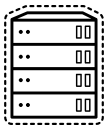
RED HAT® OPENSTACK® PLATFORM

INCREASE BUSINESS AGILITY WITH NETWORK FUNCTIONS VIRTUALIZATION

Red Hat and Intel's virtual network functions infrastructure for the communications industry

TECHNOLOGY OVERVIEW



COMMUNICATIONS INDUSTRY: NFV INFRASTRUCTURE

Virtualizing network functions gives communications companies unprecedented business agility so they can compete more effectively.

As a result,

57%

of communications operators have launched or are currently testing network functions virtualization technologies, and a further

31%

are evaluating business benefits or considering use-case scenarios.[1]

VIRTUALIZING COMMUNICATIONS INFRASTRUCTURE

As communications companies expand their product offerings to cross traditional service segments, it is essential to stay ahead of the curve with innovative new services. Conventional communications infrastructures rely on dedicated proprietary hardware to implement each network function, which increases cost and complexity. This hardware-centric, siloed infrastructure approach can impede business agility and innovation. Scalability is limited, and deployment is often sluggish, as expensive new servers must be acquired and provisioned. Staffing costs escalate as increased expertise is needed to design, integrate, operate, and maintain the various network function appliances. All of these issues make it difficult to innovate and compete.

Network functions virtualization (NFV) can provide the infrastructure flexibility and agility needed to successfully compete in today's evolving communications landscape. NFV implements network functions in software running on shared commercial off-the-shelf (COTS) servers instead of using dedicated proprietary hardware. This virtualized approach decouples the network hardware from the network functions and results in increased infrastructure flexibility and reduced hardware acquisition and operational costs. Because the infrastructure is simplified and streamlined, new and expanded services can be created quickly and with less expense. Red Hat and Intel collaborate to provide an NFV infrastructure solution that rivals the performance of physical implementations at a fraction of the cost.

VIRTUAL FUNCTIONS WITH PHYSICAL FUNCTION PERFORMANCE

Performance, cost, and high availability are critical to a successful NFV implementation. In order for NFV to be of value, it must be designed to be cost-effective and provide virtual network performance and reliability comparable to that of physical network function implementations. NFV implementations reduce costs by using inexpensive, commonly available hardware, but many fail to provide the required performance due to the added overhead of the virtual infrastructure and virtualized data planes. Simply put, network packets are delayed by unnecessary routing through the operating system, hypervisor, and processor, reducing virtual network function performance. High availability is also a concern, and considerations must be taken into account when building an NFV environment to ensure that it meets enterprise reliability standards.

Unlike other NFV solutions, the Red Hat® and Intel NFV infrastructure eliminates virtual data plane overheads to provide comparable performance to physical network function implementations – in addition to cost savings from widely available commercial hardware. Intel® Xeon® processors and 10 gigabit Intel Ethernet technology deliver extreme processing power and fast, efficient networking for the infrastructure. The Intel Data Plane Development Kit (Intel DPDK) library allows virtual network function software to route network packets around the Linux® operating system kernel, which can improve packet processing performance by up to tenfold. Open vSwitch accelerates virtual switching and network performance throughout the environment. Red Hat Enterprise Linux and the Kernel-based Virtual Machine (KVM) hypervisor provide the secure, reliable operating environment and flexible, high-performance, cost-effective virtualization needed to decouple network

1 *Telecoms.com Intelligence, "Annual Industry Survey 2016," February 2016.*

Virtualizing your network infrastructure can increase business agility, enhance service scalability, and improve subscriber experience.

functions from the hardware they run on. Red Hat OpenStack® Platform controls the overall NFV infrastructure and provides an open interface for a wide variety of network orchestration tools and virtual network functions software. And, by using Red Hat's best practices for building highly available OpenStack framework, you can be sure your NFV environment meets industry standards for reliability and availability.[2]

All of this adds up to unprecedented NFV performance and availability with a cost structure that overcomes the challenges of virtualizing network functions. With the Red Hat and Intel NFV infrastructure, you can dynamically launch, configure, and scale network functions to meet shifting traffic patterns and demands for innovative new services, all while reducing infrastructure costs and improving overall subscriber experience.

VIRTUALIZE YOUR NETWORK WITH AN OPEN FOUNDATION

As shown in Figure 1, each component of the Red Hat and Intel NFV infrastructure provides a key element to help create a high-performance, cost-effective NFV solution.

- **Red Hat Enterprise Linux** lays the open source groundwork for the foundation, allowing secure and reliable operation for virtualized network functions.
- **Open vSwitch and the KVM hypervisor** provide high-performance virtual network switching and virtual machines for network applications.
- **Red Hat OpenStack Platform** controls the foundation infrastructure and provides an interface to network functionality and services.
- **Multi-core Intel processors** provide the advanced performance, workload, and power management needed to contain operating costs without compromising network performance.
- **Intel DPDK** provides high-performance network drivers and an optimized run-time environment that maximizes packet processing performance on Intel Xeon processors. Virtual network functions and NFV infrastructure add-on software can use the Intel DPDK library to route network packets around the Linux kernel, reducing data plane overhead and accelerating performance up to tenfold.
- **10 Gigabit Intel Ethernet controllers and converged network adapters** provide fast network connections throughout the NFV infrastructure.

CUSTOMIZE YOUR NFV INFRASTRUCTURE WITH ADD-ONS

The Red Hat and Intel NFV infrastructure gives you an open foundation for a cost-effective, high-performance NFV environment. You can then choose the infrastructure add-ons and network orchestration tools you need to differentiate your service offerings, knowing that they will be compatible with your NFV foundation.

Accelerated packet processing. Packet processing acceleration add-ons use the Intel DPDK API and libraries to route and administer network packets outside the Linux kernel, further increasing data plane performance for use cases such as virtual evolved packet core (vEPC), Internet Protocol security (IPsec) gateways, and virtualized content delivery networks (CDN).

Deep packet inspection. Deep packet inspection modules bring service awareness to virtual switches to provide detailed, real-time traffic intelligence and application recognition for use cases such as dynamic service chaining and layered service offerings.

2 Red Hat, "Deploying a highly available OpenStack cloud," July 2014.

A smaller, virtualized infrastructure can provide the same service capabilities and performance as a larger hardware-centric infrastructure at a fraction of the cost.

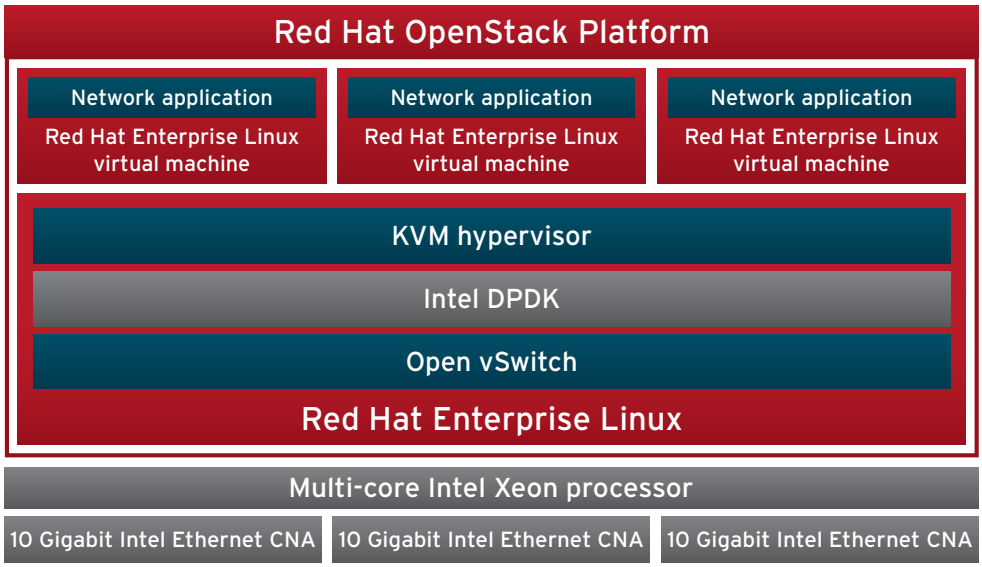


Figure 1. The components of the Red Hat and Intel NFV infrastructure work together to overcome the challenges of virtualizing network functions.

Red Hat OpenStack Platform also provides open standards-based APIs for network orchestration tools and virtual network function software. Below are a few examples of what you can accomplish with a cost-effective, high-performance NFV foundation.

REDUCE YOUR COSTS WITH INFRASTRUCTURE SIMPLICITY

Complex infrastructures are expensive to maintain and operate, and high infrastructure costs detract from the bottom line. The Red Hat and Intel NFV infrastructure simplifies your network environment by converging network functions onto a single, shared architecture. Widely available commercial hardware replaces proprietary appliances, significantly reducing capital expenditures. Decoupling the hardware infrastructure from the software network functions also allows hardware to be replaced less frequently, further increasing hardware return on investment (ROI). Operating expenditures are contained through advanced server power management features and streamlined administration and management. With improved, dynamic scalability, you can easily add and move resources between virtual network functions to meet shifting peaks in network traffic without maintaining fleets of extra dedicated network appliances that remain idle much of the time. A smaller virtualized infrastructure can provide the same service capabilities and performance as a larger hardware-centric infrastructure at a fraction of the cost.

VIRTUAL CUSTOMER-PREMISES EQUIPMENT

Communications subscribers use various CPE devices, such as routers, switches, and set-top boxes, at their sites to connect to services. In many cases, each device controls a single network service such as Internet access or cable service, and one customer will have many devices, each of which must be kept up-to-date. With the Red Hat and Intel NFV infrastructure, multiple CPE devices can be consolidated onto a single virtual setup consisting of a programmable modem, switch, and antenna, reducing costs and complexity. Software updates and service configurations are managed centrally, decreasing operational expenses. New services can be added faster, more easily, and without the need for new CPE devices, significantly improving the customer experience.

RED HAT® OPENSTACK® PLATFORM

TECHNOLOGY OVERVIEW Increase business agility with network functions virtualization

The Red Hat and Intel NFV infrastructure combines fast network performance with cost-effective commodity hardware for increased infrastructure agility and real business value.

BOOST YOUR PROFITS WITH INFRASTRUCTURE AGILITY

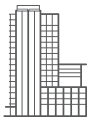
Infrastructure flexibility allows you to dynamically modify your service offerings to meet changing market needs. The Red Hat and Intel NFV infrastructure gives you the business agility you need to succeed in an increasingly competitive industry. Dynamic infrastructure scalability allows virtual functions to be automatically migrated across shared resources to accelerate service delivery and ensure growing peak demand levels are met. The risk of innovation is greatly reduced as new revenue-boosting services can be created quickly without the purchase of new hardware, and retired just as fast if market acceptance isn't realized. This allows you to pioneer creative new service offerings that can move you ahead of the competition.

ON-DEMAND SERVICES

In today's on-demand world, communications subscribers expect services to be available whenever and wherever they want to use them. With the Red Hat and Intel NFV infrastructure, shared resources can be dynamically allocated to provide any service at any time, from Internet bandwidth to video-on-demand. With improved access to all services, customers are more likely to take advantage of both existing and new services.

CONCLUSION

Network function virtualization has the potential to revolutionize the way communications providers bring services to their subscribers. Red Hat is the industry leader in making innovative open technologies safe, secure, and consumable for enterprises and communications providers. The Red Hat and Intel NFV infrastructure combines the performance of physical network implementations with the cost benefits of virtualized, commodity-based environments for increased infrastructure agility and real business value. Contact your Red Hat sales representative today to learn more about the Red Hat and Intel NFV infrastructure and take your network profitability to the next level.



ABOUT RED HAT

Red Hat is the world's leading provider of open source software solutions, using a community-powered approach to provide reliable and high-performing cloud, Linux, middleware, storage, and virtualization technologies. Red Hat also offers award-winning support, training, and consulting services. As a connective hub in a global network of enterprises, partners, and open source communities, Red Hat helps create relevant, innovative technologies that liberate resources for growth and prepare customers for the future of IT.

NORTH AMERICA
1 888 REDHAT1

EUROPE, MIDDLE EAST, AND AFRICA
00800 7334 2835
europe@redhat.com

ASIA PACIFIC
+65 6490 4200
apac@redhat.com

LATIN AMERICA
+54 11 4329 7300
info-latam@redhat.com

facebook.com/redhatinc
@redhatnews
linkedin.com/company/red-hat

redhat.com

#INC11756747_v5_0516_KVM