**3GPP TSG- Meeting #S4-241081**

**Jeju, South Korea, 20th May – 24th**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** | **0002** | **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:*** | Stage-2 Aspects of Network Slicing | | | | | | | | | |
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| ***Source to WG:*** | Samsung Electronics Co. Ltd. | | | | | | | | | |
| ***Source to TSG:*** | S4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | TEI19 | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** | C |  | | | | | ***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 can be 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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
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| ***Reason for change:*** | | S4-240690 was submitted to SA4#127-bis-e meeting to align stage-3 agreements documented in clause 8 of TR 26941 into stage 2 specification. During SA4#127-bis-e, S4-240690 was revised to S4-240813 based on email feedback. During the concluding plenary of SA4#127-bis-e, delegates requested more time to review the revision. Further, it was suggested to first to do a CR to TR 26941 before we do a CR to 26501, so changes to TS 26501 can be a simple direct porting work. This contribution applies all the changes in latest revision (S4-240813) to TR 26941. | | | | | | | | |
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| ***Summary of change:*** | | Adding stage-2 design principles text for stage-3 agreements that already existed in the technical report. The new stage-2 text will later be applied directly to stage-2 specification. | | | | | | | | |
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| ***Consequences if not approved:*** | | Insufficient description of stage-2 design principles for network slicing feature. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.4, 6.1.2, 6.1.3, 6.7.2, 8 | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR … CR … | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR … CR … | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR … CR … | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
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| ***This CR's revision history:*** | |  | | | | | | | | |

\* \* \* \* First change \* \* \* \*

## 5.4 Collaboration scenarios for network slicing

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### 5.4.1 Collaboration scenarios for network slicing based on 5G Media Streaming scenarios

#### 5.4.1.0 Introduction

This clause presents the MNO CDN, OTT, and multi-MNO distribution collaboration scenarios corresponding to those described in clauses A.2, A.3, A.8, A.11, and A.14 of TS 26.501 [20] enhanced with network slicing. Other MNO CDN and OTT collaboration scenarios (clauses A.1, A.4, A.5, A.6, A.7, A.10, A.12, and A.13 of TS 26.501 [20]) can be similarly enhanced, and are therefore not presented here.

#### 5.4.1.1 Media streaming with both AF and AS deployed in the trusted Data Network

The collaboration scenario shown in figure 5.4.1.1-1 corresponds to the MNO CDN collaboration scenario described in clause A.2 and A.11 of TS 26.501 [20] delivered using a network slice.

Figure 5.4.1.1-1: Media streaming with AF and AS in the trusted Data Network  
with Network Slicing

The 5GMS Application Provider may negotiate with the MNO for creation of a network slice as described in clause 4.2.2. The network slice is provisioned by the network operator as described in clause 4.3.

All the interactions between the participating entities (5GMS Application Provider, 5GMS-Aware Application, 5GMS Client, 5GMS AF, and 5GMS AS) for the 5G Media Streaming session described in clause A.2 and A.11 of TS 26.501 [20] apply in this scenario. All M4 interactions happen through a PDU Session established within the provisioned network slice.

#### 5.4.1.2 Media streaming with both AF and AS deployed in an external Data Network (OTT)

This collaboration scenario shown in figure 5.4.1.2-1 corresponds to the OTT collaboration scenario described in clause A.3 and A.14 of TS 26.501 [20] delivered using a network slice.

Figure 5.4.1.2-1: Media streaming with AF and AS in an external Data Network (OTT)  
with Network Slicing

The 5GMSd Application Provider may negotiate with the MNO for the creation of a network slice as described in clause 4.2.2. The network slice is provisioned by the network operator as described in clause 4.3.

All the interactions between all the participating entities (5GMS Application Provider, 5GMS-Aware Application, 5GMS Client, 5GMS AF, and 5GMS AS) described in clause A.3 of TS 26.501 [20] apply in this scenario. All M4 and M5 interactions happen through a PDU Session established within the provisioned network slice.

#### 5.4.1.3 Media streaming with AFs deployed in two separate trusted Data Networks sharing AS in an external Data Network

This collaboration scenario shown in figure 5.4.1.3-1 represents a multi-MNO distribution scenario where an external CDN (5GMS AS) is used to deliver content to multiple UEs connected to different 5GMS-capable PLMNs, as described in clause A.8 of TS 26.501 [20], but delivered using network slices on those PLMNs.

Figure 5.4.1.3-1: Media streaming with AFs in two trusted Data Networks sharing AS in external Data Network with Network Slicing

The 5GMS Application Provider may negotiate with each of the PLMNs for creation of network sliced as described in clause 4.2.2 of the present document. The network slice for each PLMN is provisioned by the PLMN operator as described in clause 4.3.

All the interactions between all the participating entities (5GMS Application Provider, 5GMS-Aware Application, 5GMS Client, 5GMS AF, and 5GMS AS, PCF) described in clause A.8 of TS 26.501 [20] apply in this scenario. All M4 and M5 interactions happen through PDU Sessions established within the provisioned network slices. Each UE in a different PLMN may use the provisioned network slice in that PLMN for all the 5G Media Streaming operations. The same external CDN (5GMS AS) serves the users of both the PLMNs, and all the signaling and media traffic is sent through PSU Sessions in respective network slices.

### 5.4.2 Collaboration scenarios for network slicing with multiple slices or Data Networks

#### 5.4.2.0 Introduction

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#### 5.4.2.1 Media streaming with AS deployed in external Data Network and AS delivering content through two different network slices

This collaboration scenario shown in figure 5.4.2.1-1 represents the case of accessing the same external Data Network through two different network slices shown in figure 4.2.1-1. An external CDN (5GMS AS) is accessed by the UE via this Data Network.

Figure 5.4.2.1-1: Media streaming with AS in external Data Network accessible through two different network slices

The 5GMS Application Provider may negotiate with the MNO to setup two different network slices with different service level agreements (SLA) as described in clause 4.3. After the SLA negotiation, the operator may provision two network slices, and provide connectivity services to the external Data Network through both the slices.

The 5GMS Application Provider may deliver Service Access Information through reference point M8. The Service Access Information delivered to the 5GMS-Aware Application may have information about different Service Operation Points accessible through each of the network slices. Upon receiving the Service Access Information, the 5GMS-Aware Application passes this information to the 5GMS Client. The 5GMS Client selects the Service Operation Point of interest, and requests media streaming session establishment over the PDU Session in the network slice that provides the required Service Operation Point. Media streaming (M4) thus happens through the selected network slice.

The other network slice may be used to fetch/contribute other media streaming assets (depending on criticality and SLA availability considerations), or serves as an alternate network slice in case the first slice becomes unavailable, as discussed in clause 6.3.

NOTE: The usage of multiple network slices simultaneously by the same application is currently not supported by either Android or iOS. This collaboration scenario is unlikely to be deployed.

#### 5.4.2.2 Media streaming with AS deployed in multiple trusted Data Networks

This collaboration scenario shown in figure 5.4.2.2-1 represents the case of accessing two different Data Networks using the same network slice as shown in figure 4.2.1-1. A CDN server (5GMS AS) is either deployed in each of the trusted Data Networks, or presents a multi-homed interface at reference point M4 through each of the trusted DNs.

Figure 5.4.2.2-1: Media streaming with AS deployed in multiple trusted Data Networks

The 5GMS Application Provider may negotiate with the MNO to provision a network slice as described in clause 4.3. The operator provisions the network slice, and provides connectivity services to both the DNs through the slice.

The 5GMS Application Provider may deliver Service Access Information through reference point M8. The Service Access Information delivered to the 5GMS-Aware Application may have information about different Service Operation Points accessible through each of the DNs. For example, an enterprise may utilize an enterprise-specific CDN (e.g., hosting enterprise-related video tutorials). 5G Media Streaming sessions for enterprise-related video tutorials use the PDU Session terminating in the enterprise-specific CDN, while some other video tutorial requests are sent through PDU Sessions terminating in a different CDN. Alternatively, a DN may act as a back-up CDN, utilized by the 5GMS Client if the primary CDN is inaccessible or unavailable for any reason.

In a variant of this scenario, the second CDN may be a CDN edge with optional media processing.

In another variation of the above scenario shown in figure 5.4.2.2-1, a common 5GMS AS may serve traffic via two trusted Data Networks down the separate PDU Sessions, as shown in figure 5.4.2.2-2.

Figure 5.4.2.2-2: Media streaming with single AS serving traffic  
through multiple Data Networks

### 5.4.3 Collaboration options based on network slicing scenarios

#### 5.4.3.0 Introduction

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This c by presenting MNO CDN collaboration scenario described in clause A.7 of TS 26.501 [20] wherein both the 5GMS AF and 5GMS AS are deployed in the Trusted DN, and the 5GMS Application Provider uses reference points M1 and M2 respectively to interact with them.

NOTE: All the collaboration scenarios described in clause A of TS 26.501 [20] can be similarly shown with each of the network slicing scenarios described in this clause.

#### 5.4.3.1 Scenario #1: Slice serving a set of enterprise services/applications

This is a network slicing scenario wherein the MNO, upon a request from an enterprise, allocates one or more network slices exclusively for enterprise users.

Figure 5.4.3.1-1 shows the case of an enterprise network slice for all applications in the enterprise UE. Every application on the enterprise UE, including the 5GMSd-Aware Application, uses the allocated network slice for communication with the DN entities.

NOTE: Android 12 onwards supports network slicing with a separate enterprise network slice allocated by the MNO.

Figure 5.4.3.1-1: Network slice for all applications in the enterprise UE

Figure 5.4.3.1-2 shows the case of an enterprise network slice for applications in the enterprise profile of the UE.

Figure 5.4.3.1-2: Network slice for enterprise profile applications

In this scenario:

- Every application in the enterprise/work profile of the UE, including the 5GMS-Aware Application, uses the allocated enterprise network slice for communication with DN entities accessible from that slice.

- Every application in the non-enterprise profile of the UE (e.g., personal profile), including the 5GMS-Aware application, uses the default (e.g., eMBB) network slice for communication with DN entities accessible from that slice.

NOTE: Android 13 onwards supports network slicing with multiple enterprise slices, and slicing based on user profiles.

#### 5.4.3.2 Scenario #2: Slice serving a specific application of an enterprise

This is a network slicing scenario wherein the MNO, upon a request from an enterprise, allocates a specific network slice for a specific service/application for enterprise users.

Figure 5.4.3.2-1 shows the case of an enterprise network slice for a specific application (e.g., 5GMS-Aware Application) for enterprise UEs. The media streaming traffic belonging to the 5GMS-Aware application is sent through the enterprise network slice, while traffic for all other applications is sent through a default network slice (e.g. eMBB).

Figure 5.4.3.2-1: Network slice for specific application for enterprise users

URSP rules, provisioned by the PCF, as described in clause 6.6.2.2 of TS 23.503 [16], assist in traffic detection and route selection of appropriate network slice for application traffic in the UE.

#### 5.4.3.3 Scenario #3: Slice optimised for a specific service/application

This is a network slicing scenario wherein the MNO allocates a specific network slice for a specific service/application for use by multiple users. (The MNO may also provision additional network slices for carrying traffic of other specific applications.)

NOTE 1: The GSM Association specifies application-based network slicing [40], in which different network slices are provisioned for different applications.

NOTE 2: Unlike Scenario#1 and Scenario#2, the users in this scenario need not belong to the same enterprise.

Figure 5.4.3.3-1 shows the case of a slice optimized for 5G Media Streaming. The traffic belonging to the 5GMS-Aware Applications of all users is sent through this network slice, while the traffic of other applications is sent through a default network slice (e.g., eMBB).

Figure 5.4.3.3-1: Network slice for specific application for all users

URSP rules, provisioned by the PCF, as described in clause 6.6.2.2 of TS 23.503 [16], assist in traffic detection and route selection of the appropriate network slice for application traffic in the UE.

#### 5.4.3.4 Scenario #4: Slice serving a virtual operator

This is a network slicing scenario where in virtual operator leases network slice from the MNO, and uses it to provide service to its customers as described in clause 5.2.2 of present document. The virtual operator may, in turn, offer any of the above three slicing scenarios on the leased network slice.

\* \* \* \* Second change \* \* \* \*

# 6 Key issues and candidate solutions

## 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 5G 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 application 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 model  7.9.3.1 PolicyTemplate resource  The 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: RO R: RO U: RO |  | Unique identifier of this Policy Template within the scope of the Provisioning Session. | | state | | Enumeration of Strings | 1..1 | C: RO R: RO U: 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: RW R: RO U: 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: RW R: RO U: RW | MNO Admin | N5: Npcf\_PolicyAuthorization Service.  N33: AsSessionWithQoS or ChargableParty. | | externalReference | | String | 1..1 | C: RW R: RO U: 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: RW R: RO U: 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: RW R: RW  U: 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: RW R: RW  U: RW |  | |  | dnn | Dnn | 0..1 | C: RW R: RW  U: RW |  | | aspId | | AspId | 1..1 | C: RW R: RW  U: RW |  | | chargingSpecification | | Charging‌Specification | 0..1 | C: RW R: RW  U: RW |  | Provides information about the charging policy to be used for this Policy Template. | |

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. As described by the candidate solution in clause 6.1.2.1, 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 stage 2 normative specification work is recommended to support Policy Template provisioning for a plurality of Network Slices and/or Data Networks:

- Update the **media streaming features** introduced in clause 4.0 of TS 26.501 [20] as follows:

1. Modify the domain model for dynamic policies (figure 4.0.6-2) to additionally illustrate the properties of Data Network Names and Network Slice identifiers as array elements in the Policy Template entity.

- Update the **procedures for downlink media streaming** defined in clause 5 of TS 26.501 [20] as follows:

2. Modify step 15 of clause 5.7.6, to specify that the Media Session Handler may check the validity of the slice identifier and DNN when instantiating a downlink dynamic policy.

3. In the procedure for dynamic policy instantiation based on network slicing for download streaming (clause 5.8.1), add the following pre-requisites:

a. The 5GMSd Application Provider may identify Network Slice(s) and/or Data Network(s) applicable to each Policy Template.

b. The 5GMSd AF is preconfigured by the 5G System operator with a mapping from IP subnet range(s) to slice identifiers/DNN duples so that it can select an appropriate network slice and/or Data Network when manipulating the network QoS of the application flows described by a Network Assistance session or Dynamic Policy invocation.

- Update the **procedures for uplink media streaming** defined in clause 6 of TS 26.501 [20] as follows:

4. In step 3 of clause 6.9.3, the Media Session Handler may check the validity of the slice identifier and DNN when instantiating an uplink dynamic policy.

5. In the procedure for dynamic policy based on network slicing for uplink streaming (clause 6.9.6), add the following pre-requisites:

a. The 5GMSu Application Provider may identify Network Slice(s) and/or Data Network(s) applicable to each Policy Template.

b. The 5GMSu AF is preconfigured by the 5G System operator with a mapping from IP subnet range(s) to slice identifiers/DNN duples so that it can select an appropriate network slice and/or Data Network when manipulating the network QoS of the application flows described by a Network Assistance session or Dynamic Policy invocation.

The following stage 3 normative specification work is recommended to support Policy Template provisioning for a plurality of Network Slices and/or Data Networks:

- The *PolicyTemplate* resource data model in TS 26.510 [42] is adjusted to permit the array of S-NSSAI and DNN duples to include more than one member.

\* \* \* \* Third change \* \* \* \*

## 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: Network Slice selection based on Traffic Descriptor information in URSP rules

From clause 5.15.5.2.2 of TS 23.501 [7], the UE uses either the URSP rules (which includes the NSSP) or the UE local configuration to determine which PDU Sessions to use to route ongoing application traffic. Clause 6.6.2.1 of TS 23.503 [16] describes the structure of URSP rules. One of the components of a URSP rule is the *Traffic description information* that helps a UE to identify matching application traffic. Table 6.6.2.1-2 of TS 23.503 [16] specifies a number of Traffic descriptor options, one of which is the *Application descriptor* that identifies traffic of applications running on the UE. An Application descriptor consists of OS Id and OS App Id properties that are known to both the UE application and the 5GMS Application Service Provider.

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 provisioning 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 synthesise 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]. The application guidance for URSP includes service parameters such as the application traffic descriptor information (synthesised in the previous step) and Route selection parameters (DNN and S-NSSAI) as specified in clause 4.15.6.10 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.

NOTE 4: Whether the UE OS should evaluate the URSP rule is up to implementation.

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

NOTE 6: 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.

\* \* \* \* Fourth change \* \* \* \*

# 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 implemented into TS 26.510 [42] to support Policy Template provisioning for a plurality of Network Slices and/or Data Networks, and the corresponding alignment text for this feature described in clause 6.1.2.1 be implemented into TS 26.501 [20].

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 changes \* \* \* \*