NGMN 5G P1
Requirements & Architecture
Work Stream End-to-End Architecture

Description of Network Slicing Concept

by NGMN Alliance

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Abstract: Short introduction and purpose of document

This document describes further details of Network Slicing including the Network slicing concept and definitions.

Document History

Date	Version	Author	Changes
31.08.2015	0.0.2	Peter Hedman and NGMN P1 WS1 E2E Architecture team	First Version (Draft)
11.09.2015	0.0.3		Scope section removed. Problem statement updated according to mail discussions. Definition section updated with draft proposal.
02.12.2015	0.0.4		Figure and related text updated Resource definition updated
03.12.2015	0.0.5		Changes as agreed at the conference call 2/12 Abbreviations added
11.12.2015	0.0.6		Clean-up as per mail review.
16.12.2015	0.1.0		Minor changes to concept and definition. Version discussed and agreed in the NGMN P1 WS1 E2E Architecture team.
13.01.2016	1.0	Klaus Moschner, NGMN Office	Formatting updates and updates following Board Approval

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1 INTRODUCTION

The NGMN 5G White Paper Version 1.0 published in February 2015 has positioned the demands and business requirements beyond 2020 and introduced the network service deployment concept of Network Slicing with some high level examples.

In order to enable SDOs to develop viable standards for Network Slicing there is a need to refine the concept and establish a common terminology for Network Slicing. This would also help actors across the industry to have a common understanding of the expectations and the characteristics of such important concept.

This document describes further details of the concept of Network Slicing and provides common terminology. It is assumed that the relevant use cases are detailed elsewhere e.g. in the 3GPP TR 22.891 [1]; some relevant network operation requirements will also be listed e.g. in 3GPP TR 22.864 [2].

2 REFERENCES

[1] 3GPP TR 22.891: “Feasibility Study on New Services and Markets Technology Enablers”

[2] 3GPP TR 22.864: “Feasibility Study on New Services and Markets Technology Enablers – Network Operation”

3 PROBLEM STATEMENT

The 5G use cases demand very diverse and sometimes extreme requirements. The current architecture utilizes a relatively monolithic network and transport framework to accommodate a variety of services such as mobile traffic from smart phones, OTT content, feature phones, data cards, and embedded M2M devices.
It is anticipated that the current architecture is not flexible and scalable enough to efficiently support a wider range of business need when each has its own specific set of performance, scalability and availability requirements. Furthermore, introduction of new network services should be made more efficient. Nevertheless, several use cases are anticipated to be active concurrently in the same operator network, thus requiring a high degree of flexibility and scalability of the 5G network.

4 THE CONCEPT OF NETWORK SLICING

4.1 Network slicing concept

As depicted in Figure 1, the network slicing concept consists of 3 layers: 1) Service Instance Layer, 2) Network Slice Instance Layer, and 3) Resource layer.

The Service Instance Layer represents the services (end-user service or business services) which are to be supported. Each service is represented by a Service Instance. Typically services can be provided by the network operator or by 3rd parties. In line with this, a Service Instance can either represent an operator service or a 3rd party provided service.

A network operator uses a Network Slice Blueprint to create a Network Slice Instance. A Network Slice Instance provides the network characteristics which are required by a Service Instance. A Network Slice Instance may also be shared across multiple Service Instances provided by the network operator.

NOTE: Whether there is a need to support sharing of Network Slice Instances across Service Instances provided by different 3rd parties is up for discussion in SDOs.

The Network Slice Instance may be composed by none, one or more Sub-network Instances, which may be shared by another Network Slice Instance. Similarly, the Sub-network Blueprint is used to create a Sub-network Instance to form a set of Network Functions, which run on the physical/logical resources.

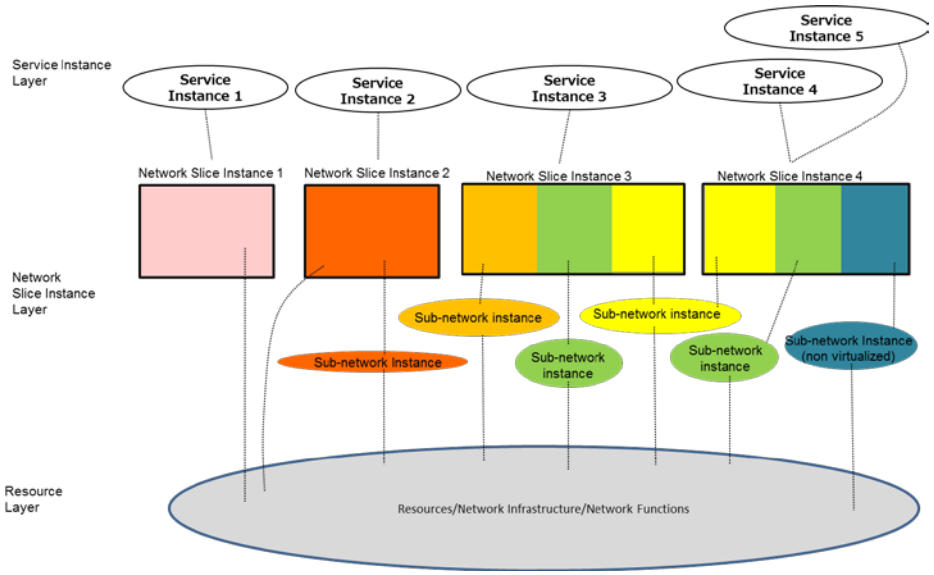

Figure 1: Network slicing conceptual outline

4.2 Definition

Service Instance: An instance of an end-user service or a business service that is realized within or by a Network Slice

Network Slice Instance: a set of network functions, and resources to run these network functions, forming a complete instantiated logical network to meet certain network characteristics required by the Service Instance(s).

- A network slice instance may be fully or partly, logically and/or physically, isolated from another network slice instance.
- The resources comprises of physical and logical resources.
- A Network Slice Instance may be composed of Sub-network Instances, which as a special case may be shared by multiple network slice instances. The Network Slice Instance is defined by a Network Slice Blueprint.
- Instance-specific policies and configurations are required when creating a Network Slice Instance.
- Network characteristics examples are ultra-low-latency, ultra-reliability etc.

Network Slice Blueprint: A complete description of the structure, configuration and the plans/work flows for how to instantiate and control the Network Slice Instance during its life cycle. A Network Slice Blueprint enables the instantiation of a Network Slice, which provides certain network characteristics (e.g. ultra-low latency, ultra-

reliability, value-added services for enterprises, etc.). A Network Slice Blueprint refers to required physical and logical resources and/or to Sub-network Blueprint(s).

Sub-network Instance: A Sub-network Instance comprises of a set of Network Functions and the resources for these Network Functions.

- The Sub-network Instance is defined by a Sub-network Blueprint.
- A Sub-network Instance is not required to form a complete logical network.
- A Sub-network Instance may be shared by two or more Network Slices.
- The resources comprises of physical and logical resources.

Sub-network Blueprint: A description of the structure (and contained components) and configuration of the Sub-network Instances and the plans/work flows for how to instantiate it. A Sub-network Blueprint refers to Physical and logical resources and may refer to other Sub-network Blueprints.

Physical resource: A physical asset for computation, storage or transport including radio access

- Network Functions are not regarded as Resources.

Logical Resource: Partition of a physical resource, or grouping of multiple physical resources dedicated to a Network Function or shared between a set of Network Functions.

Network Function (NF): Network Function refers to processing functions in a network.

- This includes but is not limited to telecom nodes functionality, as well as switching functions e.g. Ethernet switching function, IP routing functions
- VNF is a virtualized version of a NF (refer to ETSI NFV for further details on VNF).

5 ABBREVIATIONS

3GPP	3rd Generation Partnership Project
M2M	Machine to Machine
NF	Network Function
OTT	Over The Top
SDO	Standards Development Organisation
VNF	Virtual Network Function