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NFV/SDN Research Programme

Key Findings

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STL PARTNERS

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Executive Summary: Whilst telecoms service providers generally recognise the inevitability and importance of NFV/SDN, and are exploring virtualisation, most are still at a very early stage

1. Ambition levels amongst service providers are high:
   - Service providers expect NFV/SDN to deliver both cost savings and increased (service) agility
   - The majority of participants are actively exploring virtualisation and are beginning to develop new virtualised services
2. Whilst operators are exploring virtualisation, most are still at a very early stage:
   - Typically the CTO office is driving the virtualisation agenda; although governance/ownership is not always clear
   - There is some convergence around the first services/functions selected for virtualisation: IMS, vEPC, uCPE, vCPE, SD-WAN
   - Even those that are exploring new services are at a very early stage: most are running PoCs and expect to launch next year
3. Most common barriers include:
   - Culture: struggle to adopt an agile, DevOps culture; lack of coordination & common awareness about the benefits of virtualisation
   - Software skills (in network organisation): service providers don't have, and struggle to attract and retain, the relevant skills
   - Some operators find it difficult to build the business case for virtualisation & have had to change their approach
4. We see 3 different pathways/approaches to NFV/SDN emerging:

1. Technology Evolution:	2. Service-led Innovation	3. Organisational Transformation
Focus on building scaled virtualisation of a few core functions &/or sub-systems in a way that minimises risks, dependencies & organisational change.	Focus on the customer and the services themselves, developing a more cloud-like commercial model, as opposed to focusing on the underlying technology.	NFV/SDN is a key catalyst for wider organisational transformation, from both a technological and cultural perspective

Executive Summary: Whilst most service providers are at an early stage with NFV/SDN, there are still are number of lessons that can be learnt from initial successes

1. **Senior management support and understanding is critical**: regardless of strategy, participants who were further ahead with NFV/SDN had clear support (and ownership/understanding of the transformational implications) from senior management. This becomes more important as service providers seek to leverage NFV/SDN as part of a wider transformation effort.

2. To truly embrace NFV/SDN service providers **need to create a more innovative, agile culture**. Some service providers have had success by engaging and educating the workforce on the benefits of NFV/SDN (focusing less on the technology). This involves regular seminars and workshops.

3. Service providers need more relevant **software & technical skills** to manage a virtualised network. Service providers with existing cloud and data centre businesses have successfully leveraged and/or directly contracted individuals in these areas with software/virtualisation skills, accelerating learning. Service providers should also look both internally (with training) and externally (to bring on board expertise) to develop the right skill-set.

4. NFV/SDN naturally creates more of a **blur between product management, network planning, operations and IT**. To avoid silos developing, service providers should set up a steering committee (with representatives from network, cloud, IT and enterprise functions). This committee should be responsible for setting out the high-level roadmap for virtualising network functions.

5. As NFV/SDN begin to blur roles and functional areas, service providers need to move to more of a **DevOps model**. Some service providers have had success by making a partial move to this model. This involves firstly creating a team responsible for managing the infrastructure (with an understanding of applications as well as infrastructure). This is a single team that cuts across stages that were previously supported by separate teams (e.g. capacity planning, design, testing). Over time this team would also become responsible for operations. Moving to the DevOps model will also help overcome some of the cultural challenges within the organisation.

6. Those launching new virtualised services to customers need to **educate customers and develop new compelling propositions**. How customers use these services is different to legacy (e.g. on-demand, flexible, scalable). Service providers need to develop new differentiated propositions to communicate this to the customer. Additionally they need to understand the potential impact this has on customer's internal processes (e.g. finance, procurement).

7. **Building the Business Case**: Service providers that have achieved scaled production of a virtualised function/service have been able to demonstrate a clear business case for the virtualised function/service over legacy. This has allowed them scale quickly.

8. Advanced service providers are now beginning to think about the **importance of data**; which could help to enable greater operations automation.

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Research Programme: Overview of discussions

- STL Partners' research programme was focused on exploring the current state of NFV/SDN implementation across the telecommunications industry, with particular emphasis on launching new virtualised services aimed at business customers (such as vCPE services or SD-WAN).
- The research was based on anonymised discussions with 14 telecoms service providers across the globe. All discussions took place in H2 2016.
- The discussions explored the key challenges and barriers hindering progress and how service providers are planning for the future.
- Discussions covered two main areas:

1) NFV/SDN: general strategy and approach

- Rationale for NFV/SDN deployment and what has influenced this (market/business challenges)
- Overall strategy, ambitions and key focus areas
- Approach and roadmap
- General challenges and barriers
- Future ambitions
- Views on rest of industry and peers

2) Developing virtual business services

- Current virtual business services portfolio (if applicable)
- Product development process (for virtual business services) – what this looks like and how it has changed/is changing.
- Main challenges and how to overcome them
- Future business services outlook

Research Programme: Overview of participants

STL Partners spoke to a number of Executives at service providers, with varying characteristics:

Region Headquartered	**Europe**	**MENA**	**APAC**	**Americas**
	64%	7%	14%	14%

Fixed or Mobile?	**Fixed focus**	**Mobile focus**	**Fixed and mobile focus**
	7%	7%	86%

Type of Service Provider	**Group-level**	**Opco within group**	**Independent**
	36%	14%	50%

Global or National?	**Global player**	**National player**
	43%	57%

Titles of interviewees included: CTIO, Head of Transformation, Head of Networks & IT, VP Network Architecture & Technology, Product Director, Director IP Services, Head of NFV/SDN Packet Core, Senior Manager Innovation

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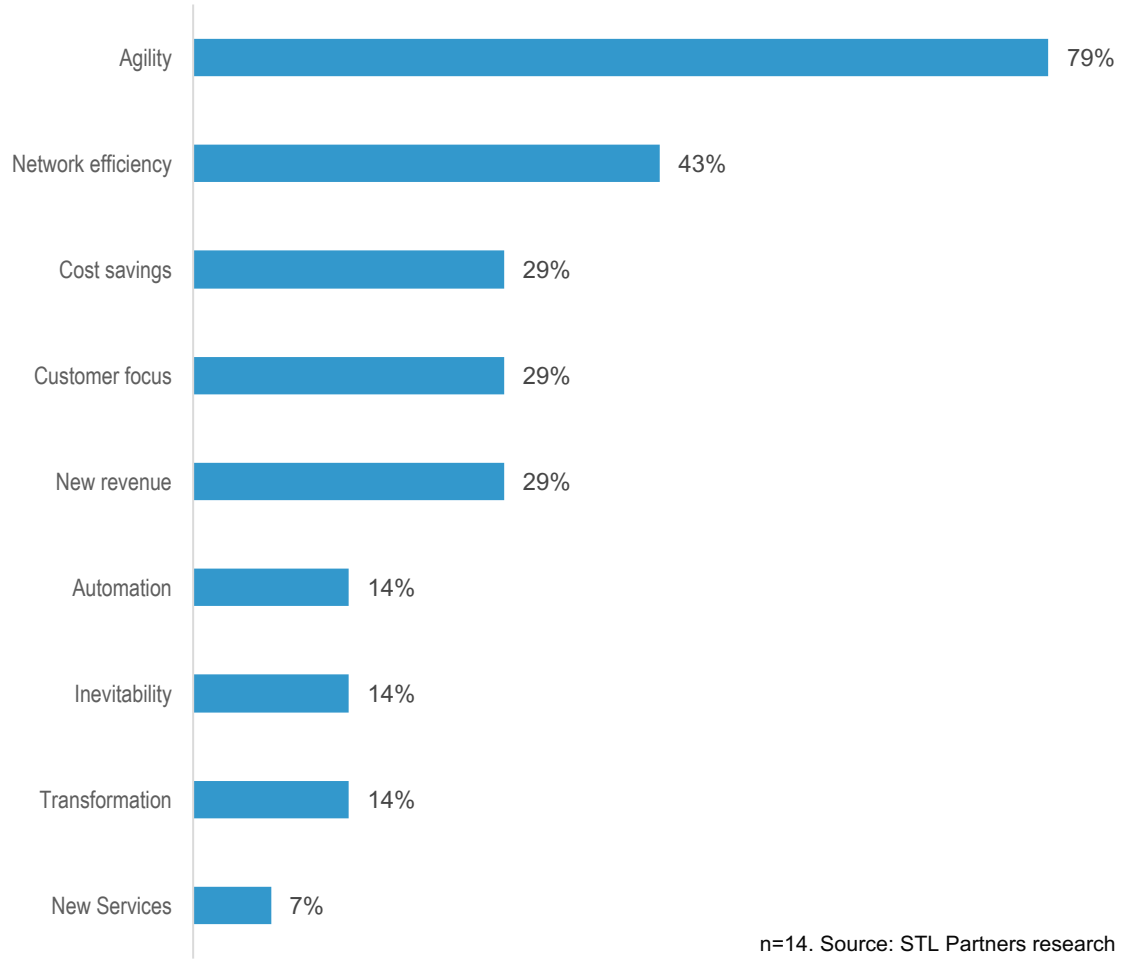
Key Drivers: Service providers see NFV/SDN as an opportunity to become more agile

- Agility is the key driver for virtualisation:
  - 79% of service providers mentioned agility when discussing what is driving them to virtualise.
  - Service providers want to be able to move faster, and to use that speed to deliver innovative services to their customers in different ways.
- Across the interviews there were a range of other drivers stated, but several of these might be seen as different forms of agility:
  - New services, transformation, automation, and customer focus are all different ways of emphasising the same point.
- While cost saving was cited by four operators, three explicitly said that cost-saving was not the object of NFV/SDN:
  - Service providers saw cost saving as one of the key arguments in favour of virtualisation put forward by vendors – this research programme suggests that service providers are not wholly convinced by this argument.

"Cost reduction is just a side effect"
– Head of Group Network Architecture, Global Converged Service Provider

"There are more opportunities with virtualised technologies. They are more modern and innovative and lead to faster delivery of services"
– CTIO, European converged operator

Figure 1. Key Drivers for SDN/NFV

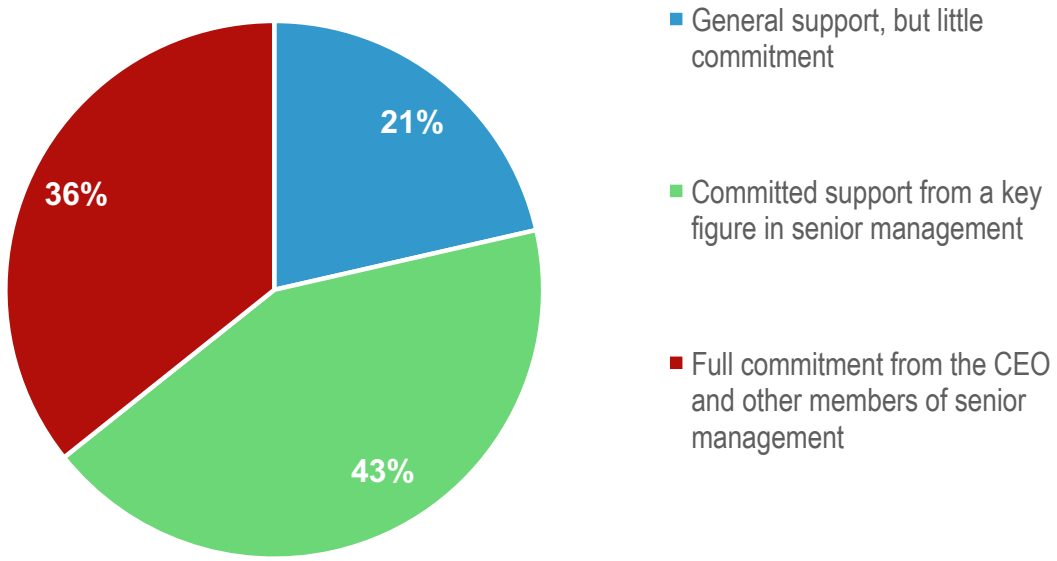


n=14. Source: STL Partners research

Top-level Support: Senior management recognise that virtualisation is inevitable, but the level of support given to virtualisation initiatives varies, and this has consequences

- Virtualisation is inevitable, and board members recognise this:
  - No service providers spoke of board-level resistance to virtualisation. There appears to be general acceptance that this is the future.
- The majority of service providers have committed support from the board for NFV/SDN initiatives:
  - 79% of service providers have committed support from senior management. In some cases (43%), this support was located in a single figure, usually the Chief Technology Officer. In others (36%), there was committed support across senior management, usually including the CEO.
- However, a few service providers suggested that senior management were making the right noises about virtualisation, and offering general support, without really throwing weight behind the initiative. This causes clear problems:
  - There is a correlation between service providers that spoke in lukewarm tones about support from senior management, and those who encountered problems with areas of resistance to virtualisation in their organisation.
  - In other words, clear and vocal commitment from senior management makes a significant difference to those trying to implement NFV/SDN initiatives.

Figure 2: Senior management support for NFV/SDN



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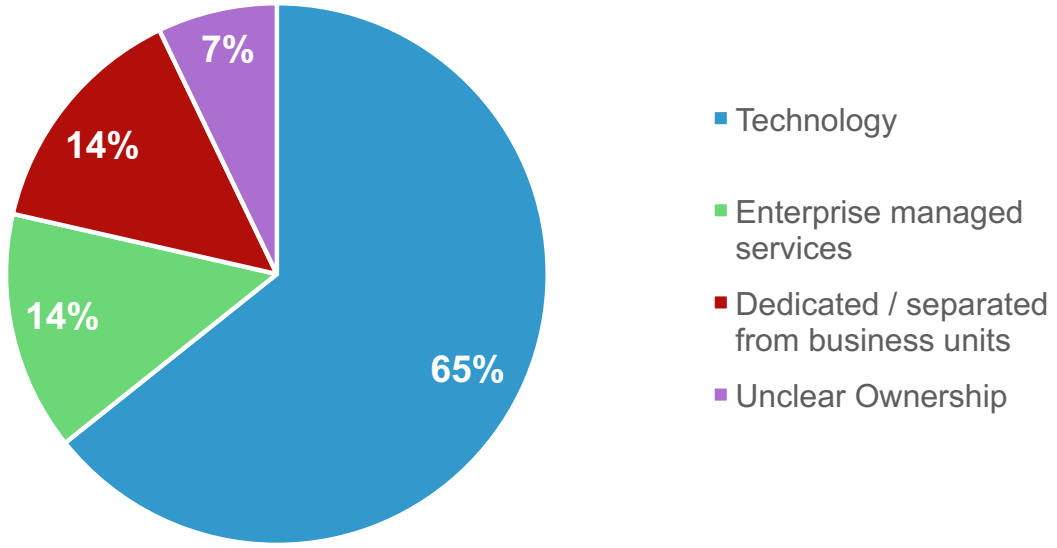
"Until a year ago the transformation programme was an IT project […] it is now a top priority for the management team"
– Head of Transformation, European converged operator

"[Drive for virtualisation] came from the top. Both Group CEO and CTO are invested in this and have been very supportive. [The] CTO issued a circular saying that if you're planning to expand, don't expand on classical, expand on virtual or new."
– Director, Emerging Technology, MENA Service Provider (Group)

Ownership: NFV/SDN initiatives are overwhelmingly owned by the technology division

- NFV/SDN initiatives tend to be driven internally by technology – usually the CTO:
  - 9 out of 14 service providers identified NFV/SDN as an initiative driven by the Technology division. Most, but not all, specifically identified the CTO as a key owner and driver.
  - While it has become clear that NFV/SDN is not just about the technology, the origins of transformation programmes as 'technology upgrades' tend to mean that the technology function has retained ownership.
- Not all ownership within technology is equal:
  - Technology is clearly the default: less well organised operators took a 'technology leads, I guess' approach.
  - More organised operators benefited from a clear and visionary, technology-led initiative. This often spread to other functional areas: 'not just a technology project' indicates both the scope of virtualisation and its default position.
- However, there are some interesting alternatives:
  - In two service providers, the principal drive came from the managed services division. (However, even in these cases the CTO's office played an important role.)
  - Two service providers had separated the virtualisation effort from traditional business units/functional areas:
    - One service provider hired a dedicated executive to own and drive the virtualisation effort, independently from the traditional functional areas.
    - In one service provider, virtualisation was explicitly driven by the CEO as an element within a wider transformation programme.

Figure 3: Internal ownership of NFV/SDN initiatives



n=14. Source: STL Partners research

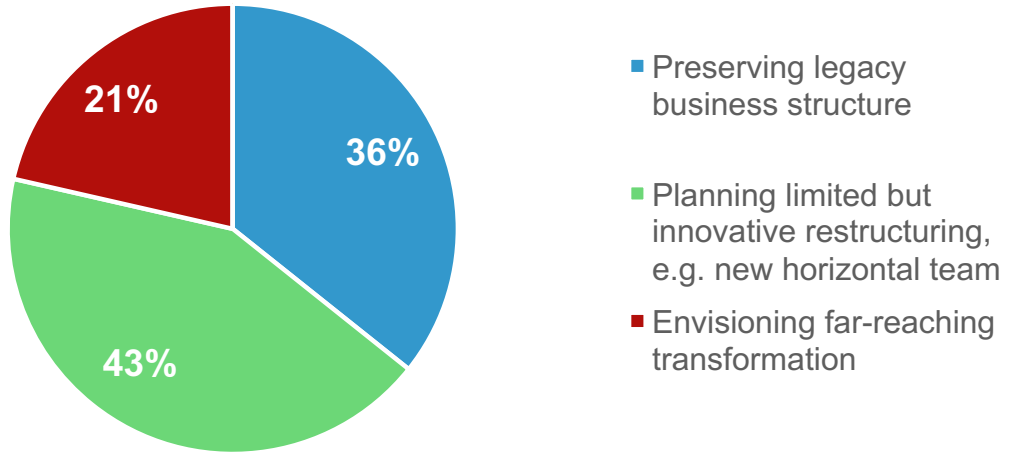
"Keep stepping back and see the bigger picture"
– Head of Networks & IT, European converged SP

"[Virtualisation] is not just a technology project"
– Head of Networks & IT, European converged SP

Organisational Structure: Service providers are increasingly understanding that NFV/SDN may involve some reorganisation – but their level of ambition varies

- Increasingly, service providers recognise that NFV/SDN may require some form of reorganisation:
  - 64% of service providers have a tendency to describe NFV/SDN as transformational. These can be split into two groups.
  - 21% clearly state that virtualisation is one key element in a much wider transformation programme. While their responses are clearly ambitious, much of their discussion around virtualisation centred around how profoundly complex and difficult transformation of this kind could be. Indeed, it is indicative that only very small service providers have made significant progress towards transformation.
  - 43% imagined reorganisation in a more limited fashion. As with the most ambitious three service providers, these six recognised the organisational implications of virtualisation: it can blur the boundaries between traditional business units/functional areas. However, they were less willing to imagine a full reorganised future, and instead envisage limited but innovative restructuring – for example a new horizontal team to manage virtualisation.
- However, some service providers are attempting to virtualise largely within their existing business structure:
  - 36% of service providers are making no substantive changes to their legacy structure.
  - Some of these service providers are paying lip service to the transformative potential of NFV/SDN initiatives – but in these cases it is clear that the power base lies in the legacy business units, and there is little evidence of genuine change to come.

Figure 4: Organisational structure under NFV/SDN



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"Dedicated new team for new initiatives (to be set up early next year to look at impact on network and tech as well as how to develop and deploy new services to customers"
– VP Network Architecture & Technology, Asian Converged SP

"[NFV/SDN is] rebuilding a plane whilst in-flight. Ripping out the engine, building a new chassis, training the pilots, bringing in new staff with different skills, repainting … all while cruising at 35,000 feet. We are trying not to lose altitude as we do it."
– Head of Networks and IT, European Converged Service Provider

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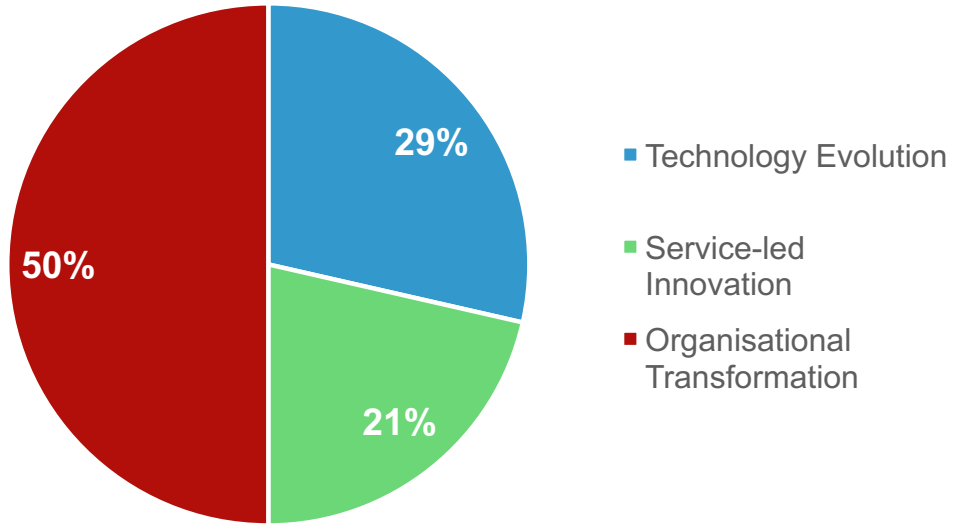
Approach: Three broad pathways to NFV/SDN implementation are emerging

- There are many potential approaches to NFV/SDN implementation. During our discussions, however, it became clear that the overarching approaches that service providers have taken fall under three broad pathways virtualisation. These are:
  1. **Technology Evolution:** Focus on building scaled virtualisation of a few core functions &/or sub-systems in a way that minimises risks, dependencies and organisational change.
  2. **Service-led Innovation:** Focus (initially) on the customer and the services themselves, as opposed to the underlying technology.
  3. **Organisational Transformation:** Focus on wider organisational transformation – NFV/SDN is a key catalyst in this transformation process, both from a technological and cultural perspective.
- These pathways describe the center of gravity behind individual service providers' approaches. In some cases, service providers have adopted approaches that fit more than one of these pathways.
  - For this report , pathways have been assigned based on the main thrust of each service provider's virtualisation programme.
- The majority (50%) of participants believed that their approach to NFV/SDN was part of a wider organisational transformation process, helping to develop new skills and transform culture and processes within their organisation.
- **More detailed definitions and explanations of the three pathways can be found in Section 5.**

Figure 5: Transformation pathways adopted



n=14. Source: STL Partners research

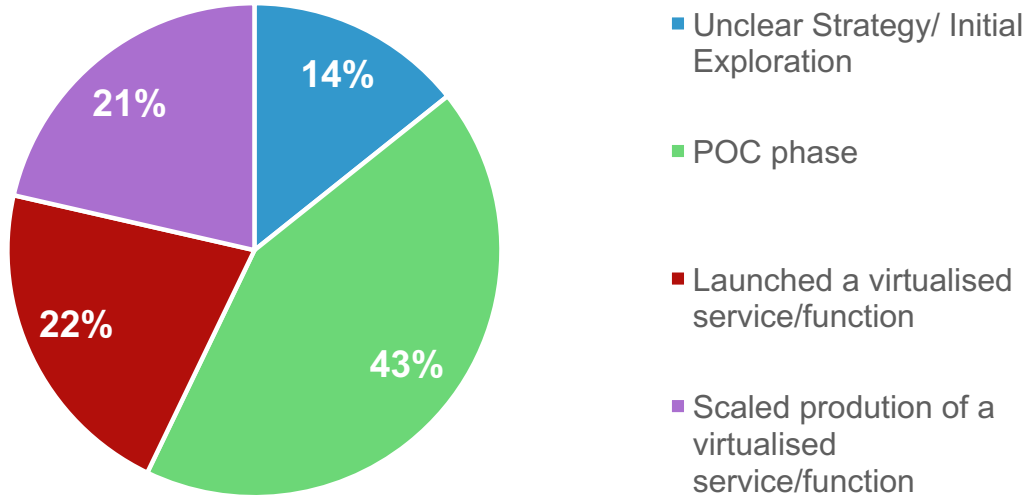
"It is not just a technology project. Our goal is to be more customer-centric with our offerings, with the ability to be agile and create products on the fly"
– Head of Networks & IT, European converged service provider

"This has been led as a transformational program, bringing together the business opportunities and cost savings. It has been mainly driven from an external perspective. Cost saving is important but doesn't drive things."
– Director, Product Management, global service provider

Progress: The majority of participants are exploring virtualised functions or services

- Whilst a number of pathways for NFV/SDN deployment are emerging, the majority of service providers have not yet achieved significant scale with virtualised functions and services.
- Participating service providers are currently exploring virtualised functions/services:
  - 64% of service providers are either at proof of concept stage or have launched a small-scale service with a handful of customers.
  - There is some convergence around the first services/functions selected for virtualisation: IMS, vEPC, uCPE, vCPE (cloud-VPN), SD-WAN
  - The majority of the service providers that are exploring NFV/SDN are planning to launch services early next year.
- Some service providers are only getting to grips with NFV/SDN:
  - Typically these organisations are less focused on enterprise services and/or experiencing a lack of customer demand for virtualised services in their market.
  - These service providers are beginning to form teams tasked with better understanding the opportunity.
- A handful of service providers have achieved scaled production of a virtualised service or function:
  - These service providers have typically been pioneers in this area, and have been focusing on virtualisation for a number of years.

Figure 6: Service providers' NFV/SDN deployment progress



n=14. Source: STL Partners research

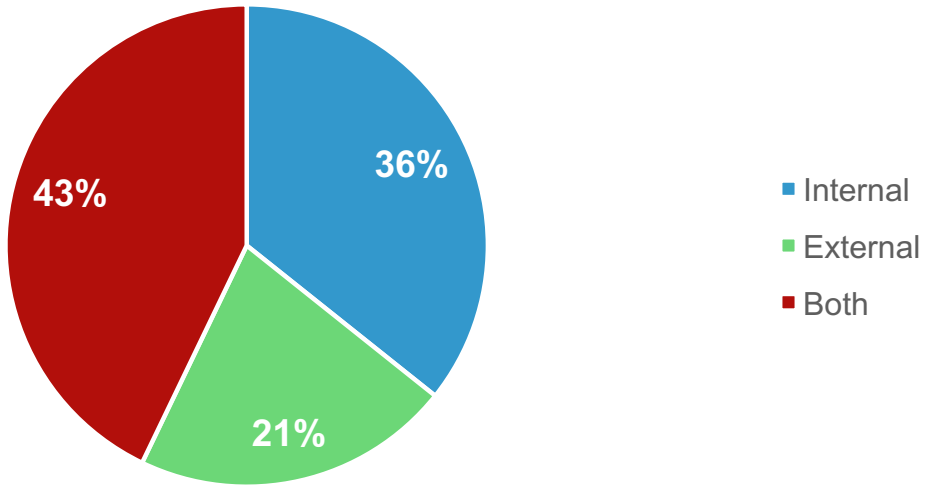
"We have piloted vCPE for managed VPN/firewall. We are now testing with friendly customers and we plan to go-to-market next year"
– VP of Network Architecture & Technology, Asian SP

"From next year, everything has to work to the new blueprint. The question of when to switch out legacy will be a business decision, evaluated on a case-by-case basis." – Head of NFV/SDN network transformation, global SP

Internal/External: Participants are focusing on a mix of areas when implementing NFV/SDN

- Service providers are focusing on different areas when deploying NFV/SDN.
- Some are focusing on the benefits virtualisation brings to their internal core network, whereas others are focused on the opportunity to develop more external edge services.
- To some extent the area of focus overlaps with the three transformation pathways.
  - Those who are looking more internally tend to see NFV/SDN as more of a technology evolution.
  - Those whose driving rationale is external tend to fall into the service-led innovation pathway.
  - Those who have attempted to do both often fall into the Organisational Transformation category.
- However, the transformation pathways do not map directly to the areas of focus. In some cases service providers who are focusing internally may still see NFV/SDN as a catalyst for wider organisational transformation.
- Those that are focusing internally are typically exploring virtualising the IMS network and vEPC.
- Those that are focusing on external, customer-facing virtualised services are typically exploring vCPE-based services and SD-WAN solutions.

Figure 7: Service providers' area of focus when implementing NFV/SDN



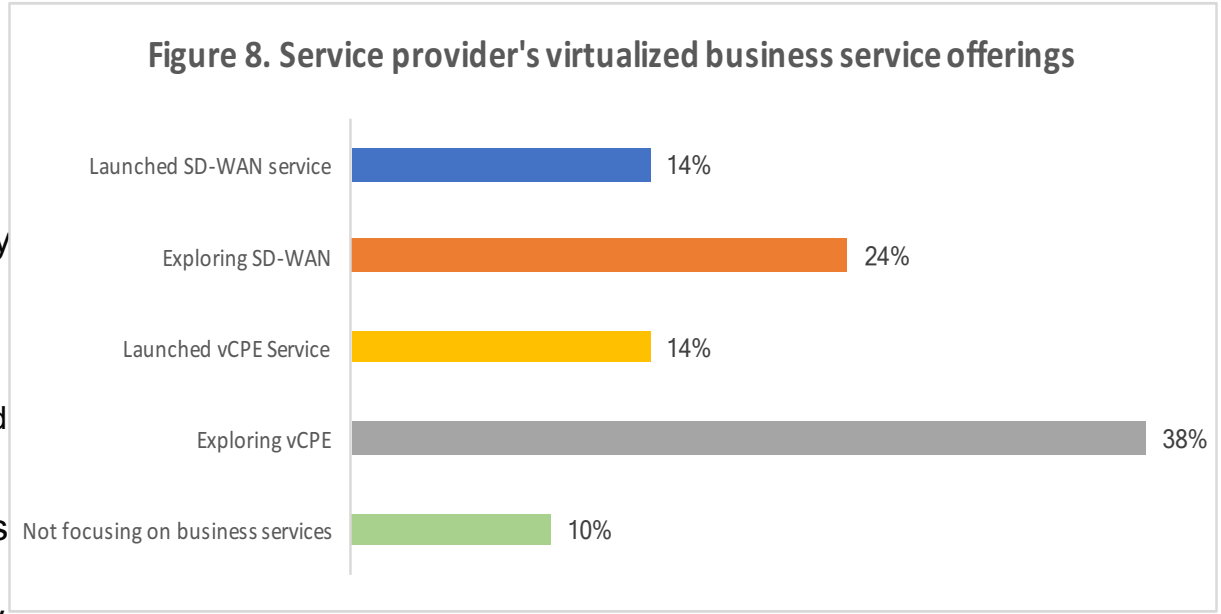
n=14. Source: STL Partners research

"The compelling event was IMS. We were looking to replace functions reaching end of life (such as IMS).Moving to a virtualised environment was the best option over a 5-year TCO.*" – CTIO, European converged SP*

"We already had 'customer configurable' services before, so [uCPE/vCPE-based services] was a logical extension."
– Director, Products, global SP

Service Offerings: Service providers are focusing on vCPE-based services and SD-WAN as the first virtualised services for business customers

- Service providers we spoke to are mostly exploring two services/service areas:
  1. 79% are either exploring or have launched a **vCPE-based service.**
  2. 57% are either exploring or have launched an **SD-WAN service.**
- Whilst the majority of participants are exploring these services, only a handful have actually launched virtualised business services.
  - 14% have launched both vCPE-based services and SD-WAN.
  - Of those that have launched vCPE services, typically the deployment has effectively been a uCPE solution, where a host of functions are pre-installed on the CPE and only activated if required by the customer.
- When launching new vCPE services or SD-WAN, service providers typically articulate a new customer proposition. This focuses on promoting greater flexibility and agility for IT. This is often driven by need to differentiate and change the dialogue with customers.
- In some markets, where vCPE solutions are less-well established, service providers are pitching vCPE solutions and SD-WAN as a more basic, lower-cost entry solution.
- When virtualising internal functions/sub-systems (e.g. IMS), service providers are typically more cautious regarding communication with customers. Until the service/system is proven they are unlikely to communicate that it running in a virtualised environment.



"We're lucky to have the cloud computing model -- for educating customers, its great to have businesses that are really there. It is not just about cost – it is about the flexibility that you didn't know you could have, and the benefits of that."
– Director, Product Management, global SP

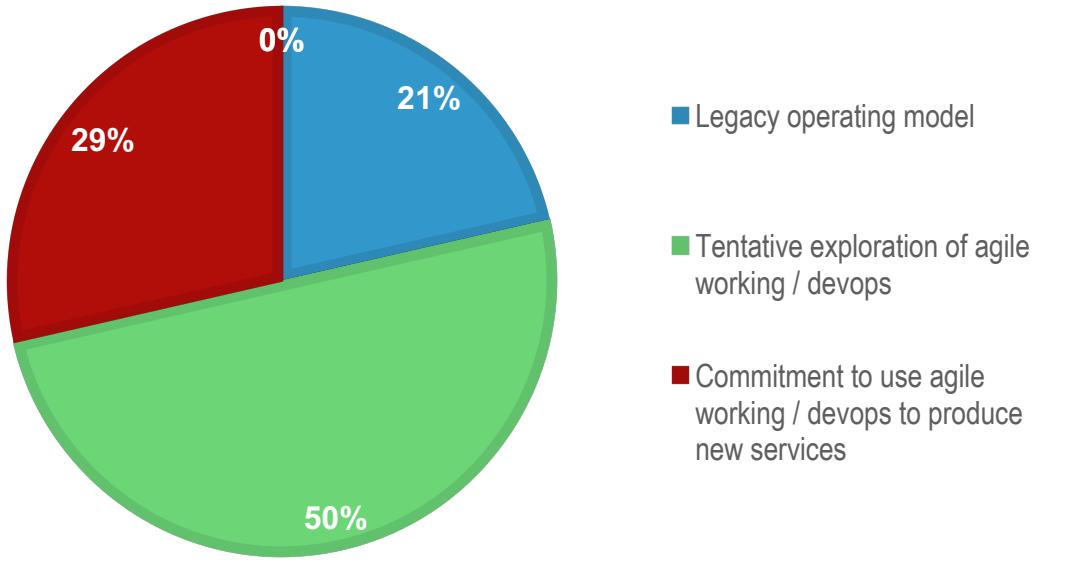
"New services are based on different propositions. Our model is like a low-cost airline. Revenue comes from services on top, where the customer ends up spending more than the normal airline [but the basic service is lower cost with less quality guarantee]"
– VP of Network Architecture & Technology, Asian SP

"We are quite cautious when communicating architectures. We have publicised the capability of NFV, but have not made public what is running on it. We want a few examples of it working to ensure it is carrier grade." – CTIO, European SP

Operating Models: service providers are exploring new operating models – but are not embracing them (yet)

- Almost all service providers are aware that virtualisation is closely related to new ways to operate, and most are experimenting with these new operating models:
  - 79% service providers are exploring new operating models, with varying levels of commitment.
- However, only a few service providers have launched new virtualised managed services, and this is reflected in the operating model:
  - 29% of service providers have advanced enough to use actually use DevOps to develop services. They are now encountering new problems – for example, co-ordination between DevOps teams and teams working in a legacy operating model.
  - It is more common (50% service providers) for DevOps to act as an experimental operating model that service providers explore tentatively, as they progress their NFV/SDN initiatives.
  - For example, service providers have often created a new team to work in an agile/DevOps manner and explore a new virtualised service – but legacy ways of working remain prevalent in the organisation.
- On the other hand, 21% operators have shown little interest in more agile ways of working. This does tend to correlate with a lower level of progress on NFV/SDN. In other words, DevOps is not a 'must-have' for virtualisation, but the two do tend to go hand-in-hand.

FIGURE 9: OPERATING MODEL UNDER NFV/SDN



n=14. Source: STL Partners research

Q. "To what extent have you started to change?"
A. "Not drastically so far. Small changes here and there but not to the scale described or suggested in these concepts. For example, one change, for the cloud platform, it should be as much as possible DevOps. How it will look as DevOps, we are working out."
– Director, Emerging Technology, MENA service provider (Group)

Challenges: Participants have encountered a number of challenges as they pursue virtualisation

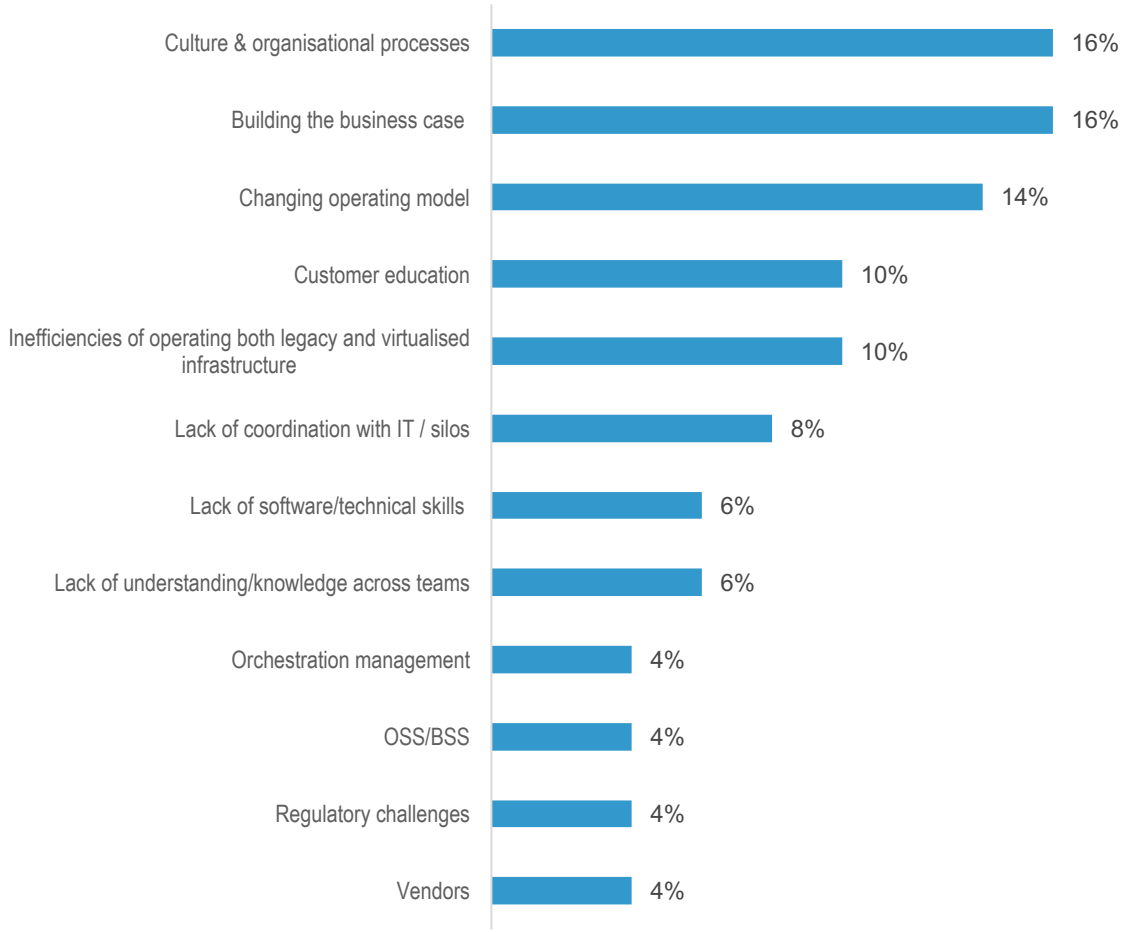
Challenge	Description
Culture & organisational processes	Internal resistance due to entrenched culture and processes; lack of willingness to change and adopt new ways of working and more agile development methodologies.
Lack of software/technical skills	Attracting and retaining the technical skillset. Network teams typically do not have strong software skills, preventing them from fully understanding and embracing NFV/SDN. Individuals will also nee to have the competence to both plan and operate the virtualised platform.
Lack of understanding/knowledge across teams	Often teams do not fully understand the benefits of NFV/SDN – this includes both the enterprise teams and in some cases the network teams. Often the conversation revolves around the technology, and not on how/why this is providing something fundamentally different, with new benefits.
Lack of coordination with IT / silos	In many cases, IT transformation is being carried out completely independently. This is likely to create silos as transformation efforts are separate.
Customer education	Customers do not always see the benefit of virtualised services; they typically ask simply for 'more bandwidth at a lower process' . Customers will need to be educated about the new services (e.g. self-service) to maximise the benefits from the service
Changing operating model	Related to culture/processes challenges, changing the operating model can be a barrier. Service providers can dace conflict between the DevOps model used by innovation teams (software, product dev) the and traditional model.
Regulatory challenges	In some cases, service providers will need to work closely with the regulator. The regulator may slow down progress to ensure that virtualised functions/services are able to meet today's regulatory requirements (e.g. security; legal intercept).
Vendors	Service providers face different challenges from vendors including: vendors lack of willingness to enable interoperability, leading to potential lock-in; misalignment with vendors due to lack of clarity over new business models.
Building the business case	Not all service providers will consider NFV/SDN from a strategic perspective. Often service providers will still be required to build a traditional business case.
Inefficiencies of operating both legacy and virtualised infrastructure	As service providers move towards a virtualised network, they will still need to manage the existing legacy network. This creates potential conflicts if one team/individual is responsible for managing both networks. In the future this will also create migration challenges.
OSS/BSS	Managing the OSS/BSS will be difficult; integrating the virtualised network with the legacy OSS/BSS will be challenging and will potentially reduce the inherent flexibility created due to NFV/SDN.
Orchestration management	Service providers are only beginning to explore NFV/SDN; the approach to virtualising functions and launching new services has typically been quite tactical. Therefore service provides have not yet developed the orchestration management, creating potential architectural challenges in the future.

Challenges: Culture, process, skills and a lack of shared understanding were referenced as the main challenges facing service providers when attempting to adopt NFV/SDN

- Participants highlighted a number of challenges they are facing as they begin to implement NFV/SDN.
- The most referenced challenges related to culture, processes and skills.
  - 57% of service providers indicated that culture was a key barrier to embracing NFV/SDN. Participants indicated that there was either an internal resistance to change or lack of willingness to change and adopt new ways of working and more agile development methodologies.
  - 57% of participants also suggested that a key challenge was the lack of software/technical skills within the organisation (particularly in the network team). The lack of skills here, and the ability to attract and retain these skills, prevents service providers from truly understanding/embracing NFV/SDN.
- A significant number of service providers (50%) also felt that there was a lack of understanding across the organisation around the benefits of NFV/SDN – this in some cases includes within the network team. This lack of understanding prevents a shared common vision and creates further cultural and process-related challenges.

> *"We also don't have the understanding / knowledge of what we are trying to do within some of the teams. We will need more software skills in the network organisation. We as an industry haven't embraced this [skills-gap] yet."*
> *– Head of Group Strategy & Transformation, European converged operator*

Figure 11. Challenges encountered when adopting NFV/SDN



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Overcoming Challenges: Service providers are taking different approaches to overcome their most significant challenges (1)

Challenge 1: Culture & Organisational Processes

Example approach 1: Engage workforce (across the organisation) in internal activities

The rationale behind NFV and SDN, as well as the implications and changes that will happen as a result will need to be known throughout the organisation, therefore it is vital that this education of the workforce (at all management levels) is done through internal activities.

For example: seminars, workshops and presentations. These internal activities should focus on both the technical aspects, for those relevant teams, but also the commercial side.

Example approach 2: Demonstrate the benefits of NFV/SDN through a tested and proven example

The benefits of the transition are often framed from a technological point of view. Some service providers have found greater success in uniting the organisation by demonstrating the benefits through a proven and tested example, as this makes the anticipated benefits actual benefits and more tangible for all internal stakeholders.

When introducing a new technology, it may sometimes take time to see all the benefits, but it will help create a culture that unites behind it.

Example approach 3: Create a group initiative for NFV/SDN transformation to identify commonalities across opcos

Creating a group initiative to identify commonalities would include: identifying multiple use cases for NFV/SDN; trialling the maturity of these use cases to learn what is and is not possible; providing a sense for timelines; outlining the technology required for each use case and some of the challenges, particular in terms of the gaps in the organisation for when the initiative takes off.

Challenge 2: Lack of software/technical skills

Example approach 1: Partner with university to retrain

Identify areas where teams' practical knowledge or skills are lacking and approach recognised academic institutions, such as universities or business schools, to determine whether they are able to offer training, courses or masterclasses to employees.

Topics might include an overview of the new technology, and training on how to adapt sales techniques to an entirely new proposition.

Example approach 2: Hire both internally and externally

Internal hiring: This may need to be combined with training to empower the teams with the new required skills and/or hiring from other business units within the organisation, such as from the cloud or data center business, (who possess the necessary skill-set).

External hiring: This would be particularly valuable for finding someone to lead the NFV/SDN transformation process, as well as train the team. A subject matter expert in this role would help to shorten the learning curve.

Example approach 3: Establish a graduate recruitment scheme

In order to recruit new staff who can develop the necessary skill-set for the service provider of the future, establish a scheme to recruit highflying graduates straight from university.

HR need to create a 1-2 year training programme that is suitable for graduates with no previous experience of NFV/SDN services or telecommunications.

Market this programme through university careers fairs and prominent publications catering to the graduate recruitment market.

Overcoming Challenges: Service providers are taking different approaches to overcome their most significant challenges (2)

Challenge 3: Lack of understanding/knowledge across teams

Example approach 1: Focus on communications between NFV/SDN leaders and areas of resistance

NFV/SDN leaders should ensure they understand reasons for resistance to virtualisation – lack of education around benefits, concerns for job security.

From this perspective, they should attempt to identify the potential benefits of virtualisation for those areas of resistance. While these areas may initially see the unwanted disruption of virtualisation, there may be ways to explain the benefits for their position.

Example approach 2: Create a horizontal steering team to ensure good communication between lines of business

The service provider should create a horizontal steering team to overlook virtualised services and keep the different lines of business in contact with one another.

This team should be focused on reviewing the service provider's virtualisation program(s) and identifying where problems may emerge with silo-ing, and then taking the necessary steps to encourage cross-functional communication and collaboration.

Example approach 3: Implement a 'dual-citizenship' approach

When planning new features, projects or functions at a group-wide level, assign joint ownership to two or more relevant people or groups in different roles at different operating companies (for example, the CMO in Country A and the CIO in Country B).

Accountability is shared between the two entities, and its success forms part of their individual targets. Both entities must find appropriate ways to collaborate effectively.

Challenge 4: Lack of coordination with IT / silos

Example approach 1: Create touch-points between teams

When planning the virtualisation strategy, define and set shared targets which can only be met by maintaining alignment between network and IT teams. Both teams' performance must be measured against these goals, and both teams are jointly accountability.

Team leaders should schedule regular 'touch-points' between teams to facilitate this alignment. This could take the form of shared deadlines, meetings or workshops.

Example approach 2: Converge network and IT teams

For those that are embracing the potential transformational impact of NFV/SDN, it is sensible to consider converging the network and IT teams, as the boundaries begin to blur.

This process includes: (1) Board/executives recognising the need to converge (2) Creating and recruiting for a new 'CTIO' role (3) Evaluating current teams (roles, skills, etc.) (4) Drawing up a new organisational structure (5) Identifying roles within new organisational structure (6) Identify new communication models (7) Begin reorganisation

Example approach 3: Set up core team to develop transformation strategy and drive implementation

The service provider should appoint or recruit a senior executive to set up core team. This core team leader selects qualified staff from all BUs to join the team (for at least x% of their time).

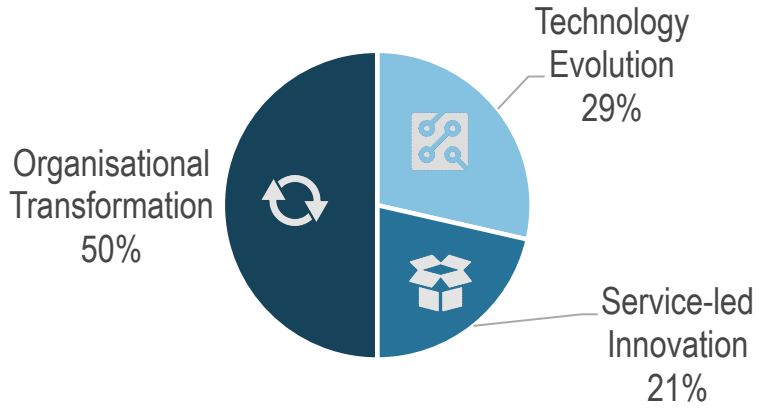
The core team elaborates the transformation strategy in collaboration with board and BU heads, and drives the transformation process in partnership with BUs and through multiple cross-cutting programs. These might include restructuring along DevOps lines, adoption of agile, product PoCs.

Contents

Three pathways to NFV/SDN adoption are emerging

- As discussed on page 14, there are many potential approaches to NFV/SDN implementation. During our discussions, however, it became clear that the overarching approaches that service providers have taken fall under three broad pathways to virtualisation, as defined below.
- Figure 12 shows how the 14 service providers we spoke to split across the three pathways.
- In-depth explanations of the characteristics of each pathway are given on the following pages.

Figure 12: Transformation pathways adopted



1. Technology Evolution

Focus on building scaled virtualisation of a few core functions &/or sub-systems in a way that minimises risks, dependencies and organisational change

2. Service-led Innovation

Focus (initially) on the customer and the services themselves, as opposed to the underlying technology.

3. Organisational Transformation

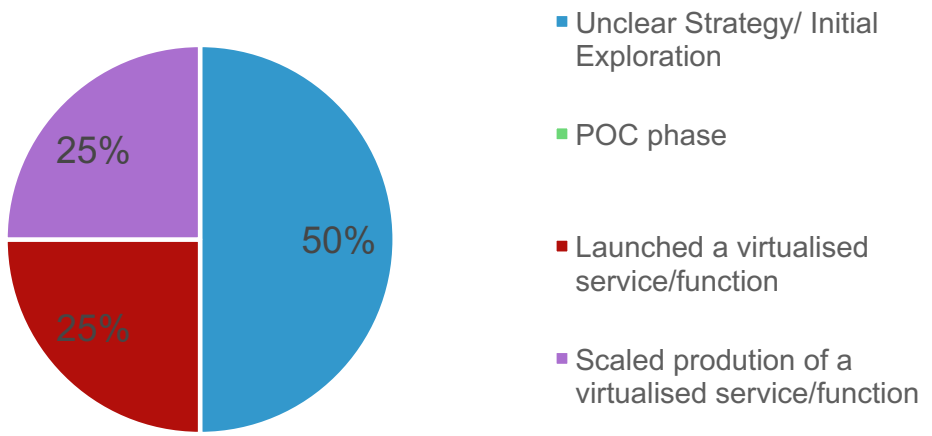
Focus on wider organisational transformation – NFV/SDN is a key catalyst in this transformation process, both from a technological and cultural perspective

Technology Evolution: building scaled virtualisation of a few core functions and/or sub-systems (1)

Overview of Pathway

- Focus on building scaled virtualisation of a few core functions &/or sub-systems in a way that minimises risks, dependencies and organisational change.
- Less focus on creating new virtualised services (for businesses).
- Initial deployment is typically not based on a strategic blueprint, but rather a solid business case for addressing an immediate need, whilst recognising wider considerations where possible.
- Typically there is limited internal appetite & skills for development; therefore the SP relies heavily on partners.

Technology Evolution: Service providers' NFV/SDN deployment progress



n=4. Source: STL Partners research

Service Provider Characteristics

- Typically mobile-centric and/or cable operator or a non-incumbent provider of fixed line services. Less focus on under-developed B2B offer.
- NFV championed as cost-effective future-proofing but NOT transformational (at least initially).

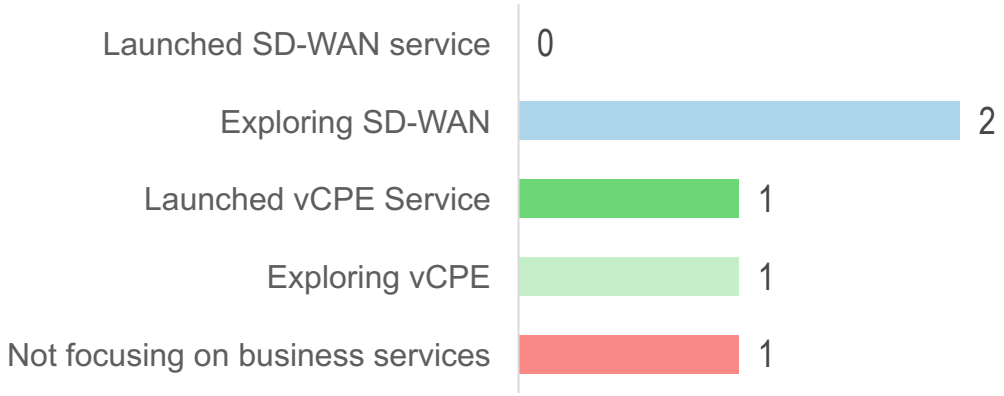
Deployment Progress

- Participants in this pathway fell in two distinct camps:
  - Those that are more at an initial exploratory phase. 2 service providers have not fully articulated an NFV/SDN strategy and are beginning to form teams to assess the implications of NFV/SDN.
  - Those that are relatively advanced in terms of virtualising functions. These service providers have focused on evolving internal functions/sub-systems, from legacy to a virtualised environment.

Technology Evolution: building scaled virtualisation of a few core functions and/or sub-systems (2)

Services

Technology Evolution: Service providers' virtualised business service offerings



n=4. Source: STL Partners research

- Focus internally: virtualising network functions and/or systems/sub-systems – principally IMS & vEPC.
- Nevertheless, some participants in the Technology Evolution pathway are exploring offering virtualised business services. However in most cases they have not launched a service.

Main Challenges

1. Still required to **build a traditional business case**, same old KPIs
2. **Risk of silos:** IT transformation is being carried out completely independently, with different requirements set
3. Attracting and retaining **technical skillset** is not easy

Next Steps

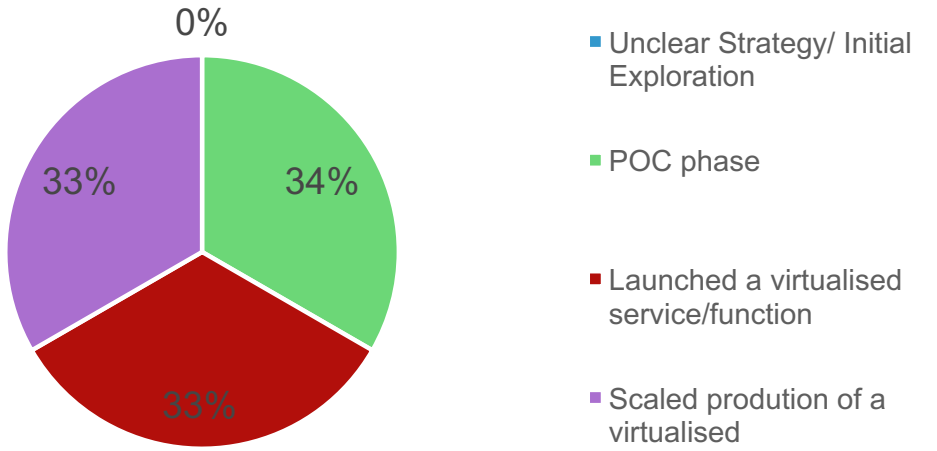
- More functions will be added onto this infrastructure when there is a clear business case/new service benefit.
- The focus will then shift to re-engineering functions for greater flexibility (More "orchestration" & "SDN-like" capabilities).
- Eventually this will lead to wider organisational change, when dependencies (such as the IT stack, regulation, commercial obligations) are involved.

Service-led Innovation: Focus (initially) on the customer and the services themselves, as opposed to the underlying technology (1)

Overview of Pathway

- Focus (initially) on the customer and the services themselves, as opposed to the underlying technology.
- Typically the service provider builds on existing 'proto-SDN' customer controlled services to offer loosely-network-coupled enterprise networking services (SD-WAN, uCPE VPN) as integral part of managed services suite.
- Service provider relies on partners to achieve this quickly & secure market acceptance of new services.
- The business rationale may originate from a strategic initiative from senior sponsor rather than extensive business case.

Service-led Innovation: Service providers' NFV/SDN deployment progress



n=3. Source: STL Partners research

Service Provider Characteristics

- Fixed (or converged) operator with mixed access.
- Potentially non-incumbent for some of its coverage.
- Create differentiated services and focus on supporting customer agility & applications.

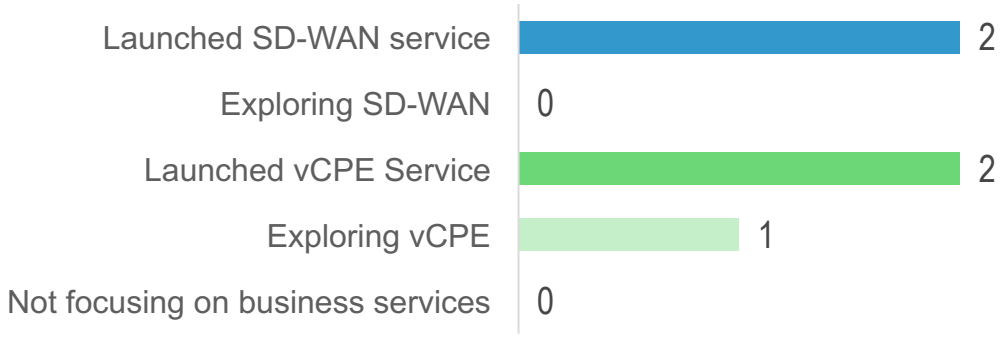
Deployment Progress

- Participants in this pathway were (naturally) relatively advanced in terms of developing virtualised business services.
- All are trialling new services with 1 service provider achieving scale with SD-WAN and vCPE-based services and another having launched services with a number of customers.

Service-led Innovation: Focus (initially) on the customer and the services themselves, as opposed to the underlying technology (2)

Services

Service-led Innovation: Service providers' virtualised business service offerings



n=3. Source: STL Partners research

- Focus externally: service providers in this pathway have typically launched SD-WAN and vCPE-based services. These initiatives were typically driven out the Enterprise BU.
- The CPE services are in practice, uCPE, where a host of functions are pre-installed and only activated if required.
- Service providers typically communicate a different proposition to the customer, built upon increased service flexibility.

Main Challenges

1. **Educating the market/customers**: demonstrating the flexibility of the new services.
2. **Operations**: need to build the competence to both plan and operate the virtualised platform.
3. **Orchestration Management**: lack of common orchestration across functions/services.

Next Steps

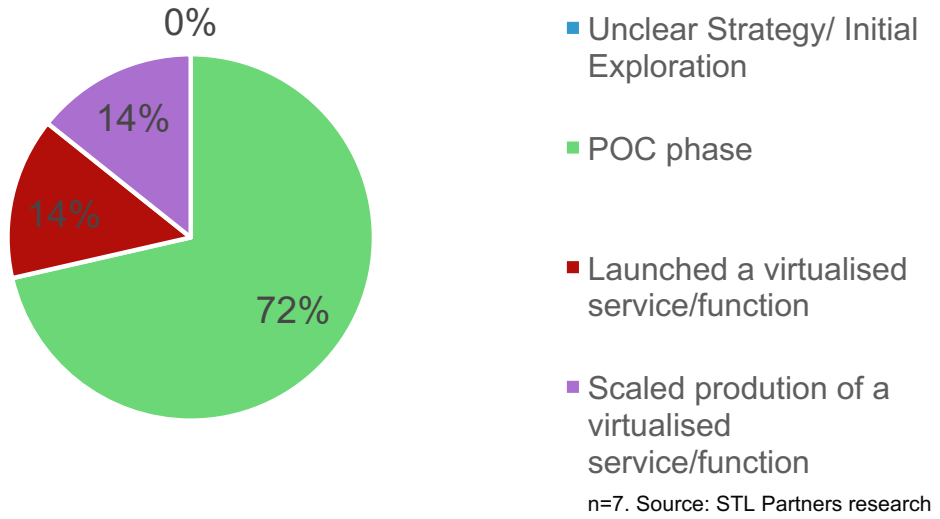
- Lots of commercial innovation (cloudification of commercial model).
- Potentially some minor re-organisation.
- Plan to then virtualise these functions and integrate network SDN. Then virtualise more of core network with SDN and Orchestration.

Organisational Transformation: Focus on wider transformation, of which NFV/SDN is a key component and catalyst

Overview of Pathway

- Focus on wider organisational transformation – NFV/SDN is a key catalyst in this transformation process, both from a technological and cultural perspective
- Operator has a long term strategy involving significant organisational transformation and is a strong believer/advocate of SDN as fundamental part of NFV.
- Fundamentally see this as a horizontal transformation project which cannot be limited to a particular service area. Likely to be focused on planning for future carefully, e.g. developing a horizontal platform.

Organisational Transformation: Service providers' NFV/SDN deployment progress



n=7. Source: STL Partners research

Service Provider Characteristics

- Fixed operator with own access. Likely to be incumbent for much of its coverage.
- Has resources and appetite to play a key role in developing the technology and change supplier landscape. Some very active in forums.

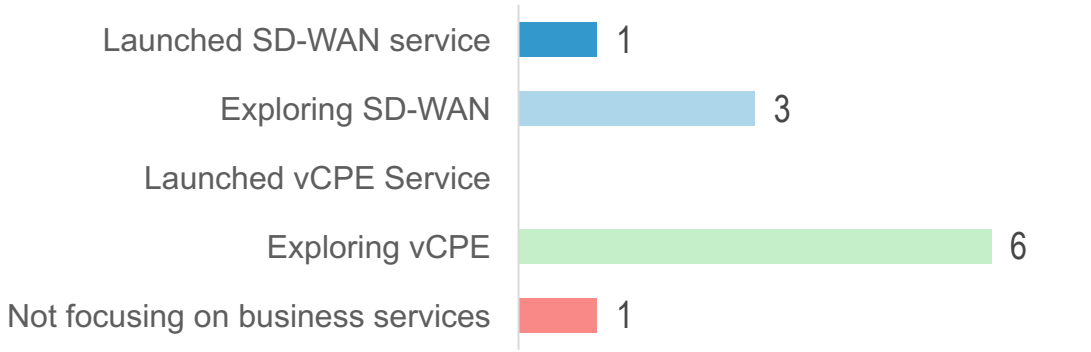
Deployment Progress

- Most of the participants in this pathway are relatively advanced in terms of their vision for NFV/SDN
- However the majority are at an earlier stage with regard to launching a virtualised function/service. The majority are at proof-of-concept phase, with the ambition of launching virtualised functions/services early next year.

Organisational Transformation: Focus on wider transformation, of which NFV/SDN is a key component and catalyst

Services

Organisational Transformation: service providers' virtualised business service offerings



n=7. Source: STL Partners research

- Participants in this pathway are typically exploring both internal and external opportunities arising from NFV/SDN.
- Internally this includes IMS, vEPC.
- Externally they are focusing on vCPE-based services and SD-WAN but; however the majority have not launched services but are simply exploring/developing them (e.g. POC phase).

Main Challenges

1. **Changing the mind-set/culture:** away from "traditional telco" towards more agile, DevOps, open approach
2. **Common understanding across the organisation**: teams (including network) do not have understanding of the benefits of NFV/SDN. Often too focused on the technology
3. Need for **software skills** within organisation
4. **Understanding the importance of data** – potential for new services

Next Steps

- Focuses heavily on process & skills transformation across the whole business. (Network/IT, marketing, sales).
- Regarding NFV/SDN, typically undertakes own lab testing and development over many years, then extensive POCs, then pilots.

Contents

Conclusions: Whilst most service providers are at an early stage with NFV/SDN, there are still are number of lessons that can be learnt from initial successes

1. **Senior management support and understanding is critical**: regardless of strategy, participants who were further ahead had clear support (and ownership/understanding of the transformational implications) from senior management. This becomes more important as service providers seek to leverage NFV/SDN as part of a wider transformation effort.

2. To truly embrace NFV/SDN service providers **need to create a more innovative, agile culture**. Some service providers have had success by engaging and educating the workforce on the benefits of NFV/SDN (focusing less on the technology). This involves regular seminars and workshops.

3. Service providers need more relevant **software & technical skills** to manage a virtualised network. Service providers with existing cloud and data centre businesses have successfully leveraged and/or directly contracted individuals in these areas with software/virtualisation skills, accelerating learning. Service providers should also look both internally (with training) and externally (to bring on board expertise) to develop the right skill-set.

4. NFV/SDN naturally creates more of a **blur between product management, network planning, operations and IT**. To avoid silos developing, service providers should set up a steering committee (with representatives from network, cloud, IT and enterprise functions). This committee should be responsible for setting out the high-level roadmap for virtualising network functions.

5. As NFV/SDN begin to blur roles and functional areas, service providers need to move to more of a **DevOps model**. Some service providers have had success by making a partial move to this model. This involves firstly creating a team responsible for managing the infrastructure (with an understanding of applications as well as infrastructure). This is a single team that cuts across stages that were previously supported by separate teams (e.g. capacity planning, design, testing). Over time this team would also become responsible from operations. Moving to the DevOps model will also help overcome some of the cultural challenges within the organisation.

6. Those launching new virtualised services to customers need to **educate customers and develop new compelling propositions**. How customers use these services is different to legacy (e.g. on-demand, flexible, scalable). Service providers need to develop new differentiated propositions to communicate this to the customer. Additionally they need to understand the potential impact this has on customer's internal processes (e.g. finance, procurement).

7. **Building the Business Case**: Service providers that have achieved scaled production of a virtualised function/service have been able to demonstrate a clear business case for the virtualised function/service over legacy. This has allowed them to scale quickly.

8. Advanced service providers are now beginning to think about the **importance of data**; data will enable greater operations automation.

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We have a strongly held view that to succeed, operators need to adopt fundamental changes in their business model: what they offer their customers, how they serve them and how they are rewarded for this. Our consulting practice is dedicated to supporting our clients embrace this vision and increasingly, supporting them in pursuing it.

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