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SDN and NFV facilitate network convergence

By Rudy Musschebroeck

New technologies such as software-defined networks (SDN) and network functions virtualization (NFV) can facilitate network convergence.

Traditionally—and often still today—dedicated access networks for wireless and wireline coexist as they each require dedicated appliances to run different protocols and services.

Today, SDN and NFV allow a single access network to hook up to a single pool of compute/storage equipment to execute virtualized network functions. This gives the ability to run different services over single access networks, maximizing the return on investment of an FTTx network by, for example, using it not only for broadband services, but for business customers and wireless fronthaul of backhaul for 5G networks.

Software defined network (SDN) is a new approach to internet protocol (IP) switching and routing architectures used in data centers and now increasingly being applied to carrier networks.

Let's explain it this way. Imagine you are driving a car from point A to point B, where your car is similar to an IP packet going from server A to server B.

In a traditional network, the road signs tell you where to go. In a similar way, the network of switches and routers will forward data packets through an IP network. However, these road signs

(routing tables) may have been installed years ago, and do not adapt to changing reality. They have no knowledge of possible traffic jams or roadwork ahead, and no awareness of alternative routes to get you to point B more quickly. In traditional networks, updating the road signs is nearly impossible—you would need to send a crew to each intersection (i.e., each switch and router) to reconfigure them manually—a slow and expensive process.

The result is suboptimal use of the available road capacity and a poor driving experience.

Take control of your network

Implementing SDN in a network is the equivalent of bringing in a central traffic command center directing self-driving cars. SDN controllers use real-time traffic information and remotely steer the cars at each intersection in real time—throughout the network and with no human intervention.

It also can give applications direct control over the traffic. For example, latency-

and jitter-sensitive applications like voice over IP and gaming can cruise through the network on fast carpool lanes—while noncritical downloads or data backups are directed to take the back roads.

This new level of dynamic control over the network improves performance and bandwidth. In the past, building bigger pipes (i.e., faster links) and over-dimensioning were reliable but expensive methods for relieving congestion. As the demand for bandwidth explodes, this approach is no longer sustainable. With SDN, choke points are reduced and network throughput is improved without resorting to widening the roads and highways.

SDN radically changes the network architecture by introducing concepts of centrally orchestrated networking, enabling agile traffic rerouting depending on network conditions, and making optimized use of the available capacity. Combined with network functions virtualization (NFV), this is driving a major transformation within service providers.
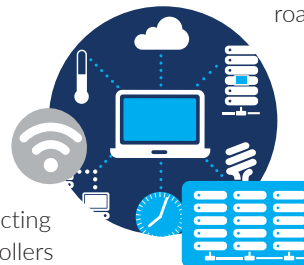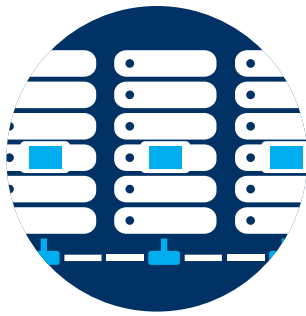
Optimize the use of your hardware

Network functions virtualization (NFV) is a new approach to the deployment of services and applications in carrier networks. Historically, each network function—routers, firewalls, deep packet inspection, 4G baseband units, session border controllers, etc.—has been implemented using a dedicated network appliance.

The use of these different appliances has some major disadvantages:

- Expensive
- Many different dedicated appliances to maintain
- Hard to determine upfront required capacity
- Slow to deploy

NFV is a technology that aims to resolve these pain points by implementing network functions in software and running them on a common hardware infrastructure.

This removes the need for dedicated appliances—similar to how the smartphone made series of specialized devices like calculators, cameras, watches and game computers disappear out of our lives. They were all replaced by smartphone apps that simply share the same screen, compute power and storage on a single device. Switching between applications and installing new ones is fast and easy. And the pace of development and innovation is tremendous, with new apps becoming available every day.

Operators seek to achieve these same benefits with NFV; a greater flexibility and agility to deploy new services, and an increased pace of innovation without requiring the development of new dedicated appliances.

NFV replaces traditional network appliances by their virtualized software equivalents. This enables service providers to use standardized hardware infrastructure in resource pools, with the ability to scale up capacity based on the demand and to increase the deployment speed of new applications and services.

Combined technologies significantly increase network agility and performance

When applied at a network scale, virtualization also brings elasticity by pooling the common hardware infrastructure and shifting workloads around—in particular, when used in combination with a software-defined network (SDN). For example, heavy mobile traffic because of a sporting event may use up to 80 percent of the CPU processing one night, while the next morning the same hardware (but different app) is busy fending off a hacker launching a denial-of-service attack.

In the same way, an access network may be used to serve wireless small cells during one time of the day when a majority of users are mobile, and then, in the next moment, serve as a fixed network for users connecting over Wi-Fi or Ethernet connections.

SDN and NFV are about to change the ways service providers manage their network, and will see an increased leverage of single access networks. Used separately or in conjunction with each other, both technologies can help them keep pace with the fast-evolving requirements for bandwidth their customers expect from them on multiple devices.

About the author

Rudy Musschebroeck is global solutions lead for Central Office, Headend and Core Networks for CommScope Connectivity Solutions. Previously, he was business development manager for Automated Infrastructure Management solutions and responsible product line management lead for Optical Distribution Frame Products in EMEA (Europe, Middle East and Africa). He has 15 years of experience in the telecom and consumer electronics industries, and has held various management positions in business development, product management, sales and marketing, research, and development. He holds a master's degree in electronics engineering from the Free University of Brussels (VUB), Belgium.

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