VOL 1 (2017) NO 4

e-ISSN : 2549-9904
ISSN : 2549-9610

INTERNATIONAL JOURNAL ON INFORMATICS VISUALIZATION

Analysis of Network Function Virtualization and Software Defined Virtualization

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Abstract— **Network function virtualization (NFV) has played important role in both industry and academic change in telecommunication services. NFV has the ability to handle reduction on OPEX and CAPEX; it provides new service and also increases quickly in getting a time value. NFV has an opportunity in doing research in developing new innovation in architecture, framework, and measures some of the technology used in deploying in NVF. In this paper, the author describes the relation between NFV, SDV and cloud computing. The architecture of NVF its advantage in using network function virtualization and some activity used in NFV and adoption of NVF and future direction of NFV, issues, and difference in NFV and SDV**

Keywords— **Network virtualization, Software defined virtualization, cloud computing, Network functions, Virtual network function.**

I. INTRODUCTION

The concept of NFV describes in 2012 and practice by many organization and researcher [1]. In November 2012 ETST (European Telecommunications standards Institute) got selected for particular group for NFV, based on quality in NFV. After Some years huge commodity of experts working for implementing the quality for NFV and also share experience in development from the initial stage. ETSI are developed more than 245 individual company and it also included 37 important providers for representing both industry and telecommunication [2]. ETSI completed starting stage it works with 11 particular groups [2], it also consists of an entire structure of architecture, hypervisor, and network used in infrastructure, security, maintain, evaluation metrics etc. Network function virtualization goal to transform the new way in network operator that perform in IT virtualization technology for a merge with various types network equipment in the organization, moreover huge volume server, switches and storage for placing the data centres. Virtual appliances based on requirement and perform without the need of installing the new equipment. It relates to the development of network function with software that performs based on the quality of IT hardware placed in the data center and also maintain without any changes in physical infrastructure.

NFV[3],[4], describes the main challenges of virtualization that provides a new way for deploy, design, maintain network services. An important concept of NFV distinguishing the physical network equipment with a function that performs in it. Some network functions like firewall will be carried out to TSP (telecommunication service provider).It assigns to some of the types of network equipment like volume server, switched, and datacenter distributed nodes for the end user. Service dissociated with a set of virtual network function that performs with software for one or two organization with the quality physical server, and then it will relocate the various network locations without any need for installation of new service or hardware.

NFV combined with TSPs to get more flexibility for the future ability and network service provider for the user and it affords new network service quickly with less cost for getting improved service. Some of the benefits that NFV provides various network service practice recently like decoupling software from hardware, Employed network function, Scaling.

This paper briefly describes NFV and SDN in introduction part. In section 2-Relationship between NFV and SDN.In section-3 briefly description about software defined virtualization. In section 4-Describing NFV framework with a clear explanation of each block. In section 5-presents advantage of network function virtualization. In section6-some related concept related to NFV. In section7-Standard activity performing in NFV. In section8- Virtualization for CDNs. In section 9-Future direction of NFV and finally in section 10-Conclusion about NFV and SDN.

II. Relationship Between NFV And SDN

Software-based networking differs between NFV and SDF, lead to enroll with two terms. NFV and SDN are closely combined with independent and additive it gives an important advantage in technology. Network functions virtualization is more complement with software defined networking, and then will not dependent on it. Network function is virtualized and distributed without the technology of SDN and Non - virtualization function will control in SDN. The primary property of two fields can be applied when NFV and change the property of hardware network element (NES) with software perform in the server, meanwhile, SDN handles with altering network protocol and control for centralization. SDN function performs in a split with the exchange of network function with an appliance and generic servers. Network functions virtualization is assistance with SDN for affording with infrastructure in SDN software and then it performs. Moreover, network function virtualization adjusts with SDN based on usage of both server and switches [5].

III. Software Defined Networking

It performs independently with both software defined networking and NFV, but SDN provides easy to employ and maintain with NFV.SDN maintain the complexity of network in software platform it alters in centralized coordination, access, and programmability. SDN affords with programmable and access with orchestrates and collection of devices perform in operation with various stages of abstraction. The user is an incentive in reconfiguring the network with function performs on the server, and also placed the network using software mechanism. NFV provides more configure network for plumb in software function. [5]

Table 1. Comparison between NFV and SDN [5]

NFV	SDN	PROBLEM
Both service and function concept	Network concept	Approach
ETSI	ONF	Formalization
Flexible and decrease in cost	Open interface	Advantage
Eg; SNMP, NETCONF	Open flow	Protocol
Server and switch commodity	Control plane and data plane	Perform application
Provider based on telecom service	Grew up in data centers	Initiator for business

IV. NFV Architecture

It based on ETSI, NFV architecture consists of three key component like Network function virtualization (NFVI), VNFs and NFV MANA [6]. Component are described [4], [7], [8].

A) NFV Infrastructure

It's mixture with both hardware and software resource it built with a platform for deploying VNFs. Commercial-off-shelf (COTS), hardware storage, network are the physical resource that offers connectivity between VNFs. Virtual resource is the concept of both storage, computing and network resource, In the concept of Virtual resource perform based on virtual layers like hypervisor it may decouple with virtual resource lying in the physical resource. In data center platform, both storage and computing resource are described in form of VMs (Virtual machines), meanwhile, virtual network depends on link and nodes. Virtual node elements like hosting or functionality of routing and two virtual are straightly connected with physical links from making modification in properties.

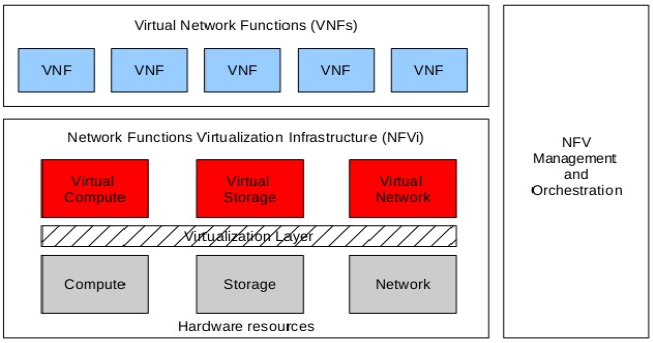

Fig1. NFV Framework

B) Virtual network functions and services

It performs in building software employed or virtualization in network functions (NFS) it performs only in a virtual resource like VM. VNFs deals with particular network function that perform with one or more VM at top most hardware network platform like routers, switches, cloud computing, and servers. Each Independent with virtualize network functions are chained or mixed with building block-style fashion for conveying entire scalable network for communication services.

C) NFV Management and NFV MANO

It based on ETSI's (European telecommunications standard institute) MANO system [9]. NFV MANO affords functionality need for VNFs, it mainly associated with operations like the configuration of VNFs and platform that perform in functions. It comprises of orchestration and lifecycle maintenance in physical and Software resource affords with virtual infrastructure and VNFs for a life stage management. Functions, service, and resources are some of the life cycle properties deployed in the data model for storing the information. NFV MANO determines the entire virtualization for particular management work need in NFV system.

Moreover, the system defines the interface for communication between various components of NFV MANO and also well managed with traditional management framework like Operation support system (OSS) and business support system it affords for maintaining both VNFs and legacy equipment perform in functions. Comparing with recent practice of NFV with main three differences like

splitting of software from hardware, flexible preparation of network functions, Incentive service provisioning.

Splitting of software from hardware: Splitting made for software to derive independently from hardware.

Flexible preparation of network functions: NFV will automatically distribute the network functions on hardware resource it will perform with various function, different duration with data centers.

Incentive service provisioning- Network operators are scalable with the performance of NFV and grows based on fine access control depends on the current situation of the network. Network function virtualization consists of four important blocks like Orchestrator, VNF manager, Virtualization layer, Virtualization infrastructure manager.

A) Orchestrator

It is liable for maintenance, the orchestration of software resource and infrastructure used in virtual hardware for acquiring network services.

B) VNF manager

It taking care of some of the life cycles of VNF like instantiation scale, termination, update events, it also affords with zero-touch automation.

C) Virtualization layer

It mainly depends on virtualization layers like physical resource, anchors the VNFs for virtual infrastructure it makes sure that life cycle of VNF is independent with hardware platform it provides with quantity interface in both VMs and hypervisors.

D) Virtualization infrastructure manager

NFV nearly related with some other innovation technology like SDN. SDN have based network technology it distinguished with access plane lying on data plane and merge with access functions like analytic centralized controller.

Both NFV and SDN provides more advantage, fully balanced with each other and provides similar features like new innovations, creativity openness, and competitiveness. A mixture of two solutions to get more values. Example - SDN affords with NFV to improve its performance, operations, and compatibility. Moreover, virtualization is distributed with network functions; it does not depend on SDN technology.

V. Advantage Of Network Function Virtualization [10]

- Network functions virtualization growing technology in the telecom industry, it has fundamental changes over the network. Network function virtualization application has more advantage in network operator; it provides essential modification in the telecommunication industry. Some advantage in using network virtualization is it decreases the cost of equipment and power consumption by merging equipment. NFV mainly based on using cost efficiency.
- NFV provides the hardware lying and makes modification in elasticity, scalability, and automation. For making changes in flexibility of network service it decreases the duration places for new services.
- It also improves quick preparation for new innovation made in network operator. Network function virtualization provides changes in network operator for a substantial decrease in activity cycle.
- More efficiency, integration, it in decrease cost of growth, time to market is based on production, reference facilities in infrastructure.
- Services are provided quickly based on demands in scaled up/down. Moreover, quick service places for improving the software without any visit required for install new version.
- Decrease energy consumption by tapping the power maintenance features with server and storage, also with workload and optimization.

VI. Some Of The Related Concepts Used In NFV

We need to combine with NFV, Cloud computing, SDN.

A) Cloud computing

Based on NIST [11] cloud computing approach provides present trends, the requirement in access the network that acquires the set of configuration computing resources based on network, services, storage, it can quickly access the minimum service and interaction. It divided into two like infrastructure provider and service provider [12]. Infrastructure provider maintains cloud platform and resource based on the usage-based pricing model, the service provider gives one or more infrastructure need for end user [11].cloud model based on five essential Characteristics and three service providers [12].

Important characteristics of cloud computing [12]

- On demand service -Based on server duration and network storage.
- Broad network access- Ability in computer storage and accessible over the network by standardizing platform.
- Resource pooling -It provides with various customer used by a multi-tenant approach with various physical resource and virtual resource is access based on requirements.
- Quick elasticity -Based on outward and inward demands of Elasticity.
- Measured service control access using a type of services like storage, process, and bandwidth.

B) Cloud service models.

They are three services used in cloud computing [11]

Software as a service (SaaS)

The customer has the ability to make use of provider applications that perform in cloud infrastructure. The application is accessed different client device by a web browser or program interface. Example- Facebook, Zen desk

Platform as service (Paas)

The customer has the ability to distribute in cloud platform it acquired an application for creating libraries, service and afford tools given by providers.

Infrastructure as a service

The customer has the ability to access storage, network and other essential resources. Consumer are distributed and perform in software's like OS and applications

TABLE 2: Common relationship between cloud computing and NFV [11]

Cloud computing	NFV	Problems
Computing concepts	Both service and function concepts	Approach
DMTF[13]	ETSI/NFV	Formalizatio n
Few Latency are agreed (Homogeneous)	Less latency(heterogeneous)	Latency
Ethernet	SNMP[14]	Infrastructure
Open flow	Many access control protocol	Protocol
Low demands on reliability	5 NINES based on availability need[15]	Reliability
Still diverse and modification	Eg.NEBS[16]	Regulation

VII. Some Stand Standard Activity Perform In NFV [17]

1. Infrastructure
2. Management and orchestration
3. Software architecture
4. Reliability and availability security and performance.

Some of the key stages used in ETSI'S NFV-ISF

- Decrease the cost of equipment and power consumption for a network appliance.
- Need to improve duration to market for getting new services.
- It provides both Multi-version and multi-tenant abilities.
- Multiple applications are available for access the solitary network appliance.
- Recommend more ecosystems for improvement and make use for a solution to software.

VIII. Virtualization For CDNs (VCDN)

Content delivery network mainly based on the content of videos, it plays a crucial role in much application for service providers and telecommunication network. It provides more control access in delivery place in a server near to end user, it decreases time and network congestion. Most approach handle with some need aspects in CDN distributed model. Virtualization of CDN (VCDN) related with CDNs in the physical server for virtualizing platform, it covers entire elements of CDN like throughput and Latency) [18].

Current status in adoption of NFV [19]

Network function virtualization is only at starting the stage with modification of competitive platform or infrastructure. Telecommunication facing more technology modification arises in it., based on reviewing many surveys and many industries development NFV for the production of the network. A Huge percentage of IT industry currently placed in various stages of NFV. In future, Most of the industries are probably have essential in empowering with NFV.

IX. Future Impact Of NFV [20] [21]

NFV providers will provide network functions same as service to network service provider with some technology it modifies pattern with same recent usage of cloud platform

It shares infrastructure and service based on requirement and acts as a resource, cost.

Top (OTT) provider play with experience quality provides for need cost based on an agreement with network service in particular service.

Network function virtualization has the ability to modify the telecom network for implement and access. Most of the communication service provider likes NFV that perform with standard servers.

NFV individual scope for virtualization with large network element like

- Mobile core network
- Server load balancer
- WAN acceleration
- Security like(Fire falls, SSL)

Some of the challenges in NFV adoption like

- Based on some standards in delivery like COTS server and more availability in middleware, it connects with performance, reliability based on demand needs for service providers.
- NFV applications have some essential features in Orchestration and automation management.
- NFV technology does not comprise in ensuring security network and integrating threat modeling with risk assessment.

X. Conclusion

Network function virtualization makes essential changes infrastructure of telecommunication platform. NFV provides some of the essential advantages of cost efficiency, improvement in the market, new innovation provides in service for telecommunication industry and application. In this paper describe an overview of network function virtualization, briefly, and also description NFV System. List some of the benefits providers by NFV, challenges lies in NFV and adoption. Some of the opportunities in telecommunication organization with various challenges in mind are harder to overcome while progress. Network function virtualization provides essential challenges in network operator like the performance of virtual appliances, migration, instantiation. Time, resource, operation transformation are some investment, some of the effective approaches will come in future to the growth of telecommunication network industry.

ACKNOWLEDGMENT

A special note of thanks to Vellore Institute of Technology (VIT) University for providing necessary infrastructure facilities to carry out the research work and my friends who have helped me to complete this study.

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