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Research Paper

Study of optimization parameters for service chaining in cloud environment

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Abstract

Recently, the access to content over the internet has increased in a significant way because of advancements in communication networks and it is growing towards integration of 5G technology in near future. Therefore, to improve the quality of experience for viewing the content over the internet requires dynamic allocation and adaptation of network resources in an optimized manner. Traditional IP networks are vertically integrated hence flexibility in network resources management is very less. Software-defined networking (SDN) as an emerging technology, which comes with the promise of the solution to dynamically govern various network resources by breaking this chain or hierarchy of vertical integration. Network function virtualization along with service chain optimization provides the solution to enhance the Quality of Experience (QoE) and Quality of Service (QoS). In this paper, we are proposing an approach to improve the QoE by ameliorating the service chain and data center parameters.

Keywords: *Software-Defined Networking; Network Function Virtualization; Quality of Service; Quality of Experience*

1. Introduction

Service Function Chaining (SFC) furnishes a very simplified management and configuration of the network, so that service providers can easily visualize a number of policies on security, assess control, packet modification, traffic engineering and Quality of service (QoS) [1] [2] [3]. In service chain, a single network can be used in various ways or multiple network policies can be deployed by creating virtual chains of multiple network components. A service chain in networking consists of a set of services such as firewalls, video optimizer, parental controls or application delivery controllers (ADCs). These components are interconnected through the network to support the application [2].

Service functionalities such as antivirus, firewalls or video optimizers can be planted at the different points of the network as shown in Figure 1. The operational nodes in the network will have one or more service function chains.

Previously in traditional networks, these service functions were dependent on the actual location of the operational node and the service functions available at that location i.e. actual service function for any node is not fixed.

Building a service chain to support new applications takes more efforts and more time in traditional networks, i.e., it requires network devices which have to be cabled in the correct sequence. Each service functionality requires a specialized set of hardware devices and each device needs to be configured individually with its own command set. In this scenario, if one component fails then the entire network gets affected and chances of errors increments. Over a period of time if there is an increase of load in the application then building an immediately reconfigured chain will not help in estimating future demands and over-provisioning of services to support growth. To support maximum level of demand which might only occur at the particular time of the year, devices needed to be sized, i.e. for extra capacity extra capital investment required.

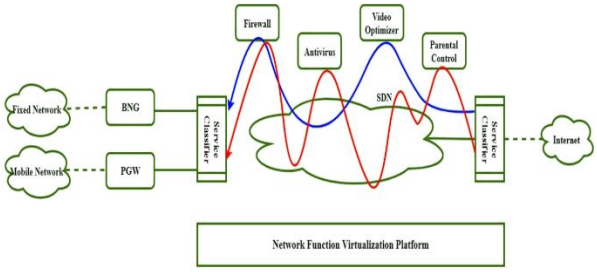

Fig. 1: Service Function Chaining.

In order to tackle issues in a traditional network, Software Defined Networking (SDN) and Network Function Virtualization (NFV) combine, provides the best solution by creating virtual chains of the network resources. SDN and NFV can make application provisioning and service chain processes shorter and easier.

SDN is an emerging technology, in which Control plane and Data plane are decoupled and Data plane is remotely controlled by the Control Plane. Decoupling of Control plane and Data plane increases the flexibility of the network which is advantageous in Service Chaining. The content delivery in SDN network is flow-based which was initially destination based in traditional networks [5] i.e. in the traditional network each packet contains the address of the destination and forwarding of these packets only depends on the destination address included in the header.

In traditional networks, middlebox services are not totally automated, but introducing NFV can make these networks fully auto-

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