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XURA

Digital Communications

Network Function Virtualization and the Evolution of Messaging Infrastructure

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The real benefit of NFV is going to be increased business agility and network elasticity that enable new commercial opportunities.

What is NFV and SDN?

More than a buzzword, Network Function Virtualization (NFV) is a complete shift in the architectural approach for most network operators as they move from fixed dedicated hardware resources to a dynamic agile network design. This shift is to be achieved by abstracting functional software from the underlying hardware via virtualization. The decomposition of performance critical functions is exciting for operators because it provides several benefits including a much greater degree of network elasticity.

The momentum behind NFV has grown rapidly since October 2013, when the first set of specifications was defined. In fact, the ETSI sponsored NFV specification group has the support of significant industry leaders such as Verizon, AT&T, BT, Orange, Telefonica, Telecom Italia and NTT.

Software Defined Networking (SDN) is a technology many times associated with NFV, yet on the other hand, is complementary to NFV and focuses on simplified network design and provisioning through abstraction of the network element control plane from the data plane in the network architecture. This means at the switch or router level, SDN moves control logic to a centralized operational layer leaving the network elements to become simple forwarding entities. The central controller can easily be modified to change behavior of the entire network providing dynamic allocation of resources to the required software element.

Momentum on NFV is expected to grow rapidly as more and more network providers invest in Network Function Virtualization and software-defined networking. SNS research predicts that this market will reach nearly $21 billion by 2020 and offer Capex savings of approximately $32 billion dollars for wireline and wireless services providers. Another prediction, by IHS Infonetics, is for the NFV hardware, software and services market to grow from $2.3 billion in 2015 to $ 11.6 billion in 2019, with software taking over 80% of this amount. This market momentum demonstrates that the industry is seriously moving towards adoption of NFV.

Relevance of NFV to the network operator

The shift to NFV is probably one of the most significant evolutionary events for the telecommunications network operator.

The near term benefits are obviously lower capital expenditures and lower operational expenditures, including data center costs, which necessarily form the business case funding the investment. Longer term, the impact will certainly be increased flexibility that will radically transform the operational business of running a telco. NFV will provide the operator with a much greater degree of network elasticity and the agility to adapt to market or consumer behavioral changes simply and quickly. This is especially important because the speed of change seems to be increasing all the time.

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Agility & flexibility

NFV increases the operator's business agility and flexibility, allowing them to quickly launch, configure, migrate and tear-down services, while minimizing vendor lock-in. This is perhaps the greatest NFV benefit to the network operator allowing it to rapidly address changes in market or consumer needs. With all software elements deployed in an NFV environment, mobile operators have the ability to allocate processing power where it is needed and will generate the greatest value. For example, some operators may use spare resources to prototype new services by combining existing software elements in new ways while others will focus on optimal asset utilization with newfound elasticity. Regardless, operators will have the flexibility to continuously improve their business with new services, scale successful ones and easily remove those that are unsuccessful and reallocate the resources.

This level of flexibility will change the business model of the network operator. When new services can be generated with minimal disruption to network infrastructure, the operational emphasis becomes focused on packaging, positioning, pricing and training. For example, an operator may address the specialized needs of a certain industry vertical by creating a virtualized service instance specifically for that sector and customizing services offered there. Previously, satisfying specialized needs required making incremental software enhancements to common, shared service platforms possibly even using proprietary hardware. NFV makes this far quicker, safer and much less complex.

Lower capital expenditures

The move to a virtualized network environment allows the operator to migrate from having a multitude of specialized purpose-built hardware stacks to a pool of unified resources utilizing commercial off-the-shelf hardware (COTS). COTS hardware is typically far less expensive and much easier to obtain for augmentation or replacement.

One benefit of virtualization is elasticity - the ability to efficiently and dynamically balance hardware capacity with variable load of service demand. This minimizes stranded capacity typical with individual hardware stacks and potentially allows the network to operate more efficiently with fewer hardware resources. Further cost is saved by eliminating power consumption and floor used for physical resources that are dedicated to peak demand of a single service, because when not used for a particular service these resources can be utilized to serve other needs.

In addition, as NFV gains momentum, it is expected that manufacturing efficiencies and pricing pressures will drive down the cost of COTS hardware significantly offering even greater savings to the operator.

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Lower operational expenditures

With a unified network running NFV Management and Orchestration, operational processes are streamlined, automated and simplified with capabilities such as self-healing, capacity scaling, and instantiation and configuration of network services. The requirement of managing disparate software updates and hardware upgrade cycles is minimized which, in the past, either required large staffing resources or resulted in internal resource bottlenecks. Any sudden increase in resource needs or hardware reallocations is easily addressed.

Some deployments will also support advanced redundancy and high availability schemes to enable service continuity (e.g. by migrating stateful VNFs in case of physical failure). NFV therefore reduces staffing requirements to manually manage and administer the processes.

Parallel deployments

By inherently supporting multi-tenancy NFV allows sharing resources by different applications, accounts, and users, serving multiple customer bases and running parallel instances of the same service, i.e. coexistence of different versions, testing and production environments, parallel customizations for similar yet different market segments, etc.

Combining these benefits

NFV offers operators the business and operational benefits mentioned above. The combination of these benefits has the potential to strategically boost their competitive position relative to OTT players and to help them introduce new innovate services at a faster speed, at lower costs and with more attractive pricing to consumer and enterprise markets alike.

Impact of NFV on messaging infrastructure

Most vendors in the messaging ecosystem embraced the abstraction of software from the underlying hardware years ago simply as a method to systematize the procurement of COTS hardware. The virtualization of that software to enable deployment into an NFV environment is a natural progression that provides additional benefits as well. Beyond simply running in a virtualized environment, the operational aspects of messaging infrastructure are significantly streamlined. This includes the ability to easily deploy virtualized software elements with centralized manageability, configure redundancy and failover and dynamically scale in/out. Plus, future solution upgrades are vastly simplified.

The question is, which virtualization technology do messaging vendors adopt? The answer isn't yet clear. Companies such as VMware, Citrix, Oracle, Microsoft, Red Hat and others are practically raging with activity in the virtualization technology arena trying to carve out individual niches. There seem to be two basic strategic approaches; open platform concepts that allow the operator to choose best-of-breed solutions in particular areas (such as messaging), and the other extreme, concepts that result in vendor specific lock-ins and restricted solutions from other providers.

For network operators embarking upon an NFV project, the two approaches that seem to dominate the conversation are VMware and OpenStack, with OpenStack being "managed" by various vendors. A number of vendors are looking to provide NFV hosted solutions for operators to house various software elements including HP, Cisco, Intel, Dell and other network equipment providers.

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Xura's virtualization strategies

Messaging solutions are expected to be high on the priority list for operators virtualizing network functions. This is because value added services are still a vital part of infrastructure and because the wide range of solutions will provide a large opportunity for NFV simplification. Xura has embraced network evolution enabled through virtualization. As a global company, we recognize that not all operators are homogeneous in their approach or at the same stage of adopting the concept. For that reason, Xura has a very flexible approach incorporating three primary deployment models enabled by virtualization.

Software only

Some operators may have standardized hardware in place and have not yet prepared with a virtualized environment. In this scenario, Xura may be asked to provide both the virtualized environment and virtualized software. This premium deployment does not take full advantage of the efficiencies of NFV, but is an option for operators wishing to take small steps toward a larger network evolution project. This model provides a dedicated virtual machine environment supporting the required Xura applications. While some efficiencies are gained by sharing the virtualized infrastructure with multiple Xura applications, the dedicated virtual environment functions essentially act as a segregated environment. While this small step approach is available, it does add cost, complexity and time to the NFV project. The majority of operators will likely choose a true NFV deployment such as a Private Cloud.

Private cloud

This deployment model follows NFV specifications with Xura's virtualized software installed in an operator's own virtualized environment. We use the phrase "Private Cloud" keeping in alignment with the terminology many of our customers are using. This deployment type takes full advantage of all the benefits virtualization offers by allowing multiple vendor solutions to share the same resources and common management tools offered by the virtualization technology. The Private Cloud is therefore available to all the operator's applications and virtualized network elements to leverage as usage requirements vary. This also allows the operator to consolidate applications into centralized data centers that support multiple deployment models including geographically dispersed operating entities in a robust and resilient centralized and geographically redundant data center design.

Cloud based services

Another term that eventually comes up in any conversation about virtualization is "Cloud Based Services" or specifically Software as a Service (SaaS). While this deployment type is not operationally related to NFV, it is a natural commercial progression where software is offered as a standalone service with the vendor managing everything. This is another deployment option Xura offers to operators that wish to focus on a SaaS based business model while outsourcing operations to Xura. The advantage with this model is that Capex is practically eliminated and all hidden Opex is gone to be replaced with predictable consumption costs tied to actual utilization i.e. pay as you use.

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NFV and messaging infrastructure evolution

As operators shift to NFV, the operational aspects of running messaging infrastructure will evolve. Moving from specialized purpose-built hardware stacks to a pool of unified resources will change business behaviors and certainly transform the value of the value added services. Below are just a few of the evolutionary concepts we expect to see.

Service consolidation

A natural step in the evolution of messaging infrastructure will be service consolidation with multiple value added service systems bundled into a single solution. For many operators this will reduce the complexity of dealing with multiple vendors and eliminate multiple hardware and software elements. Xura provides a Communications Suite (XCS) that enables a true consolidated messaging solution, supporting both 2G/3G (legacy) networks as well as messaging in an LTE/IMS environment. XCS allows for the consolidation of the following services:

SMS – core network SMS functionality including SMS routing, SMS home routing (message interception), SMS first delivery attempts, SMS store and forward, SMS spam and fraud protection, prepaid/ post-paid billing support, connections from 3rd party applications, MVNO support, flexible rules engine, SMS over IP (IP-SM Gateway)

MMS – core network MMS functionality including MMS store and forward, MMS third party content push, MMS legacy & email, addressing support, MMS content transcoding, MM4 based RCS interworking MMS with build-in WAP GW/HTTP proxy, MMS flexible rules engine, allowing e.g. spam and fraud and personalized messaging integration, MMS interoperability & roaming awareness, MMS lawful intercept, prepaid / post-paid billing support, MVNO support

RCS/IP-SM – XCS provides the critical Rich Communication Services for compliance and future evolution including full RCS5, RCS to SMS/MMS interworking, network presence and policies. Including capability discovery, 1-to-1 chat, group chat, multi-device chat, stand-alone text and multi-media messaging (SMS and MMS over IMS i.e. IP-SM), file transfer, file transfer during chat, RCS chat with non-RCS users via SMS, RCS group chat with non-RCS users via SMS, RCS chat interworking with SMS and RCS file transfer with non- RCS users via MMS.

Call completion – a world-class Voicemail solution designed from the ground up for the convergence of voice, video, data, and wireless services. The application is a fully IP based and feature-rich communications system that is IMS ready utilizing native IP networking technology and supporting all primary internet and data communications standards. Can be configured with advanced features such as notification with triggers, MMS delivery of messages, SMS alerts, visual voicemail, voice-to-text, distribution lists, shared mailboxes and message forwarding via email to highlight a few.

The consolidation of services provides an additional benefit by maximizing the use of common Product Architecture Components. This enables another level of network efficiency. Common components include Management System, Reporting and Customer Care, IPC Framework, Unified Platform, Service Logic Layer, Store & Forward/IM-Server, Presence Component, Message Store, Subscriber Database , FEPs (SOL, SCN, SMPP, UCP, IMC, MM4, MM1) and Routers (DiSC, MCO, AG). Additionally, this consolidation also provides the operator the ability to correlate usage patterns across applications for improved customer service and new commercial offerings. The Xura Analytics solution is leveraged to collect and provide these BI focused reports and analyses.

Service routing and balancing

NFV will be a complete evolution of the network and not happen with a snap of the fingers. This means that there will likely be a long period of time where operators leverage existing legacy VAS systems to maximize the initial investment and continue serving customers with minimal interruption. This will increase the complexity of technology resulting with hybrid network topology that requires sophisticated abilities to bridge physical and virtualized functions and perform service routing and balancing. Xura provides a variety of advanced routing capabilities across a range of protocols including Sigtran (SMS), SIP, Diameter and SMS / MMS / RCS applications. Products such as Message Controller (MCO), Diameter Signaling Controller (DiSC), SIP Router and Application Gateway - which operate within traditional environments or virtualized environments such as NFV allowing the operator to logically and methodically control which scenarios are serviced by what resources, and route traffic in the appropriate manner.

API enablement

Improved business flexibility is one of the primary benefits of NFV projects that will change the business model of the network operator. Messaging infrastructure when deployed into an NFV environment becomes a reusable resource that may be combined with other software elements in new ways enabling the operator to address new opportunities. One option that will be available to operators is to expose abstracted back end systems/functions such as messaging resources via an Access/API Gateway. These back end systems/functions may be limited to on premise capabilities or could include resources provided by third party partners as well.

At Xura we have exposed some key components as VNFs including our Multi-Content Message Store (MCS). Leveraging this NFV based architectural functionality will allow our customers to further expand the use of our Multi-Content Message Store into other applications and services and thus extract more value from our messaging solutions.

Significant NFV design principles

When building NFV deployments and implementations it is imperative to take into account many factors and best practices. The following are some of the design principles that apply for NFV deployment.

Rigid isolation of tenants

Multi-tenancy is inherent to NFV, as physical resources are concurrently consumed by multiple VNFs. But VNFs themselves would typically also support multi-tenancy, especially when consumed as a service e.g. by multiple applications. Such VNFs should apply rigid separation and isolation between tenants, providing end-to-end support for multi-tenancy, by ensuring that each and every component or sub-system applies such isolation. Any cross-tenants access or visibility must be avoided. For example, any shared resources must manage a completely separate state per tenant (no shared memory or global variables). This principle is critically important for security and privacy reasons. It is also important in order to prevent tenants from influencing each other, and to discretely meet Service Level Agreements of each tenant.

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Usage metering and quota management

A properly designed VNF should implement thorough accounting by means of usage metering and quota management, i.e. keep track of the use of resources and limit the usage based on applicable policy. This principle will help resource planning and proper sizing and ensure smooth scaling of the system. In many deployments users are charged for using the VNF, either because they are external customers with a pay-per-use business model, or because they are internal customers (e.g. different business units belonging to the same organization) which are internally accountable for the services they consume, or are subject to budget allowance of the service. But even in cases where charging is not applicable, usage monitoring and quota management are helpful to identify greedy users and preventing unfair usage of the service.

Operational processes

As a result of the introduction of the Management and Orchestration (MANO) NFV control stack, operators must ensure that their operational scenarios for managing all aspects of network and service health, status, performance and configuration are upgraded to include the correlation of data and control to and from the NFV MANO stack. The traditional OSS/BSS layer must integrate to the NFV orchestration function to leverage the control of virtualized infrastructure to support the setup and configuration of new services as well as recover from faults and other conditions. As a result, a review and update of operational procedures to support this new model will be required as the NFV MANO stack is deployed.

Performance metering

Virtualization and multi-tenancy introduce an extra degree of overhead. In order to ensure that service quality is maintained, it is recommended to measure performance by defining and tracking Key Performance Indicators (KPIs) and counters, such as measure response time of various types of transactions. Comparing these KPIs to equivalent KPIs of traditional (non-virtualized) service, will let the service provider detect cases where quality of service has degraded beyond the acceptable level, and take corrective action before customers are impacted in a noticeable way.

Scalability constraints

VNFs are designed to seamlessly scale, but in practice scalability is always bounded. As vendors are virtualizing their products they are required to calculate and estimate system sizing models for the NFV environment (e.g. number of VMs in the system, per a given load, and the resources allocated for each VNF). These sizing models are fairly new and may not yet be proven by sufficient field experience; hence they are more sensitive and less reliable. They are also impacted by various traffic models. The documented system capacity as measured in the vendor's lab, could be actually different in the field, where traffic model and service demand patterns are different than those in the lab. For this reason, the planned system sizing may require calibration to better fit the particular deployment. Service providers should therefore be aware of scalability constraints and keep an open eye on actual system behavior, so they can recognize these constraints and take preventive action, e.g. by increasing capacity or offloading service demand, if these constraints are hit.

Logging

Tracking, auditing and debugging of service transaction can be non-trivial in a distributed, multi-tenant, potentially multi-site and multi-vendor environment. For this reason, logging is an important tool, preferably with a single transaction identifier which is used across log files and enables trivial correlation across VMs, nodes, and NFVI-POPs. Detailed logging can also facilitate non-repudiation, provided that the logs are protected from being tampered.

Summary

NFV will offer near term benefits such as lower Capex and Opex, but the real benefit is going to be increased business agility including network elasticity and enabling new commercial opportunities. Xura fully supports the evolution to NFV and understands that each operator will have their own individual timing and approach to the project. For that reason, Xura offers three flexible approaches to virtualized software deployments to suit the operator as needed. There are many options to evolve messaging infrastructure into an NFV environment and likely other ways will develop as the technology is adopted.

Why Xura

Xura provides messaging solutions that are deployed as VNFs in compliance with NFV specifications, and in line with customer requirements. We partner with key suppliers of NFV management and orchestration products and services to ensure that our customers have a complete solution as required for a holistic deployment. Xura also supports integration of our messaging solutions in customer specific MANO stacks as we recognize that our customers may independently select MANO components and solutions as required by their business. For more information on ur reference architecture, partnerships and product roadmaps, please email contactxura@xura.com.

We are Xura

We offer our customers a pathway to next generation digital technology. Our thinking unlocks the possibilities of no boundaries communications.

For over 20 years, we have been working with Communications Service Providers (CSPs), operators and enterprises all over the world, helping them to meet the needs of tomorrow's multi-device, multi-services consumers.

We offer clever ways to financially realize opportunities from existing technology, while guiding customers to richer communications solutions by creating innovative products and services to disrupt digital.

We help 8 out of the top 10 global operators reach over 3 billion endpoints.

We are the enabler making the future of digital communications services happen.

Xura. We think beyond.

For more information
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