**3GPP TSG-SA4 Meeting #126S4-231846**

**13th-17th Nov. 2023**

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| *CR-Form-v12.0* |
| **PSEUDO CHANGE REQUEST** |
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|  | **26**.**941** | **CR** |  | **rev** |  | **Current version:** |  |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **X** |

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| ***Title:***  | **[FS\_MS\_NS\_Ph2] pCR on Conclusions and recommendations** |
|  |  |
| ***Source to WG:*** | Samsung Electronics Co., Ltd. |
| ***Source to TSG:*** | SA4 |
|  |  |
| ***Work item code:*** | FS\_MS\_NS\_Ph2 |  | ***Date:*** | 2023-11-06 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** |   |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)Rel-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
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| ***Reason for change:*** | FS\_MS\_NS\_Ph2 study is close to completion. Review of the TR and compiling agreements and recommendations is necessary, |
|  |  |
| ***Summary of change:*** | Adding conclusions and recommendations into clause 8 based on study findings and agreements. |
|  |  |
| ***Consequences if not approved:*** | Will not be possible to adopt agreements of this study into any stage-2 or stage-3 specifications.  |
|  |  |
| ***Clauses affected:*** | 8 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  |  |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  |  |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  |  |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

## \*\*\* Change 1 \*\*\*

## 6.1 Key Issue #1: Service Provisioning

### 6.1.1 Description

#### 6.1.1.1 Provisioning multiple Network Slices for media streaming

Clause 5.3.2 of the present document describes a use case for premium gaming where two network slices are provisioned by the 5GMS Application Provider for users with different subscription levels. Clauses 7 and 11 of TS 26.512 [21] describe 5G Media Streaming APIs for (respectively) M1 Provisioning and M5 Media Session Handling. However, the present APIs support only one Network Slice per Provisioning Session. Furthermore, it is not clear from [21] whether the same Service Operation Points and Policy Templates are available in different slices when they are provisioned in this way.

Open issues:

- Whether and how the 5GMS Provisioning (M1) APIs and corresponding data model definitions in [21] need to be enhanced to support the use case referenced by this Key Issue.

- Whether and how the Media Session Handline (M5) APIs and corresponding data model definitions in [21] need to be enhanced to support the use case referenced by this Key Issue.

NOTE: Migration of media flows to different Network Slice is studied separately in clause 6.3

Assumptions:

- Slice creation and activation are out of scope of this Key Issue. The 5GMS Application Provider may perform offline negotiation with MNO OAM for slice creation and activation as described in clause 4.3.

### 6.1.2 Candidate solutions

#### 6.1.2.1 Candidate solution #1: Policy template provisioning for a plurality of Network Slices and/or DNNs

Pre-requisites and assumptions:

- A single 5GMS Application Provider (with identity aspId) intends to provision a Policy Template for a plurality of Network Slices.

- The one or more Network Slices are already provisioned and activated. Appropriate Slice and DNN identifiers are known to the 5GMS Application Provider.

- The 5GMS AF is preconfigured by the 5GMS System operator with a mapping from IP subnet range(s) to S‑NSSAI/DNN duples so that it can select an appropriate Network Slice and/or Data Network when manipulating the network QoS of the applicatation flows described by a Network Assistance session or Dynamic Policy invocation.

To enable a Policy Template to be valid for more than one Network Slice and/or DNN, in this candidate solution the Policy Template resource specified in clause 7.9.3.1 of TS 26.512 [21] is modified as follows:

1. Add an array of networkContexts as a child under the applicationSessionContext parent. For backwards compatibility with the existing syntax, this array may be omitted, or present but empty.

2. Each Network Context object includes the existing sliceInfo and dnn properties. Both properties remain optional, so it is syntactically valid for the networkContexts array to contain empty objects (although this is meaningless semantically).

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| 7.9.3 Data model7.9.3.1 PolicyTemplate resourceThe data model for the PolicyTemplate resource is specified in table 7.9.3‑1 below:Table 7.9.3-1: Definition of PolicyTemplate resource

| Property | Type | Cardinality | Usage | Visibility | Description |
| --- | --- | --- | --- | --- | --- |
| policyTemplateId | ResourceId | 1..1 | C: ROR: ROU: RO |  | Unique identifier of this Policy Template within the scope of the Provisioning Session. |
| state | Enumeration of Strings | 1..1 | C: ROR: ROU: RO |  | A Policy Template may be in the PENDING, INVALID, READY, or SUSPENDED state.Only a Policy Template in the READY state may be instantiated as a Dynamic Policy Instance and applied to media streaming sessions. |
| apiEndPoint | String | 1..1 | C: RWR: ROU: RW | MNO Admin | The API endpoint that should be invoked when activating a Dynamic Policy Instance based on this Policy Template. |
| apiType | Enumeration of Strings | 1..1 | C: RWR: ROU: RW | MNO Admin | N5: Npcf\_PolicyAuthorization Service.N33: AsSessionWithQoS or ChargableParty. |
| externalReference | String | 1..1 | C: RWR: ROU: RW |  | Additional identifier for this Policy Template, unique within the scope of its Provisioning Session, that can be cross-referenced with external metadata about the media streaming session. |
| qoSSpecification | M1QoS‌Specification | 0..1 | C: RWR: ROU: RW |  | Specifies the network quality of service to be applied to media streaming sessions at this Policy Template. |
| applicationSession‌Context | Object | 1..1 |  |  | Specifies information about the application session context to which this Policy Template can be applied. |
|  afAppId | AfAppId | 0..1 | C: RWR: RWU: RW  |  | As defined in clause 5.6.2.3 of TS 29.514 [34] and clause 5.3.2 of TS 29.571 [12]. |
|  networkContexts | Array(Object) | 0..1 |  |  |
|  |  sliceInfo | Snssai | 0..1 | C: RWR: RWU: RW |  |
|  |  dnn | Dnn | 0..1 | C: RWR: RWU: RW |  |
|  aspId | AspId | 1..1 | C: RWR: RWU: RW |  |
| chargingSpecification | Charging‌Specification | 0..1 | C: RWR: RWU: RW  |  | Provides information about the charging policy to be used for this Policy Template. |

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NOTE: The cardinality relationship between aspId and sliceInfo is for future study.

### 6.1.3 Conclusions

The study of the key issue involved looking into use cases for running 5G Media Streaming services in one or more Network Slices, and the current stage-3 support for provisioning those slices. The stage-3 API for Policy Template provisioning supports one Network Slice and/or Data Network per Provisioning Session. It is useful for the 5G Application Service Provider to provision multiple Network Slices and/or Data Networks at once if the same Policy Template may be applied to one or more Network Slices and/or Data Networks.

The following is recommended for stage 3:

- The PolicyTemplate resource data model in TS 26.510 [??] is enhanced to include an array of S-NSSAI and DNN duples, as described in clause 6.1.2 of the present document, to support Policy Templete provisioning for a plurality of Network Slices and/or Data Networks.

## \*\*\* Change 2 \*\*\*

## 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].

### 6.3.2 Candidate solutions

#### 6.3.2.1 Candidate solution #1

### 6.3.3 Conclusions

This Key Issue studied the aspect of network slice replacement specified by 3GPP SA2 in TS 23.501[7] and its impact on 5G Media Streaming procedures. The study found that:

- The network slice replacement procedure is transparent to the Application Function and the Application Service Provider.

- There is no guarantee that the Alternative S-NSSAI provides similar performance as that of the replaced S-NSSAI when a network slice replacement procedure is undertaken by the 5G System.

We conclude that:

- Per 3GPP SA2 guidance on the current support of network slice replacement in the 5G System, no normative work to enhance existing procedures in TS 26.501 [20] and and data model definitions in TS 26.512 [21] is required at this time.

- Future work in 3GPP SA2 related to network slice replacement is to be monitored, and the data model definitions in TS 26.510 [??] enhanced, if necessary

## \*\*\* Change 3 \*\*\*

## 6.7 Key Issue #7: Bootstrapping application invocation on Network Slice

### 6.7.1 Description

#### 6.7.1.1 Discover appropriate Network Slice for 5GMS procedures

Clauses 5 and 6 of TS 26.501 [20] describe the high-level procedures for downlink and uplink media streaming respectively. As part of these procedures, the 5GMS Application Provider performs service provisioning at the 5GMS AF. The 5GMS-Aware Application subsequently receives Service Access Information from the 5GMS Application Provider over reference point M8 or else acquires it directly from the 5GMS AF over reference point M5. If the UE currently has access to more than one Network Slice, it is unclear how the 5GMS-Aware Application and the 5GMS Client on the UE discover the appropriate Network Slice to use to establish a new media streaming session.

Open issues:

- How the bootstrapping of the application invocation on a Network Slice happens before the 5GMS Client performs 5G Media Streaming operations.

### 6.7.2 Candidate solutions

#### 6.7.2.1 Candidate solution #1: Bootstrapping based on Traffic Descriptor information

Assumptions:

- The 5GMS-Aware Application developer is aware of different OS App Ids supported by the UE operating system.

Figure 6.7.2.1‑1 below illustrates the procedure for bootstrapping application invocation on a Network Slice.



Figure 6.7.2.1‑1: Call flow for bootstrapping application invocation on a Network Slice

The steps are as follows:

1. The 5GMS-Aware Application is installed on the UE, and and is programmed to invoke an OS-specific network connection API using a pre-defined OS App Id supported by the UE operating system.

2. The 5GMS Application Provider provisions the media streaming session in the 5GMS AF with one or more network slices at reference point M1. The provisioining information may include application information such as the ProvisioningSession.externalApplicationId specified in clause 7.2.3.1 of TS 26.512 [21]. The 5GMS AF uses this information to infer application traffic descriptor information used for application guidance, as specified in clause 4.15.6.10 of TS 23.502 [15].

3. The 5GMS AF uses the Nnef\_ServiceParameter service defined in clause 5.2.6.1 of TS 23.502 [15] to provide application guidance for URSP determination via the NEF as described in clause 4.15.6.10 of TS 23.502 [15], which is eventually delivered to the UE as described in clause 4.15.6.7 of TS 23.502 [15].

NOTE 1: URSP rules may also be configured in the UE as described in clause 4.2.2 of this present document.

4. The 5GMS Application Provider may provide Service Access Information to the 5GMS-Aware Application at reference point M8. In the Service Access Information, the 5GMS Application Provider may include information related to Service Operation Points associated with different Network Slices.

5. The 5GMS-Aware Application initiaites a media streaming session with the 5GMS Client at reference point M6. The 5GMS Client uses an OS-specific UE-internal API to request a network connection for use at reference points M5 (step 10) and M4 (step 11).

NOTE 2: If the 5GMS-Aware Application is aware about Network Slices, the 5GMS-Aware Application may explicitly indicate the Network Slice to use as part of its request for a network connection. In this case, the following step is skipped.

6. Based on the OS App Id configured for the 5GMS-Aware Application in step 1, the UE Operating System enables selection of the appropriate Network Slice using the traffic descriptor information inside the currently configured URSP rules.

NOTE 3: If multiple network slices are provided for the same traffic descriptor, the precedence information in the route selection descriptor is used to select the appropriate Network Slice.

7. The UE Operating System checks whether a PDU Session already exists in the selected Network Slice and, if so, selects this PDU Session for further interaction with the media streaming endpoints (steps 10 and 11).

8. Alternatively, if no PDU Session exists in the Network Slice, the UE Operating System creates a PDU Session using the UE-requested PDU Session establishment procedure specified in clause 4.3.2.2 of TS 23.502 [15].

NOTE 4: See table A-1 in TS 23.503 [16] for an example of this procedure.

NOTE 5: According to clause 4.2.2.2 of TS 24.526 [41], the mechanisms used by the UE Operating System to check for the existance of a PDU Session in the selected Network Slice and to establish a new PDU Session if needed are up to UE implementation.

9. Once the PDU Session is available, the 5GMS Client interacts with DNS system to resolve the IP address of the 5GMS AF and 5GMS AS instances.

10. The 5GMS Client interacts with the 5GMS AF for media session handling procedures as specified in clause 11 of TS 26.512 [21].

11. The 5GMS Client interacts witht the 5GMS AS for media streaming as specified in clause 10 of TS 26.512 [21].

### 6.7.3 Conclusions

This Key Issue studied application bootstrapping onto a Network Slice based on application information provisioned by the 5GMS Application Provider and the configuration information in the 5GMS-Aware Application. The application information provisioned by the 5GMS Application Provider is used by the 5GMS AF to provide application guidance for URSP determination in the 5G System. The configuration in the 5GMS-Aware Application and the currently configured URSP rules help the UE Operating System select the appropriate Network Slice for routing application traffic.

The following is recommended for stage 2:

- The Key Issue description and candidate solution in clauses 6.7.1 and 6.7.2 respectively of the present document be included as an informative annex to TS 26.501 [20] as guidance for implementations.

## \*\*\* Change 4 \*\*\*

# 8 Conclusions and recommendations

Network slicing is one of the key features of 5G which allows Mobile Network Operators to provision logical networks to serve a specific service or service category, or to serve customers with specific service requirements. Network slicing standardization has progressed in various different 3GPP Working Groups. Specification related to this feature includes architecture, orchestration and management, network resource models, capability management and exposure. The Key Issues studied in the present document point to a need to extend the 5GMS architecture in order to take advantage of network slicing when delivering 5G Media Streaming services.

The present document provides an overview of network slicing architecture and aspects related to slice orchestration and management as well as network slice capability exposure. It briefly describes different network slice management options such as operator-managed network slicing and third-party-managed network slicing. The present document also collects a set of use cases for running 5G Media Streaming services in one or more network slices, and describes a number of collaboration scenarios for exploiting network slicing capabilities within the 5GMS architecture. It also documents key issues and candidate solutions related to service provisioning, moving media flows to other network slices, and bootstrapping application invocation on a network slice.

It is recommended that:

1. The use cases and collaboration scenarios for network slicing documented in clauses 5.3 and 5.4 respectively be included in an informative annex to TS 26.501 [20].

2. The changes to the PolicyTemplate resource data model definition described in clause 6.1.2.1 be accepted into TS 26.510 [??] to support Policy Template provisioning for a plurality of Network Slices and/or Data Networks.

3. The Key Issue description and corresponding candidate solution on bootstrapping application invocation on a Network Slice documented in clause 6.7 of the present document be included as an informative clause or annex to TS 26.501 [20] as guidance for implementations.

## \*\*\* End of change 1 \*\*\*