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Cloud Management using Network Function Virtualization to increase Service agility

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ABSTRACT

Network Function Virtualization (NFV) aims to provide high-performance network services through cloud computing and virtualization technologies and its changing the way networks are managed by providing more scalability and flexibility. NFV promises to increase service agility and reduce the overall OPEX and CAPEX experienced by the network operators. In this paper, discussing NFV and NFV and SDN bring together a promise for service agility and OPEX reduction through extreme automation of IT and networking processes in a Service Provider environment.

Keywords: Network Function Virtualization, Software Defined Networking, cloud computing.

I. INTRODUCTION

Internet has become an integral part of everyone's life in present days. The services are delivered by the service providers, as requested by the end user. The evolution of cloud computing has provided an opportunity for the end user to customize the use of the internet as required and pay only for the requested services. However, to provide all these simplicities and customization, there are a few complex systems that work behind the scenes. Every vendor providing services to the customers has a data centre to host the service and manage them. There are severs, routers, switches and middle boxes running in a data centre environment. In traditional networks, there are physical dedicated hardware resources for compute, network and storage components, separately performing their respective tasks [2].

Increased complexity of these networks leads to increase in cost. Administration and management of the physical devices in these networks increases the capital expenditure and operational expenditure for a service provider[4]. More the number of physical devices, higher the CAPEX and OPEX. Moreover, network resource usage is highly unpredictable, leading to uncertainty among the service providers.

Not all network functions or the internetwork devices are used round the clock. Some of the network functions and devices are unused or not fully utilized. These devices and functions can be managed appropriately by sharing the resources with other users or suspending it when not in use.

This paper presents the difference in service agility between traditional network and the cloud network using NFV. On the cloud computing platform the virtualization of network function using NFV is carried out. Orchestration and management of resources, using NFV and OpenStack is demonstrated. Rest of this paper is organized as follows. Section II Methods and material Section III proposed architecture, Section IV Conclusion paper.

II. METHODS AND MATERIAL

1) Dynamic scaling

The network function and their functionality decoupling into insatiable software components provides greater flexibility to scale the actual VNF performance in a more dynamic way and with finer granularity, for instance, according to the actual

traffic for which the network operator needs to provision capacity[1].

In Figures, we use an example of a Customer Premises Equipment to illustrate the economies of scale that may be achieved by NFV. Traditional CPE shows a typical (current network service)

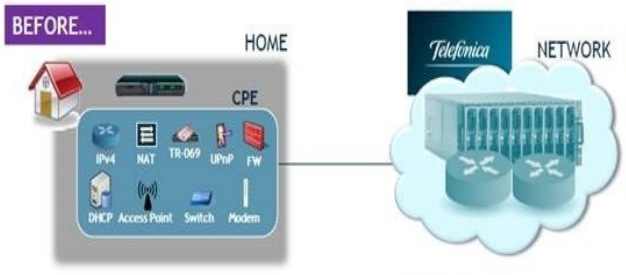


Figure 1. Traditional CPE

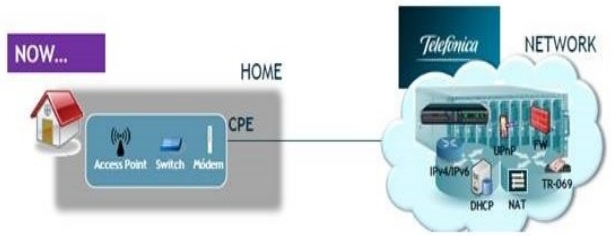


Figure 2. CPE with NFV
(Customer Premises Equipment)

The function made up the implementation of the CPE and their function like: Dynamic Host Configuration Protocol (DHCP), Network Address Translation (NAT), routing, Universal Plug and Play (UPnP), Firewall, Modem, radio and switching[1]. In this example, a single service (the CPE) is made up of eight functions. These functions may have precedence requirements.

For example, if the functions are part of a service chain2, it may be required to perform firewall functions before NAT. Currently, it is necessary to have these functions in a physical device located at the premises of each of the customers both. With such an implementation, if there is a need to make changes to the CPE, say, by adding, removing or updating a function, it may be necessary for a technician from the ISP to individually talk to or go to each of the customers. It may even require a complete change of the device in case of additions. This is not only expensive for the ISPs, but also for the customers.

In Capital Premises Equipment with NFV we show a possible implementation based on NFV in which some of the function software the CPE are transferred to a shared infrastructure at the ISP, which could also be a data center.

This makes the changes described above easier since, for example, updating the DHCP for all customers would only involve changes at the ISP. In the same way, adding another function such as parental controls for all or a subset of customers can be done at once. In addition to saving on operational costs for the ISP, this potentially leads to cheaper CPEs if considered on a large scale.

2)NFV Architecture

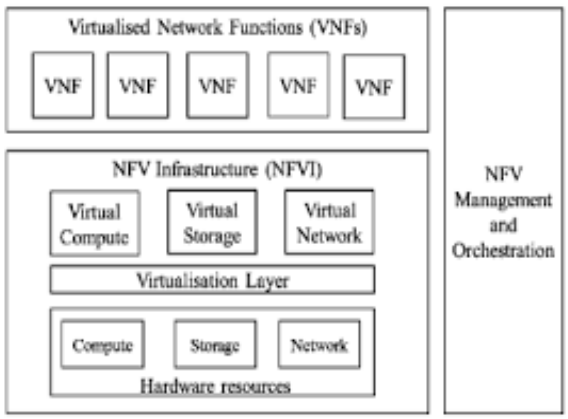


Figure 3. NFV Architecture

A. NFV Infrastructure (NFVI)

IN NFVI combination of both software and hardware resources make up the environment in which VNF are deployed. Two type of resources like physical resources include commercial of shelf computing hardware, storage and network that provide processing &connectivity To VNFs. second resource virtual are abstractions of the computing, storage and network resources. this is achieved using a virtualization layer hypervisor based ,which decouples the resources from the underlying physical resources[3].

In a data center environment, the storage and computing resources may be represented in terms of more virtual machines (VMs), while virtual networks are made up virtual nodes and links.

B. VNFS – virtualized Network Functions

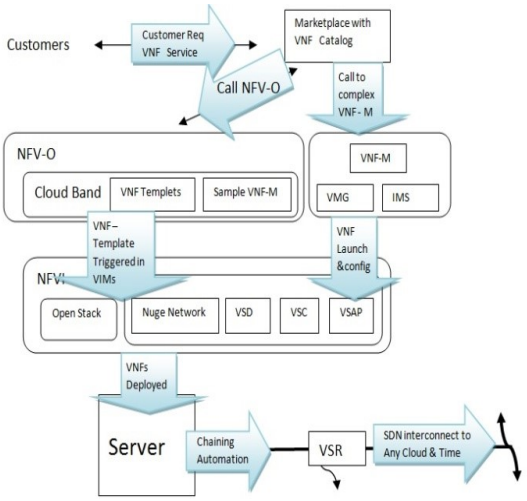
A Network function is well define functional interface and well define functional behaviour of the NFV. example of the NF is that the residential gateway in home network, DHCP server and firewall ,instruction detection etc. VNF is an implementation of an NF that is deployed on virtual resources such as a VM. A service is an offering provided by a TSP that is composed of one or more NFs[1]. In the case of NFV, the NFs that make up the service are virtualized and deployed on virtual resources such as a VM.

C. NFV Management and Orchestration (NFV MANO)

The provisioning of VNFs required the functionality that provides the NFV MANO, and related operation and VNFs configuration, function run on these infrastructure. It include the orchestration and the management of lifecycle of software and physical resources the virtualization infrastructure, support to that and also the lifecycle of VNF management . it also includes databases that are used to stores and data models the information which defined both deployment as well as lifecycle properties of services ,resources and functions[2].

In the NFV framework NFV MANO focuses on all virtualization –specific management tasks. in addition the framework define interfaces that can be used to communications between the different components, as well as coordination with traditional network system such as a OSS and BSS so as to allow for management of both VNFs as well as functions running on legacy equipment.

III. PROPOSED ARCHITECTURE



NFV- Service Chaining

NFV and SDN bring together a promise for service agility and operational and capital expenditure reduction through extreme automation of networking processes in a Service Provider environment. Shown in fig two type of customers (Internal and external) requests to the marketplace with VNF catalog for VNF service. M.K with VNF Catalog need to the NFV-orchestration (NFV-O) so they request to the NFV-O. Cloud based NFV-O provides to the VNF Templates like firewall and catalog type. also provide sample VNF-M.

The VNF Templates triggered in OpenStack and nuge network. OpenStack Provide more expansive networking automation. also expose all APIs and extension. For separate VNF-M M.K catalog also request to complex VNF-M(manager).VNF-M inapplicable Gateways and either VNF launching and configer network like AVM, VNM,A-network mininetwork and all then VNFs deployed various engineering fashion. Together various different flows that allows for simple templates only VNF side and then able to need to connect to network. Bordered network like VRS and scale out service channel.

Usecase

VNFM	NFVO	SDN Manager
Evaluate VNFD identify VM need internal connection points and network.	Evaluate NSD ,identify datacenter and tenants for VNF placement, identify external connection points& virtual link from VNFD	Based on data centres network topology info-decide to create /re-use tenant edge router using data center SDN controller interface.
Invoke VIM APIs to secure require VM resource and deploy VNF image.	SDN manager to create external virtual links(networks)	Connect tenant edge router to datacenter edge router as needed
Create internal network	Update inventory database about	Create external network(E-LAN)

point connection.	create external virtual links I.e. VLRS based on network topology received from SDN manager	And connect to tenant edge router.
Notify SDN update about datacenter.	Invoke VNFM to deploy each VNF by passing IDs of created external link & connection points to which they should be connected.	Notify NFV-O update about datacenter technology.

IV. CONCLUSION

The work presented in this paper implements the NFV based cloud network system. An NFV based cloud network system virtualizes the network functions and other internetwork system devices such as servers, firewalls etc., as per the user requirement. From obtained results it is observed that NFV based system thereby reduces the CAPEX and OPEX of an organization and increase service agility, while providing flexibility and ease of management. We have noted that many current NFV solutions, especially from the industry, have been mainly about pooling vendor specific resources hosted in a cloud rather than real support for flexibility, inter-operability, integrated management, orchestration and service automation all of which are core requirements for NFV.

V. REFERENCES

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