Bringing NFV to Life

Technological and Operational Challenges in Implementing NFV

Amdocs White Paper

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Contents

1. Introduction

This document describes key considerations for service providers embarking on the journey to virtualize their network service fabric and Amdocs' positioning to help them in this significant business transformation. Amdocs Network Functions Virtualization (NFV) product and services address service provider needs in transitioning their network services from cumbersome, static, and proprietary service offerings to a dynamic, flexible and cost effective service portfolio.

The journey to user-defined service catalog-based telco-clouds consists of multiple steps, where virtualized network and service functions will co-exist alongside the existing physical network for a period of time. Amdocs' objective is to be the partner of choice for service providers, helping them move from the physical driven network world to a virtualized network end-state, which will enable service providers to drive new services, respond quickly to customer needs and materially reduce opex and capex.

2. The NFV Business Need

Service providers are faced with high customer expectations, accelerating capacity demands and increasing competition. In order to thrive in such an environment service providers need to offer their customers a **dynamic catalog of competitive new services** that can be deployed and modified in hours rather than months, and can support growing customer expectations for user-defined networks.

To achieve this goal, it is fundamental for service providers to migrate to an Internet protocol (IP) network infrastructure and commercial off-the-shelf (COTS) hardware to eliminate vendor lock-in. An additional requirement is to bridge the divide between business and network systems; a fundamental requirement for end-to-end quality of experience.

Existing networks, which contain a variety of proprietary appliances from numerous vendors create a barrier to new service introductions, drive up the cost of meeting capacity demands, and are increasingly difficult to maintain. These obstacles negatively impact the service provider's ability to be effective in a competitive landscape that consists of existing and new over-the-top (OTT) providers. Specifically, service providers are challenged to:

Launch new services: The launch of a new service often requires the introduction of additional appliances into the network, which is often provisioned with significant over capacity, substantial integration efforts, shipment to numerous physical sites, manual installation and end-to-end testing. These activities are time consuming and entail large upfront investments, resulting in a long time to market and lower return on investment (ROI).

Efficient use of network infrastructure: Reliance on static appliances raises the cost of meeting capacity demands and meeting service specific service level agreements (SLAs). Service providers need to anticipate demand in advance and roll out networks designed to handle peak usage and unexpected traffic bursts. Lack of network programmability and automation makes real-time capacity management and resource pooling impossible.

Cost effectively maintain and change services in production: Finally, service providers are incurring high operational costs as a result of the need to support numerous proprietary appliances across sites. These costs include, dedicated spare parts inventory per appliance, technical support skills, shipping costs, larger floor space and increased power consumption. More importantly, services fabric spread across physical devices in the network is inherently difficult and expensive to maintain and is reliant on many proprietary vendor bundles. It will become increasingly impossible for such vendor bundles to offer the needed service agility required by service providers to be competitive.

The above market needs combined with innovative disruptive technology vendors and service providers themselves are driving a paradigm shift towards NFV and software defined networks (SDN). These changes will create a new, agile and flexible software-driven service provider environment, or telco cloud.

Service providers that take a telco cloud network approach can expect to:

• Remove new service introduction barriers and directly connect business systems with the network, empowering business managers to deliver tailored customer experiences quicker.

• Build user-defined network services to provide customers with more control over their experience, more service variety and choice, flexible pricing models and differentiated quality of service (QoS).

• Reduce network operation and service maintenance costs, following the transformation of legacy networks into open, programmable, IP networks that reside on commodity off-the-shelf servers.

Key requirements for future networks include:

• "IT-like" network domain skills to model services and spin up software instances from a multitude of suppliers, as opposed to managing proprietary hardware from a handful of vendors.

• NFV-ready network functions that are re-architected for automatic onboarding, scaling and orchestration.

• An NFV operations platform to provide intelligent, real-time, automated service lifecycle management and network optimization across vendors and infrastructures in a hybrid environment.

• Intelligent, automated network optimization and assurance that rely on real-time data and events.

• Alignment of business systems with network infrastructure and a common reference model for rapid service introduction.

• End-to-end customer experience management throughout the customer lifecycle, from service selection to service quality and customer care.

• Open products that use standard interfaces and application programming interfaces (APIs) to avoid vendor lock-in, simplify operations and foster innovation.

• New service design tools that simplify the service design process and enable the business manager to build, test, experiment with and change new services.

3. Challenges to Realizing the NFV Promise

Successfully navigating through the NFV journey will be challenging for service providers. The path to NFV requires a shift of 1) **technology**, 2) **operational** and **organizational processes** and 3) **new business models**.

3.1 Technology Challenges

NFV technology will mature over time

The complexity of service orchestration in a hybrid environment (containing both physical and virtual elements) is exceedingly complex. Vendors are approaching the problem from many directions and no vendor has all of the answers – so much so that several Tier-1 service providers have plans to organically build some of the components in the short term.

Although many vendors currently have components of the NFV stack, it is our view that by early 2015 vendors will have the minimal viable products needed to manage the full range of inherent complexities, from the infrastructure up to the user-defined experience.

Also, the technology still needs to prove that it adheres to the security, performance and reliability of telco-grade requirements at scale (including the NFV Infrastructure such as that provided today from OpenStack).

Finally, the complexities of frictionless Virtual Network Function (VNF) onboarding and master alarm management will evolve well into 2015 and 2016 to a more optimal level.

Standardization is lagging

Many network function providers use proprietary systems to manage their virtual network functions, which create difficulties in realizing the open environment that is required. It is therefore necessary to select a vendor which has focused on technology to VNF-enable existing network functions, and to onboard new service functions for service integration, chaining and management.

Challenge of managing the coexistence of legacy physical and virtual networks

NFV-based systems will initially need to coexist with legacy physical systems. The migration will entail a long transformation process that will need to be done gradually to minimize risk. As service providers gain experience, an increasing number of systems and functions can migrate to the telco cloud network. During the transformation phase, service providers will need to manage hybrid networks.

Risk of increasing complexity rather than reducing it

When introducing new virtual use cases one at a time, service providers risk retaining the current state of multiple silo networks that require numerous orchestration and management systems. This lessens the opportunity to reduce complexity and take advantage of full cloud elasticity and agility benefits. The transformation needs to be done in a thoughtful way that mitigates this risk through advanced planning and vendor selection.

3.2 Operational and Organizational Challenges

Choose the right application and service

Service providers embracing this shift are looking for the "killer application" that will justify the adoption of NFV. Their first use cases will depend heavily on past investments, network status and current service offerings. Service providers need to choose the right first service to test and gain NFV knowledge, in addition to providing short-term ROI and business value. To start the journey, operators are migrating towards four use cases, including virtual enterprise customer premise equipment (vCPE), IP Multimedia Subsystem (IMS) and IMS value added services such as voice recording, NFV infrastructure as a service and virtualization of the mobile core.

Operator network departments will need to transform their current operations to embrace the practices adopted by cloud providers

The skill sets required to run a hybrid virtualized and physical network will need to immediately evolve to include cloud-based capabilities such as OpenStack, software lifecycle management and a modified approach to the network operations center (NOC).

New service planning processes will need to change to support more rapid service creation

Logistic barriers for new services need to be simplified and re-engineered. More importantly, the general concept of lifecycle service delivery should be redesigned. In some situations even new employees (e.g. engineers) should be able to create and launch new services and new methods for testing service success. Testing service success will be the barometer to differentiate between successful and unsuccessful services.

The vendor ecosystem and accountability will differ

Today, much of the network is secured by network equipment providers (NEPs) who support slow moving, reliable technologies. These technologies are proprietary and generally monolithic. In comparison virtualized service building blocks can be chained to provide a set of new, rich service offerings in real time. This means that the dependence on single sourced, prepackaged vendor bundles that are in line with today's procurement principles will change. Service providers will need to carefully select vendors who are capable of helping them integrate many software-based systems in a flexible NFV services fabric.

Service providers will need to go through a change management process

As service providers implement the operational, organizational and procedural changes required to transform their business, they may encounter employee retention and organizational stability challenges. Therefore, they will need to establish a change management process. The change management process should include a change management team tasked with planning how to drive the change within the organization, building consensus and supporting new organizational initiatives, as well as collecting and analyzing feedback and implementing corrective actions when needed.

3.3 New Business Models Challenges

Service providers will change the way they pay network vendors

In order to realize the cost efficiencies of the new flexible virtual network, service providers will need to change the way they work with their suppliers to a "pay as you go or grow" model. As network changes result in in the use of one vendor's virtual network function over another, mechanisms and models will need to be put in place to accurately reconcile with vendors. New charging models, such as per virtual machine (VM), per CPU or per CPU socket will need to be established. Similarly, revenue-share models, in which the NEPs are no longer providers but partners in the eco-system, may be introduced.

Managing software licenses in a virtual environment

New pricing models will result in software license management challenges. Service providers will need a method and a mechanism to track licenses and provide the ability to attach licenses to virtual machines used. Currently there is a one-to-one ratio, one license per one proprietary NEP provided hardware, but this model will no longer be viable.

Service providers will need to reassess the way they charge customers for services

In a virtual world, customers and specifically enterprise customers may expect cloud-based business models, similar to what they receive from OTT cloud providers. This will result in a pay as you grow model, not only for suppliers but also customers.

Adding revenue and cost consideration to network operations

As the network opens up and multiple vendors can be used for each function, service providers will need to manage a growing number of suppliers. To provide the best services at the lowest possible cost, service providers will require the ability to continuously differentiate between suppliers on a cost performance basis.

Proving the transformation business case will be a challenge

First, in order to measure the potential cost savings (capex and opex), service providers will need additional visibility into their current network spend and the ability to compare it to the cost of a new, never tried before architectural model. Already, several service providers are questioning capex savings. The required management and virtual infrastructure system investment may potentially offset the hardware savings. Second, a strategic part of the business case for NFV will be based on new services and shorter time to market. Due to its nature, new services ROI is more difficult to calculate and many times it is unclear as to the number and types of new services that will be enabled, what the adoption rate will be and how much customers will be willing to pay for them.

4. Amdocs Offering – Supporting Service Providers on the Journey to a Software-Driven Environment

4.1 Overview

The transformation to a **telco cloud environment** is a paradigm shift that affects the entire service provider organization and is a journey that may take over a decade to complete. Successfully navigating the NFV journey presents challenges in terms of **technology, operational and organizational processes** and **new business models**.

Amdocs offerings support the service providers' journey to NFV and focuses on three major pillars: **NFV Operations Solution, Amdocs Network Cloud Ecosystem and a wide spectrum of services**.

Amdocs combines communications business expertise and operational support systems (OSS) experience with cutting-edge technologies to create an open NFV solution. This solution is designed to help service providers take NFV out of the lab, realize its production value, and enable true flexibility, dynamics and automation of virtual network management.

The Amdocs offering is designed to support service providers' hybrid environments, ensuring that the NFV infrastructure interworks with existing infrastructures, all the way to an 'all-NFV future.'
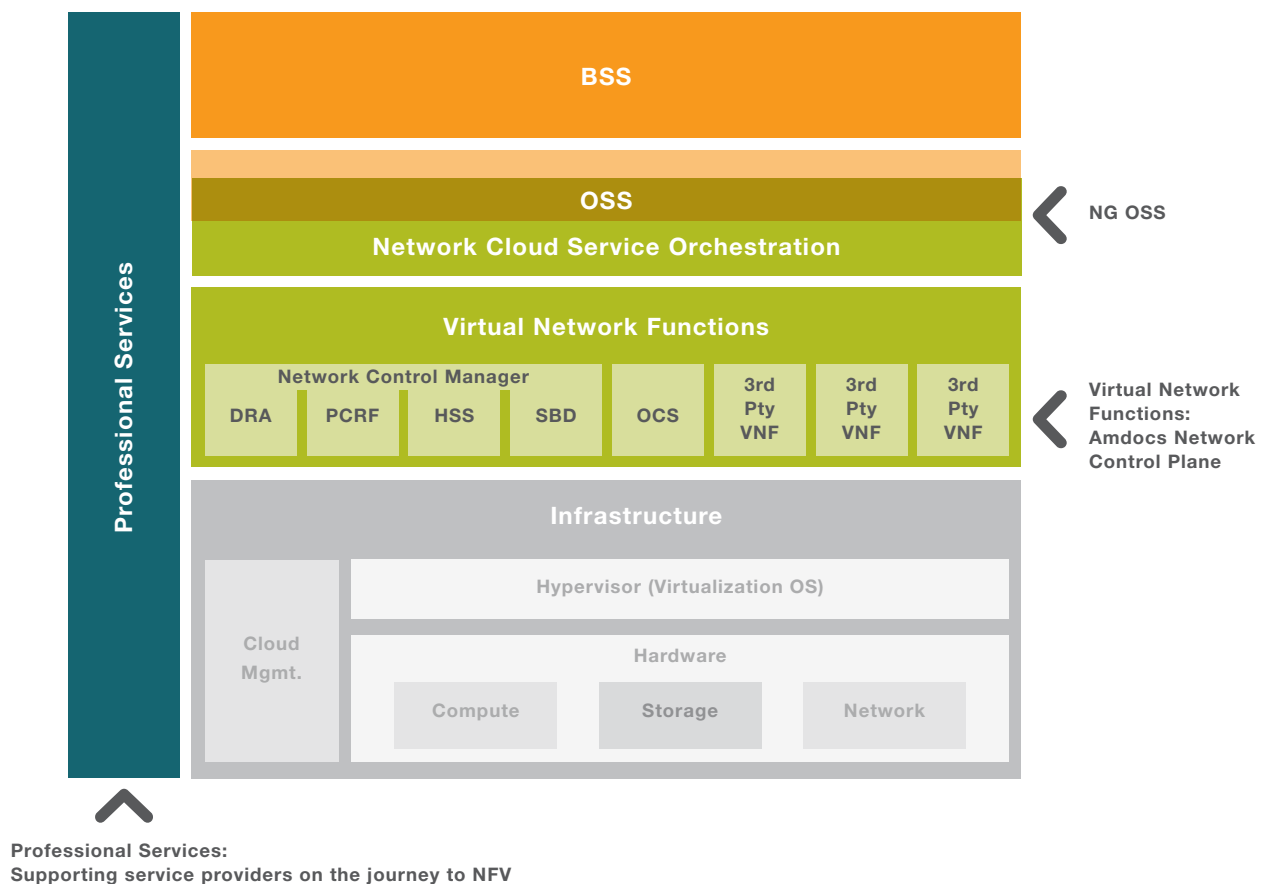
Figure 1: Amdocs NFV Offering: Addressing the operational and business challenges of NFV

4.2 Amdocs Network Cloud Service Orchestrator: Realizing the NFV Promise

Scaling the NFV promise requires an operations solution that enables service providers to rapidly define new service models and fulfill them instantly upon demand. Key requirements of such a solution include:

- Dynamic service design and fulfillment
- Automatic management of tens of thousands of instances in real time, over a distributed and multi-vendor infrastructure
- Support for services spanning virtual and physical resources
- Integration with business support systems (BSS) and operational support systems (OSS)
- Integrated policies and analytics for optimal service performance

Amdocs Network Cloud Service Orchestrator is an open, catalog-driven solution for service providers transitioning from physical networks to dynamic network-clouds. Amdocs Network Cloud Service Orchestrator continuously designs, fulfills and assures network services, from any virtual network functions (VNF) vendor, over all mainstream CMS and SDN-c.

Key elements of Amdocs Network Cloud Service Orchestrator:

Open Solution	Catalog-Driven	Dynamic, Continuous Fulfillment
• Manages any VNF, from any vendor • Supports mainstream CMS, SDN-c and hardware • An open ecosystem of VNF and NFVI partners	• Master catalog includes network resources • Reusable building blocks for fast new service definition • Linking the network and business	• Continuous comparison of desired state, actual state, and new requirements • Continuous re-fulfillment to provide services at SLA • Fulfillment across physical and virtual functions
Best-of-breed networks, no vendor lock-in	**Rapidly introduce new user-defined services**	**Agile, lean operations; virtual & physical**

4.3 Amdocs Network Cloud Ecosystem

Realizing the vision of an agile network cloud will require a host of technologies and best-of-breed products and services that openly interact, seamlessly integrate, and play in harmony.

In order to drive rapid NFV/SDN evolution and help realize the multi-vendor, agile, network-cloud vision, Amdocs has established the NFV Services Partner Program and has set up an open NFV lab environment.

The Amdocs NFV Services Partner Program is focused on pre-integrating a rich set of VNFs and network functions virtualization infrastructure (NFVI) elements to simplify the complexity of service orchestration, improve service time to market and address end-to-end SLA considerations.

Current use cases include:
- Virtual enterprise customer premise equipment (vCPE)
- Virtual IMS Core
- Virtual Evolved Packet Core (vEPC)

4.4 Why choose Amdocs as your NFV partner?

Amdocs' objective is to be the partner of choice for service providers, helping them move from the physical driven network world to a virtualized network end-state, which will enable service providers to drive new services, respond quickly to customer needs and improve operational efficiency.

As a communications IT software vendor with vast experience and assets in communications IT clouds, as well as network control and mission critical systems, Amdocs is best positioned to help service providers through this transformation.

- Amdocs has the leading communications product catalog and service fulfillment solutions.
- Amdocs is a communications-IT software company with a pedigree of cloud deployments and operations.
- Amdocs has vast experience in deploying carrier grade mission critical systems.

4.5 Amdocs NFV Operations Solution

Realizing NFV benefits lie in the ability to automatically fulfill and manage the lifecycle of telco network services across network segments and technologies, such as access and aggregation networks, core-network data centers and on-premises demarcation points.

The Amdocs NFV Operations solution extends the ETSI MANO specifications to create the industry's first open, end-to-end solution to cover both virtual and physical environments. The solution focuses on intelligent, real-time service planning and fulfillment workflow management, while calling on appropriate network function and infrastructure management systems for execution and monitoring. This is done using open interfaces and APIs, including SDN controllers, cloud management systems, and VNF managers.
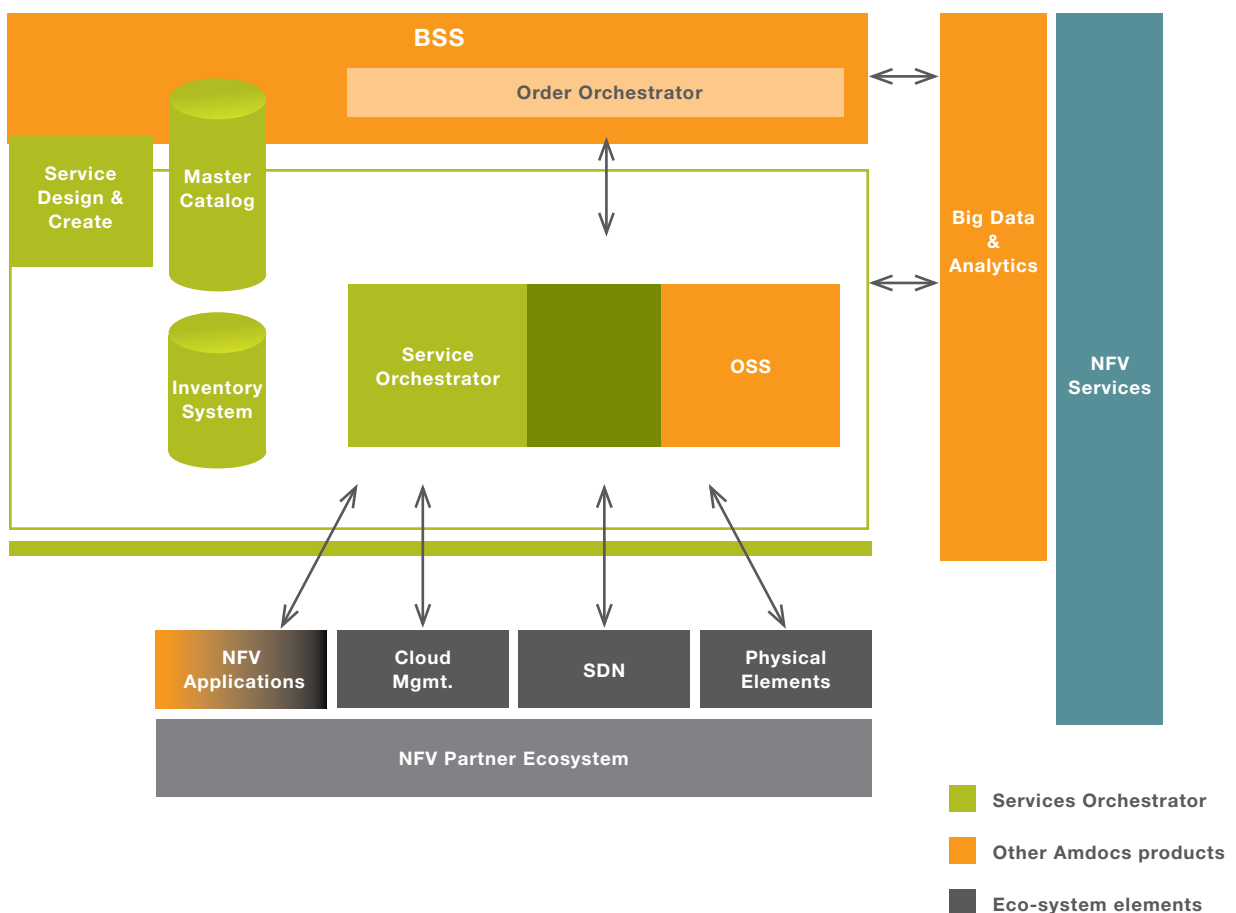

Figure 2: Amdocs NFV Orchestration Operation Solution

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About Amdocs

For more than 30 years, Amdocs has ensured service providers' success and embraced their biggest challenges. To win in the connected world, service providers rely on Amdocs to simplify the customer experience, harness the data explosion, stay ahead with new services and improve operational efficiency. The global company uniquely combines a market-leading BSS, OSS and network control and optimization product portfolio with value-driven professional services and managed services operations. With revenue of $3.6 billion in fiscal 2014, Amdocs and its more than 22,000 employees serve customers in over 80 countries.

Amdocs: Embrace Challenge, Experience Success.
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