

# SDN and NFV: Transforming the Service Provider Organization

---

Providers that embrace a holistic approach to their business transformation will be best positioned to capture future value for their shareholders

## Table of Contents

Executive Summary .....	3
Introduction.....	3
Business Processes.....	4
Roles and Responsibilities.....	5
New Software Skills.....	5
Culture.....	6
Conclusion.....	7
Bibliographic Citations.....	7
About Juniper Networks.....	7

## Executive Summary

With agile competitors entering the market, traditional telecommunications service providers must be able to respond quickly to competitive pressures and rapidly evolving customer demands. This quick response will enable sustained competitive advantage, continued customer relevance, and higher quality of earnings. Service providers who do not embrace this transformation now risk being marginalized in the industry, resulting in the loss of customer relevance and lower profitability.

History has demonstrated that the evolution of technology can have significant influence, both positive and negative, on the future success of companies that operate within an industry or a segment. At times, a new technology is so impactful that it forces current operating and business models to transform for future survival and growth. Successful transformation requires that companies not only adopt the new technology, but also evolve related business processes, organizational structure, skill sets, and culture to reflect the shift and reorientation of the company. Traditional telecommunications service providers face this challenge today.

The technologies driving this transformation are Network Functions Virtualization (NFV) and software-defined networking (SDN). With these technologies in particular, the need to embrace them as part of the fabric of the organization has never been more important. In fact, the potential impact to traditional telecommunications service providers will be unlike any other in recent history. As web-based technologies, services delivery platforms, smart devices, and automation become more prevalent, the very structure of the industry<sup>1</sup> will continue to shift, reducing barriers to entry and enabling new competitors to enter into the market.

## Introduction

Long-term capital investment in network infrastructure and the complexities of related operational processes create the traditional barriers to entry in telecom. Peak traffic load<sup>2</sup>, traffic type, breadth of applications and services, number of users, and geographic footprint all drive network infrastructure costs. The degree and complexity of manual processes associated with customer provisioning, network management, customer care, network maintenance, service delivery, and engineering create operational costs. The current mode of operations typically sees services deployed in individual silos, with complicated and highly technical processes required to run them.

The combination of NFV and SDN breaks the service silo model and lowers the relative cost of capital assets through the use of commercial-off-the-shelf hardware and software, resource pooling, network visibility, and analytics. Additionally, simplification, automation, and analytics achieve operational benefits by reducing the costs associated with manual and complex processes. As the costs and complexities of offering network-based services are reduced, new competitors will enter the market seeking to cherry-pick the highest margin and most lucrative customers. It is likely that they will marginalize the connectivity portion of the network (as has already been seen for many consumer services) and retain control of the cloud-based services that are most strategic to the higher value enterprise customer.

The profound effect this will have on telecommunications cannot be overstated. If service providers fail to act quickly, customers will rapidly adapt to the availability of new competitive services. One obvious example is the rise of over-the-top (OTT) messaging applications that have impacted SMS revenue. Disruption has come virtually out of the blue, with start-ups attracting huge enterprise valuations based on the value they have captured from traditional telecom service providers, and the perceived future potential of these new business models.

Future growth, and in some cases even survival, therefore, hinges on the service provider being able to create two fundamental proficiencies: 1) the ability to respond quickly to customer demands; and 2) the ability to build sustained and deep customer relationships. The first proficiency translates to agility, while the second is about creating and sustaining customer relevance. To enable these proficiencies, we see impacts to four highly interrelated organizational elements:

- Business processes
- Roles and responsibilities
- New software skills
- Culture

While there are many challenges to any organizational transformation, these are the elements of the organization's operating model that necessitate the most careful consideration. This paper discusses these factors in the context of the current transformations required to embrace and realize the benefits that SDN and NFV technologies promise. In the end, it is how operators manage the risk of this transition, and maintain optionality as they evolve, that will allow them to embrace innovations that provide additional strategic benefits. This ultimately creates a recipe for sustainable competitive advantage.

<sup>1</sup>Referring, in general, to the level of capital intensiveness.

<sup>2</sup>Static networks are built to capacity to carry peak traffic load and cannot easily scale up or down to optimize utilization.

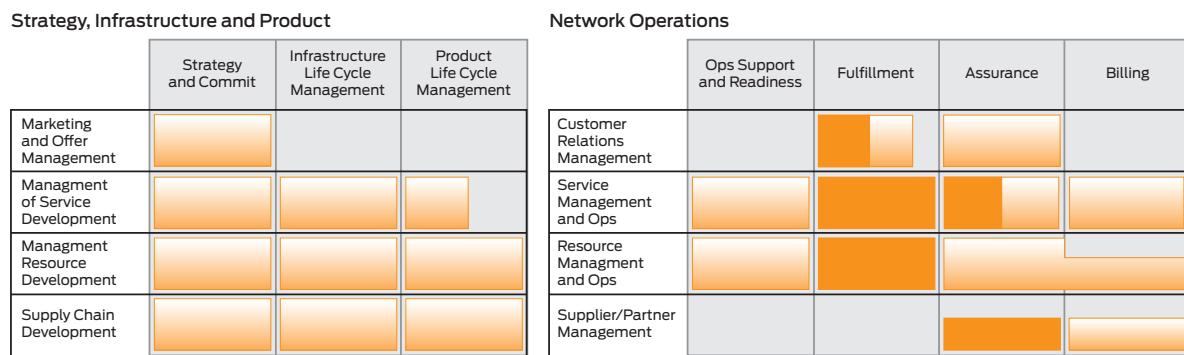
## Business Processes

The changes to traditional business processes primarily result from the abstraction of the network, which allows software processes to provide functions previously delivered by dedicated or proprietary hardware. SDN enables automated orchestration of the underlying network for user applications, and NFV enables deployment of network services when needed on virtual machines (VMs). These virtual services can be chained together by policies so that a packet flow is directed based on factors such as the source address, destination address, application type, and so on via a process known as *service chaining*.

NFV is a new equipment architecture, while SDN is a new network architecture. With NFV, service creation and product teams can now quickly build new services using virtual functions, because the virtualization of network functions simplifies the task of building complex and higher value services. SDN can further simplify the complex task of defining the workflows that activate and manage services. Simplification is an imperative to delivering services rapidly and in a profitable manner.

The changes brought by SDN and NFV require that the role of “middleware management” and operations support systems (OSS) control shift to a new model of controlling software objects, not boxes. These techniques, which were pioneered in the data center, are no longer restricted to the Web services model and the data center, but now extend to the service provider and the global network.

To assess this impact, we use the Business Process Framework (eTOM) published by the TM Forum (tmForum, 2014). This framework acts as a blueprint, and, while actual implementations will vary by each carrier, the framework represents the fundamental business processes designed specifically to support services-focused business models.



Source: inCode Consulting, TM Forum

Figure 1. Impact of NFV and SDN on the Business Process Framework

The impact of virtualization on these processes is shown in Figure 1, with the areas of impact shaded by the extent or degree of perceived impact. The Business Process Framework<sup>3</sup> defines seven processes, shown across the top of the figure from left to right, that represent the primary business processes that take strategy and ideas from concept to receipt of cash. Additionally, it depicts four interrelated functions, shown horizontally as “swim lanes.” These describe the market-facing and customer-facing functions of Marketing and Sales at the top; the internal functions of Service Development and Management, followed by Network Engineering and Management, in the middle; and supplier-facing and partner-facing functions at the bottom.

As can be seen from this perspective, most of the functions and business processes are shaded to some extent, with particular emphasis on fulfillment and assurance. The degree of shading gives one a sense of the pervasiveness of the impact that we anticipate—the darker the shading, the deeper the impact. It is not the intent of this paper to go into detail on this framework or the lower level process implications, but rather to posit questions for consideration around what happens to these traditional functions and processes. For example:

- How do you “inventory” a virtual resource?
- What will be the impact on customer acquisition, service activation, and fulfillment?
- How do you assure virtually delivered services?
- How is utilization of compute resources managed?
- What is the impact of changing supplier business models?

<sup>3</sup>The Business Process Framework also depicts Enterprise Management as a major process area, but is not addressed in this paper. Only the impacts to Strategy, Infrastructure & Product, and Operations process areas are considered.

- How will customer support evolve with multiple partners involved in the delivery of services?
- What are the new billing and pricing policies, in particular, the influence of usage-based pricing both on the supply side and on the consumption side?
- What drives the customer perception of value for virtualized services?

Understanding these impacts, and ensuring optimal and streamlined business processes enabled by the technology evolution roadmap, are the first steps in optimizing the business benefits these technologies promise. These processes need to be put in place first and in a way that easily enables them to support automation and software control.

## Roles and Responsibilities

To keep pace with this changing environment, the network provider organizational structure must change. The basis of this change is the recognition that there is less of an emphasis (relatively speaking) on traditional network engineering and capacity management as they relate to new services, and more on the speed of deploying new applications and services. Referring to Figure 1, in many service providers, the CTO has responsibility for network operations, service delivery, and development of new services. This makes sense in an environment where the IT and network infrastructure are closely related, and in many cases inextricably linked, to the services being deployed.

The result of abstracting the underlying network and separating it from service delivery is the creation of a development platform for service delivery. The underlying network is "objectified," and now accommodates the use of software development methodologies. Service providers need to embrace concepts from Agile and, in particular, DevOps, as the way to speed service delivery. This, therefore, extends the influence of traditional IT and CIO functions in the Ops Support, and Fulfillment, Assurance and Billing (FAB) processes.

The conversation here is not about reporting structure, or collapsing the CIO and CTO organizations into a single organization, but solely about clarifying the roles and responsibilities and holding some organization accountable for the transitions. The key transitions we see are:

- **CTO becomes more future-focused.** The CTO responsibilities must now focus on: 1) standards development by keeping abreast and participating in the development of technology strategy and evaluation; 2) business and network impact from the adoption of new technologies and how best to build new services, applications, and functions; and 3) legacy migration, including mediation functions and capabilities moving to SDN and NFV.
- **CIO becomes more operations-focused.** The CIO function takes on more operations responsibilities, including fulfillment and assurance. This results from the use of DevOps, which we believe becomes the mainstay of the service creation environment and has already been widely embraced within the Web services community.
- **CMO becomes more technical and feature-focused.** The CMO needs to work closely with the CIO organization to enable technical changes such as a la carte service requirements. As the CMO organization focuses on delivering and marketing services and solutions instead of connectivity, the organization will need to consider offerings that span both wire-line and wireless network infrastructure, and for which connectivity might be part of the service and not explicitly charged.
- **Sales become more solution-focused (and less network-focused).** The enterprise sales organization will need to sell customer-specific SDN and NFV enabled packages across wire-line and wireless access networks, with a focus on end-to-end management and accountability of the service and application. These services will be built to individual preferences regardless of technology.

The important point is to ensure clarity with respect to what needs to get done, and accountability to execute. The organizational titles are not as important as the focus of the function. The essential principle is accountability from a leadership perspective to drive efficiency and effectiveness of the organization.

## New Software Skills

Perhaps one of the most dramatic shifts service providers will need to facilitate is the acquisition of software development skills. We see network engineering continuing to be a core competency of service providers, as they still must manage and maintain facilities to carry the traffic. However, now with services being delivered on programmable platforms, the organization requires investment in SDN-enabled staff, in particular DevOps. Here we see the worlds of IP and IT combining.

DevOps focuses on spiral development that spans planning, use case development, framework integration, code generation, versioning control, automated systems checking, automated testing and code checking, roll forward and rollback handling, automated release building, and other functions now needed for service delivery. This process is what will enable service providers to go from delivering services in months and years to delivering services in days and perhaps minutes. DevOps brings a cloud services model to network services. Given this view, the new roles we see emerging within the service provider are:

- **IT generalists**, with responsibilities throughout the virtualization stack, including a broad range of NFV competencies
- **SDN engineering**, including lower level engineering and design skills, and flow architecture design and management
- **Cloud orchestration**, which involves third parties delivering brokerage and clearing-house capabilities
- **Partner and channel business development**, established through the enablement of APIs for services such as content delivery, XaaS, and other cloud services as part of a customer solution

The purpose of the partner and channel role will be to maximize the value that the service provider brings to the customer; the more partners and applications that the customer can connect to via the service provider network, the higher the value of the network service<sup>4</sup>.

A major challenge will be in acquiring these skills, since there will be competition from enterprise IT environments, application development companies, and Web services companies. This drives the need for defining a culture that will attract this type of talent.

## Culture

There are many attributes and definitions to culture, but Conner and Smith (Smith, 2011) succinctly define culture as “the way people think and act.” Essentially the organization’s culture will have to think and act like a software company. The shift to a “software-centric” mentality will mimic the cultures of Web services, content, and media companies while needing to maintain customer trust, network reliability, and quality, which are the cornerstones of the service provider brand. This creates a unique service provider culture.

It is important to evaluate culture to the degree to which it aligns to attributes of the external environment, which is driven by the local market within which the service provider operates, as well as attributes of the internal environment, which drives the desired behaviors of the organization. The external environment defines the interactions with customers and those outside the organization, and consequently the establishment of the brand, while the internal culture will have impacts on results and accomplishments.

The transitions brought about by NFV and SDN require changes in service delivery and customer interactions. The most foundational transition is from a connectivity mentality to that of a solutions provider, with a focus on the customer experience. Focusing on individual customer needs (whether an enterprise or a consumer) and delivery of customized services quickly with a high level of accountability will be key brand attributes. The key attributes for defining the external culture include:

- **Solution provider**, which entails a shift away from connectivity to E2E solutions
- **Customer orientation**, with a maniacal focus on the customer experience, including self-service, personalization, and responsiveness
- **Service agility**, which is the ability to respond to changing customer needs and launch services quickly and on a custom (job-order) basis
- **Accountability** for the end-to-end solution, including parts of the solution contributed by partners

The internal culture will need to adopt an innovation mentality, which is enabled in part by the ability to launch services in beta, test “on-the-fly,” and fail fast. The transition to software will require a breakdown of entrenched silos and a more collaborative feel across groups. Key attributes of the internal environment transition include:

- **Innovation**, which needs to be indoctrinated as part of the mainstream business and includes start-up incubation and venture funds
- **Experimentation**, which means getting comfortable with launching new services in “beta” mode and supporting a “fast fail” approach to launching new services
- **Talent acquisition and retention**, which involves the development of new recruitment methods to attract young professionals
- **Employee development** in software and Agile methodologies
- **Collaboration** across organizational boundaries and external partners
- **Accountability**, which evolves from today’s failure avoidance mindset to a failure tolerance one

Culture is clearly an intangible asset that must be developed and cared for, and it has more than a causal relationship to business success. The right corporate culture can help attract and retain talent, guide decision making, and create an environment of accountability directly aligned to the execution of corporate strategy.

<sup>4</sup>Metcalf’s Law

## Conclusion

The transition of service providers to NFV and SDN will start with the “low-hanging fruit” specific to different organizations, to virtualize network functions given the performance of central office terminal (COT) hardware. On the fixed side, this includes upgrades to edge networks that enable them to deliver virtualized customer premises equipment (CPE) network and managed security services that rapidly drive incremental revenue. Mobile providers are looking into content delivery network (CDN) capabilities to optimize the delivery of content to mobile devices, along with virtualization of the packet core capabilities for scale. In the short term, there will be incremental enhancements to existing capabilities and processes.

However, the considerations in this paper take a longer term view based on the shift that the telecom industry, as a whole, will undergo over the next 5 to 10 years. We see a dramatic transition in the overall market structure, characterized by the lowering of traditional barriers to entry and changing customer attitudes. This will require a differentiated approach with respect to customer relationships and orientation.

Today, the majority of industry discussion is centered on the technical merits of the evolving service provider toolkit. Service providers that embrace a holistic approach to their business transformation will be the ones that maximize their existing capabilities and capture future value for their shareholders.

## Next Steps

For more information, please consult the following assets:

- [Building Your Business Case for Network Virtualization](#) white paper
- [Network Transformation with NFV and SDN](#) white paper
- Juniper Networks [Big NFV Idea](#) web page

## Bibliographic Citations

Smith, R. C. (2011). *Change the Culture, Change the Game*. NYC: Penguin Books, Ltd.

tmForum. (2014, July 9). *Business Process Framework*. Retrieved July 9, 2014, from tmForum.org: [www.tmforum.org/Overview/13763/home.html](http://www.tmforum.org/Overview/13763/home.html)

## About Juniper Networks

Juniper Networks is in the business of network innovation. From devices to data centers, from consumers to cloud providers, Juniper Networks delivers the software, silicon and systems that transform the experience and economics of networking. The company serves customers and partners worldwide. Additional information can be found at [www.juniper.net](http://www.juniper.net).

Corporate and Sales Headquarters  
 Juniper Networks, Inc.  
 1133 Innovation Way  
 Sunnyvale, CA 94089 USA  
 Phone: 888.JUNIPER (888.586.4737)  
 or +1.408.745.2000  
 Fax: +1.408.745.2100  
[www.juniper.net](http://www.juniper.net)

APAC and EMEA Headquarters  
 Juniper Networks International B.V.  
 Boeing Avenue 240  
 1119 PZ Schiphol-Rijk  
 Amsterdam, The Netherlands  
 Phone: +31.0.207.125.700  
 Fax: +31.0.207.125.701

Copyright 2016 Juniper Networks, Inc. All rights reserved. Juniper Networks, the Juniper Networks logo, Junos and QFabric are registered trademarks of Juniper Networks, Inc. in the United States and other countries. All other trademarks, service marks, registered marks, or registered service marks are the property of their respective owners. Juniper Networks assumes no responsibility for any inaccuracies in this document. Juniper Networks reserves the right to change, modify, transfer, or otherwise revise this publication without notice.

