS also gets added networking performance when used with Intel® Ethernet Controller X540 10 Gbps network interface cards (NICs) or Intel® Ethernet Controller XL710 10/40 Gbps NICs. Both NIC families support DPDK’s support for SR-IOV and PCI pass through, which has been implemented in VirNOS for high forwarding performance. Also supported in VirNOS is Intel® Virtualization Technology (Intel® VT), which delivers Intel® Ethernet Controller XL710 hardware optimizations and off-loads for the rapid provisioning of virtual networks.

Conclusion

Real-time network applications depend on high throughput and deterministic performance. IP Infusion delivers both in a complete NFV networking solution. With VirNOS, service providers and data center operators have a virtual networking solution that scales both in performance and in support for legacy and next-generation networking protocols.

About IP Infusion

IP Infusion offers industry proven technology for disaggregated networking solutions and delivers the best network OS for white box and network virtualization. IP Infusion offers network operating systems for both physical and virtual networks to carriers, service providers, and enterprises to achieve the disaggregated networking model. With the OcNOS* and VirNOS* network operating systems, IP Infusion offers a single, unified physical and virtual software solution to deploy new services quickly at reduced cost and with greater flexibility. Over 300 customers worldwide, including major networking equipment manufacturers, use IP Infusion's respected ZebOS platform to build networks

to address the evolving needs of cloud, carrier, and mobile networking. IP Infusion is headquartered in Santa Clara, California, and is a wholly owned and independently operated subsidiary of ACCESS CO., LTD. Additional information can be found at <http://www.ipinfusion.com>.

About Intel Network Builders

Intel Network Builders is an ecosystem of independent software vendors (ISVs), operating system vendors (OSVs), original equipment manufacturers (OEMs), telecom equipment manufacturers (TEMs), system integrators (SIs), enterprises, and service providers coming together to accelerate the adoption of network functions virtualization (NFV)-based and software defined networking (SDN)-based solutions in telecom networks and in public, private, and hybrid clouds. The Intel Network Builders program connects service providers and enterprises with the infrastructure, software, and technology vendors that are driving new solutions to the market. Learn more at <http://networkbuilders.intel.com>.



¹Figure courtesy of IP Infusion.

²Performance tests were conducted by IP Infusion. Configurations: Server based on Intel® Xeon® processor E3-1240 running at 3.4 GHz with 16 G of RAM. Network connectivity was provided by an Intel® 82599EB 10 Gigabit Ethernet Controller. Complete test results available from IP Infusion by emailing your request to sales@ipinfusion.com.

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