**3GPP TSG-WG SA2 Meeting #166 *S2-2410xxxx***

**Orlando, , - , 2024** **(revision of S2-2411081)**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **23.502** | **CR** | **5054** | **rev** | **1** | **Current version:** | **19.1.0** |  |
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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:*** | KI#3: Enhancement for AF influence on traffic routing with Energy related information. | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | KDDI, TOYOTA MOTOR CORPORATION | | | | | | | | | |
| ***Source to TSG:*** | SA2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | EnergySys | | | | |  | ***Date:*** | | | 2024-11-08 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-19 |
|  | *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:*** | | TR 23.700-66 v19.0.0 has documented the UP path adjustment in.the conclusion for key issue#3: 5GS enhancements for network energy saving and efficiency.  *2) For enhancements on existing operations and procedures for energy saving and energy efficiency:*  *- UP path of PDU session may be adjusted.*  This contribution provides to enhance the AF influence on traffic routing considering the Energy related information, based on the solution #33.  Note that the detail of Energy related information is described in CR5713(S2-2411078). | | | | | | | | |
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| ***Summary of change:*** | | Introduce a AF influence on traffic routing considering the Energy Consumption information. | | | | | | | | |
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| ***Consequences if not approved:*** | | It is not specified that the procedure for AF influence on traffic routing considering Energy related information in R19 Energy Efficiency study. | | | | | | | | |
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| ***Clauses affected:*** | | 4.3.6.2, 4.3.6.4 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | |  | | | | | | | | |

\*\*\*1st Changes \*\*\*

#### 4.3.6.2 Processing AF requests to influence traffic routing and/or Service Function Chaining for Sessions not identified by an UE address



Figure 4.3.6.2-1: Processing AF requests to influence traffic routing and/or Service Function Chaining for Sessions not identified by an UE address

NOTE 1: The 5GC functions used in this scenario are assumed to all belong to the same PLMN (HPLMN in non-roaming case or VPLMN in the case of a PDU Session in LBO mode).

0. The PCF(s) subscribe to modifications of AF requests (Data Set = Application Data; Data Subset = AF traffic influence request information, Data Key = S-NSSAI and/or DNN and/or Internal Group Identifier or SUPI) from the UDR.

1. To create a new request, the AF invokes a Nnef\_TrafficInfluence\_Create service operation. The content of this service operation (AF request) is defined in clause 5.2.6.7. The request contains also an AF Transaction Id. If it subscribes to events related with PDU Sessions the AF indicates also where it desires to receive the corresponding notifications (AF notification reporting information).

To update or remove an existing request, the AF invokes a Nnef\_TrafficInfluence\_Update or Nnef\_TrafficInfluence\_Delete service operation providing the corresponding AF Transaction Id.

The Nnef\_TrafficInfluence\_Create (initiated by target AF) or Nnef\_TrafficInfluence\_Update (initiated by source AF or target AF) service operation may be used for the case of AF instance change. If Nnef\_TrafficInfluence\_Update service operation is invoked, the NEF is required to update the subscription resource. The Nnef\_TrafficInfluence\_Update service operation may include an updated notification target address. The updated subscription resource is used by the target AF.

NOTE 2: If the source AF transfers the application context to the target AF, then target AF may create new subscription via Nnef\_TrafficInfluence\_Create operation or update existing subscription via Nnef\_TrafficInfluence\_Update. However, whether and how the application context transfer is done is out of this specification.

2. The AF sends its request to the NEF. If the request is sent directly from the AF to the PCF, the AF reaches the PCF selected for the existing PDU Session by configuration or by invoking Nbsf\_management\_Discovery service.

The NEF ensures the necessary authorization control, including throttling of AF requests and as described in clause 4.3.6.1, mapping from the information provided by the AF into information needed by the 5GC.

3. (in the case of Nnef\_TrafficInfluence\_Create or Update): The NEF stores the AF request information in the UDR (Data Set = Application Data; Data Subset, Data Key = AF Transaction Internal ID, S-NSSAI and DNN and/or Internal Group Identifier(s) and/or Subscriber Category(s) or SUPI). The Data Subset identifies whether the information relates to AF traffic influence request information for traffic routing or AF traffic influence request information for service function chaining, as described in Table 5.2.12.2.1-1.

NOTE 3: Both the AF Transaction Internal ID and S-NSSAI and DNN and/or Internal Group Identifier(s) and/or Subscriber Category(s) or SUPI are regarded as Data Key when the AF request information are stored into the UDR, see Table 5.2.12.2.1-1. The Subscriber Category(s) is determined by NEF as described in clause 4.3.6.1.

(in the case of Nnef\_TrafficInfluence\_delete): The NEF deletes the AF requirements in the UDR (Data Set = Application Data; Data Subset, Data Key = AF Transaction Internal ID). The Data Subset identifies whether the information relates to AF traffic influence request information for traffic routing or AF traffic influence request information for service function chaining.

The NEF responds to the AF.

4. The PCF(s) that have subscribed to modifications of AF requests receive(s) a Nudr\_DM\_Notify notification of data change from the UDR. The Data Subset identifies whether the information relates to AF traffic influence request information for traffic routing or AF traffic influence request information for service function chaining.

5. The PCF determines if existing PDU Sessions are potentially impacted by the AF request. For each of these PDU Sessions, the PCF updates the SMF with corresponding new policy information about the PDU Session by invoking Npcf\_SMPolicyControl\_UpdateNotify service operation as described in steps 5 and 6 in clause 4.16.5.

The PCF validates whether the SFC identifier (if available) corresponds to an authorized SFC for the AF based on local configuration. If the validation has succeeded the PCF maps the SFC identifier to the corresponding Traffic Steering Policy identifier (i.e. TSP ID).

The PCF includes the Traffic Steering Policy ID(s) in the AF influence on traffic routing Enforcement Control information and/or N6-LAN Traffic Steering Enforcement Control information of the relevant PCC rule as defined in clause 6.3.1 of TS 23.503 [20]. The PCF also includes the Metadata in the N6-LAN Traffic Steering Enforcement Control information of the PCC rule when Metadata was provided by the AF.

If the AF request includes a notification reporting request for UP path change, the PCF includes in the PCC rule(s) the information required for reporting the event, including the Notification Target Address pointing to the NEF or AF and the Notification Correlation ID containing the AF Transaction Internal ID.

If the AF request includes an EAS Correlation indication or indication of traffic correlation, PCF includes in the PCC rule(s) an EAS Correlation indication or indication of traffic correlation and a Traffic Correlation ID corresponding to a set of UEs that AF request aims at, also if AF request includes a common EAS IP address or common DNAI for a set of UEs, PCC rule includes the common EAS IP address or common DNAI.

In the case of AF influence on traffic routing, the PCF may, optionally, use service experience analytics per UP path, as defined in clause 6.4.3 of TS 23.288 [50] and/or use Energy related information per UP path as described in clause 5.X.Y of TS 23.501 [2], to provide an updated list of DNAI(s) to the SMF.

The PCF may use the "Subscriber categories" as defined in "PDU Session policy control subscription information" in table 6.2-2 of TS 23.503 [20] to determine whether the PDU Session is impacted by the AF request.

6. When the updated policy information about the PDU Session is received from the PCF, the SMF may take appropriate actions to reconfigure the User plane of the PDU Session.

In the case of AF influence on traffic routing, examples of actions are:

- The SMF may consider service experience analytics, DN Performance analytics per UP path (i.e. including UPF and/or DNAI and/or AS instance) as defined in clauses 6.4.3 and 6.14.3, respectively, of TS 23.288 [50] and/or Energy related information per UP path as described in clause 5.X.Y of TS 23.501 [2] before taking any actions.

- Determining a target DNAI.

- Determining if a common DNAI needs to be used as a target DNAI.

- Adding, replacing or removing a UPF in the data path to e.g. act as an UL CL or a Branching Point e.g. as described in clause 4.3.5.

- Allocate a new Prefix to the UE (when IPv6 multi-Homing applies).

- Updating the UPF in the target DNAI with AF influence on traffic routing control parameters as described in clause 5.6.7.1 of TS 23.501 [2].

- Subscribe to notifications from the AMF for an Area of Interest via Namf\_EventExposure\_Subscribe service operation.

- Determining whether to relocate PSA UPF considering the user plane latency requirements provided by the AF (see clause 6.3.6 of TS 23.548 [74]).

When the updated policy information about the PDU Session is received from the PCF, the SMF may take appropriate actions to assist the EAS discovery and re-discovery for PDU Session with Session Breakout connectivity model such as:

- Retrieve the EAS deployment information as defined in clause 6.2.3.4.1 of TS 23.548 [74].

- Providing DNS message handling rule to forward DNS messages of the UE and/or report when detecting DNS messages as defined in clause 6.2.3.2.2 of TS 23.548 [74].

In the case of AF influence on Service Function Chaining, the SMF may take appropriate actions to enforce the N6-LAN traffic steering control:

- Provide N6-LAN traffic steering control parameters to UPF as described in clause 5.6.16 of TS 23.501 [2].

7. The SMF may decide whether it is required to send the target DNAI to the AMF for triggering SMF/I-SMF (re)selection and then inform the target DNAI information for the current PDU session or for the next PDU session to AMF via Nsmf\_PDUSession\_SMContextStatusNotify service operation.

#### 4.3.6.4 Transferring an AF request targeting an individual UE address to the relevant PCF



Figure 4.3.6.4-1: Handling an AF request targeting an individual UE address to the relevant PCF

Depending on the AF deployment (see clause 6.2.10 of TS 23.501 [2]), the AF may send the AF request to PCF directly, in which case step 1 is skipped, or via the NEF.

1. [Conditional] If the AF sends the AF request via NEF, the AF sends Nnef\_TrafficInfluenceCreate/Update/Delete Request targeting an individual UE address to the NEF. This request corresponds to an AF request to influence traffic routing to a local network and/or to a service function chain that targets an individual UE address.

When NEF receives an AF request from AF, the NEF ensures the necessary authorization control and as described in clause 4.3.6.1, mapping from the information provided by the AF into information needed by the 5GC. The NEF responds to the AF.

2. [Conditional] AF/NEF consumes Nbsf\_Management\_Discovery service operation (providing at least the UE address) to find out the address of the relevant PCF if the PCF address is not available on the NEF based on local configuration, otherwise step 1 is skipped.

NOTE 1: The AF/NEF finds the BSF based on local configuration or using the NRF.

3. BSF provides the PCF address in the Nbsf\_Management\_Discovery response to AF/NEF.

4. If step 1 was performed, NEF invokes the Npcf\_PolicyAuthorization service to the PCF to transfer the AF request. If an AF sends the AF request directly to the PCF, AF invokes Npcf\_PolicyAuthorization service and the PCF responds to the AF. To support the AF instance change, the Npcf\_PolicyAuthorization\_Create (initiated by target AF) or Npcf\_PolicyAuthorization\_Update (initiated by source AF or target AF) service operation may be used.

NOTE 2: If the source AF transfers the application context to the target AF, then target AF may create new subscription via Npcf\_PolicyAuthorization\_Create or update existing subscription via Npcf\_PolicyAuthorization\_Update. However, whether and how the application context transfer is done is out of this specification.

5. The PCF authorizes the AF request. If the PCF determines that the requirements can't be authorized, it rejects the AF request. Once the PCF authorizes the AF request, the PCF updates the SMF with corresponding new PCC rule(s) with PCF initiated SM Policy Association Modification procedure as described in clause 4.16.5.2.

The PCF includes the Traffic Steering Policy ID(s) for AF influence on traffic routing Enforcement Control information and/or N6-LAN Traffic Steering Enforcement Control information in the relevant PCC rule as defined in clause 6.3.1 of TS 23.503 [20].

The PCF may, optionally, use service experience analytics per UP path, as defined in clause 6.4.3 of TS 23.288 [50] and/or Energy related information per UP path as described in clause 5.X.Y of TS 23.501 [2], to provide an updated list of DNAI(s) to the SMF.

If Npcf\_PolicyAuthorization\_Update service operation is invoked, the PCF is required to update the subscription resource. The Npcf\_PolicyAuthorization\_Update service operation may include an updated notification target address. The updated subscription resource is used by the target AF.

When a PCC rule is received from the PCF, the SMF may take appropriate actions, when applicable, to reconfigure the User plane of the PDU Session.

In the case of AF influence on traffic routing, examples of actions are:

- The SMF may consider service experience analytics, DN Performance analytics per UP path (i.e. including UPF and/or DNAI and/or AS instance) as defined in clauses 6.4.3 and 6.14.3, respectively, of TS 23.288 [50] and/or Energy related information per UP path as described in clause 5.X.Y of TS 23.501 [2] before taking any actions.

- Determining a target DNAI and adding, replacing or removing UPF(s) in the data path, e.g. to act as UL CL, Branching Point and/or PDU Session Anchor e.g. as described in clause 4.3.5.

- Allocate a new Prefix to the UE (when IPv6 multi-Homing applies).

- Updating the UPF regarding the target DNAI with AF influence on traffic routing control parameters as described in clause 5.6.7.1 of TS 23.501 [2].

- Subscribe to notifications from the AMF for an Area of Interest via Namf\_EventExposure\_Subscribe service operation.

- Determining whether to relocate PSA UPF considering the user plane latency requirements provided by the AF (see clause 6.3.6 of TS 23.548 [74]).

In the case of AF influence on Service Function Chaining, the SMF may take appropriate actions to enforce the N6-LAN traffic steering control:

- Provide N6-LAN traffic steering control parameters to UPF as described in clause 5.6.16 of TS 23.501 [2].

\*\*\* End of Changes \*\*\*