Making NFV/SDN an Operational Reality
Pathways to Business Transformation with the Cloud-Native Telco Network
SECTION I: INTRODUCTION:

Network function virtualization and software-defined networking (NFV/SDN) were conceived as tools for the technical enablement of increased flexibility, both in terms of service creation and operational management. But over time, virtualization as an end to itself has become more or less insignificant in the big picture, as it becomes clear that it will be one tool out of many that is required for telcos to achieve real-world business goals.

A technically focused approach typically involves establishing proof points that the scheme works, optimizing it and making it flexible. But from there, it’s important to ask the question of what the business case is. To build a viable next-generation business model, beyond theory and transformative hope, it’s imperative that the industry embrace NFV/SDN as just one part of a cloud-native, trusted approach for achieving it. Goals include agility, time to market advantage, opex reductions and better customer service.

Dell EMC is leading the way on NFV/SDN’s evolution from mere virtualized topology to part of a cloud-native toolbox for creating positive new business realities. That requires a fundamental change to how we think of the underlying architecture—in particular, moving from vertical to horizontal integration.
SECTION II: THE PLATFORM MUST BE REDRAWN

Traditionally, telecom networks have been built to support specific applications from the bottom-up, in vertical configurations. The NFV/SDN era began as a piece of technical research, promising a path for converting such physical workflows into software-based iterations of them. And while the idea of virtualization has been proven to be technologically possible, this traditional siloed approach to the network hasn’t changed—the functions are simply instantiated in software instead of hardware. This creates a set of “virtualized verticals.” Moving from a physical to virtual vertical stack simply adds complexity and more components—hardly the basis for a business case.

The goal for telcos now is to establish tangible proofing points for using this architecture, such as lower total cost of ownership (TCO) for compute infrastructures, that show that they can achieve profit and other desired business outcomes from NFV/SDN investments.

To do that, NFV/SDN should be implemented as part of a cloud-native architecture: A multitenant solution where multiple applications can exist on same platform. In this topography, virtualization is one tool in the box, and should be seen as a means to an end rather than an end in and of itself. In its essence, cloud-native allows continuous, at-scale development and deployment of services and applications.

**ABSTRACTION AND DISTRIBUTION**

In its purest form, these components will be built as microservices, and containerization will be implemented, with elements tied together by open interfaces. Eventually, there will be two separate industry segments: Platform and infrastructure; and software and applications. Further, with applications disaggregated and distributed from the underlying physical architecture, different pieces of software can be spun up as needed to create services at scale, making more efficient use of the commodity x86 compute platforms than what we see today. This reduces TCO and improves time-to-market (TTM) by allowing resources to be called up on-demand to create services.

In other words, a cloud-native approach means that the infrastructure is simply consuming services as needed, instead of building all needed functions into the applications ahead of time, or by adding/modifying features in existing services on-the-fly. There is also an aspect of increasing feature velocity by only having to work towards a specific microservice with a much closer R&D loop. These two combined can be translated into lower TCO.
It should also be noted that with the introduction of such cloud-native applications and the modified platforms needed to support them, there will still be both virtualized verticals as well as classic telco verticals that remain in demand. That’s because each service provider will have its own unique set of resources and business goals; some positive outcomes are only possible based on large scale, for example—requiring an architecture that would only drive additional cost for a smaller communications service provider.

That said, while both virtualized and classic telco verticals can be built by a network equipment provider or systems integrator using cloud-native architecture and the components, the converse is not possible, where a vertical is retroactively transformed into a cloud-native deployment—so service providers must plan ahead.

From an infrastructure vendor perspective, the ecosystem consists of both large incumbent network element providers, as well as emerging smaller players who are driving the cloud-native concept. Ultimately, the supply chain should consist of one commodity infrastructure, multiple companies offering VNF and software, and an integrator to knit it together and build the services. And, integrating infrastructure from different network element suppliers should not affect how the applications perform.

**ORCHESTRATION AND MANAGEMENT**

In a cloud-native architecture, the application layer is separated from the platform to create flexibility for moving workloads around in the system. Telcos will want to start, stop, scale out or move a workload as needed—perhaps for resource allocation purposes, or perhaps because the provider needs applications should be disaggregated and distributed from the underlying physical architecture, so different pieces of software can be spun up as needed to create services at scale.
to move an app from the core to edge to cut latency. To do that in what is an increasingly complex environment, orchestration and better management become critical enablers, and telcos will be forced to adopt a much higher degree of automation.

The expectation going forward is that the infrastructure will be able to, automatically, place the workload on the right computing architecture in the right facility at the right location to most efficiently/economically deliver a service, with the right customer experience and availability.

To that end, umbrella tools for awareness and reporting will take a central role, combined with analytics. Today, the application itself tends to provide that awareness—but this approach can’t persist in a disaggregated environment. A holistic view is required, in the form of a telco-tailored domain management platform that sits on top of the infrastructure, showing visibility across the topology into which resource from which vendor is being used for what purpose at what time.

Armed with this intelligence, automated orchestration platforms can optimize telco infrastructure. For instance, the manager can determine in near real-time whether a particular app is overloaded or idling, and if there are resources that can be reclaimed and reused elsewhere.

This can also become predictive. For instance, in a pay-TV world, it’s useful...
to know not only how the distribution system is behaving at the current time, but also how it will behave in 48 hours, when, say, a popular sporting event will be on.

To enable this vision, the architecture—from platform to orchestration layer—also should be inclusive of network element platforms from multiple vendors. The cloud-native infrastructure should see no difference between a classic telco vertical, a virtualized vertical or a multitenant system, but should rather be able to draw on and consume the resources contained within each as needed for the task at hand.

This indicates that a heavy dependency on open-source components and open application programming interfaces (APIs) to allow cross-platform communication is also a key to cloud-native transformation, even though the end services themselves might not be open-source.

**OPEN-SOURCE, THE IT CLOUD AND TELCO NEEDS**
The next generation telco architecture should look for compatibility with existing IT cloud concepts in order to provide speed to market and agility—but it’s critical to understand that telcos have unique requirements that require an additional level of expertise when it comes to implementation.

The open-source community already has risen to the task of helping telcos with basic functionality for moving to cloud approaches, and common components like Linux can be used by a large community unmodified—for instance, open virtual switching and routing on standard cloud architectures are available now. And, the momentum behind open-source cloud in general will certainly be a trigger for telco-focused software developers to take a more modular, horizontal approach to delivering virtual network functions (VNFs) efficiently.

That said, more advanced telco needs will necessitate borrowing open-source concepts and building upon them. For instance, frameworks like those initiated by consortiums like OpenStack are targeted towards specific groups; with modification and systems integration this can be a valuable resource for telcos.

Similarly, IT best practices can be utilized, with tailoring. For instance, in the SLA side, an IT application is in most cases overprovisioned and scaling is done when overload is detected. But this isn’t a working model for telecom, which requires guaranteed capacity with headroom according to traffic models. On the payload side, there is an issue with dealing with finite physical resources and applications competing on those resources. What is needed is a platform built on IT fundamentals, but with added functions for telcos when it comes to resource isolation and allocation, plus awareness/analytics functions for prediction of resource depletion ahead of time.
SECTION III: DIFFERENT APPROACHES FOR BUILDING CLOUD-NATIVE BUSINESS BENEFITS

At its heart, the NFV/SDN-based telco transformation has been fomented because the enormous growth in data on networks is not sustainable with existing architecture. To be able to scale and to achieve broader business goals, the network must evolve to an economically-driven architecture that improves TCO, specifically around opex reductions.

The ownership of networks, data centers and compute resources is, put simply, commoditized. And, differentiation in operational models is diminishing. Whether it be the Internet of Things (IoT), the consumerization of IT, CloudOps/DevOps/NetOps, business intelligence and/or data-driven decision logic (both technical and operational), new service and operational models must materialize in a world of diminishing returns. Today's telcos are seeing less margin per service, less adoption per service and less service longevity.

As a result, telcos are leading aspects of the virtualization and software programmable transformation – not just responding to what competitors are doing. However, when it comes to the adoption of cloud-native, NFV/SDN-enabled telco architectures, it’s important to note that different telcos will embrace this transition on different levels—separating into three main groups.

Some Tier 1 operators, which often have thousands of engineers at their disposal, are building their own cloud infrastructure because they want to transform their networks now and lead when it comes to disruption. That said, Tier 1 telcos building on their own infrastructure will likely move to a “buy” rather than “build-from-scratch” strategy for cost reasons—there's simply no long-term economy in building one function for one operator; rather, functions should be built for many, particularly as cloud-native disruption gains momentum.

Meanwhile, the build-your-own-from-the-ground-up model doesn't work for Tier 2s or smaller Tier 1s, and a number of telcos in these groups will continue to buy either traditional or virtualized vertical stacks.

There are a few reasons for this: They may not have a deep tech department, or they might not care about flexibility initially. Others will be more experimental, but will be constrained from a cost perspective. In any case, this group will require more packaged, component-level solutions to meet their need for agility—and will require a new class of partner to accomplish their goals. That partner will have a deep, institutional understanding of how compute storage and networking comes together with NFV/SDN, automation and orchestration to support business goals.

And finally, smaller Tier 2s, Tier 3s and niche players will want to buy pre-integrated building blocks, which are modular and offer pre-integrated management, and reporting and monitoring. Here too, building out their infrastructures will require more SI and consulting expertise.

SECTION IV: CONCLUSION

To make software work in a true multitenant environment, so that it’s fully stateless and scalable, components must be interchangeable. Today, NFV/SDN is merely the vertical scaling of single functions in a virtual environment, with those functions being orchestrated as such.

To move forward, the ecosystem must create trust and
a new step in the cloud journey that’s beneficial for the entire industry, in the form of shifting from technology-driven to an economy-driven NFV/SDN.

The next-generation network will make use of virtualization as well as a series of other tools that telcos need to meet their commercial objectives. This includes redeveloped cloud-native applications; abstraction; and infrastructure disaggregation to make the applications independent and faster to deploy. And, with the separation of applications from infrastructure there will be an increased focus on management and awareness functions, which also will need to be economically focused.

And, the TCO and TTM requirements will make it impossible for any single vendor to develop an entire network service on its own, in a similar phenomenon to the auto industry, where components are included from multiple sources. That will give rise to a new ecosystem player: The NFV/SDN-trained large system integrator.

Dell EMC is the No. 1 supplier of components for building NFV/SDN infrastructure, and also offers experts that understand this space technically and operationally for telcos. Dell EMC has a disruptive vision and unique approach to NFV/SDN that is not tied to one specific VNF vendor or orchestration vendor. We are building ecosystems with different players, approaches and VNFs, in an effort to create, test, prove and drive an ecosystem that’s completely open. Ultimately, telcos should be able to replace one component with another without compromising the applications.

Right now, the value chain is busy operationalizing NFV/SDN, not generating revenue and building cloud-native tool sets. At Dell EMC, we’re committed to building and designing cloud-native telco architectures of the future, bringing together an understanding of how compute storage and networking comes together with NFV/SDN, automation and orchestration.

The underlying infrastructure for all digital transformation is the same – compute, storage, networking – the nuances are in the right operational processes, automation tools, management, telemetry and optimization principles based on the particular workload. Dell EMC will focus on working with SI, NEPs, orchestration vendors and VNF providers, bringing its increased expertise and organizational/institutional knowledge to help telcos through the transformation.