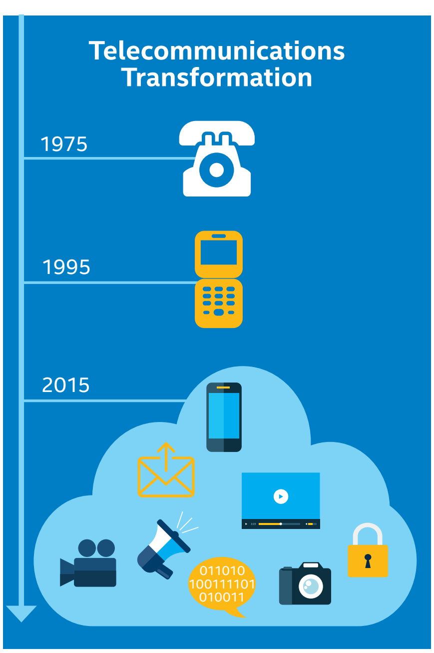
SOLUTION BRIEF

Network Functions Virtualization
Service Provider

Virtualizing the Evolved Packet Core

Enabling communications service providers to scale up and support rapidly rising 4G LTE traffic while controlling costs

Virtualizing the evolved packed core is among the top three ways to reduce capital expenses through network functions virtualization according to a recent survey by Infonetics Research.[1]



Executive Summary

In many regions, communications service providers are facing a critical challenge: To keep up with a rapidly rising volume of 4G LTE traffic emanating from mobile devices and Internet of Things (IoT) sensors, they must scale key elements of their network, including the evolved packet core (EPC), while controlling costs. All converged voice and data traffic from every 4G LTE–enabled mobile device travels through the EPC to enter the fixed core of a communication service provider's network. From smart phones and tablets to connected cars and homes, all devices using 4G LTE depend on the EPC.

In the past, EPC solutions have been deployed on purpose-built systems. Today, communications service providers are looking for alternative deployment models that will help them support fast-growing network demand. Moving to a virtualized EPC (vEPC) solution can help service providers achieve more cost-effective scaling by using standard high-volume servers in place of purpose-built systems.

System integrators, software vendors, and platform providers rely on Intel® technologies to deliver the performance and scalability required for vEPC solutions. Intel is also participating in the development of open standards, contributing to the open source community, developing reference architectures, engaging with industry participants, and collaborating on trials that can help facilitate the evolution to vEPC solutions and accelerate network transformation by use of network functions virtualization.

Accommodating Rapidly Growing Traffic

Throughout the 20th century, telephone companies relied on purpose-built systems for switching and other key network functions. Telecommunications business models have radically changed since the last century: Instead of focusing on a single type of service such as telephony, service providers now offer a variety of services, from voice, video, and data to application optimization and security capabilities. Yet many service providers continue to use purpose-built systems for network functions.

The tremendous growth in network traffic throughout the last decade, however, is forcing service providers to consider alternatives to purpose-built systems. The emergence of smart phones and tablets has substantially increased traffic from the mobile radio network. Currently, there are more people using more mobile devices to do more things, from calling and texting to sharing images and streaming high-definition video.

Today's 4G LTE networks must handle not only the continuously expanding volumes of mobile device traffic but also the growing traffic from IoT technologies. Sensors with 4G LTE radios are being deployed in a wide range of industries, from agriculture and transportation to healthcare and energy. Service providers need ways to accommodate all this traffic from connected devices while controlling costs.

The continuing use of purpose-built systems is unsustainable as the volume of network traffic rises. Service providers need to scale their network capacity and nimbly introduce new services while avoiding the high costs of purchasing expensive, inflexible purpose-built equipment.

The EPC is one of the most promising candidates for a change. In 4G LTE networks, the EPC provides the essential signaling, management, control, and accounting for all IP-converged voice and data network traffic. The functional elements provided by the EPC are Mobility Management Entity (MME); Serving Gateway (SGW) and Packet Data Network Gateway (PGW); Policy and Charging Rule Function (PCRF); and Home Subscriber Server (HSS). While many service providers have used purpose-built systems for EPC in the past, scaling the EPC to accommodate traffic growth with purpose-built systems can be very expensive.

The time is right for a change. In regions where 4G LTE is not yet available, service providers in those areas have an opportunity to choose an alternative to purpose-built systems before they begin to invest. In other parts of the world, some service providers are already prepared to refresh existing EPC solutions or scale their EPC to accommodate an increase in traffic. The growing use of IoT technologies that use 4G LTE radios presents another driver to make a change now. Service providers must handle not only additional traffic from IoT devices but also a different type of traffic—small data streams flowing from a potentially huge number of sensors and connected devices.

Implementing a Virtualized EPC

Implementing virtualized EPC (vEPC) solutions can help service providers scale to accommodate growth in the number of subscribers, traffic, or connections while controlling costs (Figure 1).

Figure 1. Communications service providers need to scale their evolved packet core (EPC) to accommodate traffic growth while controlling costs

The continuing use of purpose-built systems is unsustainable as the volume of network traffic rises. Service providers need to scale their network capacity and nimbly introduce new services while avoiding the high costs of purchasing expensive, inflexible purpose-built equipment.

Initially, communications service providers might opt for small implementations of vEPC before applying this model to consumer voice and data traffic. For example, they might deploy vEPC for IoT usage only. Doing so allows them to explore the vEPC model and gain the necessary skills for managing these solutions before conducting a full implementation for consumer usage. Service providers can work to optimize performance before applying vEPC to the real-time requirements of voice and streaming. Service providers can also choose to virtualize different functional elements (MME, SGW, PGW, PCRF, or HSS) at various stages of deployment depending on their business drivers and comfort level.

Similarly, large service providers could implement vEPC for a wholesale Mobile Virtual Network Operator (MVNO) offering. MVNO service providers license network services at wholesale rates from large service providers and then resell services to consumers. By applying vEPC to an MVNO offering, large service providers can test this model on a limited segment of their total traffic before undertaking a wider deployment.

Achieving Cost-Effective Scaling with vEPC

Moving to a vEPC model can help service providers scale up to accommodate growing 4G LTE traffic while controlling capital and operating costs (Figure 2). Service providers can employ cost-effective, standard high-volume servers for their EPC instead of costly, purpose-built systems. As traffic grows or as their implementation use case expands, they can add standard high-volume servers or implement vEPC on standard high-volume servers they already own rather than purchasing expensive purpose-built systems.

Using standard high-volume servers can also help reduce operating costs. Service providers can take advantage of existing skill sets to manage and service these systems instead of hiring experts or relying on their solution providers.

Evolving the Telecom Network

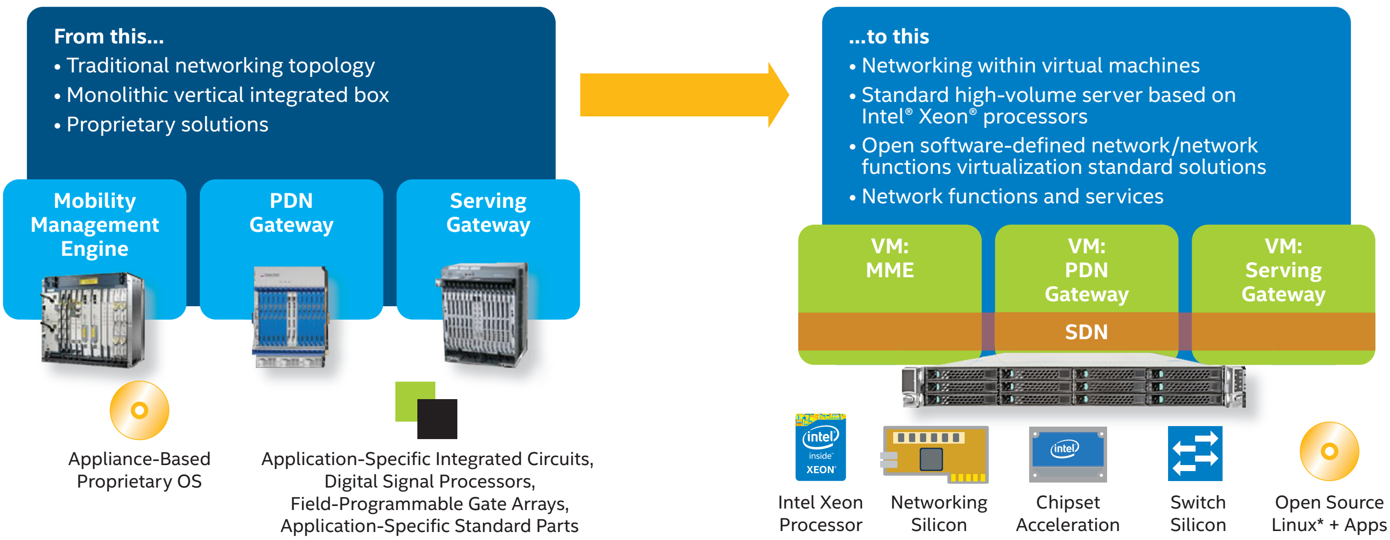


Figure 2. Virtualizing network functions enables service providers to eliminate expensive purpose-built devices and consolidate functions on more economical standard high-volume servers

Adopting a vEPC solution as part of a broader move toward network functions virtualization can also help service providers enhance agility. By abstracting network functions from the underlying hardware, service providers can dynamically re-provision workloads across standard high-volume servers, or scale those server resources up or down as their needs change. In the future, that dynamic re-provisioning could happen quickly, allowing service providers to add resources to EPC functions, for example, for certain events or peak days.

Finally, moving to a vEPC solution that separates hardware from software enables service providers to avoid vendor lock-in. They are free to select the right combination of systems and software for their specific needs.

Building vEPC Solutions with Intel Technologies

Intel has worked closely with industry participants to develop reference architectures that maximize the value of vEPC. These architectures capitalize on open, industry-standard technologies that help service providers cost-effectively scale their EPC and enhance agility.

The reference architectures incorporate software that takes advantage of Enhanced Platform Awareness (EPA) capabilities for OpenStack* cloud operating environment and resource orchestration. Developed by Intel and others, EPA enables deployment of network virtual machines (VMs) onto server platforms with the specific hardware and silicon capabilities that are optimal for the particular needs of the VMs. EPA allows service providers to reduce packet delays and enforce latency requirements for latency-sensitive enterprise telecommunications workloads, such as Voice over IP (VoIP) services.

In addition, the reference architectures incorporate network functions virtualization infrastructure (NFVI)—a collection of middleware deployed on standard high-volume servers that provides manageability and configuration of the virtualized applications. Intel has made key contributions to the development of an open NFVI by supporting the Linux* Foundation* Open Platform for Network Functions Virtualization (OPNFV) and Open Networking Foundation (ONF), and by producing the Data Plane Development Kit (DPDK).

The vEPC reference architectures incorporate Intel® Xeon® processors and Intel® Ethernet products along with EPA-optimized software to help ensure solutions have the deterministic performance and scalability for EPC functions. Developers can capitalize on DPDK libraries and optimized network adapter drivers to improve packet processing throughput on the Intel® architecture. The DPDK–optimized Open vSwitch* improves network functions virtualization performance running on cloud-based data center resources.

To realize the benefit of network functions virtualization, service providers should consider following the vEPC reference architectures that decouple hardware from software. Employing these reference architectures, service providers can achieve the full cost and agility advantages of vEPC.

Summary

As 4G LTE network traffic continues to increase, service providers need to scale their EPC. Using costly purpose-built systems for the EPC is not easily sustainable. Moving to a vEPC solution, which runs virtualized EPC functions on a standard high-volume server powered by Intel technologies, can help

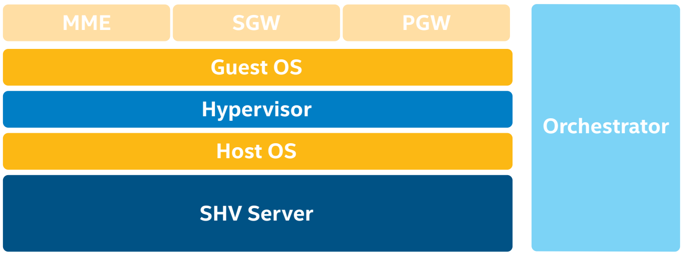


Figure 3. A vEPC solution virtualizes EPC functions—including Mobility Management Entity, Serving Gateway, and Packet Data Network Gateway—on a standard high-volume server powered by Intel® technologies.

service providers accommodate fast-growing volumes of mobile traffic while controlling costs (Figure 3). Adopting vEPC as part of a network functions virtualization strategy can help service providers achieve the agility they need to keep up with a rapidly evolving telecommunications landscape.

For More Information

The Intel® Open Network Platform is advancing open solutions for network functions virtualization and software-defined networking. Learn more: **www.intel.com/content/www/us/en/communications/network-infrastructure-open-source-open-standards.html**

Intel® Network Builders—one of the key Intel Open Network Platform initiatives—is a vendor ecosystem dedicated to accelerating the adoption of network functions virtualization and software-defined networking. Learn more: **https://networkbuilders.intel.com**

Find the solution that's right for your organization. Contact your Intel representative, register at **Intel IT Center**, or visit **intel.com/communications**.

[1] Infonetics Research, "NFV Strategies: Global Service Provider Survey," May 1, 2015.

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