**SA WG2 Meeting #153eS2-220xxxx**

**October 10th – 17th, 2022; Elbonia (revision of S2-220)**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **23.501** | **CR** |  | **rev** | **-** | **Current version:** | **17.6.0** |  |
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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:***  | Adding a clause for the description of SFC  |
|  |  |
| ***Source to WG:*** | Nokia, Nokia Shanghai Bell |
| ***Source to TSG:*** | S2 |
|  |  |
| ***Work item code:*** | SFC |  | ***Date:*** | 2022-09-22 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-18 |
|  | *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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | According to the conclusions of TR 23.700-18, following changes are proposed for the normative work. 1. A new sub-clause dedicated for SFC feature under clause 5.6 Session Management is proposed to capture the high-level description and the principles as agreed during the study
2. A sentence in clause 5.6.7 Application Function influence on traffic routing is added to mention that a subset of the same interface can be used by an AF to influence 5G traffic steering towards a SFC
3. A reference for IETF spec related to SFC is added
4. A couple of abbreviations are added
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| ***Summary of change:*** | It is proposed to add high level desciption of SFC and text explaining how to enble AF to influence 5G traffic steering to support SFC in the specification.Additionally, a new reference and a couple of abbreviations are added. |
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| ***Consequences if not approved:*** | SFC feature cannot be supported in R18 |
|  |  |
| ***Clauses affected:*** | Clause #2, #3.2, #5.6.7, #5.6.x(new clause) |
|  |  |
|  | **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:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

*FIRST CHANGE*

## 5.6 Session Management

### 5.6.x Service Function Chaining

An SFC is an abstracted view of a service that specifies the set of required SFs as well as the order in which they must be executed as defined in IETF RFC 7665 [xxx]. Each SF in an SFC is an opaque processing element in user plane over the N6-LAN. SFPs are pre-defined and indicate which SF(s) in the SFC the packets assigned to a particular SFP must go, and they are identified by SFC policy identifiers.

An AF (e.g., a third-party AF) may send requests to influence 5GC traffic steering for selected traffic of one UE, a group of UE or any UE towards a SFC. Application Function influence on traffic routing as defined in clause 5.6.7 is applicable to enable an AF to request the pre-defined SFPs for traffic flow(s) related to target UE(s) with the following clarification and enhancement:

* The AF is aware of SFC policy identifiers based on SLA agreements
* The AF request may additionally include SFC policy identifier corresponding to a pre-defined SFPs together with optional metadata
* When the AF request includes the SFC policy identifier, only the following N6 Traffic Routing requirements shall be used: Traffic Description, Target UE identifier(s), Spatial Validity Condition, AF transaction identifier.
* The PCF checks whether the indicated SFC policy identifiers correspond to an authorized SFP for the AF and maps the SFC policy identifier to a corresponding identifier (i.e., TSP ID(s)) within the PCC rule.
* The PCF provides the TSP ID(s) and the metadata (if available) in the PCC rules to SMF. The TSP ID refers to a traffic steering behaviour that is configured in the SMF/UPF.
* The SMF provisions to the UPF corresponding PDRs, FARs, QERs, etc. to support SFC. The SMF creates a FAR with the Forwarding Policy parameters set to the TSP ID(s), and the FAR includes the metadata (if available).
* The UPF serving as PSA uses the TSP ID(s) to steer traffic over N6. In this case, the TSP ID(s) identifies a specific SFP in the SFC. The UPF provides the metadata (if available) together with the traffic sent to the N6 service functions.
* The N6-LAN traffic steering control and AF-influenced traffic steering control may be applicable simultaneously to the same traffic.

NOTE 1:  In this Release of the specification, only traffic handled over N6 by PSA UPF(s) in 5G network is supported.

NOTE 2:  The existing user plane mechanisms (e.g., VXLAN, NSH, GENEVE, GRE, VLAN, etc.) defined at IETF are reused as applicable by the PSA UPF to support SFC.

NOTE 3: It is assumed that a Home Routed roaming PDU Session does not have an offloading point in a VPLMN.

*NEXT CHANGE (2)*

### 5.6.7 Application Function influence on traffic routing

#### 5.6.7.1 General

The content of this clause applies to non-roaming and to LBO deployments i.e. to cases where the involved entities (AF, PCF, SMF, UPF) belong to the Serving PLMN or AF belongs to a third party with which the Serving PLMN has an agreement. AF influence on traffic routing does not apply in the case of Home Routed deployments. PCF shall not apply AF requests to influence traffic routing to PDU Sessions established in Home Routed mode.

An AF may send requests to influence SMF routeing decisions for traffic of PDU Session. The AF requests may influence UPF (re)selection and (I-)SMF (re)selection and allow routeing user traffic to a local access to a Data Network (identified by a DNAI).

The AF may issue requests on behalf of applications not owned by the PLMN serving the UE.

If the operator does not allow an AF to access the network directly, the AF shall use the NEF to interact with the 5GC, as described in clause 6.2.10.

The AF may be in charge of the (re)selection or relocation of the applications within the local part of the DN (as defined in TS 23.548 [130]). Such functionality is not defined. For this purpose, the AF may request to get notified about events related with PDU Sessions.

In the case of AF instance change, the AF may send request of AF relocation information.

A subset of the same interface defined in this clause may be used by an AF to influence 5GC traffic steering for SFC as described in clause 5.6.x.

The AF requests are sent to the PCF via N5 (in the case of requests targeting specific on-going PDU Sessions of individual UE(s), for an AF allowed to interact directly with the 5GC NFs) or via the NEF. The AF requests that target existing or future PDU Sessions of multiple UE(s) or of any UE are sent via the NEF and may target multiple PCF(s), as described in clause 6.3.7.2. The PCF(s) transform(s) the AF requests into policies that apply to PDU Sessions. When the AF has subscribed to UP path management event notifications from SMF(s) (including notifications on how to reach a GPSI over N6), such notifications are sent either directly to the AF or via an NEF (without involving the PCF). For AF interacting with PCF directly or via NEF, the AF requests may contain the information as described in the Table 5.6.7-1:

Table 5.6.7-1: Information element contained in AF request

|  |  |  |  |
| --- | --- | --- | --- |
| Information Name | Applicable for PCF or NEF (NOTE 1) | Applicable for NEF only | Category |
| Traffic Description | Defines the target traffic to be influenced, represented by the combination of DNN and optionally S-NSSAI, and application identifier or traffic filtering information.  | The target traffic can be represented by AF-Service-Identifier, instead of combination of DNN and optionally S-NSSAI.  | Mandatory |
| Potential Locations of Applications | Indicates potential locations of applications, represented by a list of DNAI(s). | The potential locations of applications can be represented by AF-Service-Identifier. | Conditional(NOTE 2) |
| Target UE Identifier(s) | Indicates the UE(s) that the request is targeting, i.e. an individual UE, a group of UE represented by Internal Group Identifier (NOTE 3), or any UE accessing the combination of DNN, S-NSSAI and DNAI(s). | GPSI can be applied to identify the individual UE, or External Group Identifier can be applied to identify a group of UE. | Mandatory |
| Spatial Validity Condition | Indicates that the request applies only to the traffic of UE(s) located in the specified location, represented by areas of validity. | The specified location can be represented by geographical area. | Optional |
| AF transaction identifier | The AF transaction identifier refers to the AF request. | N/A | Mandatory |
| N6 Traffic Routing requirements | Routing profile ID and/or N6 traffic routing information corresponding to each DNAI and an optional indication of traffic correlation. | N/A | Optional(NOTE 2) |
| Application Relocation Possibility | Indicates whether an application can be relocated once a location of the application is selected by the 5GC. | N/A | Optional |
| UE IP address preservation indication | Indicates UE IP address should be preserved. | N/A | Optional |
| Temporal Validity Condition | Time interval(s) or duration(s). | N/A | Optional |
| Information on AF subscription to corresponding SMF events | Indicates whether the AF subscribes to change of UP path of the PDU Session and the parameters of this subscription. | N/A | Optional |
| Information for EAS IP Replacement in 5GC | Indicates the Source EAS identifier and Target EAS identifier, (i.e. IP addresses and port numbers of the source and target EAS). | N/A | Optional |
| User Plane Latency Requirement | Indicates the user plane latency requirements | N/A | Optional |
| Information on AF change | N/A | Indicates the AF instance relocation and relocation information. | Optional |
| Indication for EAS Relocation | Indicates the EAS relocation of the application(s) | N/A | Optional |
| Indication for Simultaneous Connectivity over the source and target PSA at Edge Relocation | Indicates that simultaneous connectivity over the source and target PSA should be maintained at edge relocation and provides guidance to determine when the connectivity over the source PSA can be removed. | N/A | Optional |
| NOTE 1: When the AF request targets existing or future PDU Sessions of multiple UE(s) or of any UE and is sent via the NEF, as described in clause 6.3.7.2, the information is stored in the UDR by the NEF and notified to the PCF by the UDR.NOTE 2: The potential locations of applications and N6 traffic routing requirements may be absent only if the request is for subscription to notifications about UP path management events only.NOTE 3: Internal Group ID can only be used by an AF controlled by the operator and only towards PCF. |

For each information element mentioned above in the AF request, the detailed description is as follows:

1) Information to identify the traffic. The traffic can be identified in the AF request by

- Either a DNN and possibly slicing information (S-NSSAI) or an AF-Service-Identifier

- When the AF provides an AF-Service-Identifier i.e. an identifier of the service on behalf of which the AF is issuing the request, the 5G Core maps this identifier into a target DNN and slicing information (S-NSSAI)

- When the NEF processes the AF request the AF-Service-Identifier may be used to authorize the AF request.

- An application identifier or traffic filtering information (e.g. 5 Tuple or FQDN range). The application identifier refers to an application handling UP traffic and is used by the UPF to detect the traffic of the application

 When the AF request is for influencing SMF routing decisions, the information is to identify the traffic to be routed.

 When FQDN range is provided it may be used by SMF as one of the triggers for retrieving EAS Deployment Information from NEF. Retrieval of EAS Deployment Information is defined in TS 23.548 [130].

NOTE 1: It is also possible that the SMF triggers retrieving EAS Deployment Information based on implementation or local configuration.

 When the AF request is for subscription to notifications about UP path management events, the information is to identify the traffic that the events relate to.

2) Information about the N6 traffic routing requirements for traffic identified as defined in 1). This includes:

- Information about the N6 traffic routing requirements that is provided per DNAI: for each DNAI, the N6 traffic routing requirements may contain a routing profile ID and/or N6 traffic routing information.

- An optional indication of traffic correlation, when the information in 4) identifies a group of UEs. This implies the targeted PDU Sessions should be correlated by a common DNAI in the user plane for the traffic identified in 1). If this indication is provided by the AF, the 5GC should select a common DNAI for the target PDU Sessions from the list of DNAI(s) specified in 3).

NOTE 2: The N6 traffic routing requirements are related to the mechanism enabling traffic steering in the local access to the DN. The routing profile ID refers to a pre-agreed policy between the AF and the 5GC. This policy may refer to different steering policy ID(s) sent to SMF and e.g. based on time of the day etc.

NOTE 3: The mechanisms enabling traffic steering in the local access to the DN are not defined.

3) Potential locations of applications towards which the traffic routing should apply. The potential location of application is expressed as a list of DNAI(s). If the AF interacts with the PCF via the NEF, the NEF may map the AF-Service-Identifier information to a list of DNAI(s). The DNAI(s) may be used for UPF (re)selection and (I‑)SMF (re)selection.

4) Information on the UE(s). This may correspond to:

- Individual UEs identified using GPSI, or an IP address/Prefix or a MAC address.

- Groups of UEs identified by an External Group Identifier as defined in TS 23.682 [36] when the AF interacts via the NEF, or Internal-Group Identifier (see clause 5.9.7) when the AF interacts directly with the PCF.

- Any UE accessing the combination of DNN, S-NSSAI and DNAI(s).

 When the PDU Session type is IPv4 or IPv6 or IPv4v6, and the AF provides an IP address and/or an IP Prefix, or when the PDU Session type is Ethernet and the AF provides a MAC address, this allows the PCF to identify the PDU Session for which this request applies and the AF request applies only to that specific PDU Session of the UE. In this case, additional information such as the UE identity may also be provided to help the PCF to identify the correct PDU Session.

 Otherwise the request targets multiple UE(s) and shall apply to any existing or future PDU Sessions that match the parameters in the AF request.

 When the AF request targets an individual UE and GPSI is provided within the AF request, the GPSI is mapped to SUPI according to the subscription information received from UDM.

 When the AF request targets any UE or a group of UE, the AF request is likely to influence multiple PDU Sessions possibly served by multiple SMFs and PCFs.

 When the AF request targets a group of UE it provides one or several group identifiers in its request. The group identifiers provided by the AF are mapped to Internal-Group identifiers. Members of the group have this Group Identifier in their subscription. The Internal-Group Identifier is stored in UDM, retrieved by SMF from UDM and passed by SMF to PCF at PDU Session set-up. The PCF can then map the AF requests with user subscription and determine whether an AF request targeting a Group of users applies to a PDU Session.

 When the AF request is for influencing SMF routing decisions, the information is to identify UE(s) whose traffic is to be routed.

 When the AF request is for subscription to notifications about UP path management events, the information is to identify UE(s) whose traffic the events relate to.

 When the AF request is for traffic forwarding in a PDU Session serving for TSC, the MAC address used by the PDU Session is determined by the AF to identify UE whose traffic is to be routed according to the previously stored binding relationship of the 5GS Bridge and the port number of the traffic forwarding information received from TSN network.

5) Indication of application relocation possibility. This indicates whether an application can be relocated once a location of the application is selected by the 5GC. If application relocation is not possible, the 5GC shall ensure that for the traffic related with an application, no DNAI change takes place once selected for this application.

6) Temporal validity condition. This is provided in the form of time interval(s) or duration(s) during which the AF request is to be applied.

 When the AF request is for influencing SMF routing decisions, the temporal validity condition indicates when the traffic routing is to apply.

 When the AF request is for subscription to notifications about UP path management events, the temporal validity condition indicates when the notifications are to be generated.

7) Spatial validity condition on the UE(s) location. This is provided in the form of validity area(s). If the AF interacts with the PCF via the NEF, it may provide geographical area (e.g. a civic address or shapes) and the NEF maps the information to areas of validity based on pre-configuration. The PCF in turn determines area(s) of interest based on validity area(s).

 When the AF request is for influencing SMF routing decisions, the spatial validity condition indicates that the request applies only to the traffic of UE(s) located in the specified location.

 When the AF request is for subscription to notifications about UP path management events, the spatial validity condition indicates that the subscription applies only to the traffic of UE(s) located in the specified location.

8) Information on AF subscription to corresponding SMF events.

 The AF may request to be subscribed to change of UP path associated with traffic identified in the bullet 1) above. The AF request contains:

- A type of subscription (subscription for Early and/or Late notifications).

 The AF subscription can be for Early notifications and/or Late notifications. In the case of a subscription for Early notifications, the SMF sends the notifications before the (new) UP path is configured. In the case of a subscription for Late notifications, the SMF sends the notification after the (new) UP path has been configured.

- Notification target address for receiving event notification.

- Optionally, an indication of "AF acknowledgment to be expected".

 The indication implies that the AF will provide a response to the notifications of UP path management events to the 5GC. The SMF may, according to this indication, determine to wait for a response from the AF before the SMF configures in the case of early notification, or activates in the case of late notification, the new UP path as described in clause 5.6.7.2.

 The AF subscription can also request to receive information associating the GPSI of the UE with the IP address(es) of the UE and/or with actual N6 traffic routing to be used to reach the UE on the PDU Session; in this case the corresponding information is sent by the SMF regardless of whether a DNAI applies to the PDU Session.

9) An AF transaction identifier referring to the AF request. This allows the AF to update or remove the AF request and to identify corresponding UP path management event notifications. The AF transaction identifier is generated by the AF.

 When the AF interacts with the PCF via the NEF, the NEF maps the AF transaction identifier to an AF transaction internal identifier, which is generated by the NEF and used within the 5GC to identify the information associated to the AF request. The NEF maintains the mapping between the AF transaction identifier and the AF transaction internal identifier. The relation between the two identifiers is implementation specific.

 When the AF interacts with the PCF directly, the AF transaction identifier provided by the AF is used as AF transaction internal identifier within the 5GC.

10) Indication of UE IP address preservation. This indicates UE IP address related to the traffic identified in bullet 1) should be preserved. If this indication is provided by the AF, the 5GC should preserve the UE IP address by preventing reselection of PSA UPF for the identified traffic once the PSA UPF is selected.

11) Information for EAS IP Replacement in 5GC. This indicates the Source EAS identifier and Target EAS identifier (i.e. IP addresses and port numbers of the source and target EAS) for a service subject to Edge Computing.

12) User Plane Latency Requirement. This includes AF requirements for User Plane latency. (see clause 6.3.6 of TS 23.548 [130]).

13) Information on AF change. The AF relocation information includes:

- AF Identifier: the identifier of the target AF instance.

NOTE 4: The AF relocation information is applicable for interaction with NEF only and it is not stored in UDR or transferred to PCF, even for the case AF directly interacts with PCF.

14) Indication for EAS relocation. This indicates the application(s) are to be relocated.

15) Indication for Simultaneous Connectivity over source and target PSA at Edge Relocation (see clause 6.3.4 of TS 23.548 [130]). Indicates that source and target PSA should coexist for some time at PSA relocation, and may influence the establishment of a temporary N9 forwarding tunnel between the source UL CL and target UL CL. It may also provide guidance for the time interval after the described traffic ceases when the connectivity over the source PSA may be removed.

An AF may send requests to influence SMF routeing decisions, for event subscription or for both.

The AF may request to be subscribed to notifications about UP path management events, i.e. a UP path change occurs for the PDU Session. The corresponding notification about a UP path change sent by the SMF to the AF may indicate the DNAI and /or the N6 traffic routing information that has changed as described in clause 4.3.6.3 of TS 23.502 [3]. It may include the AF transaction internal identifier, the type of notification (i.e. early notification or late notification), the Identity of the source and/or target DNAI, the IP address/prefix of the UE or the MAC address used by the UE, the GPSI and the N6 traffic routing information related to the 5GC UP.

NOTE 5: The change from the UP path status where no DNAI applies to a status where a DNAI applies indicates the activation of this AF request; the change from the UP path status where a DNAI applies to a status where no DNAI applies indicates the de-activation of this AF request.

 In the case of IP PDU Session Type, the IP address/prefix of the UE together with N6 traffic routing information indicates to the AF how to reach over the User Plane the UE identified by its GPSI. N6 traffic routing information indicates any tunnelling that may be used over N6. The nature of this information depends on the deployment.

NOTE 6: N6 traffic routing information can e.g. correspond to the identifier of a VPN or to explicit tunnelling information such as a tunnelling protocol identifier together with a Tunnel identifier.

NOTE 7: In the case of Unstructured PDU Session type the nature of the N6 traffic routing information related to the 5GC UP is described in clause 5.6.10.3.

 In the case of Ethernet PDU Session Type, the MAC address of the UE together with N6 traffic routing information indicates to the AF how to reach over the User Plane the UE identified by its GPSI. The UE MAC address (es) is reported by the UPF as described in clause 5.8.2.12. The N6 traffic routing information can be, e.g. a VLAN ID or the identifier of a VPN or a tunnel identifier at the UPF.

When notifications about UP path management events are sent to the AF via the NEF, if required, the NEF maps the UE identify information, e.g. SUPI, to the GPSI and the AF transaction internal identifier to the AF transaction identifier before sending the notifications to the AF.

The PCF, based on information received from the AF, operator's policy, optionally service experience analytics per UP path received from NWDAF, etc., authorizes the request received from the AF and determines for each DNAI, a traffic steering policy ID (derived from the routing profile ID provided by the AF) and/or the N6 traffic routing information (as provided by the AF) to be sent to the SMF as part of the PCC rules. The traffic steering policy IDs are configured in the SMF or in the UPF. The traffic steering policy IDs are related to the mechanism enabling traffic steering to the DN.

The DNAIs are related to the information considered by the SMF for UPF selection and (I‑)SMF (re)selection, e.g. for diverting (locally) some traffic matching traffic filters provided by the PCF.

The PCF acknowledges a request targeting an individual PDU Session to the AF or to the NEF.

For PDU Session that corresponds to the AF request, the PCF provides the SMF with a PCC rule that is generated based on the AF request, Local routing indication from the PDU Session policy control subscription information and taking into account UE location presence in area of interest (i.e. Presence Reporting Area). The PCC rule contains the information to identify the traffic, information about the DNAI(s) towards which the traffic routing should apply and optionally, an indication of traffic correlation and/or an indication of application relocation possibility and/or indication of UE IP address preservation. The PCC rule also contains per DNAI a traffic steering policy ID and/or N6 traffic routing information, if the N6 traffic routing information is explicitly provided in the AF request. The PCF may also provide in the PCC rule information to subscribe the AF (or the NEF) to SMF events (UP path changes) corresponding to the AF request in which case it provides the information on AF subscription to corresponding SMF events received in the AF request. This is done by providing policies at PDU Session set-up or by initiating a PDU Session Modification procedure. When initiating a PDU Session set-up or PDU Session Modification procedure, the PCF considers the latest known UE location to determine the PCC rules provided to the SMF. The PCF evaluates the temporal validity condition of the AF request and informs the SMF to activate or deactivate the corresponding PCC rules according to the evaluation result. When policies specific to the PDU Session and policies general to multiple PDU Sessions exist, the PCF gives precedence to the PDU Session specific policies over the general policies. The PCF authorizes the AF request of User Plane Latency Requirements. If the PCF determines that the requirements can't be authorized, the PCF rejects the AF request.

The spatial validity condition is resolved at the PCF. In order to do that, the PCF subscribes to the SMF to receive notifications about change of UE location in an area of interest (i.e. Presence Reporting Area). The subscribed area of interest may be the same as spatial validity condition, or may be a subset of the spatial validity condition (e.g. a list of TAs) based on the latest known UE location. When the SMF detects that UE entered the area of interest subscribed by the PCF, the SMF notifies the PCF and the PCF provides to the SMF the PCC rules described above by triggering a PDU Session Modification. When the SMF becomes aware that the UE left the area subscribed by the PCF, the SMF notifies the PCF and the PCF provides updated PCC rules by triggering a PDU Session Modification. SMF notifications to the PCF about UE location in or out of the subscribed area of interest are triggered by UE location change notifications received from the AMF or by UE location information received during a Service Request or Handover procedure.

When the PCC rules are activated, the SMF may, based on local policies, take the information in the PCC rules and, optionally, the Service Experience analytics and/or DN Performance analytics per UP path (including UPF and/or DNAI and/or AS instance) as defined in clause 6.4.3 and clause 6.14.3, respectively, of TS 23.288 [86] into account to:

- (re)select UP paths (including DNAI(s)) for PDU Sessions. The SMF is responsible for handling the mapping between the UE location (TAI / Cell-Id) and DNAI(s) associated with UPF and applications and the selection of the UPF(s) that serve a PDU Session. This is described in clause 6.3.3. If the PDU Session is of IP type and if Indication of UE IP address preservation is included in the PCC rules, the SMF should preserve the UE IP address, by not reselecting the related PSA UPF once the PSA UPF is selected, for the traffic identified in the PCC rule. If the user plane latency requirement is included in the PCC rules, the SMF chooses the PSA UPF that satisfies the user plane latency requirement. If the PCC rules are related to a 5G VN group served by the SMF and if the Information about the N6 traffic routing requirements includes an indication of traffic correlation, the SMF should select a common DNAI for the PDU Sessions of the 5G VN group.

- configure traffic steering at UPF, including activating mechanisms for traffic multi-homing or enforcement of an UL Classifier (UL CL). Such mechanisms are defined in clause 5.6.4. This may include that the SMF is providing the UPF with packet handling instructions (i.e. PDRs and FARs) for steering traffic to the local access to the DN. The packet handling instructions are generated by the SMF using the traffic steering policy ID and/or the N6 traffic routing information in the PCC rules corresponding to the applied DNAI. In the case of UP path reselection, the SMF may configure the source UPF to forward traffic to the UL CL/BP so that the traffic is steered towards the target UPF.

- if Information on AF subscription to corresponding SMF events has been provided in the PCC rule, inform the AF of the (re)selection of the UP path (UP path change). If the information includes an indication of "AF acknowledgment to be expected", the SMF may decide to wait for a response from the AF before it activates the new UP path, as described in clause 5.6.7.2.

When an I-SMF is inserted for a PDU Session, the I-SMF insertion, relocation or removal to a PDU session shall be transparent (i.e. not aware) to the PCF and to the AF. The processing of the AF influence on traffic routing is described in clause 5.34 and detail procedure is described in clause 4.23.6 of TS 23.502 [3].

*NEXT CHANGE (3)*

# 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".

[2] 3GPP TS 22.261: "Service requirements for next generation new services and markets; Stage 1".

[3] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".

[4] 3GPP TS 23.203: "Policies and Charging control architecture; Stage 2".

[5] 3GPP TS 23.040: "Technical realization of the Short Message Service (SMS); Stage 2".

[6] 3GPP TS 24.011: "Point-to-Point (PP) Short Message Service (SMS) support on mobile radio interface: Stage 3".

[7] IETF RFC 7157: "IPv6 Multihoming without Network Address Translation".

[8] IETF RFC 4191: "Default Router Preferences and More-Specific Routes".

[9] IETF RFC 2131: "Dynamic Host Configuration Protocol".

[10] IETF RFC 4862: "IPv6 Stateless Address Autoconfiguration".

[11] ITU‑T Recommendation I.130: "Method for the characterization of telecommunication services supported by an ISDN and network capabilities of an ISDN".

[12] ITU‑T Recommendation Q.65: "The unified functional methodology for the characterization of services and network capabilities".

[13] 3GPP TS 24.301: "Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS): Stage 3".

[14] IETF RFC 3736: "Stateless DHCP Service for IPv6".

[15] 3GPP TS 23.228: "IP Multimedia Subsystem (IMS); Stage 2".

[16] 3GPP TS 22.173: "IMS Multimedia Telephony Service and supplementary services; Stage 1".

[17] 3GPP TS 23.122: "Non-Access-Stratum (NAS) functions related to Mobile Station in idle mode".

[18] 3GPP TS 23.167: "3rd Generation Partnership Project; Technical Specification Group Services and Systems Aspects; IP Multimedia Subsystem (IMS) emergency sessions".

[19] 3GPP TS 23.003: "Numbering, Addressing and Identification".

[20] IETF RFC 7542: "The Network Access Identifier".

[21] 3GPP TS 23.002: "Network Architecture".

[22] 3GPP TS 23.335: "User Data Convergence (UDC); Technical realization and information flows; Stage 2".

[23] 3GPP TS 23.221: "Architectural requirements".

[24] 3GPP TS 22.153: "Multimedia priority service".

[25] 3GPP TS 22.011: "Service Accessibility".

[26] 3GPP TS 23.401: "General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access".

[27] 3GPP TS 38.300: "NR; NR and NG-RAN Overall Description".

[28] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol Specification".

[29] 3GPP TS 33.501: "Security architecture and procedures for 5G system".

[30] 3GPP TS 36.300: "Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2".

[31] 3GPP TS 37.340: "Evolved Universal Terrestrial Radio Access (E-UTRA) and NR; Multi-connectivity; Stage 2".

[32] 3GPP TS 23.214: "Architecture enhancements for control and user plane separation of EPC nodes; Stage 2".

[33] 3GPP TS 22.101: "3rd Generation Partnership Project; Technical Specification Group Services and Systems Aspects; Service aspects; Service principles".

[34] 3GPP TS 38.413: "NG-RAN; NG Application Protocol (NGAP)".

[35] 3GPP TS 33.126: "Lawful Interception Requirements".

[36] 3GPP TS 23.682: "Architecture enhancements to facilitate communications with packet data networks and applications".

[37] 3GPP TS 22.280: "Mission Critical Services Common Requirements (MCCoRe); Stage 1".

[38] 3GPP TS 23.379: "Functional architecture and information flows to support Mission Critical Push To Talk (MCPTT); Stage 2".

[39] 3GPP TS 23.281: "Functional architecture and information flows to support Mission Critical Video (MCVideo); Stage 2".

[40] 3GPP TS 23.282: "Functional architecture and information flows to support Mission Critical Data (MCData); Stage 2".

[41] 3GPP TS 32.240: "Charging management; Charging architecture and principles".

[42] 3GPP TS 38.401: "NG-RAN Architecture description".

[43] 3GPP TS 23.402: "Architecture enhancements for non-3GPP accesses".

[44] IETF RFC 4960: "Stream Control Transmission Protocol".

[45] 3GPP TS 23.503: "Policy and Charging Control Framework for the 5G System".

[46] 3GPP TS 23.041: "Public Warning System".

[47] 3GPP TS 24.501: "Non-Access-Stratum (NAS) protocol for 5G System (5GS); Stage 3".

[48] 3GPP TS 24.502: "Access to the 5G System (5GS) via non-3GPP access networks; Stage 3".

[49] 3GPP TS 29.500: "5G System; Technical Realization of Service Based Architecture; Stage 3".

[50] 3GPP TS 38.304: "NR; User Equipment (UE) procedures in idle mode".

[51] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification".

[52] 3GPP TS 36.304: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode".

[53] Void.

[54] IETF RFC 4861: "Neighbor Discovery for IP version 6 (IPv6)".

[55] 3GPP TS 23.271: "Functional stage 2 description of Location Services (LCS)".

[56] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service description; Stage 2".

[57] IETF RFC 4555: "IKEv2 Mobility and Multihoming Protocol (MOBIKE)".

[58] 3GPP TS 29.510: "5G System: Network function repository services; Stage 3".

[59] 3GPP TS 29.502: "5G System: Session Management Services: Stage 3".

[60] IETF RFC 7296: "Internet Key Exchange Protocol Version 2 (IKEv2) ".

[61] 3GPP TS 23.380: "IMS Restoration Procedures".

[62] 3GPP TS 24.229: "IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3".

[63] 3GPP TS 23.292: "IP Multimedia Subsystem (IMS) centralized services; Stage 2".

[64] 3GPP TS 23.222: "Functional architecture and information flows to support Common API Framework for 3GPP Northbound APIs".

[65] 3GPP TS 29.244: "Interface between the Control Plane and the User Plane Nodes; Stage 3".

[66] 3GPP TS 32.421: "Telecommunication management; Subscriber and equipment trace; Trace concepts and requirements".

[67] 3GPP TS 32.290: "5G system; Services, operations and procedures of charging using Service Based Interface (SBI)".

[68] 3GPP TS 32.255: "5G Data connectivity domain charging; Stage 2".

[69] 3GPP TS 38.306: "NR; User Equipment -UE) radio access capabilities".

[70] 3GPP TS 36.306: "Evolved Universal Terrestrial Radio Access -E-UTRA); User Equipment -UE) radio access capabilities".

[71] 3GPP TS 29.518: "5G System; Access and Mobility Management Services; Stage 3".

[72] 3GPP TS 23.285: "Architecture enhancements for V2X services".

[73] IETF RFC 2865: "Remote Authentication Dial In User Service (RADIUS)".

[74] IETF RFC 3162: "RADIUS and IPv6".

[75] 3GPP TS 29.281: "General Packet Radio System (GPRS) Tunnelling Protocol User Plane (GTPv1-U)".

[76] 3GPP TS 26.238: "Uplink streaming".

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[79] 3GPP TS 28.533: "Management and orchestration; Architecture framework".

[80] 3GPP TS 24.250: "Protocol for Reliable Data Service; Stage 3".

[81] IETF RFC 8684: "TCP Extensions for Multipath Operation with Multiple Addresses".

[82] IETF RFC 8803: "0-RTT TCP Convert Protocol".

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[84] 3GPP TS 23.316: "Wireless and wireline convergence access support for the 5G System (5GS)".

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[86] 3GPP TS 23.288: "Architecture enhancements for 5G System (5GS) to support network data analytics services".

[87] 3GPP TS 23.273: "5G System (5GS) Location Services (LCS); Stage 2".

[88] 3GPP TS 23.216: "Single Radio Voice Call Continuity (SRVCC); Stage 2".

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Editor's note: The reference to BBF WT-457 will be revised when finalized by BBF.

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[96] Void.

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[98] IEEE Std 802.1Q-2018: "IEEE Standard for Local and metropolitan area networks--Bridges and Bridged Networks".

[99] 3GPP TS 38.423: "NG-RAN; Xn Application Protocol (XnAP)".

[100] 3GPP TS 36.413: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)".

[101] 3GPP TS 29.274: "Evolved General Packet Radio Service (GPRS) Tunnelling Protocol for Control plane (GTPv2-C); Stage 3".

[102] 3GPP TS 23.632: "User Data Interworking, Coexistence and Migration; stage 2".

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[108] 3GPP TS 28.552: "Management and orchestration; 5G performance measurements".

[109] 3GPP TS 24.193: "Access Traffic Steering, Switching and Splitting; Stage 3".

[110] 3GPP TS 24.526: "User Equipment (UE) policies for 5G System (5GS); Stage 3".

[111] 3GPP TS 22.186: "Enhancement of 3GPP support for V2X scenarios; Stage 1".

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[115] 3GPP TS 33.210: "Network Domain Security (NDS); IP network layer security".

[116] 3GPP TS 38.415: "PDU Session User Plane Protocol".

[117] 3GPP TS 24.535: "Device-side Time-Sensitive Networking (TSN) Translator (DS-TT) to network-side TSN Translator (NW-TT) protocol aspects; Stage 3".

[118] 3GPP TS 32.274: "Charging Management; Short Message Service (SMS) charging".

[119] 3GPP TS 23.008: "Organization of subscriber data".

[120] 3GPP TS 38.314: "NR; Layer 2 measurements".

[121] 3GPP TS 23.287: "Architecture enhancements for 5G System (5GS) to support Vehicle-to-Everything (V2X) services".

[122] 3GPP TS 29.503: "5G System; Unified Data Management Services; Stage 3".

[123] 3GPP TS 32.254: "Charging management; Exposure function Northbound Application Program Interfaces (APIs) charging".

[124] 3GPP TS 33.535: "Authentication and Key Management for Applications based on 3GPP credentials in the 5G System (5GS)".

[125] 3GPP TS 38.410: "NG-RAN; NG general aspects and principles".

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[128] 3GPP TS 23.304: "Proximity based Services (ProSe) in the 5G System (5GS)".

[129] 3GPP TS 23.247: "Architectural enhancements for 5G multicast-broadcast services".

[130] 3GPP TS 23.548 "5G System Enhancements for Edge Computing; Stage 2".

[131] IEEE Std 802.3: "Ethernet".

[132] 3GPP TS 29.561: "5G System; Interworking between 5G Network and external Data Networks; Stage 3".

[133] 3GPP TS 29.513: "Policy and Charging Control signalling flows and QoS parameter mapping; Stage 3".

[134] 3GPP TS 23.558: "Architecture for enabling Edge Applications (EA)".

[135] 3GPP TS 26.501: "5G Media Streaming (5GMS); General description and architecture".

[136] 3GPP TS 23.256 "Support of Uncrewed Aerial Systems (UAS) connectivity, identification and tracking; Stage 2".

[137] GSMA NG.116: "Generic Network Slice Template".

[138] IETF RFC 3948: "UDP Encapsulation of IPsec ESP Packets".

[139] 3GPP TS 24.539: "5G System (5GS); Network to TSN translator (TT) protocol aspects; Stage 3".

[140] 3GPP TS 33.220: "Generic Authentication Architecture (GAA); Generic bootstrapping architecture".

[141] 3GPP TS 33.223: "Generic Authentication Architecture (GAA); Generic Bootstrapping Architecture (GBA) Push function".

[xxx] IETF RFC 7665: "Service Function Chaining (SFC) Architecture".

*NEXT CHANGE (4)*

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

5GC 5G Core Network

5G DDNMF 5G Direct Discovery Name Management Function

5G LAN 5G Local Area Network

5GS 5G System

5G-AN 5G Access Network

5G-AN PDB 5G Access Network Packet Delay Budget

5G-EIR 5G-Equipment Identity Register

5G-GUTI 5G Globally Unique Temporary Identifier

5G-BRG 5G Broadband Residential Gateway

5G-CRG 5G Cable Residential Gateway

5G GM 5G Grand Master

5G NSWO 5G Non-Seamless WLAN offload

5G-RG 5G Residential Gateway

5G-S-TMSI 5G S-Temporary Mobile Subscription Identifier

5G VN 5G Virtual Network

5QI 5G QoS Identifier

ADRF Analytics Data Repository Function

AF Application Function

AKMA Authentication and Key Management for Applications

AnLF Analytics Logical Function

AMF Access and Mobility Management Function

AS Access Stratum

ATSSS Access Traffic Steering, Switching, Splitting

ATSSS-LL ATSSS Low-Layer

AUSF Authentication Server Function

BMCA Best Master Clock Algorithm

BSF Binding Support Function

CAG Closed Access Group

CAPIF Common API Framework for 3GPP northbound APIs

CH Credentials Holder

CHF Charging Function

CN PDB Core Network Packet Delay Budget

CP Control Plane

DAPS Dual Active Protocol Stacks

DCCF Data Collection Coordination Function

DCS Default Credentials Server

DL Downlink

DN Data Network

DNAI DN Access Identifier

DNN Data Network Name

DRX Discontinuous Reception

DS-TT Device-side TSN translator

EAC Early Admission Control

ePDG evolved Packet Data Gateway

EBI EPS Bearer Identity

EUI Extended Unique Identifier

FAR Forwarding Action Rule

FN-BRG Fixed Network Broadband RG

FN-CRG Fixed Network Cable RG

FN-RG Fixed Network RG

FQDN Fully Qualified Domain Name

GBA Generic Bootstrapping Architecture

GEO Geostationary Orbit

GFBR Guaranteed Flow Bit Rate

GIN Group ID for Network Selection

GMLC Gateway Mobile Location Centre

GPSI Generic Public Subscription Identifier

GUAMI Globally Unique AMF Identifier

HMTC High-Performance Machine-Type Communications

HR Home Routed (roaming)

IAB Integrated access and backhaul

IMEI/TAC IMEI Type Allocation Code

IPUPS Inter PLMN UP Security

I-SMF Intermediate SMF

I-UPF Intermediate UPF

LADN Local Area Data Network

LBO Local Break Out (roaming)

LEO Low Earth Orbit

LMF Location Management Function

LoA Level of Automation

LPP LTE Positioning Protocol

LRF Location Retrieval Function

MBS Multicast/Broadcast Service

MBSF Multicast/Broadcast Service Function

MBSTF Multicast/Broadcast Service Transport Function

MB-SMF Multicast/Broadcast Session Management Function

MB-UPF Multicast/Broadcast User Plane Function

MEO Medium Earth Orbit

MFAF Messaging Framework Adaptor Function

MCX Mission Critical Service

MDBV Maximum Data Burst Volume

MFBR Maximum Flow Bit Rate

MICO Mobile Initiated Connection Only

MINT Minimization of Service Interruption

ML Machine Learning

MPS Multimedia Priority Service

MPTCP Multi-Path TCP Protocol

MTLF Model Training Logical Function

N3IWF Non-3GPP InterWorking Function

N5CW Non-5G-Capable over WLAN

NAI Network Access Identifier

NEF Network Exposure Function

NF Network Function

NGAP Next Generation Application Protocol

NID Network identifier

NPN Non-Public Network

NR New Radio

NRF Network Repository Function

NSAC Network Slice Admission Control

NSACF Network Slice Admission Control Function

NSAG Network Slice AS Group

NSI ID Network Slice Instance Identifier

NSSAA Network Slice-Specific Authentication and Authorization

NSSAAF Network Slice-specific and SNPN Authentication and Authorization Function

NSSAI Network Slice Selection Assistance Information

NSSF Network Slice Selection Function

NSSP Network Slice Selection Policy

NSSRG Network Slice Simultaneous Registration Group

NSWO Non-Seamless WLAN offload

NSWOF Non-Seamless WLAN offload Function

NW-TT Network-side TSN translator

NWDAF Network Data Analytics Function

ONN Onboarding Network

ON-SNPN Onboarding Standalone Non-Public Network

PCF Policy Control Function

PDB Packet Delay Budget

PDR Packet Detection Rule

PDU Protocol Data Unit

PEI Permanent Equipment Identifier

PER Packet Error Rate

PFD Packet Flow Description

PNI-NPN Public Network Integrated Non-Public Network

PPD Paging Policy Differentiation

PPF Paging Proceed Flag

PPI Paging Policy Indicator

PSA PDU Session Anchor

PTP Precision Time Protocol

PVS Provisioning Server

QFI QoS Flow Identifier

QoE Quality of Experience

RACS Radio Capabilities Signalling optimisation

(R)AN (Radio) Access Network

RG Residential Gateway

RIM Remote Interference Management

RQA Reflective QoS Attribute

RQI Reflective QoS Indication

RSN Redundancy Sequence Number

SA NR Standalone New Radio

SBA Service Based Architecture

SBI Service Based Interface

SCP Service Communication Proxy

SD Slice Differentiator

SEAF Security Anchor Functionality

SEPP Security Edge Protection Proxy

SF Service Function

SFC Service Function Chaining

SFP Service Function Path

SMF Session Management Function

SMSF Short Message Service Function

SN Sequence Number

SNPN Stand-alone Non-Public Network

S-NSSAI Single Network Slice Selection Assistance Information

SO-SNPN Subscription Owner Standalone Non-Public Network

SSC Session and Service Continuity

SSCMSP Session and Service Continuity Mode Selection Policy

SST Slice/Service Type

SUCI Subscription Concealed Identifier

SUPI Subscription Permanent Identifier

SV Software Version

TA Tracking Area

TAI Tracking Area Identity

TNAN Trusted Non-3GPP Access Network

TNAP Trusted Non-3GPP Access Point

TNGF Trusted Non-3GPP Gateway Function

TNL Transport Network Layer

TNLA Transport Network Layer Association

TSC Time Sensitive Communication

TSCAI TSC Assistance Information

TSCTSF Time Sensitive Communication and Time Synchronization Function

TSN Time Sensitive Networking

TSN GM TSN Grand Master

TSP Traffic Steering Policy

TT TSN Translator

TWIF Trusted WLAN Interworking Function

UAS NF Uncrewed Aerial System Network Function

UCMF UE radio Capability Management Function

UDM Unified Data Management

UDR Unified Data Repository

UDSF Unstructured Data Storage Function

UL Uplink

UL CL Uplink Classifier

UPF User Plane Function

URLLC Ultra Reliable Low Latency Communication

URRP-AMF UE Reachability Request Parameter for AMF

URSP UE Route Selection Policy

VID VLAN Identifier

VLAN Virtual Local Area Network

W-5GAN Wireline 5G Access Network

W-5GBAN Wireline BBF Access Network

W-5GCAN Wireline 5G Cable Access Network

W-AGF Wireline Access Gateway Function

*END OF CHANGES*