Source: Samsung Electronics Co. Ltd, Qualcomm Incorporated

**Title: Additional Potential Issues for Network Slicing Extensions**

**Agenda Item: 8.10**

**Document for: Discussion and Agreement**

# **Introduction**

During the 3GPP SA4#116-e meeting, document S4-211603 was agreed to which outlined a list of potential areas for initial specification related to network slicing. This contribution extends on that document and presents few more open issues that can be studied related to network slicing in 3GPP SA4. Further, since SA4#117-e is the final meeting before finalizing Rel-17 for TR 26.804, proposed adding a conclusion sub-clause in clause 5.12 of TR 26.804 to request the continuation of study of network slicing enhancements in Rel-18.

# **Problem areas for Initial Specification related to Network Slicing**

Network slicing is realized by provisioning multiple PDUSessions between the UE and network. So, a media service with multiple network slices will have as many PDUSessions. Each PDUSession is assumed to have different QoS considerations. In addition, the UE is assumed to have a different IP address for each PDUSession it is provisioned to use.

With this network slicing architecture, few more open issues arise in addition to the open issues listed in clause 5.12.5 of TR 26.804. This contribution presents few more such open issues.

#### 2.1 AF to AF interface for interoperability considerations

It is understood that the current network slicing architecture standardized in 3GPP SA2 and SA5 groups support the option of one AF for all network slices or a separate AF per individual slice. Even 3GPP SA4 standard 26.512 supports both of these options in the provisioning API using the M1 interface to provision QoS of individual network slices.

Clause 7.9.2 specifies the API URI for a specific policy template as {apiRoot}/3gpp-m1/v1/provisioning-sessions/{provisioningSessionId}/ policy-templates/‌{policyTemplateId}.

Clause 7.9.3 of TS 26.512 describes the Data model of a PolicyTemplate resource that includes an “*ApplicationSessionContext*” object with “*sliceInfo*” and “*dnn*” parameters. Using this data model and the above API URI, the application provider can configure QoS specification at the 5GMSd AF for both the above options – one AF for all slices, or an AF per each slice.

However, one aspect that SA4 has not delved much into is the aspect of interoperability when there are separate AFs responsible for different slices in a media service. It is possible that the operator may end up deploying different types of AF functions from different vendors for different network slices of a media service (e.g., Provisioning AF, Network Assistance AF, Data Collection AF etc.). In such a scenario AF to AF communication may become important to maintain the overall QoS of media service, and not just the maintenance of QoS of individual network slice. Hence, there is a need to study the impact and necessity of AF to AF communication for interoperability considerations.

#### 2.2 Impact of Dynamic Policy Invocation

MSH uses the Dynamic Policies API request (clause 11.5 of TS 26.512) to activate a QoS-related Dynamic Policy Template at the 5GMSd AF. When such an activation is sought for traffic of a network slice (and thus a PDUSession), it is not clear what the impact to the specification is if the requested QoS cannot be satisfied within the same network slice/PDUSession.

One option that may be possible is that, as a result of Dynamic Policies API request, the UE may have to move from one network slice to a different network slice to satisfy the requirements (e.g., the maximum requested bit rate, minimum requested bit rate) specified in the QoS-related Dynamic Policy Template sent by the MSH to the 5GMSd AF. Alternatively, none of the existing network slices may be able to provide the requested QoS.

#### 2.3 AS Resolution and Routing

Similar to the possibility of a different 5GMSd AF in different slices, it is possible that a different 5GMSd AS serves different network slices. In this context, the issue remains that how media description documents (e.g., DASH MPD) are prepared before they are delivered to the UE. Different physical 5GMSd AS instances may have different network endpoint information (because they exist in different network subnets of different network slices) that need to be encoded into the MPD files before they are sent to the UE.

Alternatively, there may be a single 5GMSd AS which is resolved through some address resolution scheme and the content for delivery within the network slice is retrieved from that 5GMSd AS and delivered to the UE using the network QoS configured for the specific PDUSession.

It is to be studied how media description documents such as a DASH MPD are prepared with endpoint information of 5GMSd AS servers, the types of identification information of the AS endpoints, and if the AS endpoints can in fact be reachable using the PDUSession to retrieve traffic for delivery using that PDUSession.

#### 2.4 Reporting

The current REl.16 specification in TS 26.512 describes four different API for reporting:

* M1 Consumption Reporting Provisioning API
* M1 Metrics Reporting Provisioning API
* M5 Consumption Reporting API
* M5 Metrics Reporting API

While the first two API above are the provisioning API from the application provider to the 5GMSd AF, the last two API are the API used by the MSH to report metrics.

It should be noted that none of the above API have any slice level visibility into the metrics reporting. TS 26.512 can greatly benefit by enhancing Rel.16 API to include metrics reporting per slice i.e. change the report format to include per slice metrics.

3GPP SA2 and SA5 specifications have enabled reception of slice level metrics from entities such as NWDAF and SMO. Enhancing our media level reports to include slice level metrics can help AF responsible for network slice (e.g., a DCAF) to take appropriate actions by correlating slice level measurements received from entities such as NWDAF and SMO. Such correlation can help AF take appropriate actions e.g., enhance application performance using SA2 defined methods such as AF influenced traffic routing etc.

Another aspect of study is the impact of network slicing on the data collection architecture being specified as part of the EVEX work item. When network slicing is used to deploy a media service, it is possible that there may exist different DCAF functions for different network slices. Aspects such as mechanisms to discover DCAF for a network slice needs some study.

# **Impact to multiple study/work items in SA4**

Existing description of clause 5.12 of TR 26.804 specifies many problem areas of network slicing related to 5G media streaming. However, it is of our belief that the impact of network slicing is not only limited to 5G media streaming work item, but also impacts other study/work items in SA4:

* Problem areas described in clause 2.1, 2.2, and 2.3 of this contribution equally applies to other study/work items in SA4 such as 5GMS\_EDGE where the AFs under discussion in these clauses be deployed in edge
* Clause 2.4 describes impact to EVEX work item where a DCAF for a specific network slice is to be discovered. Further, clause 4.1 of TS 26.531 that specifies the general description and architecture of data collection and reporting specifies the following in clause 4.1:

## “4.1 General

*… The intermediary Application Function envisaged in [4] is here named the Data Collection AF. It is intended that this reference architecture be instantiated in domain-specific ways to suit the needs of different features of the 5G System.* ***The reference architecture may be instantiated separately in different slices of a network****.”*

* FS\_NPN4AvProd in TR 26.805 specifies a key issue (Key Issue 2: Media Protocols on 5G: Using QoS for traffic segregation) and solutions leveraging network slices

We propose that impact for network slicing be looked at from the perspective of multiple work items.

# **Proposal**

We propose that the following two changes be adopted into TR 26.804.

**===== CHANGE =====**

### 5.12.5 Potential open issues

The following potential open issues are identified:

1) Usage of network slicing identification information as part of service provisioning information (M1)

2) Applicable stage 2 and stage 3 aspects related to impact to QoS specification during service provisioning because of network slicing

3) Usage of network slicing identification information during dynamic policy procedures (M5)

4) Applicable stage 2 and stage 3 aspects related to impact to QoS specification because of network slicing in dynamic policy procedures

5) Will one AF be sufficient to interact with all network slices? Or, is there a separate AF for each slice?

6) Provisioning of media services with multiple network slices – Enhancements to M1 interface

7) QoS Management for network slices – will the QoS be provisioned and managed separately for each slice by the ASP?

8) Determining the need for AF-to-AF communication at reference point M3 to support interoperability if AF instances from different vendors are deployed in the same 5GMS System.

9) Impacts of network slicing on dynamic policy invocation APIs.

10) Impacts of multiple network slices on media description documents such as DASH MPD. The preference is to study solutions that do not require MPD manipulation (potentially in collaboration with MNO) before studying solutions that require MPD manipulation.

11) Impacts of network slicing on 5GMS QoE metrics and consumption reporting**===== CHANGE =====**

### 5.12.X Conclusion

1. The collaboration scenarios, deployment architectures, and potential open issues concerning network slicing extensions are to be studied further in Rel.18.
2. Impact of network slicing is across multiple work items. Therefore, study for network slicing extensions is to be looked at from the perspective of multiple work items.

**===== END CHANGES =====**