Hewlett Packard Enterprise

Technical white paper

Get a Dedicated Mobile Core

HPE Virtual Mobile Core

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The telecommunications industry is changing again. And the addition of LTE, the Internet-of-Things (IoT), and virtualization are creating opportunities for smaller, dedicated players to offer communications services targeted at specific audiences, features, and needs. Virtual Mobile Core (vCore) will enable it.

Breakup of mass-market operators is around the corner

The possibility for a telecommunications core network application to operate in an "as-a-service" world—dedicated or shared, on-premises or off—makes new business models accessible in the telecommunications space. This can radically change the shape of this industry.

There are many advantages communications service providers (CSPs) see in having their own core network, independent of specific radio network (RAN) providers. They include:

- Switching radio network providers easily and benefiting from best coverage and prices as they see fit
- Negotiating between them
- Protecting their subscribers' data better, and isolating or even encrypting it from radio carriers
- Introducing specific, niche services that fit their needs—without relying on large operators' roadmaps, timing, and billing provisioning systems—and improving time to market

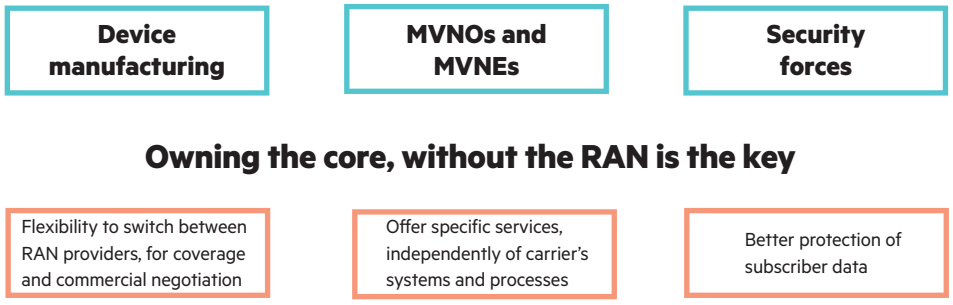

Figure 1. Dedicated players coming in with targeted audiences, features, needs

Virtualization of a core network

The major network virtualization deployment models—growing in enterprise data centers—all converge toward "cloud" models, by which enterprise IT hardware is consumed as a service, provided in a dedicated or shared way by a customer, on-premises or off.

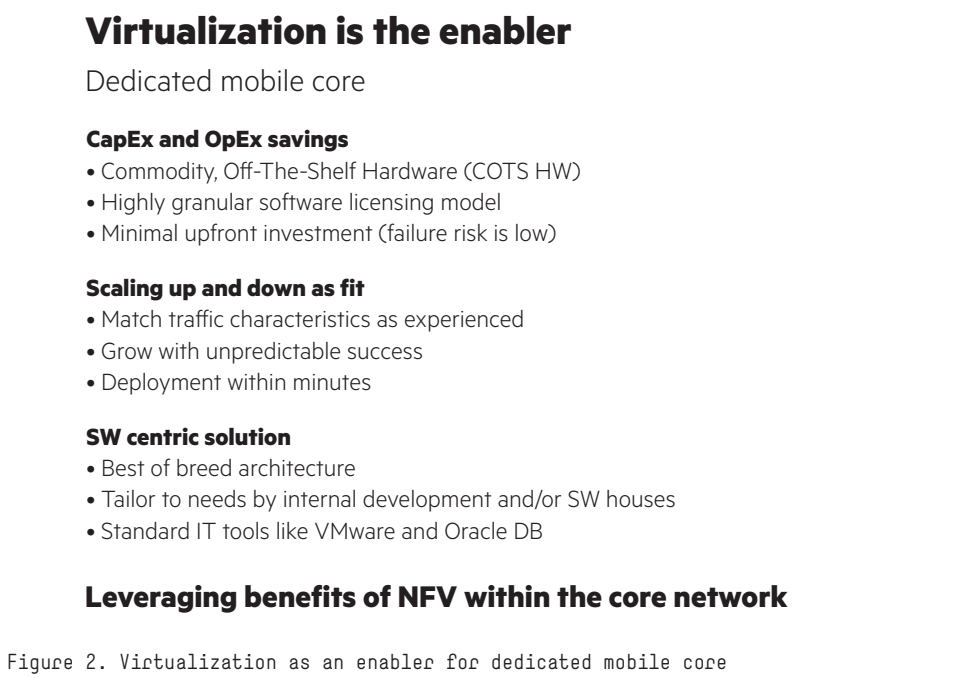

Figure 2. Virtualization as an enabler for dedicated mobile core

With these new deployment models, setting up a core network function becomes much easier:

- First, companies setting up core network instances save an enormous amount of time. People who have deployed core network technologies know how long it takes to get access to a carrier hotel or carrier-grade data center, and stack-up multiple appliances within these environments. And it's also cumbersome to release these applications, and configure and install them. Our experience is that complex installs, which used to take months, can now be done in a few minutes with preconfigured software images. This is a revolution within the core network world.
- Second, companies setting up core network instances don't have to invest in building their own equipment. While leasing capacity within core network instances has always been available, the lack of flexibility such arrangements provide for the lease requestor always ends up with operational challenges. A company that wants to operate a core network instance in a given country or region can now buy on-demand enterprise IT hardware capacity in that country or region. Once done, an image of its core network technologies is installed and services provided.
- Finally, companies setting up core network instances can—at least conceptually—move these instances from one place to another pretty easily. While complex core network set-ups might be difficult to move from one place to another—due to their high degree of integration complexity and huge volumes of data and connectivity—ramping up an instance or decreasing its scale is an easier thing to consider. This can be of interest for ramping up operations that are dedicated to a certain type of traffic, or a temporary event.

According to Infonetics survey, 59% of those responding for NFV reported plans to deploy mobile core/vEPC by 2016 or later, and many reportedly plan to leverage a vIMS core for VoLTE as well.[1]

LTE further simplifies things

Benefits of virtualization might be offset by complexity inherent to the virtual network functions themselves. The result: Although the computing environments on which core network applications reside would be fluid, the Virtual Network Function (VNF) environment wouldn't be, and as a consequence, benefits moving to an enterprise IT would be offset.

The advent of LTE—at a time when Network Function Virtualization (NFV) is also happening—creates a nexus of forces that can lead to an extreme simplification of the service provider's operating environment:

- LTE architecture dramatically flattens the network architecture. The result is a more limited number of network functions that need to be integrated together in order to deliver commercial services, less complexity, and a more fluid environment for deployment and configuration flexibility.
- The advent of Voice over LTE (VoLTE) brings communications services within the IP domain, with voice services and text messages to be supported within an IP-based environment. This opens up a model where interconnection between carriers can happen in a single point, which is referred to as the "MME." This network function, which can run on virtualized computing environments, becomes extremely strategic for service providers. By interconnecting at an MME level, with a service provider host, companies can deploy their own core network, which can support all sorts of traffic that they will define by themselves—without needing to specify it upfront. Companies interconnecting at an MME level will completely control the nature of the services they will offer.

Advent of LTE forces enable service providers to deploy new capabilities within their core network. It pushes them into defining an architecture and a reference topology that will be here throughout the next 10 years or more. This can't happen without full leverage of NFV.

New business models for service providers

The combination of LTE and NFV opens up new business models for traditional service providers, which can really change the way our industry works.

A huge change for roaming

As of today, service providers need to sign bilateral agreements with other service providers operating in a roaming country for their subscribers to access to their services. These agreements are sometimes subject to regulation—specifically for voice services.

The advent of LTE and NFV potentially change the game. As stated, LTE provides a new and simple interconnection point with the MME function. This lets mobile virtual network operators (MVNOs) potentially connect in the network with a single interface—the host MME—to deliver whatever service they want to offer.

In parallel, leveraging NFV enables service providers to define core network configurations that they could run on third- party hardware—ideally rented as a service—potentially located anywhere in the world.

So, instead of leveraging complex and pricy interconnect agreements for roaming traffic, setting up MVNO operations in countries visited becomes very easy. And it lets customers connect to

[1] SDN and NFV strategies: Global service provider survey; Infonetics Research-March 2014

these MVNO operations while roaming, and enjoy the same services that they access in their home country.

With its vCore solution, Hewlett Packard Enterprise (HPE) has built a preintegrated, virtualized end-to-end solution that includes all the necessary tools for supporting these new roaming agreements. From media traffic to service control, it includes a Signaling and Packet Gateway (SAEGW/PGW), a Digital Routing Agent (DRA), a Home Subscriber Server (HSS), an Internet Media Subsystem (IMS) and VoLTE environment, a policy control rule function (PCRF), and an Online charging system (OCS), which all run on virtualized hardware.

Impact on wholesale service providers

Service providers have always had a wholesale business, specifically when we are talking about Tier 1s, which operate legacy networks in most of the developed economies of the world. Selling wholesale services has been moving out of reselling voice services into reselling data and video services. In fact, wholesale divisions of service providers are now supporting a large variety of offers toward large companies in the telecoms and media space.

Wholesale service providers have always tried to adjust their offerings to market demand from a pricing perspective. The challenge they face is adjusting the capacity they sell to meet buyers' demands. This is one driver of the severe price war that exists in the wholesale marketplace.

As a mobile service provider, how can you price a wholesale agreement to Netflix when it starts offering mobile services in a country that does not offer similar services? How can you plan for the traffic volume? As a mobile service provider, how can you address market demand when traffic volume is not easy to predict, such as machine-to-machine (M2M)?

How can you agree on a wholesale agreement with a content provider that would deliver mobile services for only a short period of time, for example, the Olympics?

The advent of LTE and NFV enables service providers to benefit from clustering, and the elasticity that virtualization techniques provide. By using it, they can segregate traffic and run multiple concurrent instances of their mobile data core network. This enables performing all sorts of adjustments within each instance, such as letting some instances be ad funded, or wholesale some instances to customers with a capacity that exactly fits wholesaler requests.

Similarly, the fact that these instances run on virtualized environments enables a quick ramp up and down. It also drives new possibilities, and opens up the set-up of dedicated instances

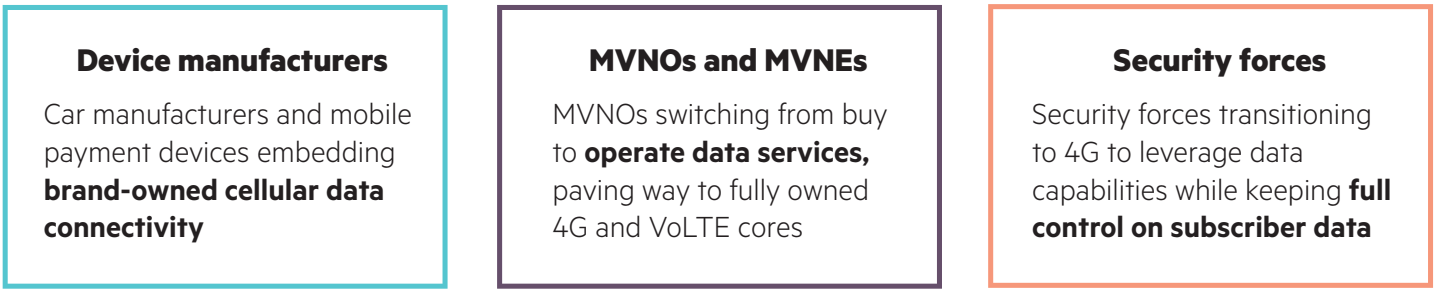

Figure 3. Examples of dedicated service providers

to some sorts of traffic, and for a limited time. This fits very well with the need to support unpredictable growth, or temporary instances for traffic associated to special events.

Barriers of entry lowered for emerging service providers

Example 1. Device providers as dedicated CSPs
Device providers see value-add in selling branded connectivity embedded in their devices. By doing this, they increase the device's perceived value—in the customer's eyes—and can enhance their annuity businesses.

For device providers, acting as a CSP, enables them to provide more value to their customers. Instead of having their consumers engage a CSP, they get the full value chain from a single, one-stop shop. The device provider expands its role in the value chain to also include communications and application management.

Figure 4. Device providers shortening the value chain in IoT connectivity

Gartner predicts that the installed base of "things," excluding PCs, tablets, and smartphones, will grow to 26 billion units in 2020, which is almost a 30-fold increase from 2009. The component cost of IoT-enabling consumer devices will approach $1.[2]

Example 2. Car manufacturers as dedicated CSPs

The advent of LTE and NFV comes at a time when the automotive industry is making headway toward integrating enhanced communication services into the cars it produces. By setting up the eUICC standard for long-term lifecycle SIM cards, the GSMA has taken a major step toward enabling this change for the automotive industry. But if you look at the car's lifecycle, this doesn't address all the challenges a car manufacturer is facing.

A car—as a connected device—can be manufactured in a given country, say Brazil. When the cars are just out of the factory, the connectivity services have to be tested with a local Brazilian carrier. Then they are shipped to the country where they are going to be sold, say the United States. As soon as they hit the sales point, they must able to connect to a local U.S. carrier to deliver connectivity to the driver. Then after some time, the car may change ownership. It may also cross borders and be sold in other countries—in each of these steps the connectivity services will have to be delivered.

[2] Gartner Security & Risk Management Summits 2014

Leveraging LTE and NFV at the same time is of great advantage. By leveraging its attributes, car manufacturers can become de facto MVNOs in multiple countries—pretty easily. They define a core network services configuration, negotiate MME interconnect agreements with service providers, and deliver embedded multimedia services in the cars they sell—regardless of where the cars go.

Using a preintegrated vCore network solution, car manufacturers are able to manage a deployment program across tens of countries and throughout the lifecycle for each and every vehicle sold.

Many new cars, particularly in developed markets, come with embedded connectivity (that is, connectivity powered by an embedded modem and an embedded or user-supplied SIM), which is forecasted to constitute nearly 89% of new cars sold by 2024.[3]

Example 3. Security and safety forces as dedicated CSPs
Many industries need to establish private and secure communications networks. Whether it's for industrial sites submitted to high-security constraints, or communications needs of security and safety forces like the army, police, firemen, and health assistance, Tetra—for professional mobile radio—has been the de facto standard. Until now, it has not been displaced by any technology leveraging cellular commercial technologies. The international GSM-Railway standard, which attempted to do that, never really replaced the Professional Mobile Radio (PMR) standard within this area.

The challenge with the PMR standard is that it struggles handling large volumes of data compared to 3G, and even more so when compared to LTE. With the advent of these cellular technologies, real-time video streaming is now used by mobile consumers extensively, and has become part of the day-to-day experience expected when using a mobile service.

Within their professional day-to-day experience, security and safety forces—requiring secure communications—can leverage these data and video capabilities. For example, security and safety forces accessing several operations can take pictures of what they see, and send them across to management. Similarly, video calling could help show what they are talking about—to remote officers, so decisions can be made regarding the situation. However, for these secure exchanges to take place, security and safety forces need to own the core network instance to support services their employees will use.

Using a vCore solution, deployed within an LTE environment, enterprises and security and safety forces can manage their own core network instances, inclusive of data services and VoLTE services. They can encrypt the data communications they deliver, while enjoying the benefits of the large bandwidth provided by 4G. They can also implement their own internal numbering plan, and enable group calling, sub-group calling, and even priority calling with PCRF capabilities.

As all vCore functions are virtualized, a standard configuration of the core network can be predefined by security and safety forces, and enterprises, who can install it in a given environment on demand. Even if this doesn't provide the same flexibility as TETRA—due to radio access network dependency over an existing LTE network, the convenience provided by the leverage of video and enhanced data services make this alternative worth considering. On the enterprise side, due to the fact that network installs do not change often within industrial plants, vCore is even more accurate.

LTE networks is now being considered to support mission-critical voice and data services as it has lower latency than 2G/3G networks, and provides faster call set-up times for emergency services—similar to the user experience provided by push-to-talk private mobile radio (PMR) networks. With dedicated public safety networks deployments.[4]

3 Connected cars: Worldwide trends, forecasts and strategies 2014–2024; Analysys Mason-June 2014

4 Can MNOs offer outsourcing services for public safety networks, and is this a new revenue stream for them? Analysys Mason-October 2013.

Example 4. Content providers as dedicated CSPs

Content providers are facing two major trends within the content delivery market. First, content consumption becomes more and more de-linearized. This means content consumers are no longer willing to plan their activities so they can watch a piece of content broadcasted. They want to access the content worth interest to them when they happen to become available for viewing it. This drives adoption of content delivery over networks that aren't designed for broadcasting, and through access to a library of contents that consumers can navigate. It also enables direct interaction with the consumer—more targeted advertising and new ad-funded business models.

Second, access to these non-linear content libraries happens more and more over devices on the go. These devices can connect to a variety of networks—WiFi, and cellular 3G and 4G—and consumers expect smooth content delivery, even if contents being streamed are over cellular technologies.

These two trends have lowered barriers of entry for new content delivery companies to provide mobile services. This has led new players to jump into this opportunity, such as Netflix, Amazon, and even content producers willing to bypass the value chain and reach customers with mobile services offered under their own brand.

Using a vCore solution—deployed in a hybrid cellular environment—content providers and CSPs can work together. By leveraging virtualization technology, they can run dedicated instances of a core network so that the corresponding content provider traffic can be routed to customers. They can also scale up and down as they see fit, along with traffic volumes consumed. By leveraging value-added functionalities of the packet gateway included in the vCore solution,they can very precisely monitor the volume and nature of content that's delivered to consumers, and leverage this DPI- provided information to support alternative charging models and prioritize content delivery.

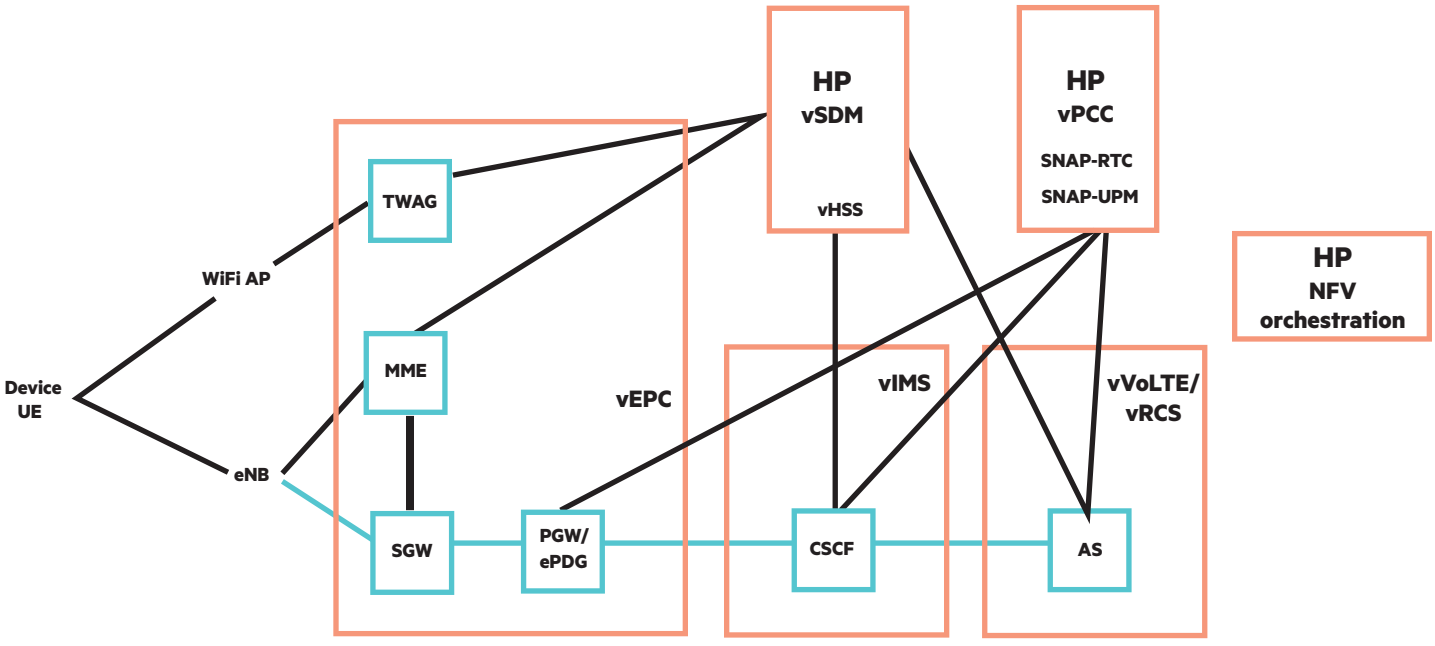

Figure 5. HPE vCore–conceptual architecture

HPE Virtual Mobile Core—HPE vCore

Hewlett Packard Enterprise vCore is a preintegrated, pretested solution that brings together all the key elements of a core mobile network. Key functions include:

- **HPE Virtual Home Subscriber Server (HPE vHSS)** is a software product that acts as a central mobility management repository for customer data attached to the vCore. It runs on standard virtualization technologies (VMware ESX and KVM) and can support EMS and VoLTE services. There are two versions, a single or FE/BE instance that leverage HPE profile Manager, which acts as a user data repository (UDR) within the second option.
- **Virtual packet gateway (vPGW)** runs on standard virtualization technologies and can act as a 2G/3G/4G gateway supporting different value-added features. Beyond the benefits driven by virtualization, one of the most important is the capability to analyze traffic's nature in real time through http proxy capabilities and deep packet inspection (DPI). These capabilities enable traffic steering across multiple instances of a core network, and applicability of multiple policies over traffic running through the same vPGW.
- **Virtual IMS (vIMS)** provides CSPs with an entry point into the software-defined delivery of core communication services. Transitioning to vIMS enables service providers to enter a high level of standardization and interworking within their core network. Combining IMS with NFV enables a large variety of deployment models for service providers to unlock the commercial potential of personal communication services.
- **Virtual Voice over LTE (vVoLTE)** enables service providers to leverage 4G to move out of the circuit-switched era. This transition simplifies the core network's architecture and reduces the cost of delivering communication services. It enables recovery of formerly allocated bandwidth to data services for additional data capacity. Deploying VoLTE within a virtualized environment expands IMS services potential and fully completes the transition to a fully software- defined, IP-based core network. It includes HPE MSE Adjunct AS and HPE MSE MRF—both run on standard virtualization technologies and offer a complete platform for VoLTE value-added services execution.
- **Virtual Policy and Charging Control (vPCC)** is based on HPE SNAP—an integrated policy and charging solution. HPE SNAP is a flexible and modular solution that includes real-time charging (SNAP RTC) and unified policy manager (SNAP UPM). Both run on standard virtualization technologies, and can be deployed separately or as a preintegrated vPCC enabling operators to quickly and easily bring new use cases and products to market.

With HPE global delivery force, HPE vCore is available in two main models.

- **vCore as a technology** is a fully integrated, pretested dedicated core. Taking advantage of HPE global experience and expertise in vCore technologies and HPE local presence in most regions and countries for on-site integration and assimilation with local carriers and partners.
- **vCore as a Service** uses HPE business process operation (BPO) run to your core network for you.

Virtual Mobile Core—the next step

New kinds of companies are entering the communications space, and many require full control of the services they provide. What makes this possible is the total separation between radio carriage and core network functions. vCore takes this another step forward by offering a core network that is fully virtualized, and is an economically feasible solution.

Learn more at
hp.com/go/vCore

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