Source: Samsung Electronics Co. Ltd

**Title: [FS\_MS\_NS\_Ph2] Key Issue #3: Moving media flows to other slices**

**Agenda Item: 8.9**

**Document for: Discussion and Agreement**

# **Introduction**

During the SA4#123e meeting, a contribution S4-230600 was submitted which was revised to S4-230680 and finally noted. The MBS group had email exchange on these contributions. The final revision before the conclusion of SA4#123e meeting is the proposal from BBC and available at https://www.3gpp.org/ftp/tsg\_sa/WG4\_CODEC/TSGS4\_123-e/Inbox/Drafts/MBS/S4-230680\_BBC.docx.

This document uses the above revision as a basis for further revision. This document provides updates for majority of the questions listed in the contribution S4-230680. For last two questions in the old contribution S4-230680 on the impact of network slice replacement on Network Assistance sessions currently under progress is described in another contribution S4-230932.

The original contribution S4-230600 proposed configuration of Alternative S-NSSAI through the 5GMS Application Provider at the 5GMS AF, which then gets communicated to PCF so PCF can do the network slice replacement procedure described in clause 5.15.19 of TS 26.501. SA4 MBS group discussed that the configuration of Alternative S-NSSAI for slice replacement procedure is in the purview of SA2. For this revision, the configuration of Alternative S-NSSAI is assumed to happen using the same mechanisms specified in clause 5.15.19 of TS 23.501. In this revised contribution, proposal text is presented to describe service continuity with 5G Media Streaming procedures with an assumption that the Alternative S-NSSAI is made aware to the 5GMS Application Provider. Without this, the existing M5 procedures described in TS 26512 are broken.

# **Network Slice replacement procedure**

TR 26941 clause 4.2.2 describes the network slice replacement procedure when a network slice becomes unavailable. TS 23501 clause 5.15.19 describes this procedure further in detail. As part of the procedure, AMF is triggered, either by local configuration, or due to a notification from OAM, NSSF, or PCF, to replace the current S‑NSSAI with an Alternative S-NSSAI. The notifications from the OAM, NSSF, or PCF to the AMF may include the Alternative S-NSSAI information.

In TS 26501 and TS 26512, defined are 5G Media Streaming procedures where in the 5GMS Application Provider performs service provisioning at the 5GMS AF using the M1 interface. TS 26512 clause 7.9 describes data model of Policy Template resource and the M1 Policy Template Provisioning API. The Policy Template data model includes slice information as part of the applicationSessionContext property. It is assumed that the 5GMS Application Provider gets this information from the OAM. It is not clear how the Policy Template provisioning happens for the Alternative S-NSSAI if the network slice replacement procedure described in clause 5.15.19 of TS 23.501 is performed. This proposal describes a call flow for configuration of Policy Templates for the Alternative S-NSSAI with the assumption that such information is known to the 5GMS Application Provider. Without such a knowledge the M5 procedures described in clause 11 of TS 26.512 cannot be requested (e.g., Dynamic Policy because the 5GMS Application Provider is the entity responsible to provision policies for a given S-NSSAI). More details in the following clauses of this contribution.

# **Proposal**

We propose following change be adopted into TR 26.941 for key issue #3.

**===== 1. CHANGE =====**

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: “Vocabulary for 3GPP Specifications”.

…

[A] 3GPP TS 29.514: "5G System; Policy Authorization Service; Stage 3".

**===== 2. CHANGE =====**

## 6.3 Key Issue #3: Moving media flows to other Network Slices

### 6.3.1 Description

#### 6.3.1.1 Migration of media streaming application flows between Network Slices

As introduced in clause 4.2.3 of the present document, clause 5.1 of TR 23700-41 [26] studies a Key Issue on network slice service continuity. According to this, a Network Slice or Network Slice instance can become overloaded or the performance of the Network Slice may fall below the requirements of its SLA.

The recommendation in clause 8.1 of [26] is for the 5G System to identify an alternative slice to migrate application flows from the PDU Session of the current slice to the existing PDU Session or a new one in the chosen alternative slice. When 5G Media Streaming sessions are carried over a PDU Sessions that cannot be migrated transparently to the application layer with the support of the service continuity procedure, the impacts on ongoing 5G Media Streaming sessions needs to be studied.

Open issues:

- Whether the service continuity procedure is transparent to 5G Media Streaming or requires enhancement of existing procedures and data model definitions in TS 26.501 [20] and TS 26.512 [21].

#### 6.3.1.2 Baseline Procedures

Figure 6.3.1.2-1 illustrates the current procedure for dynamic policy invocation at reference point M5 as specified in TS 26.501 [20] and TS 26.512 [21].



Figure 6.3.1.2-1: Procedure for dynamic policy invocation as currently specified in TS 26.512

The steps are as follows:

1. The 5GMS Application Provider configures a provisioning session at the 5GMS AF at reference point M1.

2. The 5GMS Application Provider provides service announcement information to the 5GMS-Aware Application in the UE as described in step 4 of clause 5.1 for downlink streaming and step 4 of clause 6.1 for uplink streaming in TS 26.501 [20].

3. (Optional) In case the 5GMS Client in the UE received only a reference to the Service Access Information, then it acquires the Service Access Information from the 5GMS AF as described in step 6 of clause 5.1 of [20].

4. Media streaming procedures are then carried out at reference point M4 as specified in step 8 of clause 5.1 for downlink media streaming and step 8 of clause 6.1 for uplink media streaming in [20].

Given a set of applicable Policy Templates whose ApplicationSessionContext information matches that of the current application flow (i.e. matching S-NSSAI and DNN information), steps 5–8 below are repeated until either the 5GMS AF accepts instantiation of a Policy Template for the application flow or until all the applicable Policy Templates have been exhausted. The details of the dynamic policy procedure at reference point M5 is specified in step 7 of clause 5.1 for downlink media streaming and step 7 of clause 6.1 for uplink media streaming in [20].

5. The Media Session Handler picks an applicable Policy Template.

6. The Media Session Handler requests the 5GMS AF to apply the network QoS described by the Policy Template to the application flow in the current slice by sending the policyTemplateId and M5QoSSpecification as described in clause 11.5 of [20].

NOTE: How the 5GMS AF determines the current slice and DNN for the incoming request is for future study.

7. In the first alternative, the 5GMS AF concludes that the network QoS described by the requested Policy Template can be applied in the current slice. The 5GMS AF instantiates and applies the requested dynamic policy and returns back to the Media Session Handler with a success response.

8. In another alternative, the 5GMS AF concludes that the network QoS described by the requested Policy Template cannot be satisfied in the current slice. The 5GMS AF denies instantiation of requested dynamic policy and returns back to the Media Session Handler with a denied response. When the Media Session Handler receives this response, steps 5-8 are repeated with the next applicable Policy Template

9. Media streaming at reference point M4 (as specified in step 8 of clause 5.1 for downlink media streaming and step 8 of clause 6.1 for uplink media streaming in [20]) continues in the current slice, with possible performance degradation if all applicable Policy Templates were exhausted without success.

Figure 6.3.1.2-2 illustrates the impact on the M5 Dynamic Policy procedure when the network decides to replace the primary Network Slice with an alternative Network Slice as specified in clause 5.15.19 of TS 23.501 [7], and the 5GMS Application Provider is not aware of Network Slice replacement.



Figure 6.3.1.2-2: Impact on Dynamic Policy procedure when 5GMS Application Provider is not aware of network slice replacement

Preconditions:

- The primary Network Slice is provisioned in the 5G System and the S‑NSSAI for the primary Network Slice is known to the 5GMS Application Provider prior to 5GMS service provisioning.

The steps are as follows:

1. The 5GMS Application Provider performs service provisioning at the 5GMS AF as described in clause 7 of TS 26.512 [21].
2. The 5GMS Application Provider provides the Service Announcement Information to the 5GMS-Aware Application in the UE. The service announcement information includes either the whole Service Access Information (i.e. details for Media Sessiona Handling at reference point M5d and for Media Streaming access at M4d) or a reference to the Service Access Information.
3. (Optional) In case the 5GMS Client received only a reference to the Service Accessi Information, then it acquires the Services Access Information from the 5GMS AF.
4. The network (PCF in this example call flow, but also possibly performed by AMF, NSSF, or OAM) performs the Network Slice replacement procedure described in clause 5.15.19 of TS 23.501 [7]. The PCF updates the URSP rules with the Alternative S‑NSSAI information. TS 23.503 [16] clause 6.6.2.2 describes the procedure about how the UE is provisioned with URSP rules by the PCF. TS 23.503 [16] clause 6.6.2.3 and clause 4.2.2 of present document describe the UE procedure for associating applications with PDU Sessions based on URSP. This step may involve creation of a new PDU Session or modification of an existing PDU Session as specified in clause 4.2.2 of present document so the Media Session Handler and Media Stream Handler are able to reach the 5GMS AF and 5GMS AS instances respectively via reference points M5 and M4.
5. The Media Session Handler invokes the dynamic policy instantiation procedure on the 5GMS AF for the application flow in the PDU Session of the Alternative S-NSSAI. However, the Media Session Handler may not have appropriate Policy Templates to request activation because of the reason that the 5GMS Application Provider has not configured applicable Policy Templates for the Alternative S-NSSAI.

### 6.3.2 Candidate solutions

#### 6.3.2.1 Candidate solution #1: Provisioning of Policy Templates for Alternative S‑NSSAI by 5GMS Application Provider before network slice replacement

This candidate solution studies the impact of network slice replacement on 5GMS procedures as described in the description of this Key Issue and also as specified in clause 5.15.19 of TS 23.501 [7]. Specifically, the impact of network slice replacement is examined in relation to the dynamic policy invocation procedure specified in clause 4.7.3 of TS 26.512 [21] in the case where Policy Templates applicable to an alternative Network Slice are provisioned in the 5GMS AF before a network slice replacement procedure is invoked.

Editor's Note: Whether (or not) the move to the alternative Network Slice is transparent to the 5GMS Client is to be specified by SA2. This candidate solution is to be updated after progress in SA2 on this topic.Assumptions:

- There is no change in the DN because of the Network Slice replacement procedure, i.e. the same DN is accessible from both the primary Network Slice and the alternative Network Slice.

NOTE: This corresponds to example Data Network *DNB* in figure 4.2.1‑1 which mapped into both Network Slice instance *X* and Network Slice instance *Y*.

- The 5GMS AF instance accessed by the Media Session Handler through the primary Network Slice is also accessible through the alternative Network Slice at reference point M5. There is no change in the IP address of the 5GMS AF instance.

- The 5GMS AS instance accessed by the Media Stream Handler through the primary Network Slice is accessible through the alternative Network Slice at reference point M4. There is no change in the IP address of the 5GMS AS instance.

Figure 6.3.2.1-1 illustrates the impact on M5 Dynamic Policy procedure when the network decides to replace the primary S-NSSAI with an Alternative S-NSSAI as specified in clause 5.15.19 of TS 23.501 [7], and the 5GMS Application Provider is aware of network slice replacement. This applies in the case where OAM configures the Alternative S-NSSAI information and the 5GMS Application Provider is aware of the Alternative S-NSSAI e.g., communicated through the OAM.

NOTE: For cases where the Alternative S-NSSAI is configured by PCF, NSSF, or AMF, how the 5GMS Application Provider gets to know the Alternative S-NSSAI information is to be checked with SA2.



Figure 6.3.2.1-1: Procedure for configuration of Policy Templates for Alternate S-NSSAI
in case of network slice replacement

Preconditions:

- The primary Network Slice **and alternative Network Slice** are provisioned in the 5G System and the S‑NSSAIs for both of these are known to the 5GMS Application Provider prior to 5GMS service provisioning.

The steps are as follows:

1. The 5GMS Application Provider performs service provisioning with the 5GMS AF at reference point M1 as described in clause 7 of TS 26.512 [21]. **The provisioning information from the 5GMS Application Provider includes a Policy Template citing an Alternative S-NSSAI in addition to a primary S-NSSAI in order to support the Network Slice replacement procedure.** The DNN for both slices is the same.

NOTE: The provisioning procedure in this step corresponds to either the initial M1 service provisioning request or an update of an existing provisioning service resource.

NOTE: It is up to the 5GMS Application Provider whether matching Policy Templates are provisioned across both the primary S-NSSAI and the Alternative S-NSSAI.

1. If the 5GMS AF is in the trusted Data Network, it interacts directly with the PCF, using the Npcf\_‌Policy‌Authorization service as defined in clause 5.2.5.3 of TS 23.502 [15], to create an appropriate application session context in the PCF with the Alternative S-NSSAI information. The data model for ApplicationSessionContext is specified in clause 5.6.2.2 of TS 29.514 [A].
2. Alternatively, if the 5GMS AF is in the external Data Network, it may use the Nnef\_AFsession‌With‌QoS service as defined in clause 5.2.6.9 of TS 23.502 [15] to configure the Alternative S-NSSAI information. The NEF may invoke the Npcf\_PolicyAuthorization service on behalf of the 5GMS AF to create an appropriate session context in the PCF with the provided Alternative S-NSSAI information. The data model for ApplicationSessionContext is specified in clause 5.6.2.2 of TS 29.514 [A].
3. The 5GMS Application Provider announces the 5GMS service to the 5GMS-Aware Application running in the UE. The service announcement includes either the whole Service Access Information (i.e. details for Media Session Handling at reference point M5d and for Media Streaming access at M4d) or a reference to the full Service Access Information.
4. (Optional) In case the 5GMS Client received only a reference to the Service Access Information in the previous step, it acquires the Services Access Information from the 5GMS AF via reference point M5.

The 5GMS Client is now aware of Policy Templates applicable for both the primary S-NSSAI **and the Alternative S-NSSAI**.

At some later point in time:

1. The network (PCF in this example call flow, but also possibly performed by AMF, NSSF, or OAM) initiates the Network Slice replacement procedure described in clause 5.15.19 of TS 23.501 [7]. The PCF updates the URSP rules with the Alternative S‑NSSAI information. TS 23.503 [16] clause 6.6.2.2 describes the procedure about how the UE is provisioned with URSP rules by the PCF. TS 23.503 [16] clause 6.6.2.3 and clause 4.2.2 of present document describe the UE procedure for associating applications with PDU Sessions based on URSP. This step may involve creation of a new PDU Session or modification of an existing PDU Session as specified in clause 4.2.2 of present document so the Media Session Handler and Media Stream Handler reach the 5GMS AF and 5GMS AS instances via reference points M5 and M4 respectively.

NOTE: After step 6, for any subsequent 5G Media Streaming API requests over M5 reference points that require 5GMS AF interaction with PCF and/or NEF for use with the PDU Session in Alternative S-NSSAI, appropriate application session context is available at the PCF for any application-related processing.

1. The Media Session Handler invokes the M5 Dynamic Policy API with a valid policyTemplateId that is applicable for the provisioned Alternative S-NSSAI, according to clause 11.5 of TS 26.512 [21].
2. The 5GMS AF interacts with PCF to request necessary actions to apply the requested dynamic policy.
3. The 5GMS AF responds to the 5GMS Client that the requested dynamic policy has successfully been applied.

#### 6.3.2.Y Candidate solution #Y: Provisioning of Policy Templates for Alternative S‑NSSAI by 5GMS Application Provider after network slice replacement

This candidate solution studies the impact of network slice replacement on 5GMS procedures becauseas described in the description of this Key Issue and also as specified in clause 5.15.19 of TS 23.501 [7]. Specifically, the impact of network slice replacement is examined in relation to the dynamic policy invocation procedure specified in clause 4.7.3 of TS 26.512 [21] in the case where Policy Templates applicable to an alternative Network Slice are provisioned in the 5GMS AF after a network slice replacement procedure is invoked.

Editor's Note: Whether (or not) the move to the alternative Network Slice is transparent to the 5GMS Client is to be specified in SA2. This candidate solution is to be updated after progress in SA2 on this topic.

Assumptions:

- There is no change in the DN because of the Network Slice replacement procedure, i.e. the same DN is accessible from both the primary Network Slice and the alternative Network Slice.

NOTE: This corresponds to example Data Network *DNB* in figure 4.2.1‑1 which mapped into both Network Slice instance *X* and Network Slice instance *Y*.

- The 5GMS AF instance accessed by the Media Session Handler through the primary Network Slice is also accessible through the alternative Network Slice at reference point M5. There is no change in the IP address of the 5GMS AF instance.

- The 5GMS AS instance accessed by the Media Stream Handler through the primary Network Slice is accessible through the alternative Network Slice at reference point M4. There is no change in the IP address of the 5GMS AS instance.

Figure 6.3.2.Y-1 illustrates the impact on the M5 Dynamic Policy procedure when the network decides to replace the primary Network Slice with an alternative Network Slice as specified in clause 5.15.19 of TS 23.501 [7], and the 5GMS Application Provider is made aware of the network slice replacement after the fact.



Figure 6.3.2.Y-1: Procedure for configuration of Policy Templates citing Alternative S-NSSAI after network slice replacement procedure

Preconditions:

- The Primary Network Slice is provisioned in the 5G System and the S‑NSSAI for the primary Network Slice is known to the 5GMS Application Provider prior to 5GMS service provisioning.

The steps are as follows:

1. The 5GMS Application Provider performs service provisioning with the 5GMS AF at reference point M1 as specified in clause 7 of TS 26.512 [21].
2. The 5GMS Application Provider announces the 5GMS service to the 5GMS-Aware Application running in the UE. The service announcement includes either the whole Service Access Information (i.e. details for Media Session Handling at reference point M5d and for Media Streaming access at M4d) or a reference to the full Service Access Information.
3. (Optional) In case the 5GMS Client received only a reference to the Service Access Information, it acquires the Services Access Information from the 5GMS AF via reference point M5.
4. The network (PCF in this example call flow, but also possibly performed by AMF, NSSF, or OAM) performs the network slice replacement procedure described in clause 5.15.19 of TS 23.501 [7]. The PCF updates the URSP rules with the Alternative S‑NSSAI information. TS 23.503 [16] clause 6.6.2.2 describes the procedure about how the UE is provisioned with URSP rules by the PCF. TS 23.503 [16] clause 6.6.2.3 and clause 4.2.2 of present document describe the UE procedure for associating applications with PDU Sessions based on URSP. This step may involve creation of a new PDU Session or modification of an existing PDU Session as specified in clause 4.2.2 of present document so the Media Session Handler and Media Stream Handler reach the 5GMS AF and 5GMS AS instances via reference points M5 and M4 respectively.
5. The PCF notifies the 5GMS AF about network slice replacement, and includes the Alternative S-NSSAI information.

NOTE: Notification of network slice replacement by the PCF to 5GMS AF is to be specified by SA2.

1. The 5GMS AF notifies the 5GMS Application Provider about network slice replacement, and includes the Alternative S-NSSAI information.

NOTE: Notification of network slice replacement by the 5GMS AF to 5GMS Application Provider is to be specified by SA2.

1. The 5GMS Application Provider updates the service provisioning information at the 5GMS AF with Policy Templates citing Alternative S-NSSAI as described in clause 7 of TS 26.512 [21].
2. If the 5GMS AF is in the trusted Data Network, it interacts directly with the PCF, using the Npcf\_‌Policy‌Authorization service as defined in clause 5.2.5.3 of TS 23.502 [15], to create an appropriate application session context in the PCF with the Alternative S-NSSAI information. The data model for ApplicationSessionContext is specified in clause 5.6.2.2 of TS 29.514 [A].
3. Alternatively, if the 5GMS AF is in the external Data Network, it may use the Nnef\_AFsession‌With‌QoS service as defined in clause 5.2.6.9 of TS 23.502 [15] to configure the Alternative S-NSSAI information. The NEF may invoke the Npcf\_PolicyAuthorization service on behalf of the 5GMS AF to create an appropriate session context in the PCF with the provided Alternative S-NSSAI information. The data model for ApplicationSessionContext is specified in clause 5.6.2.2 of TS 29.514 [A].
4. The 5GMS Application Provider may reannounce the 5GMS service to the 5GMS-Aware Application in the UE.
5. (Optional) In case the 5GMS Client received only a reference to the Service Access Information in the previous step, it reacquires the Services Access Information from the 5GMS AF via reference point M5.
6. The Media Session Handler invokes the M5 Dynamic Policy API with a valid policyTemplateId that is applicable for the provisioned Alternative S-NSSAI, according to clause 11.5 of TS 26.512 [21].
7. The 5GMS AF interacts with PCF to request necessary actions to apply the requested dynamic policy as described in clause 5.7.1 of TS 26.501[20].
8. The 5GMS AF responds to the 5GMS Client that the requested dynamic policy request is successful.

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