NFV and SDN for 5G networks

NEKTARIA consultancy services

About

NEKTARIA Consultancy was founded by Nektaria Efthymiou following a career as an executive in Telecoms and Technology. NEKTARIA Consultancy aims to support companies going through technology transformations and evolution paths by providing hands on support and guidance based on a holistic approach that is well grounded in the wider business context.

Services

We are here to help. We offer consultancy services on:

- Technology feasibility
- Technology strategy
- Product strategy
- M&A due diligence
- Feasibility studies
- SMEs Mentoring

Projects

- Technology projects
- Technical Proposals to raise funds
- Technical Due diligence
- Product marketing strategy

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- Medium to large size organisations
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NFV AND SDN

Software Defined Networks (SDN) started by the need to enable changes in protocols in a centralized way without changing the software each time on the network devices .

While Network Functions Virtualization (NFV) is driven by the requirement of service providers to speed up the deployments of new network services, without restrictions placed by hardware limitations.
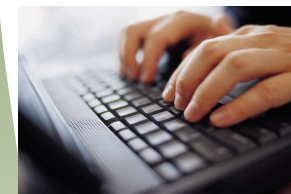
The main focus of NFV is to optimise the network services operated by a network infrastructure, while SDN aims at making network control directly programmable allowing network adjustment to meet changing demands.

Although NFV and SDN are not new, they gain a lot of attention as they are considered as enablers for the 5G vision and the key elements of 5G networks architecture.

NFV & SDN enable 5G opportunities for Telcos

NFV and SDN are not new concepts in telecommunication industry. There are networks today that use NFV platforms with SDN for central control and configuration. Nevertheless, NFV and SDN are not widely used in the industry mainly due to lack of common standards, variation of NFV maturity amongst network suppliers and challenges to change the industry mindset from today's static networks to tomorrow's fluid network architectures.

Current MNO's network infrastructures are populated with several integrated hardware-based network functions and distributed control plane designs, which bring inflexibility to network configuration and introduce two main challenges for the service providers :

(1) long service deployment cycles that limit the innovation and performance improvements in networks,

(2) limitations to cope with changes in data demand and user's traffic requirements.

As a result, current network deployments have a high Total Cost of Ownership (TCO) and hence limit the flexibility operators have to adapt networks and offer new services to support new use cases.

5G's vision is based on openness and flexibility to allow service delivery in a fast and most economical manner, enabling quick introduction of new use cases in networks.

Clearly, NFV and SDN are key enablers for that 5G vision. NFV offers flexibility by removing the dependency on the hardware and allowing more possibilities for shorter deployment cycles and faster service upgrades, while optimises the cost of offering new services to meet requirements for new use cases.

On the other hand, SDN decouples the data and control planes of network functions and introduces an open Application Programming Interface (API) between the decoupled planes. As a result it offers a programmable network, which simplifies the network operation and control and provides the operators with the capability to achieve configuration changes with a centralised control.

Networks based on SDN and NFV will enable network operators to offer services to their customers in the same speed other internet content providers, such as Google or Skype, offer services to their customers today.

Business case and competitive landscape for the Telco industry

A SDN/NFV network platform with full automation will enable MNOs to provide Network as a Service (NaaS) capabilities.

Network slicing will enable 5G networks to deliver a multitude of services with different requirements. With network slicing a mobile operator will be able to deliver over the same physical network, multiple virtual slices configured end to end to achieve the required performance and support different use cases. For example, an autonomous car will require low latency but not necessarily high throughput, while a streaming service may need high throughput and low latency.

To achieve the end to end flexibility to support multiple use cases with 5G, an orchestration layer—using SDN principles-that aggregates individual domains, abstracts their presentation and exposes it over a single API is used.

Network applications can utilise these APIs to request e2e services across various domains. The orchestrator is decomposing those requests into the required resources, within individual domains, and asks required configurations. It also maps e2e Service Level Agreements (SLAs) to quality requirements within the different domains.

A virtualisation layer, on top of the orchestrator, allows virtualisation of resources to create e2e slices.

However, without automation, across all network functions, operators will never be able to realise the benefits of these architectures to achieve the long term 5G vision.

Challenges of NFV/ SDN for 5G network business cases

Mobile networks have traditionally been very carefully managed because they are so critical and tightly regulated. Therefore, there has been a certain amount of resistance to the idea of open standards and cloud enablement for those networks.

There are technical, cultural, political and economic challenges to achieve this migration:

-Technical: (a) the high speed telecommunication networks need strict interoperability; (b) large scale SDN/NFV deployments across telecommunication network need to meet performance requirements; (c) automation deployment in multi-vendor networks is important to achieve the promised efficiencies; (d) end to end management of multiple virtual devices will necessitate development of new management models as opposed to the traditional ones.

-Cultural: (a) network engineers need to adopt a new mindset and learn new IT skills;

(b) service models need to be redefined to acquire new revenue streams.

-Political: standards organizations, suppliers and service providers have to agree and deliver the common framework and architecture.

-Economic: NFV and SDN will enable the 5G longer term vision for openness, flexibility and adaptability by lowering the cost of ownership of those networks. However, the CAPEX vs OPEX ratio shifts, compared to static networks. This generates negative cash flow predictions, during investment planning, when such architectures deployed in small scale during early stages. It also generates negative cash flow when deployed across the network, due to uncertain demand for new use cases and challenges that further delays e2e automation in multivendor networks.

Ultimately the most complex question for the business case is whether this is an infrastructure revolution and will touch every service, or simply a way of doing one or two services differently.

If it's the former, then it will be difficult to have viable business cases, without a holistic approach .

If it's the latter, then it is going to be a slow deployment and the proven services will create strong business cases to extend NFV/ SDN to the whole network longer term.

In order for those scenarios to improve cash flow predictions, automation is important to enable full benefit of the technology and reduce OPEX expenditure.

Strengths of NFV/SDN for 5G network business cases

The main benefits, for Telcos, adopting NFV/SDN architectures include the followings:

-Avoiding supplier lock-in by enabling competition on price and performance.

-Deploying services fast.

-Extending the lifetime and functionality of hardware with software upgrades.

-Offering a wider range of performance features.

- Improving efficiencies by configuring resources based on service requirements .

- Expanding the number of possible providers, including smaller suppliers coming out of the IT environment.

-Adapting infrastructure to an environment where development, testing and implementation is possible on an operational infrastructure.

Competitive landscape

SDN is removing the dependency on legacy features. This reduces the barrier to entry for new players and allows for more competitors in the space. The increased competition will create downward pricing pressure for an industry that has benefitted from high margins for decades.

An entirely new set of products are introduced, such as SDN controllers, network virtualisation and analytics that play a major role in networks. Tools for user interfaces, monitoring systems, network analytics and troubleshooting become

insertion points for new players who can move and create new revenue opportunities with those peripheral technologies.

SDN/NFV players will try to differentiate through price and performance improvements, in order to enter the Telco industry ecosystem and compete with existing players.

Although, price and performance will be differentiators, the risk of deploying and operating a multivendor network cannot be underestimated.

SDN/NFV and automation will allow more players to breakthrough.

The change in network architectures affects those who have built a business around selling and building Telecommunication networks.

Existing Telco suppliers will have to compete with IT companies.

Network Integrators will learn how to architect and evaluate those products, possibly shifting their selling approach to take into account the changes in the ecosystem.

Integrators might see an opportunity to provide an outsource service to integrate and manage those networks, while newcomers who might want to offer early trials will win some early deals.

Architects, engineers and companies who have experience on SDN/NFV architectures and can become the trusted advisors on migration plans and integration strategies for the Telco service providers will be able to differentiate and create a revenue opportunity.

SDN/NFV is a big step of moving traditional static networks to more fluid and flexible architectures and those suppliers who will offer the functionality and enter first will get an advantage.

WHAT IS THE 5G BUSINESS CASE FOR NFV/SDN

The preparation for 5G with SDN/ NFV and network orchestration is critical for the 5G business case.

The benefits can be substantial and potentially generate new revenue streams, but in the short term there are many challenges and considerations for changing traditional static networks to more fluid multivendor network architectures.

The short term investment will be negative without looking the overall holistic benefits.

On the other hand , the discussion for a clear demand to support new

use cases will never end, until someone moves first to create the environment for new use cases deployment and generate the demand to create new revenue opportunities.

This is the time to develop business models to purchase this technology and experiment with different scenarios until the right model is matched. For example, network technology can be purchased as a CAPEX option, where Software is bought separately; or as a mix of CAPEX and OPEX, where the hardware is bought and the software is licensed; or as pure OPEX with a subscription only ; or a pay as you grow model.

But still this is not enough. The business model for such network investment cannot be based only on traditional products i.e. data and voice minutes. Instead new service propositions need to be considered.

While the specifications for the 5G core architecture are expected to be finalized in June, operators such as Verizon and AT&T are already preparing their core networks to be 5G ready by moving to cloud-centric, distributed at the edge and virtualized within NFV and SDN architectures .

Although there is a view that 5G doesn't need multiple slices to succeed there is the argument that without it, it will be difficult to fully deliver the 5G longer term vision.

But the question that remains is how operators will generate the revenues to cover the cost of those network deployments.

Highlights

- SDN/NFV will enable network slicing, whilst orchestration functions will realize the flexibility to support multiple use cases.

- Those architectures will challenge the Telco industry to shift to multivendor, software distributed networks, which are different to the existing static configurations.

- Without automation, the business case will always be negative for such deployments, but once all pieces come together, the long term benefits will outweigh the initial challenges.

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