

VNF management method using VNF Group Table in Network Function Virtualization

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Abstract— This paper proposes efficient VNF management method using VNF Group Table in NFV (NFV : Network Function Virtualization), which is gaining attention from many network operator. ETSI ISG NFV WG is researching NFV. It refers to concept of utilizing network function in server OS rather than the equipment. Currently, ETSI ISG WG are divided into six groups, is standardizing, but need to study on the basis of traffic classification aspects or performance metrics. Therefore, in this thesis, research is conducted to create and utilize the VNF Group Table at NFV MANO to propose efficient VNF management techniques in terms of traffic statistics from NFV management.

Keywords— NFV, Orchestrator, VNF, VFS, Group Table.

I. INTRODUCTION

NFV is a technology that enables operators to manage their infrastructure more efficiently by operating functionality separately from the existing software [1]. Traditionally, the hardware and software of the network were located in one place, which led to the hardware dependency. In this framework, there was also a downside to the need for hardware to be deployed in order to apply new software to the network. Currently most network equipment is equipment that combines software with hardware. There are challenges in adopting new application services, replacing outdated equipment, and responding to traffic change, with a network environment comprised of dedicated hardware devices [2]. As a result, many institute is researching NFV, which is divided from existing networks by virtualizing network function and implementing network functions in virtualized environment of normal server.

NFV is a technology that virtualize cloud computing based storage, compute and network resources, control VNF using open interface [3]. In relation to this, we are working on the NFV Working Group in ETSI to study the relevant architectures and open interfaces, but lack discussion on a variety of usecases.

In this paper, the VNF Group Table is constructed based on the number of VNF referenced on each path referenced in the Orchestrator of NFV MANO and this Group Table based, proposes method that distribute traffic efficiently creating new VNF Forwarding Graph and dividing VNF which is referenced multiple times. Chapter 2 describes the NFV architecture and components that make up each of the

components, and Chapter 3 describes VNF management method using proposed table in this paper, and Chapter 4 presents the conclusion.

II. RELATED WORK

NFV runs on the high-performance x86 platform, enabling users to activate functions in a particular tunnel on the network. The goal of NFV is to build a service profile for the virtual environment, and utilize the service profile for x86 to build on the network, and then configure the virtual service in this logical environment. Well formed NFV significantly reduces manual provisioning and training.

NFV also reduces the need for provisioning. Customers can purchase functionality only for specific tunnels instead of purchasing a large firewall or IDS/IPS system which responsible for entire network. This reduces initial capex, but the true benefits are the operational benefits. NFV is very similar to VM wear in terms of a number of systems running multiple virtual servers and running Point & Click provisioning systems.

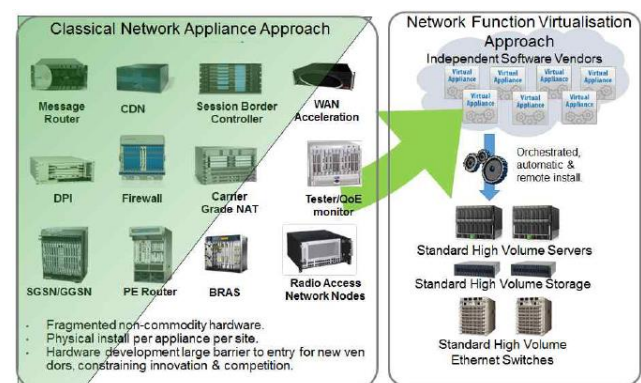


Figure 1. NFV Vision

Figure 1 shows the vision of the NFV vision defined by ETSI ISG. The left picture represents a traditional network, where each equipment combines hardware and software. The right picture represents perform function in software abstracting each hardware by NFV. The introduction of NFV enables rapid dynamic delivery of services without needing to install new equipment. Also, reducing the number of

communications carriers as required by the network operation, network operators can dramatically reduce Capex and Opex.

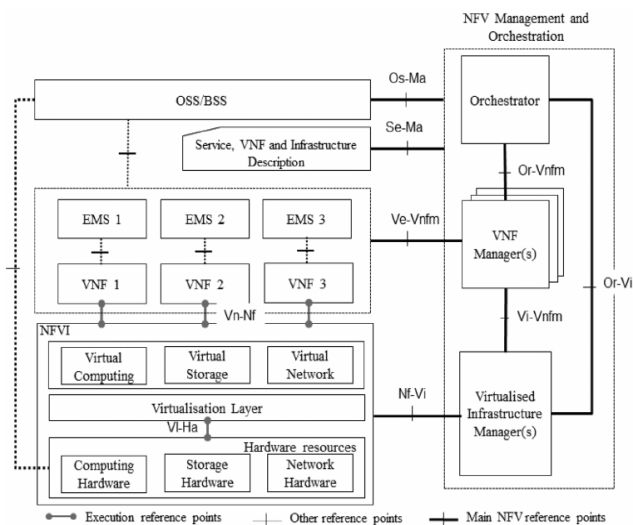


Figure 2. ETSI NFV Architecture

Figure 2 shows a picture of the NFV structure defined by ETSI. The NFV architecture consists largely of VNF, NFVI (Network Function Virtualization Infrastructure) and NFV MANO. NFVI consists of physical hardware resources and provides virtualized computing, storage, network resources, and network resources through the control of VIM (VIM : Virtualization Infrastructure Manager). VNF represents virtualized network function and is implemented through virtualized resources provided by NFVI. [4]. VNF is controlled by VNF Manager. Orchestrator perform entire network orchestration and management [5]. Services, VNF and Infrastructure Description defines VNF batch templates, Forwarding Graph Graph, information related service and NFV Infrastructure information model.

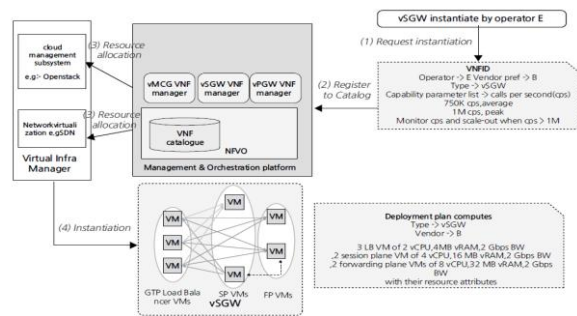


Figure 3. VNF on-boarding & Instantiation

Figure 3 shows that VNF corresponding vSGW(vSGW : virtual signaling gateway) is registered catalog and become on-boarding state, and a series of steps in which instances are created.

1) **VNF on-boarding phase** : A step that VNF is registered by NFVO in catalog officially and create VM by VIM.

2) **VNF Instantiation phase** : A step that generates instance that can execute registered VNF. Check if requestor have the right to create instance and get needed resources from VIM.

3) **VNF Instance update phase** : A step that the existing VNF instance is replaced by a new on-boarding instance. updates are required for the occurrence of required resource or QoS changes or errors occur.

4) **VNF Instance Termination** : A step that terminate all resources and network connections to terminate working VNF instance

III. PROPOSED METHOD

The inefficiency of the required route can occur if VNF is distributed across multiple paths. Therefore, in this paper, we propose a technique for managing VNFs creating new VFS(Virtualized Function Set) that based on the number of times references in VNF Group Table in NFV Orchestrator.

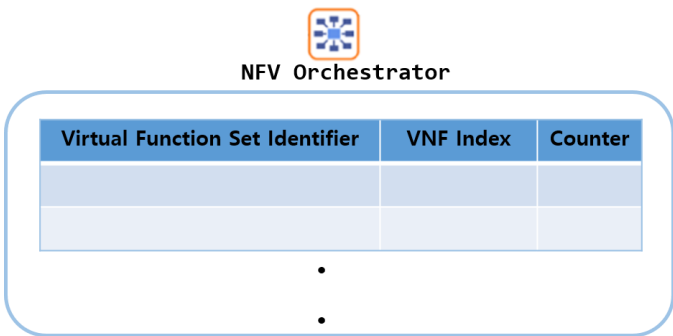


Figure 4. VNF Group Table

Figure 4 shows the VNF Group Table in NFV Orchestrator. The table consists of the Virtual Function Set Identifier and the VNF Index and Counter Index. Each VNF can be identified by Virtual Function Set Identifier and VNF Index. In addition, since NFV Orchestrator has global information about VNF, which exists on every path, it can obtain the number of times each VNF is referenced. Configure and maintain the VNF Group Table based on these three information in NFV Orchestrator.

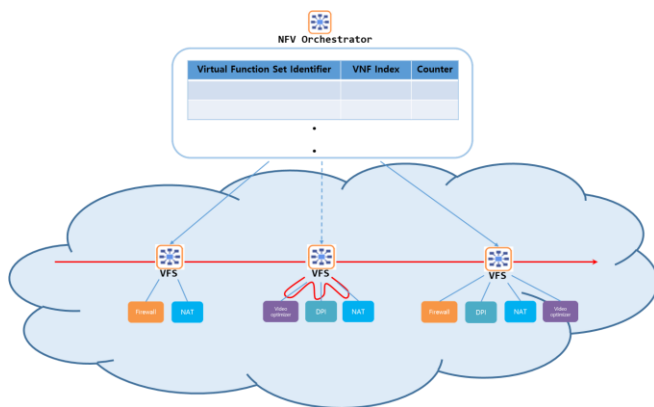


Figure 5. VNF Management Method

Figure 4 shows the process of representing traffic processing in the proposed suggestion. In NFV, there are many VNF. Various service functions are tied to VNF, Firewall, Video Optimizer, NAT(NAT : Network Address Transition), Deep Packet Inspection, Parental Controls, etc. If Firewall, Deep Packet Inspection, NAT, Video Optimizer functions are needed in multiple traffic fields, the traffic will have an inefficient path if there are multiple VNF in multiple VFS rather than not existing VNF in a VFS. In addition, traffic processing slows down. To reduce these problems, create a new VFS and then Firewall, Deep Packet Inspection, NAT, Video Optimizer are tied to one function. So, it can have efficient path.

In NFV Orchestrator, make VNF Group Table and identify frequently used VNFs and then create a VFS by combining these VNFs. So, packets are handled quickly because it is not pass through multiple paths to find needed VNF. Users receive enhanced services.

IV. CONCLUSIONS

NFV features various network equipment, storage and switches to control network equipment, thereby reducing network equipment operating costs, increasing efficiencies, and responding to service response and traffic change. By applying NFV technology, the benefits of installing new equipment can be improved without installing new equipment, thereby reducing the cost of new equipment and the cost of maintaining the new equipment. In addition, NFV can quickly market new services and applications by enabling new services and applications that are created based on software-based architectures. In this paper, we have recently described a focus on NFV, which is receiving attention from many network operators, and proposed efficient VNF management techniques in NFV Orchestrator. By creating the VNF Group Table in Orchestrator, and by gathering frequent reference points, you can designate routes, a variety of services can be dealt with quickly. In future studies, we will conduct research on implementing suggestions in NFV environments and conducting research on detailed scheduling policies and various requirements for implementing detailed scheduling policies for route setup.

ACKNOWLEDGMENT

This research was supported by the MISP(Ministry of Science, ICT & Future Planning), Korea, under the National Program for Excellence in SW(R22151610050001002) supervised by the IITP(Institute for Information & communications Technology Promotion).

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