Migrating Enterprise Services to the Virtual Domain

Reducing cost and vendor lock-in, and choosing a future-proof platform
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Summary

Market overview
The movement away from seeing IT as a supporting activity is challenging the view of M. E. Porter (Competitive Advantage: Creating and Sustaining Superior Performance, The Free Press, 1985) and his description of the value chain within an organization. Whereas the value chain is still valid in its concept, the role of technology has entered what Porter terms “primary activities” and so is moving away from a clearly delineated supporting function that can be isolated and marginalized towards becoming an intrinsic part of the fabric of the organization. However, managing this newly integrated enabler of business activity is where the difficulties will surface. If cost reduction is a driver, then some will opt to separate the operational management and divorce it from IT activities. Others will embrace software as a vehicle to drive change and embrace new ways of managing IT.

The use of software as a change-driver is clearly seen in the emergence of cloud computing, software-defined networking (SDN), network functions virtualization (NFV), analytics, and DevOps – and many more IT concepts – in the telecoms environment. This has marked a profound change in the way telcos buy technology and deploy their networks. According to Ovum forecasts, capital spending by telco and OTT companies in the next five years (2016–20) will total $2.1 trillion, creating a fierce competitive environment. Although this means that telcos will spend formidable amounts to transform their networks, it is not yet clear how they will do so, and how they will achieve return on investment (ROI) for these new technologies. Ovum’s ICT Enterprise Insights 2016/17 – Global: ICT Spend and Sourcing survey (n=7,076) shows that approximately 28% of IT spending is on infrastructure, with 72% of the spend on software. This shift in how organizations spend IT budgets shows that increasingly the focus of telcos is to move to a software-defined approach to delivering services.

The telco transformation that is under way follows years of linear value chain and market development, which may no longer provide the economies of scale, flexibility, and cost-effectiveness the current telecoms environment requires. The following list is a short summary of trends and disruptions that are changing the telecoms market. Specifically, telcos

• are constantly arguing that they need to innovate (and fail) quicker, so that they remain competitive against web-scale companies and are able to react to market demands quickly
• no longer want to be driven by a handful of large vendors that provide end-to-end infrastructure, and they want to choose best-of-breed components – even when those are provided by start-ups
• want to shift value from hardware to software, where service innovation can take place more rapidly
• want to transform their points of presence and potentially turn them into distributed data centers.

These trends are strongest in the enterprise services market, where telcos are trying to find new ways to cater to the demands of enterprise customers, both large and small. The importance of the enterprise market is increasing, as the consumer environment is extremely competitive both within and outside the traditional value chain. Internet giants, handset manufacturers, and start-ups are now competing for a piece of traditional telecom services, cannibalizing the core revenue streams of telcos across the globe. In response, telcos are attempting to redefine their value proposition to consumers with SDN and NFV, but it remains to be seen whether they can truly transform their business to become more agile service providers.

The enterprise market, however, is very different. There are significant entry barriers for new companies – let alone small companies and start-ups – and clients pay for carrier-grade availability and reliability. Enterprise services have evolved gradually and telcos are now ready to take the next step to make their offerings more attractive, and their technology more cost-effective and agile, while maintaining a high quality of experience for their end users. The DevOps movement is an answer to the need for agility in terms of the velocity of how services are created and deployed, but DevOps alone will not solve the problem of vendor lock-in or manual processes that act as a brake on innovation. SDN and NFV are technologies that will transform enterprise services and the way telcos do business by allowing the adoption of agile
methodologies and microservices. These new, more-focused services can be developed for specific business challenges and will drive increased business engagement in the use of technology to solve business problems.

This does not mean that telcos will deploy these new technologies overnight. The shift will take place in stages and requires a variety of different approaches depending on a number of different factors, including: market segment, customer type, type of service, access technology, legacy requirements, and equipment refresh cycles. The biggest challenge for the wider ecosystem is that this shift from hardware-based solutions towards software-based solutions will require the entire value chain to move in the same direction. However, some actors will be challenged by the shift in income patterns and new business models needed for a software-defined ecosystem. It is clear that a transformation is necessary for both vendors (sustaining their profitability) and operators (deploying and maintaining a cost-effective and responsive network) to adopt new ways of doing business.

**The future of telco enterprise services**

Ovum has conducted forward-looking research, assessing the likely technology landscape in 2025. This research has taken account of broad political, macroeconomic, social, and environmental issues and has attempted to map core telecoms issues. In the enterprise domain, several trends are expected to reshape how telcos do business. Some of these trends are outlined below.

*Enterprises will become the telco revenue driver*

Although telcos are focused on improving large enterprise services, it is the mid-market enterprise sector that will provide revenue growth in the next decade. It is by far the biggest proportion of the enterprise market in terms of IT spending, but historically it has been underserved by telcos. In the past, telcos have tended to treat the enterprise market in respective countries as monolithic. In most cases, they have sold a series of core “point” services such as telephony, business broadband, and basic mobile services. Telcos have, until recently, ploughed resources into the high end of the global enterprise market (for managed services) and of course into the consumer market.

A few trends have coincided, prompting action. First, revenues from the largest accounts have not grown as much as predicted when telcos first set up distinct large-enterprise arms. Second, the advent of cloud computing, spurred by the ubiquity of high-bandwidth broadband in Europe, has enabled the industrialization of network-based IT services. Such services are by their nature more cost-effective to deliver, thereby appealing to telcos and potentially businesses of all sizes, including enterprises. The enterprise market is often defined more by sets of requirements than by number of employees. It is not homogenous, so a homogenous approach will not be successful. Telcos are now trying to research the needs of their enterprise targets not just by size, but by location, vertical, and qualitative criteria, such as whether they are new businesses, or well established, or even international in reach.

Tackling all enterprises requires careful investment. There is no need to necessarily deploy all one’s weapons in the battle to win business; the art is in choosing the right tools for the right audience. Telcos must fully investigate exactly which audiences they would prioritize given the necessarily limited resources at their disposal, and most importantly, the network technologies involved.

*Experiential metrics transform SLAs*

By 2025, enterprise IT concerns will have shifted from pure governance to performance. According to Ovum surveys, CIOs already own more business KPIs than technology KPIs. The issue is how to translate that into managed services contracts; SLAs still mainly cover technical performance, not business performance.

Workload-specific SLAs will emerge, effectively aligned to specific processes and lines of business (and may be prescribed by regulators in some industry contexts). The shift to experiential, performance-led pricing
is related to new digital KPIs within enterprises. Once, technology investment was viewed as a business cost, but in 2025, as a matter of course, the C-level will measure it as a growth and efficiency driver, with performance bonuses associated with the quantifiable results of digitization. For example, performance metrics might be increased digital transaction volumes or reduction of customer dissatisfaction via digital interactions.

In 2015, CIOs of enterprises were being pushed into a brokerage role, finessing supplier choice in digital environments, instead of creating and managing all infrastructure and services in-house. The popularity of hybrid cloud services in 2015 provided a foretaste of the status quo in 2025. Just because CIOs can self-configure cloud and IT services, does not mean that they want to. The criticality of integrated network, compute, and app tuning will lead experiential enterprises to favor service providers with hybrid skills. Not least, CIOs will favor service providers with the capabilities to be a single point of accountability across diverse, multisupplier environments. What is the telco? By 2025 we should read “cloud” rather than “communications” service provider – and in 2025’s digital economy, the telco will be a tastemaker, broker, policeman, and trusted guide.

This new role of the telco is a major departure from today’s norm. Business processes, operations, technology, support, and everything in between these will need to be redefined to cater to services that run on-premise, in the telco cloud, in the public cloud, or in a hybrid manner. Although telcos may not yet have the visibility and ability to transform into becoming these single points of accountability, they are now assessing their strategies, starting with technical transformation. This will be the initial step towards operational transformation and, although it is not easy, it will form the first pieces of the puzzle.

Modernizing CPE: opportunities and pitfalls
Telcos are currently planning the next generation of enterprise services and perceive this market as having significant opportunity. At the same time, they are attempting to reduce costs, increase service agility, and attract interest from medium-size and larger clients that integrate their own systems. They are aiming to become integrated providers of connectivity, cloud services, and much more by transforming their business using the software concepts outlined above. But to do so, they first need to become much more efficient in the way they deploy their enterprise services, starting from the customer premises equipment (CPE). The need is much higher in the enterprise domain, where cost is a major decision factor for end users. Identifying future areas of demand by IT management will enable service providers to be proactive, gaining a head start on their competitors and a lead in the market. Ovum research (Ovum Enterprise Challenges survey 2014/15; n=700) identified three markets in which service providers should offer services:

- Security management.
- DevOps and application monitoring.
- Mobile application monitoring and testing.

The opportunities for these new services vary by geography and industry vertical, so ensuring these new offerings are timed and targeted at the appropriate audience is the key to success. Ovum asked what services enterprises would be looking for from CSPs. The clear number one service was security management, with 17% citing it as the highest priority, and more than 20% citing it as among the top three priorities. Overall, Ovum considers that enterprise customers are looking to make greater use of MSP (managed service provider) services to address a combination of skills shortage, increased operating costs, and flexibility to scale to meet demand (to deal with seasonality, for example).

The drivers for modernizing CPE are obvious:

- Existing physical equipment requires technicians for nearly every activity, including installation, upgrade, maintenance, and decommissioning.
- The functionality of existing, traditional CPE is monolithic. The fact that the CPE is monolithic does not imply that a new CPE is required for a new service, rather that for cost-optimization reasons, telco CPEs are non-modular and have a fixed set of functions that cannot usually be upgraded.
• Traditional CPEs cannot follow the direction telcos are trying to establish, in terms of improving customer experience and fostering innovation.

All of these arguments about traditional CPE translate to higher costs for telcos, including the actual equipment and also “truck rolls” (i.e. sending technicians to the customer site to fix problems or upgrade services). The drawbacks also affect end users, who need to wait for days or even weeks before a service is enabled. Therefore, telcos are now assessing new platforms that will reduce these costs and, at the same time, allow them to offer new services more quickly. And, as with almost all other network upgrade activities, there are several options and there is no clear consensus as to which one is best. In reality, different telcos will follow different upgrade paths, depending on many different variables: existing CPE deployed, vendor relationships, SDN/NFV adoption status, economic issues, ability to perform certain levels of own-systems integration, and ecosystem participation.

Nevertheless, telcos now have different options for modernizing CPE and are active in developing their strategies. The following sections describe what is available for telcos currently.

From traditional CPE to virtualization and white boxes

Traditional or physical CPE (pCPE) are monolithic devices that are used to enable a specific service set. Although there is some form of upgradability on these devices – through remote network upgrades – the vast majority of equipment requires manual intervention to enable a new service. For example, a SME client that requires a firewall or VPN service on top of a pure connectivity package may require a new CPE to be shipped to them, and a technician to configure it. New types of CPE are now emerging, where different degrees of functionality are offloaded to the network, while the processing capabilities of CPE are also increasing. The following table shows a brief comparison of what is available today to telcos, although there are many choices that fall between these different classifications.

<table>
<thead>
<tr>
<th>Equipment type</th>
<th>Benefits</th>
<th>Shortcomings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical CPE (pCPE)</td>
<td>• Economies of scale</td>
<td>• Monolithic design and operation</td>
</tr>
<tr>
<td></td>
<td>• Immediate rollout if necessary</td>
<td>• Expensive maintenance</td>
</tr>
<tr>
<td></td>
<td>• Technology and operational maturity</td>
<td>• Limited upgradability</td>
</tr>
<tr>
<td></td>
<td>• Established internal telco processes</td>
<td>• Vendor lock-in</td>
</tr>
<tr>
<td>Virtualized CPE (vCPE)</td>
<td>• Self-service capabilities</td>
<td>• Technology is not yet mature</td>
</tr>
<tr>
<td></td>
<td>• Continuous service improvements</td>
<td>• More expensive in the short term</td>
</tr>
<tr>
<td></td>
<td>• Lower TCO in the long term</td>
<td>• Implications not fully understood</td>
</tr>
<tr>
<td></td>
<td>• Ability to run virtual network functions (VNFs)</td>
<td>• Current functionality may not match pCPE</td>
</tr>
<tr>
<td>White-box CPE</td>
<td>• Completely commoditized hardware</td>
<td>• No established open source software distributions</td>
</tr>
<tr>
<td></td>
<td>• Borrows flexibility and scalability from the IT domain</td>
<td>• Early concept in telecoms and implications not understood</td>
</tr>
<tr>
<td></td>
<td>• Broader vendor options</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Open source and web-scale company activities (Facebook, Google, et al)</td>
<td></td>
</tr>
</tbody>
</table>

Source: Huawei

In reality, a telco CPE strategy is likely to include a mix of these, in order to select the best properties from each category of devices. In the short term, telcos are likely to maintain compatibility with existing systems, while in the long term, cost savings and enhanced agility will be more important. The most difficult task telcos are faced with right now is how to bridge these two disparate requirements.

In reality, the absolute segmentation for CPE lies between the physical and virtual, as there are several common themes between white-box CPEs and vCPEs, and different vendors may have different interpretations. Figure 1 summarizes three choices telcos can currently make to migrate away from pCPE.

There are several differences between these choices, including operational, technical, and cultural issues:
• Traditional physical CPE requires all functionality to be deployed on the client’s premises in proprietary hardware and software. This leads to rigid service specification and the challenges discussed above.
• Thin CPE sees all functionality migrated to the telco cloud, where management and service introduction become centralized. This may also be referred to as edge CPE.
• Thick CPE is where the equipment is commoditized (often a vanilla x86 server, switch, and modem), but all functions that would be present in a pCPE run in software, as VNFs. This may also be referred to as a cloud CPE or a white-box CPE.
• A grey box is when a pCPE is enriched with processing capabilities to run VNFs.

Figure 1: Technology options for CPE deployments

Telcos have come to realize that no single option can provide the benefits and also adapt to their current networks. For example, what should a telco deploy if it wants to offer new services on top of existing offerings? Augment existing CPE functionality through a grey box or launch completely new CPE? Should it choose a new deployment, and should this CPE be thick or thin? As with all things NFV at the moment, the introduction of new CPE is likely to be a gradual and careful process, in order to ensure that existing services are not interrupted.

**White-box CPE**

White-box CPE, a recent trend in the telco network, is best described as commoditized hardware and software. White-box CPE is characterized by the software it runs and is considered to be an off-the-shelf small server; in the case of NFV, this is a small x86 appliance. The benefit of using a white-box CPE is that the device can be loaded with any vendor software at will and can run different VNFs from – theoretically – any vendor. In other words, network functions are completely abstracted from the hardware level in these devices and network services are implemented in software alone.
Grey boxes
Although the white-box strategy is certainly attractive to telcos at the moment, there are several short and mid-term challenges associated with their introduction to the network. First of all, many current-generation VNFs are not mature enough to replace traditional CPE. Moreover, maintenance, traffic management, configuration, and many other functions are either absent or lack maturity.

One short-term answer to this is a grey box, where a traditional pCPE is enriched with an x86 server, capable of running VNFs. By combining these two, telcos can ensure that existing services are not affected, while future services are also introduced into their CPE offerings.

Live service migration
All of the options presented above and innovative hybrid approaches are certainly something to consider for the future of networks. We can surely project that in 10 years, telecom networks will be distributed clouds, with software driving innovation, service velocity, and ultimately, the telco business model. Most telcos – and certainly Tier-1s – can no longer rely just on access revenues – whether considering the consumer or enterprise market – but need to become value-added service providers. However, in the short term, telcos are faced with the difficult task of balancing between maintaining existing services in good health while planning for a future with SDN and NFV.

From the perspective of benefits, telcos should theoretically migrate from pCPE to white boxes immediately, to capitalize on the advanced economies of scale, software and hardware transparency, service innovation, and many other benefits. Practically, however, the evolution from pCPE to vCPE and white boxes is not as straightforward as telcos expect – and as some vendors discuss. Figure 2 illustrates a small selection of potential migration strategies from existing pCPE to vCPE/white-box CPE.

The figure above makes a major assumption: that existing pCPE can offload parts of its functionality to the cloud and can potentially become simply an access enabler. However, the vast majority of pCPE deployed in the market will not be able to do so, but several pCPEs sold today – by supporting next-generation provisioning protocols used for provisioning virtualized network services and setting up service-chaining – do offer the capability to migrate certain functions to the cloud, starting the evolution to these new platforms.

Under the assumption that pCPE can be upgraded to a flavor of vCPE, we can assume that telcos currently have several different options: migrate existing platforms to vCPE, migrate to a hybrid platform that includes both pCPE and service-chaining in the telco cloud, or deploy new white boxes that can theoretically
run any new service and support all types of potential new software and services. However, the discussion about this migration does not fully account for the major issues of device management, traffic management, operations and maintenance, and other functionality that is necessary to run an enterprise CPE.

**Migrating voice**

Many CPE in the enterprise domain are used to enable voice services, including traditional circuit-switched TDM, analog connections, or newer SIP-based services. These CPE run customized software on proprietary hardware that is highly optimized in terms of performance and, of course, cost. They also include a variety of other functions that are necessary to enable voice services and to ensure that quality is maintained at a high standard.

At the moment, neither white boxes nor any flavor of vCPE can support native voice services. Some form of hybrid approach will be needed to address legacy TDM and analog connectivity requirements within a virtualized environment.

An innovative answer – and one that at least one Tier-1 telco has now chosen – is a NETCONF-enabled voice gateway, which supports critical legacy voice connectivity and functionality augmented by NFVI (NFV infrastructure) placed either at the edge of the network or on an adjacent white-box CPE. It is precisely these types of hybrid approaches that telcos will need to actively consider to address legacy issues and cost issues as they migrate to virtualization.

**Ovum view**

Ovum understands that the future of telecom networks lies in virtualization, SDN, NFV, and other software-based concepts. We expect telecom networks to be distributed carrier-grade clouds as soon as 10 years in the future, but have doubts that telcos fully understand the level of operational transformation needed to reach these goals. The technology is merely the smaller concern when operations, culture, business models, vendor relationships, and internal processes need to be redefined before the aforementioned technologies can bear fruit.

CPE is one of the key areas where SDN and NFV can help bring significant benefits, by reducing TCO, improving ROI, and increasing service velocity. Several telcos are now trialing new generations of CPE in order to understand the implications of deploying them in their business. Virtualized CPE, white and grey boxes, and NETCONF-enabled classical CPEs are all valid technologies and will very likely be deployed in telco networks.

The full transition to the use of vCPE and white boxes is not a straightforward one, especially when considering the migration of existing legacy services, including voice. In fact, plain white-box CPEs currently cannot support the necessary functionality to enable all services, especially voice. As such, Ovum expects that in the short term, CPE will require the best of both worlds: traditional service support and capabilities to be upgraded to future systems. This may manifest as a NETCONF-enabled classical CPE running voice service through existing network control protocols with the ability to be service-chained with other VNFs.
The OneAccess view

In order to realize the full benefits of virtualization, it is clear that the long-term goal is full software abstraction of network functions. Equally clear is the need for a significant and potentially long period of transition to deal with the many associated technical, organizational, and cost issues, several of which are explored in this paper.

As a service provider specialist that has long focused on the specific needs of telcos, OneAccess has adopted a strategy that facilitates this transition by providing telcos with an extensive range of virtual and physical platforms and VNFs that enable seamless service migration, while at the same time avoiding vendor lock-in.

One key area we have addressed is how to migrate legacy connections into a virtualized world. Thus we have introduced a range of NETCONF-enabled voice gateways to allow analog and TDM connections to be seamlessly bound into next-generation orchestration systems. In addition to our voice products, all of our latest generation and some existing data products, including those for VDSL and LTE, are NETCONF-enabled. OneAccess has taken a lead in this area by fully remodeling its software in YANG and has already introduced NETCONF-enabled classical CPEs to market. The advantage of this approach for our telco customers is that it enables cost-effective pCPE to be introduced into an NFV service-chain, either at the customer premises or in the data center and provisioned with a choice of CLI, TR-069, or NETCONF.

Another key component of our strategy is full software abstraction of our network functions and this has already been realized both for white-box CPE deployments using a specially developed middleware called Open Virtualization Platform (OVP), as well as in our physical access platforms to enable service-chaining with additional VNFs, including third-party ones.

Our experience is that there is no one-size-fits-all approach to meeting the requirements of virtualization. Different telcos have different market requirements, as well as a diverse set of internal constraints to overcome. The main common factor is the transition journey as telcos cannot switch their traditional revenue-generating services to virtualization overnight. OneAccess facilitates this transition while enabling the end-goals of virtualization: market agility, speedier time-to-market, opex reductions, and improved wallet-share at enterprise customers. We call this approach: Fast Network Virtualization.
ABOUT OVUM

Ovum is a leading global technology research and advisory firm. Through its 180 analysts worldwide it offers expert analysis and strategic insight across the IT, telecoms, and media industries. Founded in 1985, Ovum has one of the most experienced analyst teams in the industry and is a respected source of guidance for technology business leaders, CIOs, vendors, service providers, and regulators looking for comprehensive, accurate and insightful market data, research and consulting. With 23 offices across six continents, Ovum offers a truly global perspective on technology and media markets and provides thousands of clients with insight including workflow tools, forecasts, surveys, market assessments, technology audits and opinion. In 2012, Ovum was jointly named Global Analyst Firm of the Year by the IIAR.

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