Source: Samsung Electronics Co. Ltd

**Title: [FS\_MS\_NS\_Ph2] Overview of Network slicing feature and capabilities**

**Agenda Item: 8.10**

**Document for: Discussion and Agreement**

#  Introduction

During the SA#96 meeting, a study item SP-220675 on media streaming aspects of network slicing Phase 2 was officially agreed and the work on this study item is scheduled to begin during the SA4#120e meeting. This document provides an overview the network slicing feature as currently standardized in 3GPP, and lists some of the capabilities offered by this feature.

# Overview

## 2.1 General

Clause 5.12 of 3GPP TR 26.804 [A] provides a brief overview of network slicing feature standardization in different 3GPP groups. This clause describes different slice management processes in little more detail that are relevant for specifying the media streaming aspects of network slicing.

## 2.2 Slice Orchestration and Management

3GPP TS 28.530 [B] and TS 28.531 [F] specify general concepts related to network slicing and slice life cycle management including specification of roles related to network slicing such as the Communication Service Customer (CSC), Communication Service Provider (CSP), Network Operator (NOP), Network Slice Customer (NSC), and Network Slice Provider (NSC). A network operator can perform both the roles of a CSP and NSP. A request from a CSC to the CSP or the NSP for setting up a network slice is in the form of a set of slice attributes that represents the service requirements for the service that the customer intends to provide to its users.

GSM Association describes a GST template (Generic Network Slice Template) [C] which specifies a set of attributes that characterize a type of network slice/service. The slice customer prepares a NEST (Network Slice Type) based on GST attributes and forwards it to the NSP for slice orchestration. A NEST is a GST filled with values. A study on GST attributes by SA2 is specified in TR 23.700-40 [S], and a reference to GST attributes is included in clause 5.15.2.2 of TS 23.501 [J]. SA6 has also looked into supporting GST attributes and NEST in their study on network slice capability exposure for application enablement (NSCALE) in TR 23700-99 [M]. The normative specification for this work is being specified in 3GPP TS 23.435 [P].

GST attributes, as defined in [C], are categorized into two types:

- Character attributes: These attributes typically characterize a slice (e.g., throughput, latency, APIs etc.). The character attributes can be further tagged as performance related attributes, function related attributes, control and management related attributes

- Scalability attributes: These attributes typically characterize the scalability of a slice (e.g., number of UEs)

The CSP/NSP translates the NEST to service requirements for a set of subnets (e.g., core, transport network, RAN) using the slice NRM as described in 3GPP TS 28.530 [B], TS 28.541 [D], TS 28.542 [E]. Based on individual slice subnet requirements, slice subnet resources are provisioned using slice orchestration operations for creating and managing NSI (Network Slice Instance) and NSSI (Network Slice Subnet Instance) resources as defined in 3GPP TS 28.531 [F]. Such operations include:

- Creation/modification/termination of NSI instances

- Creation/modification/termination of NSSI instances

- Creation/modification/termination of 3GPP NF instances

The management and orchestration concepts such as provisioning management services, fault supervision management services, and performance assurance management services in addition to management service specification on the above slice resources is specified in TS 28.532 [G]. TS 28.545 [H] and TS 28.546 [I] describe fault supervision aspects about management and orchestration of networks and network slicing.

3GPP TS 23.501 [J] and TS 23.502 [K] specify control plane architecture and procedures on enabling the connection of the UE to the above provisioned network slices including setting of PDUSessions through those slices to the intended DNN. TS 23.503 [L] describes the data model for URSP rules and NSSP policies that enable UE application traffic to be routed through the provisioned network slices to the respective DNNs.

In addition to the SA2 and SA5 work above, SA6 conducted a study on network slice capability exposure for application layer enablement in [M]. The application layer enablement architecture in [M] is based on the Service Enabler Architecture Layer for Verticals (SEAL) whose functional architecture and information flows are specified in TS 23.434 [N].

One of the key issues under study in [M] is whether SA6 can define a more concise application layer exposed network slice lifecycle management with additional functionality for verticals. One of the solutions being studied in clause 6.1.1 of [M] is to interface the network slice capability enablement server with the 5G system in order to perform all the SA5 defined network slice lifecycle management operations. With this capability, applications of different verticals can interface with the network slice capability enablement server for all network slice related operations.

3GPP TS 27.007 [Q], in clause 10.1, describes how via AT commands the UE is able to set network slice preferences.

## 2.2 Network Slice Capability Exposure

SA6, in [M], has documented several key issues and candidate solutions in addition to enabling network slice lifecycle management operations using the network slice capability enablement server. Some of the key issues relevant to our study are the following:

- Discovery and registration aspects for management service exposure

- Network slice fault management capability

- Communication service management exposure

- Application layer QoS verification capability enablement

- Network slice related performance and analytics exposure

- Network slice capability exposure in the edge data network

- Delivery of existing Network slice information to the trusted-third party

- Network slice creation to the third party and UE

In addition to the above information available at the network slice capability enablement server, CT3 has specified the stage-3 definition of Network Data Analytics Function Services of the 5G system which proposes the data model for network slice information that NWDAF can provide to authorized customers [R]. Such information can also be used as network slice capability information.

#  Proposal

We propose that clause 2 above be considered for inclusion in clause 4 of TR 26941 after the approval of TR 26941 version 0.1.0 skeleton in contribution S4-221055.

# References

[A] 3GPP TR 26.804: “Study on 5G media streaming extensions”

[B] 3GPP TS 28.530: "Management and orchestration; Concepts, use cases and requirements".

[C] GSM Association NG.116, “Generic Network Slice Template”, <https://www.gsma.com/newsroom/wp-content/uploads//NG.116-v6.0.pdf>

[D] 3GPP TS 28.541: "Management and orchestration; 5G Network Resource Model (NRM); Stage 2 and stage 3".

[E] 3GPP TS 28.542: "Management and orchestration of networks and network slicing; 5G Core Network (5GC) Network Resource Model (NRM); Stage 1".

[F] 3GPP TS 28.531: "Management and orchestration; Provisioning".

[G] 3GPP TS 28.532: "Management and orchestration; Generic management services".

[H] 3GPP TS 28.545: "Management and orchestration; Fault Supervision (FS)".

[I] 3GPP TS 28.546: "Management and orchestration of networks and network slicing; Fault Supervision (FS); Stage 2 and stage 3".

[J] 3GPP TS 23.501: "System architecture for the 5G System (5GS)".

[K] 3GPP TS 23.502: "Procedures for the 5G System (5GS)".

[L] 3GPP TS 23.503: "Policy and charging control framework for the 5G System (5GS); Stage 2".

[M] 3GPP TS 23.700‑99: " Study in Network slice capability exposure for application layer enablement (NSCALE)".

[N] 3GPP TS 23.434: " Service Enabler Architecture Layer for Verticals (SEAL); Functional architecture and information flows ".

[O] 3GPP TS 29.520: " 5G System; Network Data Analytics Services; Stage 3"

[P] 3GPP TS 23.435: “Procedures for Network Slice Capability Exposure for Application Layer Enablement Service”

[Q] 3GPP TS 27.007: “AT command set for User Equipment (UE)”

[R] 3GPP TS 29.520: “5G System; Network Data Analytics Services; Stage 3”

[S] 3GPP TR 23.700-40: “Study on enhancement of network slicing; Phase 2”