BEYOND NEXT GENERATION OSS

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Executive summary

- The adoption of NFV/SDN technologies is driving the need for OSS evolution, but these are not the only factors driving operational change.
- NFV/SDN offers significant benefits to the service provider in particular service agility as well as OPEX and CAPEX savings.
- NFV/SDN are dynamic technologies that require operational systems to evolve from support for static or slow changing networks to dynamic networks.
- Amdocs views the evolution from existing OSS to agile operational systems that can fully support the needs of next-generation networks, including management of the NFV Service Lifecycle. Amdocs approach to OSS is an evolutionary one which enhances existing OSS with new capabilities to provide a smooth upgrade path to support NFV/SDN networks.

Technology developments are changing networks

The communications industry is undergoing an unprecedented level of change. The interval between introducing new network technologies is decreasing as data capacity is increasing. These changes have a profound impact on the operational aspects of today's networks to the extent that the traditional operational systems are being forced to adapt.

In addition to the plethora of new access technologies such as LTE, LTE-A and 5G there are three specific technologies that are set to fundamentally change networks and their operational and support systems.

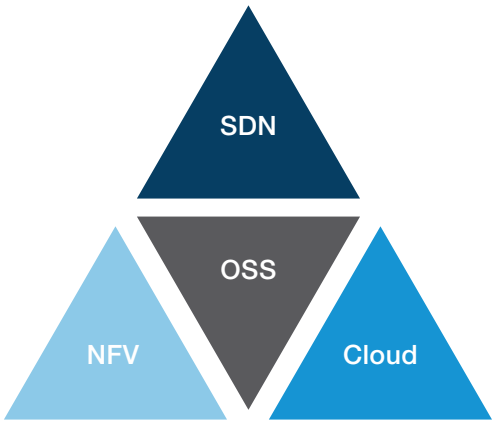


Figure 1. Technologies driving evolution of OSS

1. Cloud Computing

Cloud computing is a technology adopted by the IT industry. Cloud computing is virtualization of standardised commercial off-the-shelf (COTS) IT hardware into virtual instances. These virtual instances consume less power, reduce required floor space, and maximise storage, computing power and network resource flexibility.

2. Software-Defined Networks (SDN)

Software-defined networking is an architectural approach that separates the data and control planes in the core and transport layer of networks using an SDN controller (SDN-C). SDN enables faster service deployment and changes to connectivity. SDN simplifies configuration by abstracting the network into an API.

3. Network Function Virtualization (NFV)

At its most basic level NFV can be considered a deployment option. NFV decouples network functions from their specialized hardware and enables their operation on standardised COTS servers. Where NFV differs from Cloud Computing is in the level of automated orchestration and carrier grade availability.

Why NFV?

This paper will focus on the impact of NFV as the most disruptive of these technology areas to impact the operational layer. NFV adoption is being actively driven by the service provider community as opposed to the vendor community. It is expected to deliver significant benefits to service providers with the potential to reduce the influence of Network Equipment Providers (NEPs) who have engineered "vendor lock-in" in the past through the use of proprietary standards and extensions to reduce equipment interoperability.

The 3 key benefits that are expected from NFV are:

- Improved service agility
  - Improvements in customer experience
  - Improvements in service enablement
- Reduced equipment expenditure (CAPEX)
- Improved operational efficiency (OPEX)

Initially the focus of NFV was on OPEX and CAPEX reduction, but increasingly SPs are looking at the ability to improve service flexibility as the key driver for NFV adoption. Improving service agility can drastically reduce the time and resources required to create a new service, and ultimately a new revenue stream. The ability to react rapidly to market and competitive pressures is critical as it is the catalyst for service innovation, and profitability.

Why does OSS need to change?

Existing OSS systems and in particular the inventory systems that form the "single-source of truth" are critical for delivering operational efficiency in existing networks. With the deployment of SDN/NFV new operational challenges, unique to these dynamic networks, need to be addressed. With NFV the network becomes the master and OSS, and in particular inventory systems need to provide a near real-time view of that network.

NFV and SDN create highly dynamic networks that can potentially be in a constant state of flux as the networks dynamically reconfigure or change in response to automated parameters. This radically different requirement is one of the key catalysts for the evolution of OSS. As NFV/SDN achieves widespread adoption within the network the increasingly dynamic nature of the network means operational systems need to adapt and change to match that need.

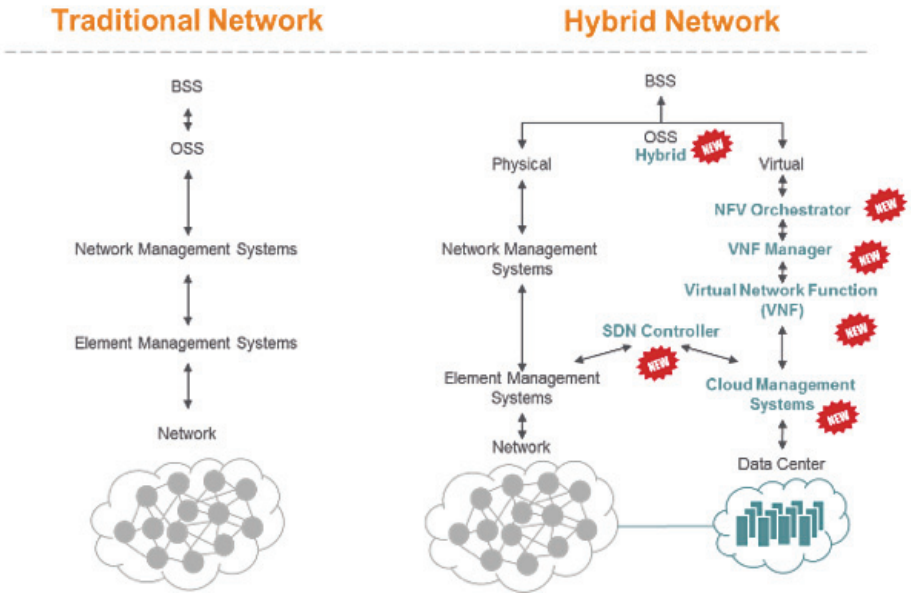


Figure 2. Why Hybrid Networks drive OSS change

NFV implementation phases

Looking at NFV adoption today the majority of advanced SPs are running trials and proofs of concepts. In what we call Phase 1 of NFV the focus is ensuring that the new VNFs perform at least as well as the physical network functions (PNFs) that they are replacing. From a technical point of view this is an important step as these VNFs are the key building blocks for NFV adoption and the virtualization of the network.

In this phase the operational issues related to NFV are simple. Typically the VNF is instantiated on a dedicated server, in a pre-defined location, often with a dedicated team whose role it is to operate and maintain that function. At this most basic level the VNFs do not require complex orchestration, and many of the systems deployed are managed using simple Element Management Systems (EMS), Cloud Management Systems (CMS) or VNF Managers (VNF-M). In Phase 1 it is possible to implement NFV without a complex orchestration function because of the simplicity and static nature of the VNFs. Essentially phase 1 is the replication of the physical network with a virtual version. Because the number of network elements is small, the EMS and VNF Managers are sufficient. However, as the number of VNFs and the complexity of the network increases there is a need for a dedicated NFV-Orchestrator.

In Phase 2 of NFV there is a requirement to implement highly scalable NFV-Orchestration systems that can manage the more advanced requirements of a VNF network including the instantiation and management of many dynamic VNFs. In this phase, as scalability becomes more important, we are likely to expose the limitations of NFV orchestrators that have been developed on a legacy EMS platform. These NFV orchestrators were never designed to scale, and for full network deployment of NFV a purpose built NFV orchestrator is essential. In addition as virtualization increases in the network the need to support multi-vendor NFV environments increases. Multi-vendor capable, vendor agnostic NFV-orchestrators become essential.

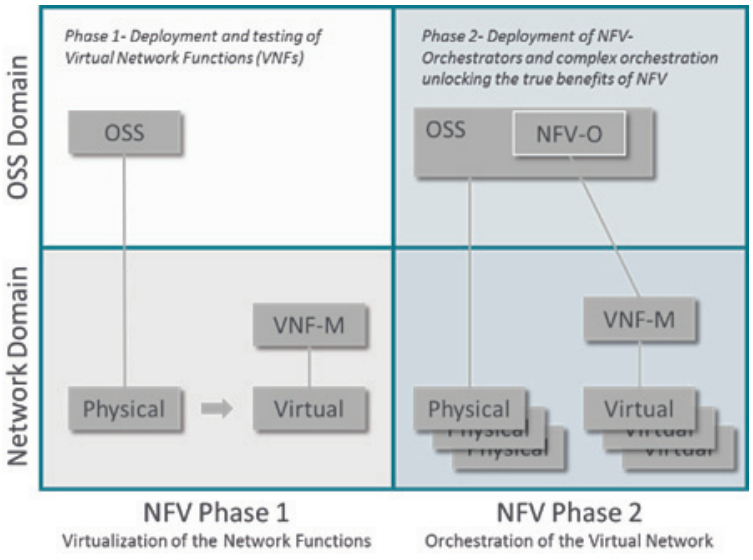


Figure 3. NFV implementation phases

Other factors driving OSS evolution

In addition to NFV we see a number of other factors impacting the industry and driving change in the OSS layer. As well as data usage, and in particular video, putting stress on network capacity there are four additional factors that impact operations:

1. Service complexity

Service complexity continues to increase within the industry. In the residential or consumer space Quad play – the combination of fixed telephony, Broadband Internet, TV and Mobile services is commonplace among tier 1 service providers in developed markets. In markets, such as North America and Western Europe, SPs are extending their core offering beyond the four base services in to the Multiplay to “Super-play” domains where more than 6 services are offered to consumers. Typical offerings include simple internet security, cloud storage, or back-up but these are important as potential new revenue streams. In addition they help SPs improve the stickiness of their offerings and so reduce subscriber churn.

In the enterprise market the level of service complexity increases still further. SPs are able to offer multiple business services, but the ability to rapidly create, adapt and upgrade these services mean that the user experience in the enterprise space is often poor. In addition increasingly these Enterprise services utilise NFV and SDN increasing service complexity. Cross-domain orchestrators must be able to orchestrate NFV-Orchestrators and SDN-Controllers.

In Western Europe and North America we have seen a wave of mergers and acquisitions. The impact of this is that SPs potentially have a much broader portfolio of services to offer, but the ability to cross sell from their existing customer base into the acquired customer base may be limited by the lack of cross domain orchestration systems.

Increased service complexity creates challenges for service providers, particularly in the area of fulfilment. If they are going to address the full market opportunity, SPs increasingly need a service orchestration solution that manages both traditional fulfilment stacks and the new NFV and SDN fulfilment stacks.

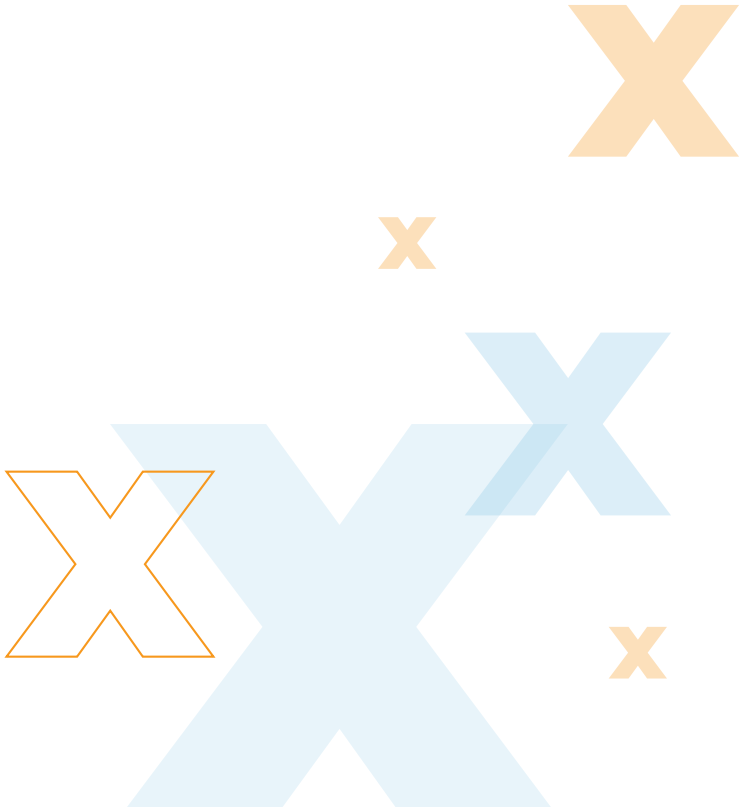
2. Lack of service agility

While NFV brings within grasp the prospect of service instantiation within minutes, the ability for service providers to define, create, test, adapt and launch new services has changed little in the last decade. Engineering organizations are often seen as the bottle neck within the process of new service development in the telecommunications domain. Typically new service development is time and resource heavy, and testing is a major percentage of service development time.

Amdocs believe that future operational systems require an automated service design capability, either as part of the NFV-Orchestrator function or as an adjunct system. To address the service agility issues the service design capability must have:

- The agility to design new services efficiently
- The ability to implement or instantiate new services efficiently
- The ability to automate the transition from design to implementation
- The ability to feedback service fault information to automate design amendments and updates

If an adjunct system is used it must be capable of tight integration to the NFV-Orchestrator and support automated transfer of designs.



3. Service-centricity

Service providers globally are seeing market saturation. Even in Africa the rate of growth in mobile networks is decreasing as these markets mature. The inability to grow through subscriber acquisition creates the need to focus on strategies to reduce churn and grow revenue organically. Customer experience becomes more important as ARPU plateaus or in some cases is clearly in decline.

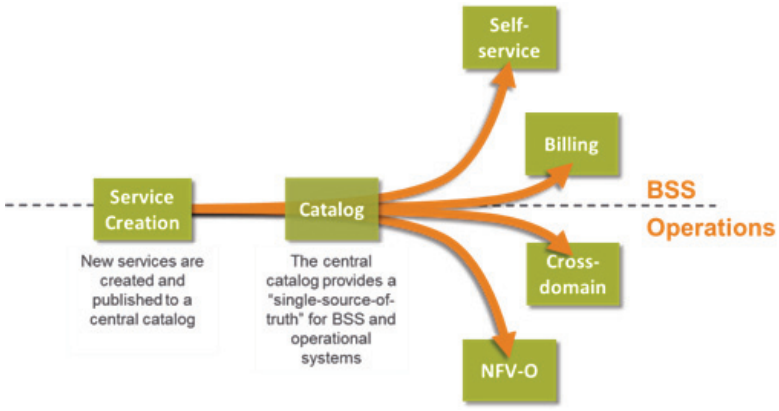


Figure 4. Central catalog enables service centricity

In addition service providers are seeing customer demands changing. Data services have overtaken voice as critical service, and consumers expect to be always connected with high quality on multiple devices.

Service providers need to become service-centric as opposed to network-centric. Improved customer experience is achieved through integrated end-to-end services, as opposed to simply good network performance. The ability to create strong end-to-end services requires a catalog-based approach to service development and strong OSS-BSS integration. Amdocs believes that a single shared product catalog addresses a number of synchronization issues caused by multiple catalogs.

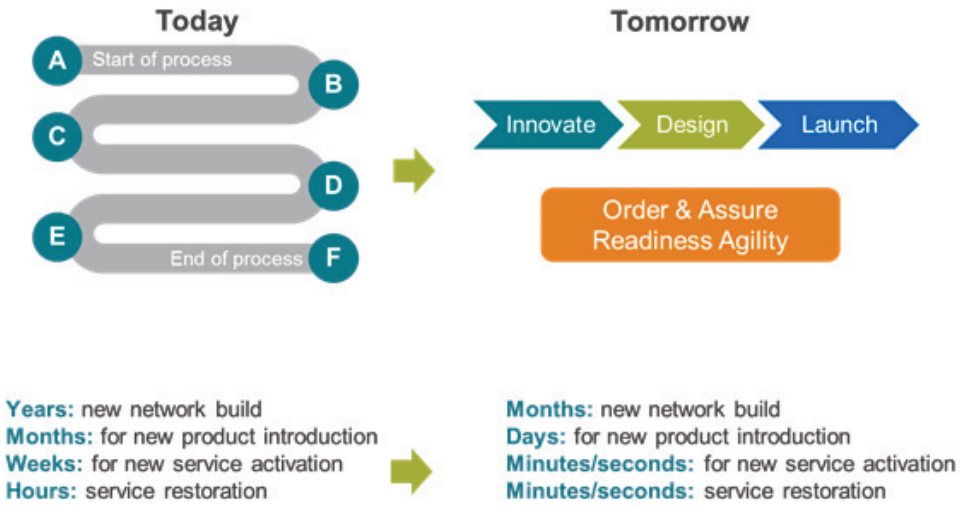


Figure 5. The impact of NFV on service agility

4. Hybrid networks

The vast majority of service providers introducing NFV will experience a prolonged period where they need to operate hybrid networks. Hybrid networks are a mixture of the traditional networks, using physical network functions (PNFs) as well as virtual networks with virtual network functions (VNFs). These hybrid networks increase complexity and this has an impact on the operational layer. The challenge of the hybrid network is not the complexity of NFV, but the complexity of managing existing networks, combined with SDN/NFV. The inability of some of the new entrants to the NFV orchestration market to manage existing networks is a major credibility issue. Hybrid networks will dominate for the next 10 years at least.

5. Real-time inventory and service tree management

The transition from static to dynamic networks drives the need for real-time or near real-time inventory and service-tree management. Because existing networks change at a relatively slow pace, in response to planned roll-out, upgrade and maintenance of existing inventory systems have not needed to perform in real-time.

SDN/NFV creates dynamic networks which will be in a state of constant flux in response to planned and unplanned events. Management and assurance of these dynamic networks requires a live topographic, service and network view in near-real-time. In addition to enable historic fault management and investigation it must be possible to recall the network configuration at a specific point in time in order to analyse fault data and assess network performance.

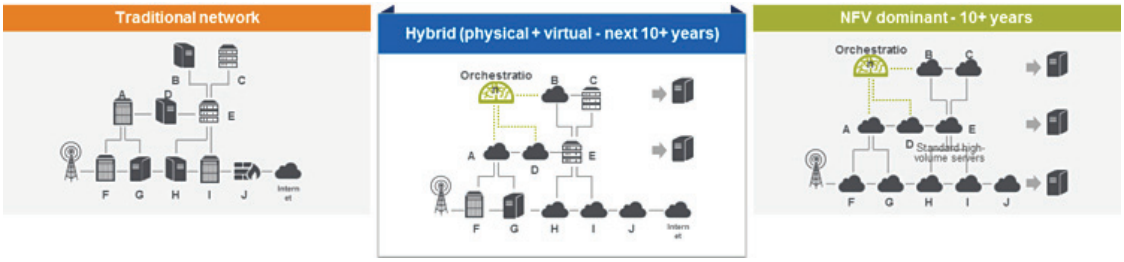


Figure 6. The hybrid reality

Evolution to an agile Operations

Amdocs' approach to supporting NFV/SDN and addressing the service-related factors is evolutionary rather than revolutionary. Amdocs has developed a modular approach adding a number of new components to create a next generation of operational systems. Amdocs Next Generation OSS evolution blueprint incorporates the capabilities required to support both existing and next-generation network technologies and services, providing an evolution path from today's OSS to tomorrow's agile operational systems.

Amdocs approach is about augmenting existing OSS systems with the capabilities they require to address the operational needs for NFV/SDN and beyond.

To find out more go to **www.nfvreadyoss.com**

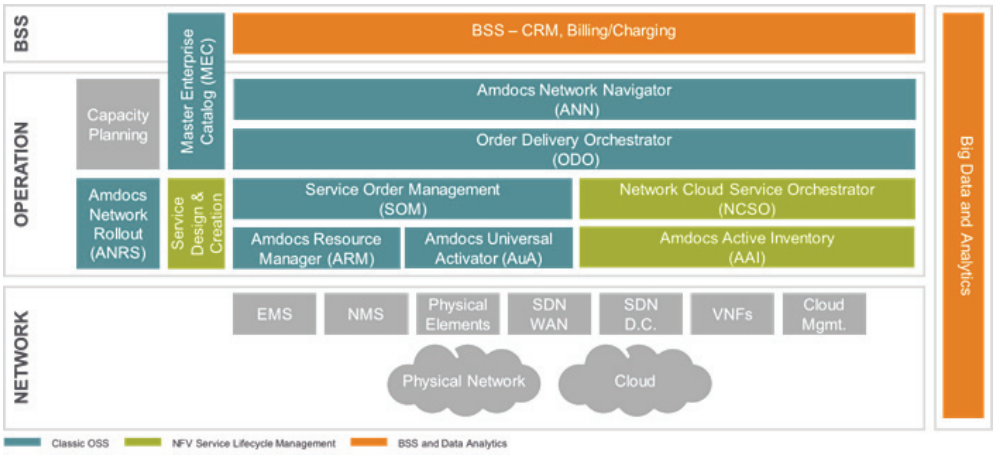


Figure 7. Amdocs Next Generation OSS Evolution Blueprint

ABOUT AMDOCS

Amdocs is the market leader in customer experience software solutions and services for the world's largest communications, entertainment and media service providers. For more than 30 years, Amdocs solutions, which include BSS, OSS, network control, optimization and network functions virtualization, coupled with professional and managed services, have accelerated business value for its customers by simplifying business complexity, reducing costs and delivering a world-class customer experience.

The Amdocs portfolio enables service providers to capture the world of digital immediacy by operating across digital dimensions to engage customers with personalized, omni-channel experiences; creating a diversified business to capture new revenue streams; becoming data empowered to make business and operational decisions based on insight-based and predictive analytics; and achieving service agility to accelerate the fast rollout of new technologies and hybrid network services.

Amdocs and its more than 24,000 employees serve customers in over 90 countries. Listed on the NASDAQ Global Select Market, Amdocs had revenue of $3.6 billion in fiscal 2015.

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