

# Study on architecture & aspects of Network slicing

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**Abstract**— *This In the era of 5G networks the main goal is to support various industries which are characterized by various Performance requirements. To achieve this Network slicing is considered to be the major key to enhance cellular networks with the desired flexibility. During the past years, various research on network slicing concept has been conducted, and the main operational principles or network slicing have been established. There are various issues in network slicing which need to be addressed. This article provides a comprehensive overview of various issues of network slicing proposed by the research community and, more importantly, the current status of the research on network slicing. The paper also focuses on key research areas which need to be addressed.*

**Keywords**— *Network slicing, 5G, NFV, SDN, Mobile network*

## Introduction

The 5G technology is emerging so rapidly and expected to build on 4G network offering support to various network services and performance requirements [1]. 5G era is touted as the generation of mobile networks that will support dedicated use-cases and provide specific types of services to satisfy simultaneously various customer demands.

Unlike the “one-fit-all” type of the 4G architecture, 5G is anticipated to consider diverse business demands with often conflicting requirements encouraging service innovation and programmability through the use of open sources and open interfaces that allow access to third parties. By allowing different parties to instantiate and run a software-based architecture, 5G becomes inherently a multitenant ecosystem, whereby a tenant refers to a user or group of users with specific access rights and privileges over a shared resource. Hence, 5G networks offer multi-tenancy support and service-tailored connectivity, providing a top-notch Quality of Service (QoS) which will ultimately result in a long lasting Quality of Experience (QoE) with a truly differentiated service provisioning on top of a shared underlying network infrastructure. The next fifth generation (5G) cellular networks is approaching rapidly. Various research activities are conducted worldwide and covering all commercial and non commercial business aspects [2].

## Network Slice Definition

Network is slicing of physical network into multiple logical virtual network, acknowledging resource allocation and process optimization of various system which were simply flawless, sharing of system infrastructure, in order to enhance the use rate of cyber source, to give the best Support for various clients utilize diverse services[3]. It will form an end to end logical network, and flexibly provide one or more network services according to the demand of slicing demand. It is a type of system sharing and a method for on-request organizing. For each system cut, exclusive assets, for example, virtual servers arrange transmission capacity, and administration quality is completely ensured. Because the slices are isolated from each other, a slice of error or fault does not affect the Communication of other slices.

There are two major Key Technologies of Network Slicing: SDN and NFV

Network slicing is the key feature of network function Virtualization (NFV) and software defined network (SDN) applied in the 5G phase.

## Software Defined Network (SDN)

Software defined network (SDN) as a new type of network architecture in the future, the network can be programmable and control and forwarding separation two features into the Internet and mobile communications and other fields, solving the problem existing in the network is not flexible and rigid, accelerate the new application in the network deployment and online[4]. The main function of SDN is the ability to control the network planning, open and flexible call forwarding separation, and centralized control, it can be forwarding plane and control plane separation of network equipment, flexible scheduling and control network traffic, network automation and intelligent [5]. The existing SDN architecture is mainly composed of three layers: Infrastructure (Layer), which contains a large number of basic network devices, and is responsible for the rule processing and data forwarding from the control layer. The control layer (Control Layer) of the layer is the core of the whole structure, responsible for data forwarding resource arrangement, network topology control, information collection etc. The application layer (application layer), as its name implies, contains a large number of application services that call resources through the northbound interface. The top layer is the application layer, the lower layer is the infrastructure layer, and the middle control layer is connected with the application layer and the infrastructure layer through the north interface and the South interface respectively. the structure of software defined network is shown in figure 1

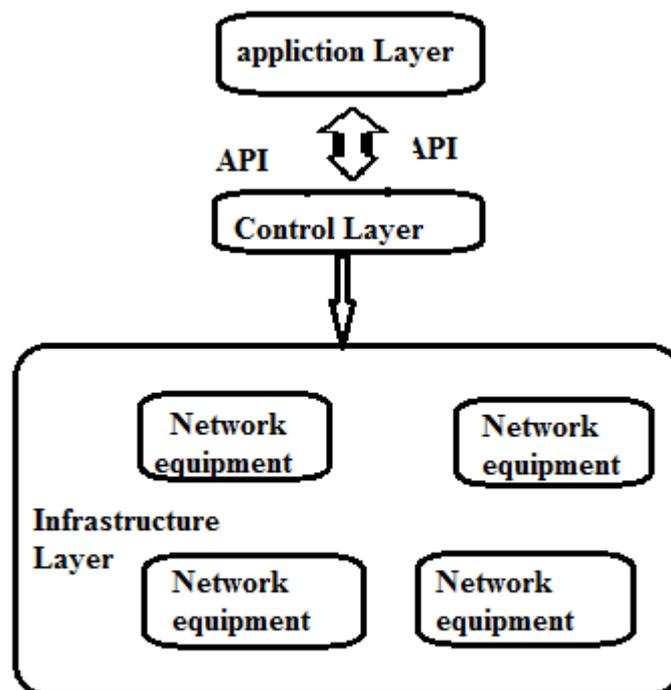


Figure 1: SDN three layer architecture

## Network Function Virtualization (NFV)

Network function Virtualization (NFV) is a technology based on the concepts of control / data Forwarding, separation, virtualization, SDN controller and data center. It is mainly to achieve the creation of dynamic network, while providing virtual resources, hardware and software realization of the traditional decoupling of telecommunications equipment, network equipment function no longer relying on special hardware, can be a virtual resource physical resource by virtualization technology which is abstracted into corresponding, for upper application, in order to realize the network function virtualization objective[6]. The required IT resources can be fully and flexibly shared to realize the rapid development and deployment of new services, and realize automatic deployment, flexibility, fault isolation and self-healing according to the actual business requirement[7]. The main idea is to install the equipment in the corresponding virtual machine software, which constitutes a virtual network device, as long as the virtual machine is assigned to the IT resource and the real ability of the same hardware, network equipment and network performance of virtual entity is the same. In accordance with the previously established network topology, the virtual network element is connected to form a virtual network. The main function of NFV is to realize

virtual network elements and virtual networks, and the network construction and organization form have changed, but the performance of the network is not changed. The three layer in figure 2 architecture of Network Function Virtualization (NFV)

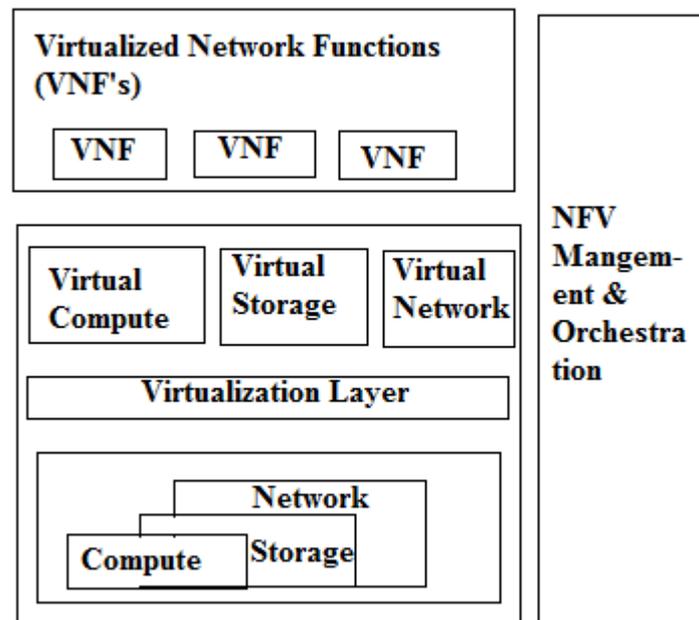
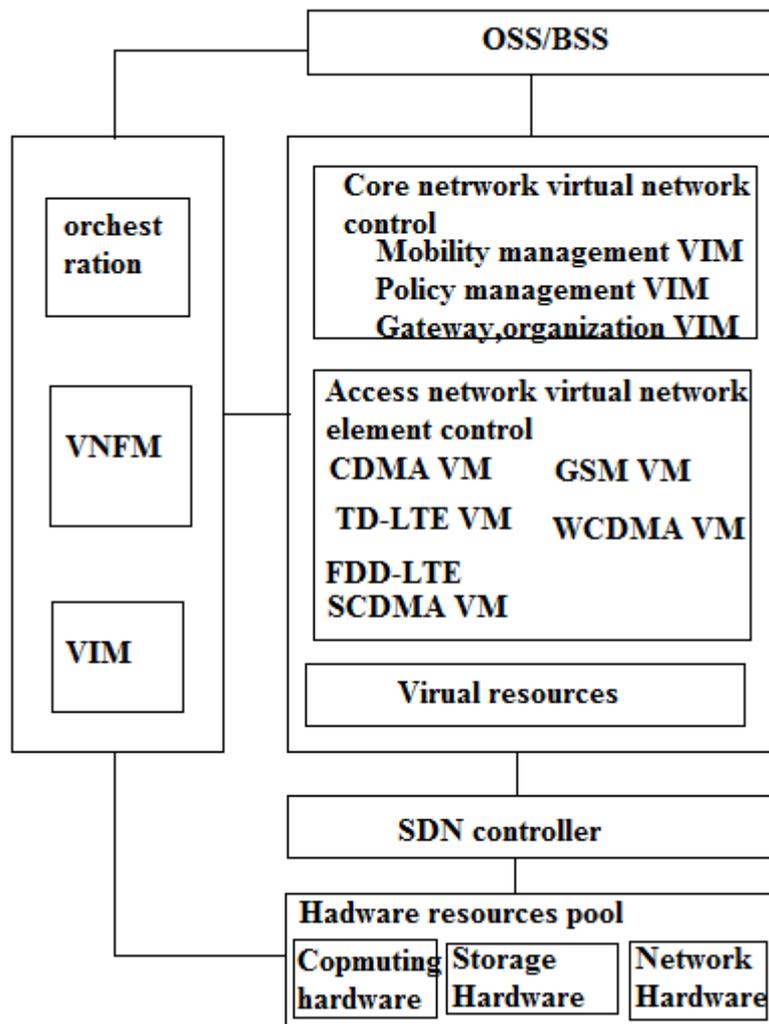


Figure 2: NFV three layer architecture

The Evolutionary Value of SDN and NFV for Network Slicing Architectures A SDN achieves the control and forwarding separation, and puts control functions to the SDN controller, and A SDN controller is formed to control the situation of multiple forwarding devices simultaneously, centralized control simplifies the infrastructure requirements, to enhance the network by using intelligent centralized control. At the same time, NFV technology of telecommunications equipment hardware and software decoupling of network equipment virtualization, the hardware equipment is more and more universal, shape normalization, the future of virtual network device will use a unified and standardized hardware platform X.86 server combined with virtual machine with VNF function, reduce the cost of the device, greatly simplifies the network deployment, to achieve a flexible deployment of the cyber source. At the same time, the network architecture that introduces SDN and NFV technology will have the capability of global view and global optimization. Among them, the top API interface in the SDN architecture has the characteristics of opening, so that operators or applications APP can flexibly add and delete business according to their own needs, and allow users to customize or develop two times. And the SDN controller to control the forwarding equipment configuration and related forwarding behaviour, makes the ability to slice open programming, users can quickly meet various business needs, greatly enhance the user experience of third party applications have a strong attraction.

Architecture Analysis of Network Slice The network is the mainstream architecture section presents two main technology of SDN, based on NFV, which includes five main parts, operations and business support system management module, scheduling module, SDN controller module, NFV module, hardware virtualization layer resource layer module [8]



### Operation and Business Support System Module(OSS/BSS)

As the OSS/BSS system is the main function module, control of the whole network, the static configuration including infrastructure and function of the network, while limiting the network service resources, is the core of the network control module. Operations and business support system module by operators or service providers and three party requests for each module network virtualization layer in providing customized strategy, management and configuration of SDN controller, management arrangement module, hardware resources module, configuration information and timely updates of customized strategies and corresponding module, real time the command to adjust SDN controller, SDN controller to maintain the operating environment. At the same time, at the beginning of the slicing, the corresponding slice identifier is generated to become the identity ID of each slice. For common slices, the OSS/BSS system module maps the services directly to the device[9].

### Management and Orchestration (MANO)

MANO is a management arrangement module of NFV, mainly by the virtual infrastructure management (VIM), virtual network function management (VNFM), orchestrator composed of three entities, dynamic allocation of infrastructure and function is mainly responsible for the entire network, the completion of the virtualization layer, hardware resource management and scheduling responsible for the virtual network and hardware resources, the mapping and OSS/BSS service resource process implementation[105]. The slice management layout consists of three phases:

## Design Stage

In this stage, the demand side section provided by section management function template and editing tools, parameters setting section, including network topology, function module and interaction protocol, performance index and hardware requirements etc. OSS/BSS generates the relevant NS use cases based on the service requirements. The NS use case contains the network functions needed for the service, the interfaces between the network elements, the network elements, and the network resources needed by the network elements.

## Conclusion:

Network slicing has become one of the most representative network service capabilities in 5G networks. SDN and NFV have become the main technical support network section, through business scene demand for network customized cutting and realizing network flexibility, and optimize business processes and data routing, makes use of cyber source to achieve the optimization. Network slicing is major challenge in 5G network security in this paper aspects of network slicing & architecture is covered.

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