

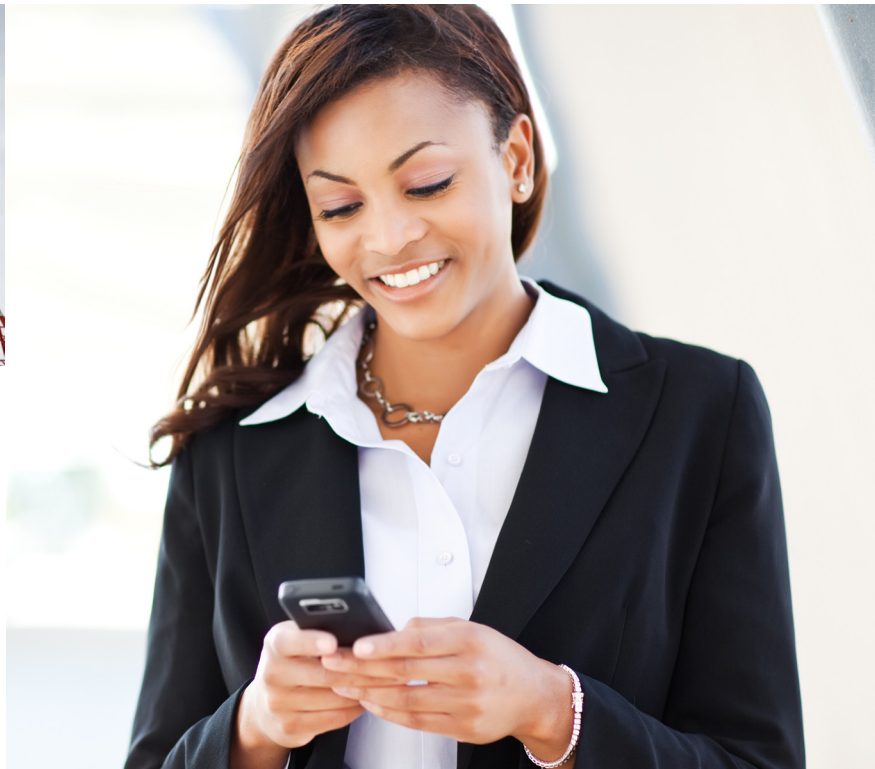
Fast track Network Virtualisation in the Telecoms Industry / February 2017

As the squeeze on legacy revenues tightens ^{p2} / So what's the outlook? ^{p4} /

Our top-line findings: rising uptake of VNF ^{p6} / New opportunities arise for vendors ^{p10}

Fast track Network Virtualisation

How Telecom operators worldwide view core network function virtualisation (NFV) and the accelerating transition to IP



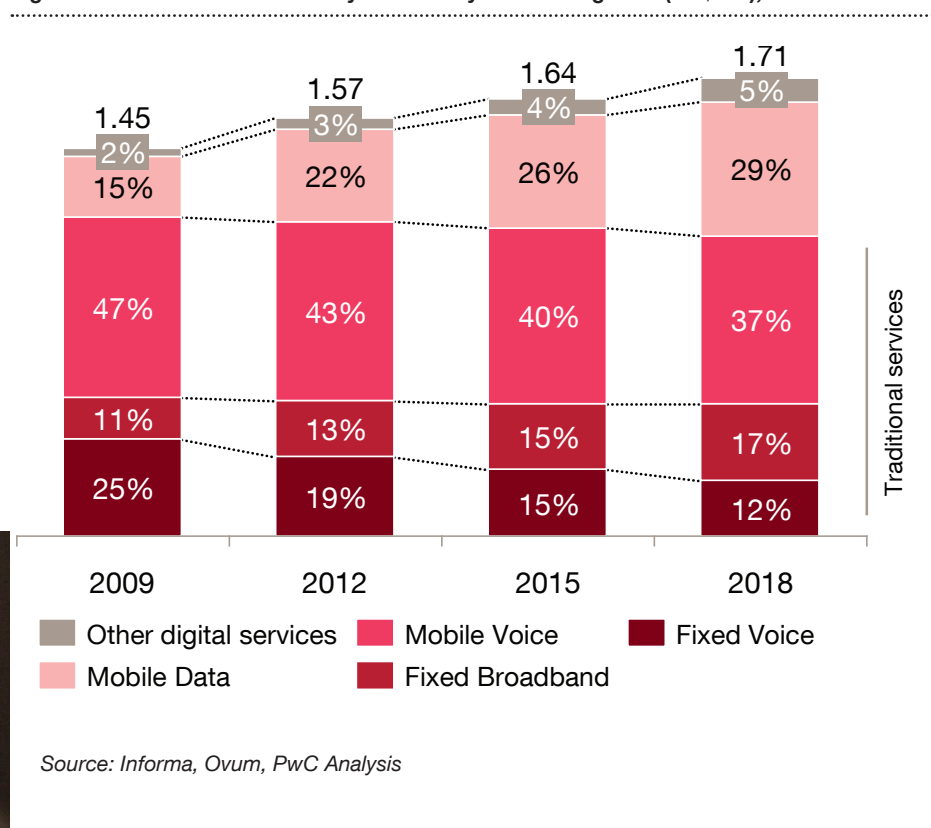
As the squeeze on legacy revenues tightens...

Across the world, most telecoms operators are facing a common challenge: an intensifying squeeze on their traditional revenues – especially from voice services – combined with downward pressure on data margins, as revenue per unit of traffic across their networks continues to decline.

It's a pincer movement that was inconceivable when operators' current networks were initially designed and built. On the voice side, consumers and businesses are less and less inclined to make traditional dialled calls, as they migrate to apps offering internet-based voice services, whether from mobile or fixed-line devices. At the same time, mobile telcos' former star performer – SMS – is seeing declining revenues, as customers switch to more feature-rich messaging apps and the expanding array of data services on offer.

Figure 1 shows the impacts of these trends on operators' revenue mix, with fixed-line and mobile voice in decline, offset by growth in mobile and other data services. This ongoing shift has caused operators to re-focus their network investments on new priorities, in an effort to limit the revenue losses and capitalise on the areas of growth.

Figure 1: Global telecom industry revenue by service segment (US\$ trn), 2009-2018



...operators' network revenues are failing to keep pace with surging data traffic

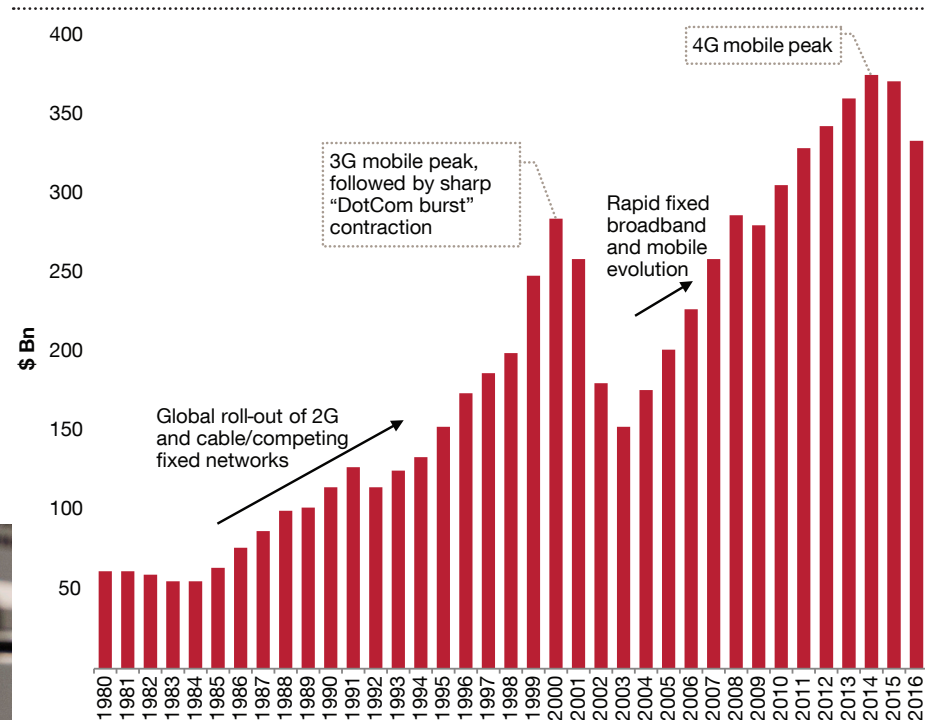
In combination, these trends are seeing the growth in bandwidth and throughput requirements outpace operators' network revenues. Whether fair or not, this situation leaves operators with only one realistic option in commercial terms: to invest in mobile and data capabilities that can deliver

more data over their networks at a lower cost, thus enabling them to handle the strong growth in data traffic while still generating a reasonable return.

Riding the cycle of telco network capex...

This all adds up to a need for operators to make their networks more efficient. And it's an imperative whose emergence is coinciding with a major inflexion point in the long-term cycle of the industry's network investments.

Figure 2: Global annual capex level in the telecom industry, 1980-2016



Note: Excludes Licences, Spectrum and R&D

Source: Capital IQ, OECD, Credit Suisse, GSMA Intelligence, IDC, PwC analysis

As Figure 2 shows, the historical trend in industry capex has – mostly – been relentlessly upwards for several decades, driven by rising numbers of operators and steady subscriber growth. However, this long-term increase in telecoms equipment spend has been punctuated by some cyclical slowdowns – the largest being after the DotCom bust in 2000/2001. Growth resumed with heavy investments in 3G networks and – from around 2010/2011 – rising investment in 4G. But this wave peaked in 2014, with a drop-off ahead of the forthcoming anticipated commencement of 5G network investments.

So what's the outlook?

Over the past ten years, customers worldwide have progressed from feature phone handsets to smartphones and a growing array of other internet-enabled devices. If operators are to profit from the resulting continued explosion in data traffic, networks – notably mobile networks – have to evolve to keep pace.

Using the pre-5G pause in capex growth as an opportunity for virtualisation

This is where the timing of the technology cycle comes into play. Major investments in 5G mobile infrastructure are currently two to three years away, with take-off expected in 2019/2020. In the intervening period, mobile network capex is expected to largely move sideways at around or – in some years – even slightly below its current levels.

This lull presents operators with a golden one-off opportunity to get their house in order, by providing them with a two-to-three-year breathing space before wide scale implementation of 5G drives mobile capex to a new peak in 2019-2020. During this period, they can fix the core of their networks to get them fit for purpose in an increasingly data-rich world, thus repositioning themselves to be ready for the next generational advance in network technology.

Blending IMS and VNF to drive both revenue and cost benefits

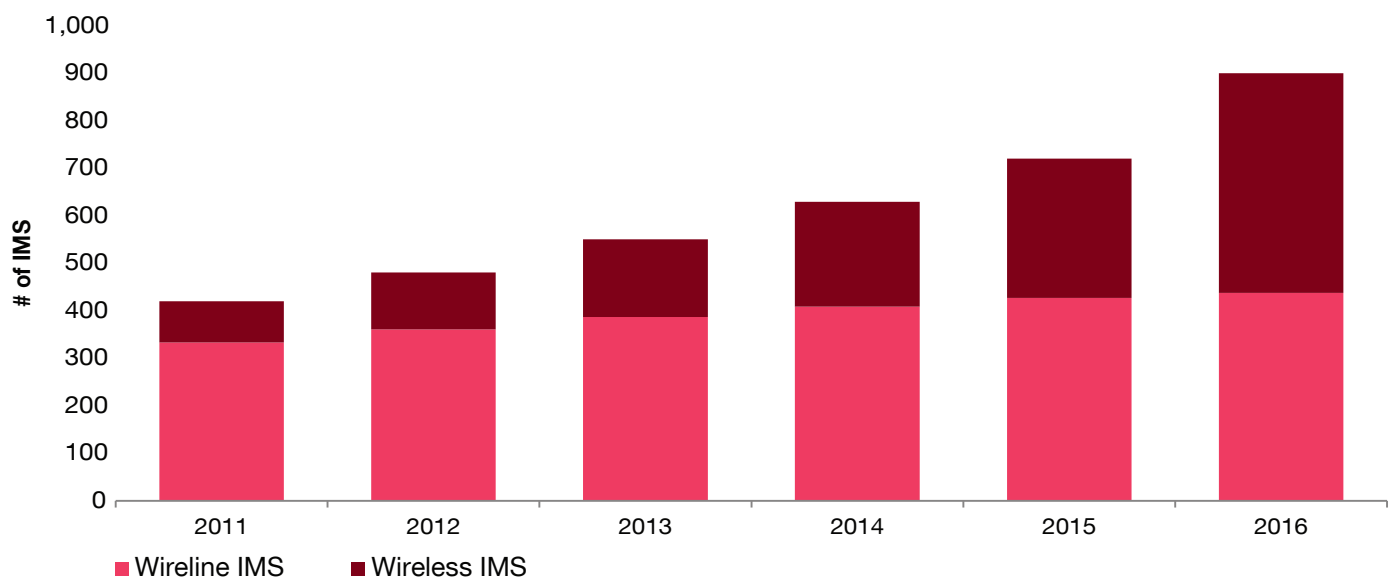
Many operators are already moving to exploit this window of opportunity. Research by the GSMA confirms that mobile operators in particular are now refreshing and upgrading elements of their networks – and that these investments are accelerating as more companies come to appreciate the twin challenges at hand. These are, first, to drive higher revenues by supporting and delivering more services. And second, to reduce costs by running networks more efficiently.

Operators are pursuing these dual goals through two complementary technologies that – while separate – dovetail together to get the best out of both. On the revenue front, they're using IP Multimedia Sub-system (IMS) to open up new service opportunities and revenue streams: it can cost up to 50% less to launch an application on IMS rather than on vertical services.

And on the costs front, they're combining IMS with virtualised network functions (VNF), thus enabling network load to be allocated dynamically to where capacity is available, and removing the need to keep investing in higher network capacity to handle rising traffic. Over a five-year period, the cumulative cost of IMS virtualised through VNF can be 50% less than that of employing multiple physical IMS.



Figure 3: Number of deployed IMS in Carrier Networks, 2011-16



Source: Ericsson, IHS, PwC Analysis

The accelerating industry-wide move to adopt IMS is illustrated in Figure 3. Its implementation is enabling operators to support a growing range of voice-over-IP (VoIP) offerings on platforms including LTE and WiFi, ensuring that customers don't suffer dropped calls as they move between different modes of connectivity. By orchestrating all the various elements, IMS not only enables new services. It also reduces cost, by acting as an intelligent overarching cloud layer managing the network in a coordinated, integrated way and boosting resilience.

At the same time, embedding VNF into the network infrastructure enables changes to be handled through software rather than hardware. As a result, network servicing and maintenance involve less effort and lower cost, while customers get a better service experience – paying an affordable price to enjoy the seamless, uninterrupted connectivity on the move that today's customers regard as a hygiene factor.

Our top-line findings: rising uptake of VNF – driven by VoLTE and cost efficiency

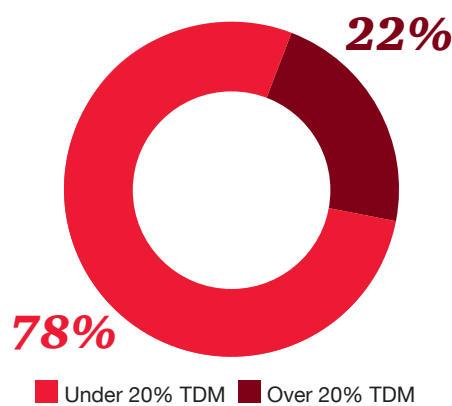


To investigate how operators worldwide are responding to this blizzard of change, we've conducted in-depth research interviews with over 40 heads of technology and engineering and expert market commentators at a diverse array of telecoms service providers across the globe. Our findings confirm that uptake of VNF is accelerating, driven partly by mobile operators and VoLTE deployments, and partly by cost efficiency pressures. It's also clear that there are opportunities for specialised VNF software vendors to enter the space.

Finding 1: Carriers are moving towards IP core networks, but a full transition is being slowed by outstanding legacy contracts

Beneath these overarching findings, three themes emerge particularly strongly from the research. First, carriers are continuing to transition to an IP core network, but in many cases are maintaining their legacy time division multiplexing (TDM) infrastructure for existing customer relationships and interconnections. While some have already gone 100% to IP, a significant proportion – as Figure 4 shows – still have more than 20% of their network based on TDM.

Figure 4: TDM/IP mix of carriers

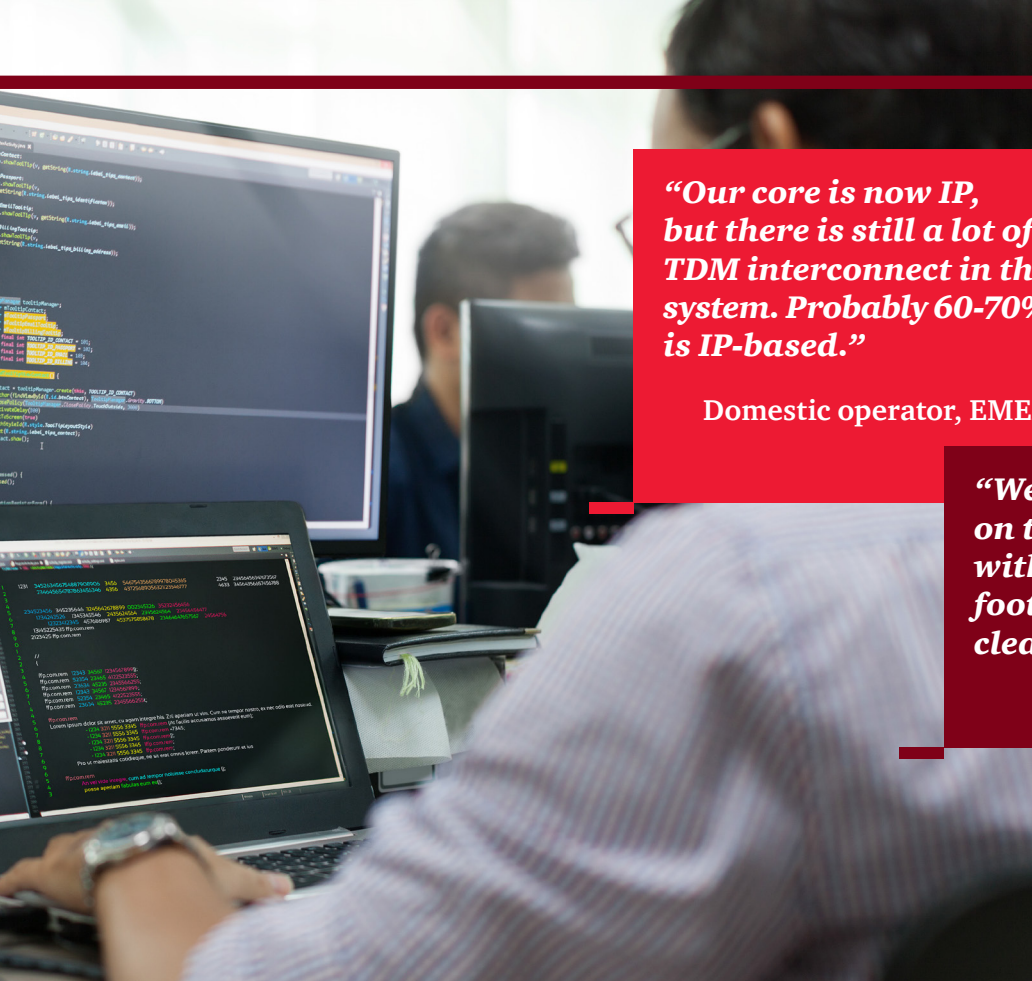


Source: PwC interviews

However, the direction of travel remains decisively towards IP: a large majority of those carriers that still have legacy infrastructure plan to increase their IP mix in the next three to five years. This suggests that the take-off in network virtualisation is finally poised to happen. Yet some barriers to moving to an all-IP core remain. Asked what factors are preventing them from dispensing completely with their legacy networks, our respondents point to the need to maintain TDM connections and existing profitable relationships (see Figure 5).

Finding 2: The adoption of VNF is accelerating, driven by a need for more capacity and rising customer uptake of VoLTE

The second theme that emerges from our research is an acceleration in VNF uptake in the next three to five years, driven by rising adoption VoLTE aligned with capacity upgrades and pressures to increase network efficiency. Our study finds that only 9% of carriers to date have begun to virtualise a significant amount of their core network, with the remaining 91% having virtualised less than 20%. But an overwhelming 87% expect to increase their level of virtualisation in the next three to five years.



“Our core is now IP, but there is still a lot of TDM interconnect in the system. Probably 60-70% is IP-based.”

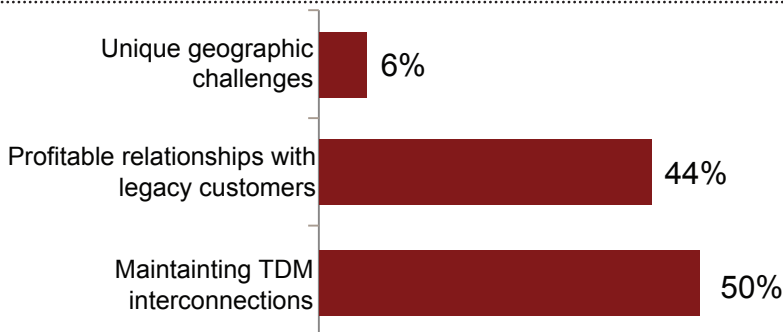
Domestic operator, EMEA

“We are 100% IP-based on the core network, with a small TDM footprint that we cleaned up last year.”

Tier 1 operator, US

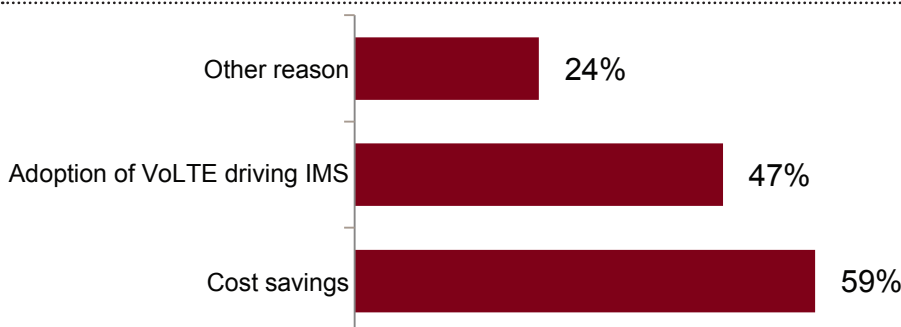
Asked to cite the drivers for the uptake of VNF in their core network, our interviewees point to two main factors (see Figure 6). The top driver by a significant margin is cost savings, followed by VoLTE adoption – underlining the blend of cost and revenue benefits opened up by network virtualisation.

Figure 5: Primary reason carriers are maintaining a legacy network



Source: PwC interviews

Figure 6: Drivers of VNF uptake in the core network



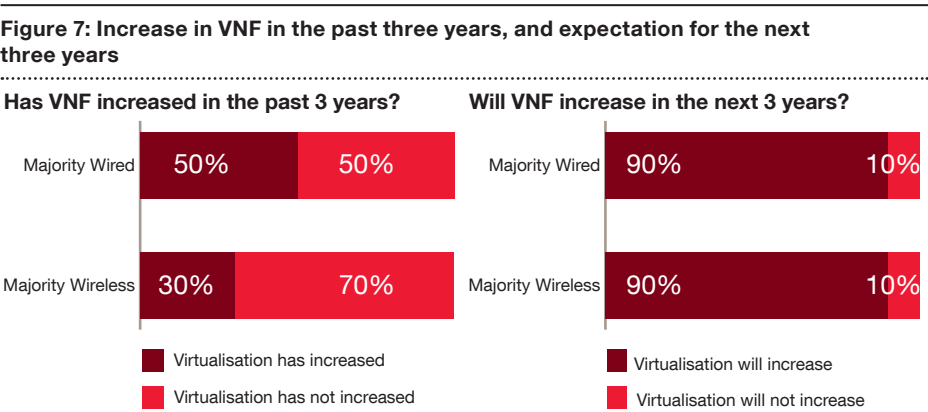
Source: PwC interviews

The third theme is a particularly strong drive to adopt VNF over the next three years among mobile operators and large Tier 1 players. All operators agree that uptake of VNF in the industry will speed up, with 43% overall saying VNF adoption has accelerated in the past three years, and 88% expecting it to increase in the next three. But the anticipated acceleration is faster among mobile operators than wired players (see Figure 7).

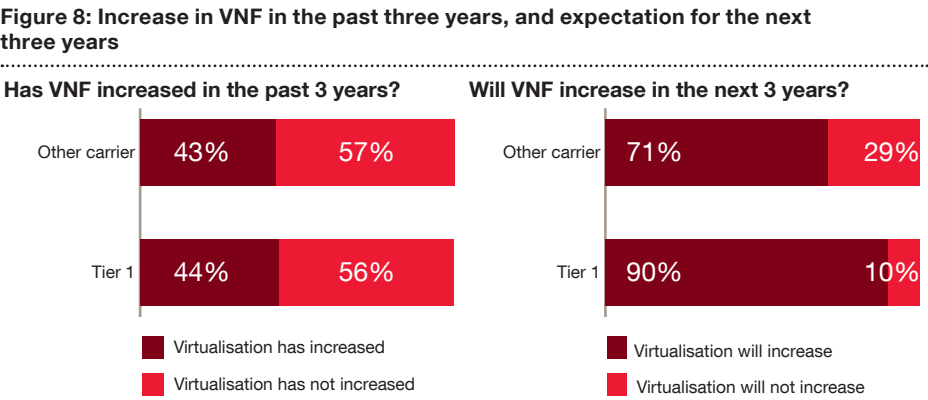
Finding 3: Wireless operators and large Tier 1 operators are anticipating a faster acceleration in uptake of VNF

Similarly, as Figure 8 shows, Tier 1 carriers voice higher expectations than other operators of increased virtualisation in the next three years – indicating a greater commitment to VNF implementation among larger telcos.

An analysis of the findings by geography shows that North America is the only region where more than half of operators say VNF uptake has increased over the past three years – a finding that indicates North America has led the move towards virtualisation to date. But other regions are set to catch up, with a higher proportion of operators in APAC, EMEA and Latin America than in North America expecting it to increase in the next three years. So virtualisation is set to be an increasingly global phenomenon.



Source: PwC interviews



Source: PwC interviews

As operators worldwide approach this pervasive migration, they’re largely in agreement over the main risk factors that can delay VNF adoption. However, while they identify these barriers as including integration complexity, vendor lock-in and the strong presence of legacy equipment in their networks, they’re still united in expecting VNF uptake to accelerate.

“10% of our network is virtualised. I expect the rest will be virtualised within three years.”

Multi-territory operator, LATAM



“We have chosen to transition to VNF now to save costs, transition to VoLTE, and due to latency on the network.”

Tier 1 operator, US

Drivers towards VNF are that it's cheaper from a cost perspective and it allows us to offer customers virtualised services.”

Tier 1 operator, US

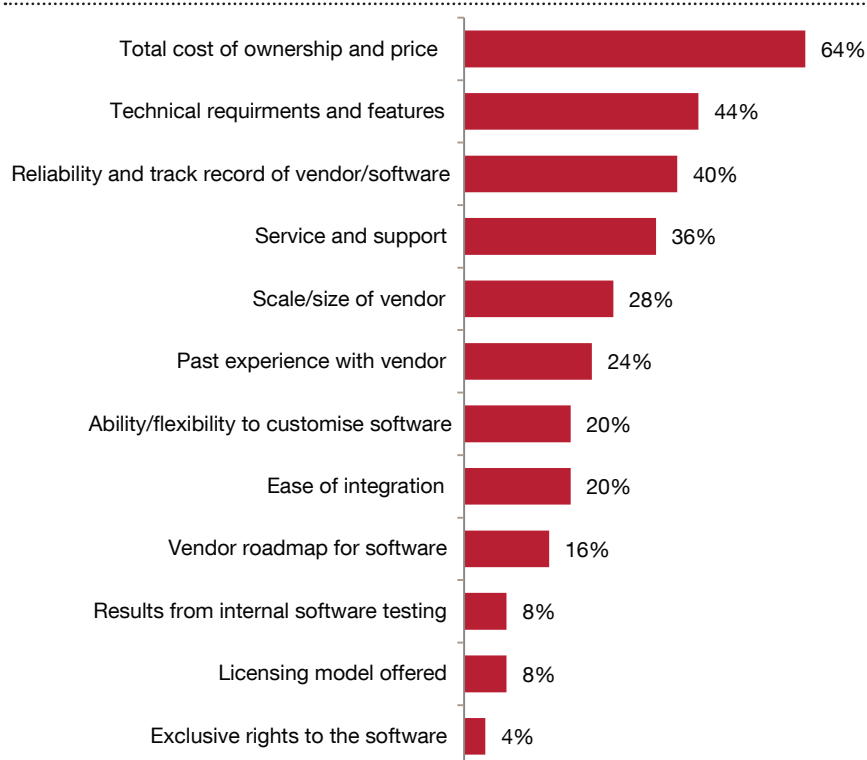
“There is a strategic case for VNF from an innovation point of view.”

Multi-territory operator, EMEA

New opportunities arise for vendors – with cloud-centric and NFV skills to the fore...

Over the coming three years, the rising industry-wide investment in IMS and VNF could open up major opportunities for specialist telecoms software vendors. These opportunities are underlined by our findings on operators' key purchasing criteria for core network software providers.

Figure 9: Key purchasing criteria given by interviewees (multiple responses allowed)



Source: PwC interviews

As Figure 9 shows, cost – encompassing both up-front price and total cost of ownership (TCO) – remains carriers' top purchasing criterion. Yet behind this they also rank technical software capabilities and a proven track record as important. A prior relationship with the vendor ranks lower than specialist skills and support, indicating the potential emergence of greater disruption and diversity among vendors, provided they can demonstrate reliability and ease of integration.

“We started with proprietary hardware and are moving towards cloud solutions...I will not be going back to a physical solution for this, and we will instead be looking for a cloud solution.

Virtualisation will change our mix of suppliers.”

Multi-territory operator, APAC

“Going forward, I think we are more likely to use small vendors as we move towards virtualisation.”

Multi-territory operator, LATAM

“We are now mandating capacity-to-virtualise in our tender process. Vendors held out for as long as they could on proprietary hardware and software because they made more money that way.”

Multi-territory operator, LATAM

...while operators will need to elevate their software capabilities to capitalise on the opportunity presented

For operators, the implications of the rapid move towards network virtualisation over the next two to three years are equally profound. By 2020, the combination of IMS and VNF means their networks will be completely different from today, with their network capabilities having effectively become IP capabilities.

This important shift (in many ways taking place under the bonnet) means Telcos will have finally crossed the divide from their past as network engineers to their future as software developers. And there'll be no going back. Rather than teams of hardware maintenance engineers out in the field, they'll need smaller groups of IT engineers and software programmers working centrally to control and fine-tune network operations.

At the start of this paper, we highlighted the ongoing migration of industry revenues away from traditional services and towards new IP and data-rich offerings (see Figure 1). The logical conclusion of this trend is a new telco model founded on software-defined networks, and that's the new world that operators worldwide are now poised to enter. It's an exciting future – and, operators will be hoping, one that's more profitable than the recent past.



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