3GPP TSG SA WG2#166 S2-2411936

Orlando, USA,18-22 November 2024 (revision of)

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **23.503** | **CR** | **1438** | **rev** | **-** | **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:*** | Support of network slice replacement based on AF request | | | | | | | | | |
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| ***Source to WG:*** | ZTE, KDDI | | | | | | | | | |
| ***Source to TSG:*** | SA2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | DUMMY | | | | |  | ***Date:*** | | | 2024-11-04 |
|  |  | | | |  | |  | | |  |
| ***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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
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| ***Reason for change:*** | | This CR proposes adding the AF requested slice replacement feature to “AF influence on Access and Mobility related policy control”. This change enables the AF to request the slice replacement. | | | | | | | | |
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| ***Summary of change:*** | | * add the AF requested slice replacement feature to “6.1.2.1 Access and mobility related policy control” , “6.1.2.6 AF influence on Access and Mobility related policy control”and “6.5 Access and mobility related policy information”. | | | | | | | | |
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| ***Consequences if not approved:*** | | Lack of the support of AF-requested slice replacement in the 5GS | | | | | | | | |
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| ***Clauses affected:*** | | 6.1.2.1.1, 6.1.2.6, 6.5 | | | | | | | | |
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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 ... | | |
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| ***Other comments:*** | | The DUMMY WI code needs to be replaced by the TEI19\_XX WI on "New WID on Network Controlled Network Slice Selection", once allocated after the WI approval | | | | | | | | |
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| ***This CR's revision history:*** | |  | | | | | | | | |

\* \* \* Start of Change \* \* \*

6.1.2 Non-session management related policy control

6.1.2.1 Access and mobility related policy control

6.1.2.1.1 General

The access and mobility related policy control encompasses the management of service area restrictions, the management of the RFSP Index, the management of the UE-AMBR, the management of the UE Slice-MBR, the slice replacement management and the management of the SMF selection. This clause defines the management of service area restrictions and RFSP Index for a UE registered over 3GPP access. The management of service area restrictions for a 5G-RG or a FN-CRG using W-5GAN are specified in TS 23.316 [27].

The management of service area restrictions enables the PCF of the serving PLMN (e.g. V-PCF in roaming case) to modify the service area restrictions used by AMF as described in clause 5.3.4 of TS 23.501 [2].

A UE's subscription may contain service area restrictions, which may be further modified by PCF based on operator defined policies at any time, either by expanding a list of allowed TAIs or by reducing a non-allowed TAIs or by increasing the maximum number of allowed TAIs. Operator defined policies in the PCF may depend on input data such as UE location, time of day, information provided by other NFs such as an AF request to change the service coverage, network analytics from NWDAF, etc.

The AMF may report the subscribed service area restrictions received from UDM during Registration procedure or when the AMF changed, the conditions for reporting are that local policies in the AMF indicate that access and mobility related policy control is enabled. The AMF reports the subscribed service area restrictions to the PCF also when the policy control request trigger for service area restrictions changes, as described in clause 6.1.2.5, is met. The AMF receives the modified service area restrictions from the PCF. The AMF stores them and then uses it to determine mobility restriction for a UE. The PCF may indicate to the AMF that there is an unlimited service area.

The service area restrictions consist of a list of allowed TAI(s) or a list of non-allowed TAI(s) and optionally the maximum number of allowed TAIs.

NOTE 1: The enforcement of the service area restrictions is performed by the UE, when the UE is in CM-IDLE state or in CM-CONNECTED state when in RRC Inactive, and in the RAN/AMF when the UE is in CM-CONNECTED state.

The management of the RFSP Index enables the PCF to modify the RFSP Index used by the AMF to perform radio resource management functionality as described in clause 5.3.4 of TS 23.501 [2]. The PCF may determine to modify the RFSP Index at any time based on operator policies that take into consideration e.g. accumulated usage, load level information per network slice instance, the indication that high throughput is desired for a specific application traffic or independently of the application in use and other information described in clause 6.1.1.3. If the modified RFSP index value indicates that EPC/E-UTRAN access is prioritized over the 5G access for the UE, the PCF may, based on operator policy, include a RFSP Index in Use Validity Time of the RFSP Index.

The determination of the RFSP Index value requires to configure the PCF with the mapping of RAT Type and/or Frequency value to the RFSP Index that will be sent to RAN.

Operator policies in the PCF may modify the RFSP index based on the Allowed NSSAI, Target NSSAI, Partially Allowed NSSAI, S-NSSAI(s) rejected partially in the RA, rejected S-NSSAI(s) for the RA, Alternative S-NSSAI(s) mapped to some Replaced S-NSSAI(s) or Pending NSSAI as defined in clause 5.15 of TS 23.501 [2].

Operator policies in the PCF may determine that the access and mobility related policy information (e.g. RFSP index value or service area restrictions) can change at the start and stop of an application traffic detection, at the start and stop of a SM Policy Association to a DNN and S-NSSAI, or immediately. In the former case, the PCF subscribes to the SMF for application traffic detection as described in clause 6.2.2.5. In addition, when the PCF evaluates that the access and mobility related policy information need any changes, the PCF reports it to the AF if the AF has subscribed to the notification on outcome of service area coverage change as defined in clause 6.1.3.18.

Operator policies in the PCF may determine that the access and mobility related policy information (e.g. RFSP index value or service area restrictions) can change based on the Spending Limits information from CHF as defined in clause 6.1.1.4.

For radio resource management, the AMF may report the subscribed RFSP Index received from UDM during the Registration procedure or when the AMF changed. The conditions for reporting are that local policies in the AMF indicate that access and mobility related policy control is enabled. The AMF reports the subscribed RFSP Index to the PCF when the subscription to the RFSP Index change to the PCF is met. The AMF receives the modified RFSP Index from the PCF.

NOTE 2: The enforcement of the RFSP Index is performed in the RAN.

Upon change of AMF, the source AMF informs the PCF that the UE context was removed in the AMF in the case of inter-PLMN mobility.

The management of UE-AMBR enables the PCF to provide the UE-AMBR information to the AMF based on serving network policy. The AMF may report the subscribed UE-AMBR received from UDM. The conditions for reporting are that the PCF provided Policy Control Request Triggers the AMF to report subscribed UE-AMBR. The AMF receives the modified UE-AMBR from the PCF. The AMF provides a UE-AMBR value of the serving network to the RAN as specified in clause 5.7.2.6 of TS 23.501 [2].

The management of the SMF selection enables the PCF to instruct the AMF to contact the PCF during the PDU Session Establishment procedure to perform a DNN replacement, as specified in clause 5.6.1 of TS 23.501 [2]. To indicate the conditions to check whether to contact the PCF at PDU Session establishment (as specified in clause 6.1.2.5), the PCF provides the Policy Control Request Triggers SMF selection management and, if necessary Change of the Allowed NSSAI, together with SMF selection management related policy information (see clause 6.5) during UE Registration procedure and at establishment of the AM Policy Association.

The PCF may update the SMF selection management information based on a PCF local decision or upon being informed about a new Allowed NSSAI. The AMF applies the updated SMF selection management information to new PDU Sessions only, i.e. already established PDU Sessions are not affected.

The management of the slice replacement enables the PCF to instruct the AMF to contact the PCF to provide the Alternative S-NSSAI for each S-NSSAI that requires slice replacement as specified in clause 5.15.19 of TS 23.501 [2]. The AMF reports S-NSSAI(s) of the serving network that requires slice replacement. The conditions for reporting are defined in clause 6.1.2.5. The PCF returns the Alternative S-NSSAI for the S-NSSAI of the serving network received from the AMF. The AMF receives the Alternative S-NSSAI for each S-NSSAI that requires slice replacement for which it has provided to the PCF.

If the AMF has indicated support of the Network Slice Replacement for the UE and the PCF detects the change in the availability of the S-NSSAI in the Allowed NSSAI (i.e. the S-NSSAI becomes unavailable or available) based on a PCF local decision (e.g. based on OAM or NWDAF analytics output), the PCF notifies the S-NSSAI availability information (see clause 6.5) based on the implicit subscription from the AMF. The AMF may also interact with the PCF to determine the Alternative S-NSSAI for S-NSSAI to be replaced based on Policy Control Request Triggers as defined in clause 6.1.2.5.

The PCF may receive AF triggered network slice replacement requirement from the AF or NEF, including the Replaced S-NSSAI and the corresponding Alternative S-NSSAI. Based on the implicit subscription from the AMF, the PCF notifies the S-NSSAI availability information including the Replaced S-NSSAI, the corresponding Alternative S-NSSAI and an indication indicating that the replacement is requested by an AF, to the AMF, (see clause 6.5 as specified in clause 5.15.5.2.2a of TS 23.501 [2].The optional management of UE-Slice-MBR enables the PCF to modify the value in the list of Subscribed UE-Slice-MBR assigned to a SUPI based on serving network policies, if the HPLMN permits based on roaming agreement. The AMF reports the Subscribed UE-Slice-MBR for each S-NSSAI of the serving network. The S-NSSAI of the VPLMN is derived from the Subscribed S-NSSAI by the AMF and provided to the PCF. The AMF may provide the Subscribed S-NSSAI together with the S-NSSAI of the VPLMN. The conditions for reporting are defined in clause 6.1.2.5. The PCF returns the authorized UE-Slice-MBR for the S-NSSAI of the serving network. The AMF receives the authorized list of UE-Slice-MBR value for each S-NSSAI for which it has provided the Subscribed UE-Slice-MBR from the PCF. Then the AMF provides the authorized list of UE-Slice-MBR for the S-NSSAIs in the Allowed S-NSSAI to the RAN as specified in clause 5.7.1.10 of TS 23.501 [2].

The optional management of 5G access stratum time distribution enables the PCF for the UE to instruct the AMF about the 5G access stratum time distribution parameters, i.e. 5G access stratum time distribution indication (enable, disable). Optionally, when 5G access stratum time distribution or (g)PTP time synchronization is enabled, the PCF for the UE instructs the AMF about the Uu Time synchronization error budget. Optionally, when 5G access stratum time distribution is enabled, the PCF for UE instructs the AMF about the clock quality reporting control information (clock quality detail level, clock quality acceptance criteria).

In the case that the PCF for the UE (providing the access and mobility related policy information) and the PCF for the PDU Session of this UE (providing the Session Management related policies) are separate PCF instances, the following applies:

- If the PCF for the UE determines that the access and mobility related policy information can change at the start and stop of an application traffic detection, the following applies:

- The PCF for the UE may subscribes to be notified about the PCF binding information when a PCF for the PDU Session (of this UE) is registered in the BSF, including the SUPI, DNN, S-NSSAI. The DNN, S-NSSAI is either provided by the AF or locally configured in the PCF for certain Application Identifier(s). An alternative mechanism for the PCF for the UE to be notified of the PCF for the PDU Session of this UE is to request the AMF to send to the PCF for the PDU Session of the DNN, S-NSSAI, via SMF, the request for notification of SM Policy Association establishment. In this case, the PCF for the PDU Session should subscribe Request for notification on SM Policy Association establishment or termination Policy Control Request Trigger as described in clause 6.1.3.5 to get the binding information of PCF for the UE (as defined in clause 6.1.1.2.2).

- When the PCF for the UE is notified that PCF for the PDU Session is registered, either via the BSF that provides the UE address, DNN and the PCF address, PCF instance Id and PCF set id if available or via PCF for the PDU Session when it received a request for notification from the SMF. The PCF for the UE may subscribe to the "start/stop of application traffic detection" event defined in clause 6.1.3.18 or trigger a policy decision if there is a SM Policy Association to the DNN, S-NSSAI.

- The reporting of "start/stop of application traffic detection" to the PCF for the UE is used as input for a policy decision to change the access and mobility related policy information.

NOTE 3: The PCF for the UE may subscribe to the notifications of newly registered PCF for the PDU Session and subscribe to the "start/stop of application traffic detection" events for multiple applications with different application identifiers. When PCF receives the notifications for multiple applications, the PCF for the UE can determine which access and mobility related policy information to apply based on local configuration and operator policy.

- If the PCF for the UE determines that the access and mobility related policy information can change at the establishment and termination of a SM Policy Association to a DNN and S-NSSAI base on the notification sent by the BSF, the PCF may indicate to the BSF to report the registration of a PCF for the PDU Session when the first SM Policy Association is established and the deregistration of the PCF for the PDU Session when the last SM Policy Association is terminated for a DNN, S-NSSAI.

- The PCF for the UE checks if an AF is subscribed to be notified on outcome of service area coverage change, using the related event defined in clause 6.1.3.18.

#### 6.1.2.5 Policy Control Request Triggers relevant for AMF

The Policy Control Request Triggers relevant for AMF are listed in the tables below and define the conditions when the AMF shall interact again with PCF after the AM Policy Association Establishment or UE Policy Association Establishment.

The PCF provides Policy Control Request Triggers to the AMF indicating a specific UE (i.e. SUPI or PEI) in the Policy Association establishment and modification procedures defined in the TS 23.502 [3]. The Policy Control Request Triggers are transferred from the old AMF to the new AMF when the AMF changes.

The Policy Control Request Triggers are not applicable any longer at termination of the AM Policy Association or termination of UE Policy Association.

Table 6.1.2.5-1: Policy Control Request Triggers relevant for AMF and 3GPP access type

| Policy Control Request Trigger | Description | Condition for reporting |
| --- | --- | --- |
| Location change (tracking area) | The tracking area of the UE has changed. | PCF (AM Policy Association, UE Policy Association) |
| Change of UE presence in Presence Reporting Area | The UE is entering/leaving a Presence Reporting Area. | PCF (AM Policy Association, UE Policy Association) |
| Service Area restriction change | The subscribed service area restriction information has changed. | PCF (AM Policy Association) |
| RFSP index change | The subscribed RFSP index has changed. | PCF (AM Policy Association) |
| Change of the Allowed NSSAI | The Allowed NSSAI has changed. | PCF (AM Policy Association) |
| Generation of Target NSSAI | The Target NSSAI has been generated. | PCF (AM Policy Association) |
| Change of Partially Allowed NSSAI | The Partially Allowed NSSAI has changed. | PCF (AM Policy Association) |
| Change of S-NSSAI(s) rejected partially in the RA | The S-NSSAI(s) rejected partially in the RA has changed. | PCF (AM Policy Association) |
| Change of rejected S-NSSAI(s) for the RA | The rejected S-NSSAI(s) for the RA has changed. | PCF (AM Policy Association) |
| Change of Pending NSSAI | The Pending NSSAI has changed. | PCF (AM Policy Association) |
| UE-Slice-MBR change | The subscribed UE-Slice-MBR has changed. | PCF (AM Policy Association) |
| PLMN change | The UE has moved to another operators' domain. | PCF (UE Policy Association) |
| Slice replacement management | The AMF cannot determine the Alternative S-NSSAI for an S-NSSAI or, the AMF has determined/changed the Alternative S-NSSAI for an S-NSSAI after received the Alternative S-NSSAI from OAM or network slice availability notification from NSSF, or if the AMF is requested to perform Network Slice Replacement but the AMF determines that the Network Slice Replacement is not triggered. | PCF (AM Policy Association) |
| Connectivity state changes | The connectivity state of UE is changed. | PCF (UE Policy Association) |
| NWDAF info change | The NWDAF instance IDs used for the UE or associated Analytics IDs used for the UE and available in the AMF have changed. | PCF (AM Policy Association) |
| Satellite backhaul category change | Satellite backhaul category changes between different types of satellite backhaul, or between satellite backhaul and non-satellite backhaul. | PCF (UE Policy Association) |
| LBO Information change | LBO Information (i.e. DNN(s) and/or S-NSSAI(s) that are allowed for LBO in VPLMN in SMF Selection Data) has changed. | PCF (UE Policy Association) |

Table 6.1.2.5-1a: Policy Control Request Triggers relevant for AMF and both 3GPP and Non 3GPP access type

|  |  |  |
| --- | --- | --- |
| Policy Control Request Trigger | Description | Condition for reporting |
| Access Type change  (NOTE 1)  (NOTE 2) | The Access Type or RAT Type or both Access Type and RAT Type changed, added, or removed. | PCF (AM Policy Association, UE Policy Association) |
| UE-AMBR change | The subscribed UE-AMBR has changed. | PCF (AM Policy Association) |
| SMF selection management | UE request for an unsupported DNN or UE request for a DNN within the list of DNN candidates for replacement per S-NSSAI. | PCF (AM Policy Association) |
| Configured NSSAI change | The Configured NSSAI has changed. | PCF (UE Policy Association) |
| NOTE 1: RAT Type change is applicable only for AM Policy.  NOTE 2: Corresponding triggers are defined for this PCRT at stage 3. | | |

Table 6.1.2.5-2: Policy Control Request Triggers relevant for AMF and Non 3GPP access type

|  |  |  |
| --- | --- | --- |
| Policy Control Request Trigger | Description | Condition for reporting |
| wrong non-3GPP access | UE has connected to a wrong non-3GPP access that does not match its subscribed S-NSSAI(s). | Always report |

NOTE 1: In the following description of the Policy Control Request Triggers relevant for AMF, the term trigger is used instead of Policy Control Request Trigger where appropriate.

If the Location change trigger are armed, the AMF shall activate the relevant procedure which reports any changes in location as explained in clause 5.6.11 of TS 23.501 [2] by subscribing with the Npcf\_AMPolicyAssociation service or Npcf\_UEPolicyAssociation service. The reporting is requested to the level indicated by the trigger (i.e. Tracking Area). The AMF reports that the Location change trigger was met and the Tracking Area identifier.

If the Change of UE presence in Presence Reporting Area trigger is armed, i.e. the PCF subscribed to reporting change of UE presence in a Presence Reporting Area, including a list of PRA ids. In addition, for "UE-dedicated Presence Reporting Area" a short list of TAs and/or NG-RAN nodes and/or cells identifiers is included. Then, the AMF shall activate the relevant procedure which reports any Change of UE presence in Area of Interest as explained in clause 5.6.11 of TS 23.501 [2]. The reporting is requested for the specific condition when target UE moved into a specified PRA. The AMF reports the PRA Identifier(s) and indication(s) whether the UE is inside or outside the Presence Reporting Area(s) to the PCF.

The Service Area restriction change trigger and the RFSP index change trigger shall trigger the AMF to interact with the PCF for all changes in the Service Area restriction or RFSP index data received in AMF from UDM. The reporting includes that the trigger is met and the subscribed Service Area restriction or the subscribed RFSP index provided to AMF by UDM, as described in clause 6.1.2.1.

The Change of the Allowed NSSAI trigger shall trigger the AMF to interact with the PCF if the Allowed NSSAI has been changed. The reporting includes that the trigger is met and the new Allowed NSSAI. The PCF may update RFSP index and/or SMF selection management related policy information (described in clause 6.5) in the AMF based on the Allowed NSSAI.

The Generation of a Target NSSAI trigger shall trigger the AMF to interact with the PCF. The reporting includes that the trigger is met and the generated Target NSSAI. The PCF may generate RFSP index associated with the Target NSSAI.

The Change of the Partially Allowed NSSAI trigger shall trigger the AMF to interact with the PCF if the Partially Allowed NSSAI has been changed. The reporting includes that the trigger is met and the new Partially Allowed NSSAI. The PCF may update RFSP index related policy information (described in clause 6.5) in the AMF based on the Partially Allowed NSSAI.

The Change of the S-NSSAI(s) rejected partially in the RA shall trigger the AMF to interact with the PCF if the S-NSSAI(s) rejected partially in the RA has been changed. The reporting includes that the trigger is met and the new S-NSSAI(s) rejected partially in the RA. The PCF may update RFSP index related policy information (described in clause 6.5) in the AMF based on the S-NSSAI(s) rejected partially in the RA.

The Change of the rejected S-NSSAI(s) for the RA shall trigger the AMF to interact with the PCF if the rejected S-NSSAI(s) for the RA has been changed. The reporting includes that the trigger is met and the new rejected S-NSSAI(s) in the RA. The PCF may update RFSP index related policy information (described in clause 6.5) in the AMF based on the rejected S-NSSAI(s) for the RA.

The Change of the Pending NSSAI trigger shall trigger the AMF to interact with the PCF if the Pending NSSAI has been changed. The reporting includes that the trigger is met and the new Pending NSSAI. The PCF may update RFSP index related policy information (described in clause 6.5) in the AMF based on the Pending NSSAI.

If the Configured NSSAI change trigger is armed, the AMF shall report the Configured NSSAI and mapping of each S-NSSAI of the Configured NSSAI to corresponding HPLMN S-NSSAI values as defined in clause 5.15.4.1.1 of TS 23.501 [2] to the PCF. The V-PCF sends the HPLMN S-NSSAI to the H-PCF after mapping the S-NSSAI of the VPLMN into the S-NSSAI of the HPLMN as described in clause 4.15.6.7 of TS 23.502 [3]. The H-PCF may take this into account to update UE Policy as defined in clause 6.1.2.2. When the UE is connected to a non-3GPP access, the PCF may take this into account to update UE Policy e.g. ANDSP as defined in clause 6.1.2.2.

The UE-AMBR change trigger shall trigger the AMF to interact with the PCF for all changes in the subscribed UE-AMBR data received in AMF from UDM. The reporting includes that the trigger is met and the subscribed UE-AMBR provided to AMF by UDM, as described in clause 6.1.2.1.

The Slice-UE-MBR change trigger shall trigger the AMF to interact with the PCF for all changes in the Subscribed UE-Slice-MBR for each subscribed S-NSSAI in the NSSAI with a Subscribed UE-Slice-MBR received at the AMF from UDM. The reporting includes that the trigger is met, as described in clause 6.1.2.1.

If the PLMN change trigger is armed, the AMF shall report it to the PCF to trigger the update of V2X service authorization parameters to the UE as defined in clause 6.2.2 of TS 23.287 [28], to trigger the update of ProSe authorization parameters to the UE as defined in clause 6.2.2 of TS 23.304 [34], to trigger the update of A2X service authorization parameters to the UE as defined in clause 6.3.2.2 of TS 23.256 [43] and to trigger the update of Ranging/Sidelink Positioning authorization parameters to the UE as defined in clause 6.2.2 of TS 23.586 [41]. The reporting includes the event with the serving PLMN ID.

If the SMF selection management trigger is set, then the AMF shall contact the PCF when the AMF detects that the UE requested an unsupported DNN and the PCF indicated DNN replacement of unsupported DNNs in the Access and mobility related policy information (see clause 6.5). The PCF shall select a DNN and provide the selected DNN to the AMF.

If the SMF selection management trigger is set, then the AMF shall contact the PCF when the UE requested a DNN within the list of DNN candidates for replacement for the S-NSSAI indicated in the Access and mobility related policy information (see clause 6.5). The PCF shall select the DNN and provide the selected DNN to the AMF.

If the slice replacement management trigger is set, the AMF shall contact the PCF:

- in Case i) when AMF cannot determine the Alternative S-NSSAI for the S-NSSAI(s), e.g. NSSF doesn't provide Alternative S-NSSAI and there is no Alternative S-NSSAI in the AMF local configuration. The reporting includes that the trigger is met, the S-NSSAI(s) that requires slice replacement, as described in clause 6.1.2.1.

- in Case ii) if the AMF can determine the Alternative S-NSSAI for the S-NSSAI(s) when network slice replacement applies for some S-NSSAIs, or if the AMF determines to stop the network slice replacement for some S-NSSAI(s) after receiving the Alternative S-NSSAI from OAM or network slice availability notification from NSSF. The reporting includes the trigger is met and S-NSSAI(s) that requires slice replacement and the corresponding Alternative S-NSSAI. If no corresponding Alternative S-NSSAI is provided, the PCF is informed no Alternative S-NSSAI is mapped to the replaced S-NSSAI(s) any longer.

NOTE 2: In the above two cases, the Alternative S-NSSAI does not have to be a Subscribed S-NSSAIs.

NOTE 3: AMF receiving network slice replacement notification from the PCF is not a trigger for the AMF to update the PCF with the mapping information between Alternative S-NSSAI and replaced S-NSSAI.

- in Case iii) if the AMF is requested to trigger the network slice replacement as described in clause 5.15.5.2.2a of TS23.501[2] and the AMF determines that the network slice replacement cannot be triggered. The reporting includes that the trigger is met, and a cause value.

If the Connectivity state changes trigger is set, then the AMF shall notify the PCF when the UE connectivity state is changed e.g. from IDLE to CONNECTED. The AMF then reset the trigger.

The NWDAF info change trigger shall trigger the AMF to interact with the PCF when the list of NWDAF Instance IDs used for the UE or associated Analytics IDs used for the UE at the AMF are changed in the AMF.

If the Satellite backhaul category change trigger is armed, the AMF shall report the Satellite backhaul category to indicate the change between different types of satellite backhaul, or the change between satellite backhaul and non-satellite backhaul (as specified in clause 5.43.4 of TS 23.501 [2]) to the PCF. The PCF may take this into account to update UE Policy as defined in clause 6.1.2.2.

The AMF indicates a PCRT corresponding to wrong non-3GPP access when the UE has connected to a non-3GPP access that is not supporting the configured NSSAI. The AMF also indicates whether it is for untrusted or trusted non-3GPP access. This triggers the PCF to update the relevant policies on the UE e.g. WLANSP or Non-3GPP access network selection information.

If the LBO Information change is armed, the AMF shall report the LBO Information (i.e. DNN(s) and/or S-NSSAI(s) that are allowed in VPLMN for LBO roaming in SMF Selection Data) to the PCF when there is change in the LBO Information.

If the Access Type change trigger is met, the AMF reports the changed, the added or the removed Access Type and/or the changed RAT Type to the PCF.

\* \* \* Next Change \* \* \*

6.1.2.6 AF influence on Access and Mobility related policy control

6.1.2.6.0 General

The AF influence on Access and Mobility related policy control refers to the AF capability to request a service area coverage or the indication that high throughput is desired for a UE.

Two methods enable the AF to influence Access and Mobility related policy control (see clause 4.15.6.9 of TS 23.502 [3] for the related procedures):

- The AF requests a service area coverage for the UE and/or indicates that high throughput is desired, knowing that certain conditions are met, i.e. the application traffic needs a change of service area coverage or high throughput, as defined in clause 6.1.2.6.1.

- The AF provides the service area coverage and/or the indication that high throughput is desired for one or multiple UEs that may or may not already be registered or fulfil certain conditions related to application traffic. This is considered when the AM Policy Association is established or via a modification of an AM Policy Association, as defined in clause 6.1.2.6.2.

The AF may also support to influence on Access and Mobility related policy to request network slice replacement for target UE, as defined in clause 6.1.2.6.1 and clause 6.1.2.6.2.

6.1.2.6.1 AF request Access and Mobility related Policy Control for a UE

This clause applies to non-roaming, i.e. cases where the PCF, AF, AMF and SMF belong to the serving PLMN, or the AF belongs to a third party with which the Serving PLMN has an agreement. AF influence on Access and Mobility related policy control does not apply in the case of Home Routed or Local breakout roaming cases.

The AF may subscribe to notifications when a PCF for the UE is registered in the BSF for a certain SUPI or GPSI.

The AF may contact, either directly or via NEF, the PCF for the UE to request notifications on the outcome of a service area coverage change (represented as a geographical area or a list of TA(s)) or the indication that high throughput is desired for UE traffic or both, for a SUPI or a GPSI. The request applies until the AF requests to terminate the request, or the AF request expires (according to relevant input provided by the AF), or the AM Policy Association is terminated. The AF may subscribe to notifications on the outcome of the service area coverage change to the PCF, according to the events described in clause 6.1.3.18. At the time the AF request expires, the PCF removes the context provided by the AF and then checks if the Access and Mobility related policy information needs to be updated at the AMF.

NOTE: The assumption is that the AF also removes the context at the time the AF request expires.

When the AF contacts the NEF then the following mappings are performed by the NEF:

1) The geographical area (e.g. a civic address or shapes) is mapped into a list of TAs determined by local configuration.

2) The GPSI, if provided, is mapped to a SUPI according to the subscription information received from UDM.

The PCF takes the list of TAs as input for policy decisions, considering the list of TAs provided by the AF as allowed TAIs for the UE when calculating the service area restrictions, then checking operator policies to determine whether the service area restrictions need to be updated.

The PCF reports the outcome of a service area coverage change, including the list of allowed TAIs (that is mapped to a geographical area if the requests goes via NEF) and any changes to the AF, according to the events described in clause 6.1.3.18.

The PCF checks if the RFSP value index for a UE needs to be changed, as described in clause 6.1.2.1, using the indication that high throughput is desired. The PCF reports to the AF that the request was executed, but without reporting anything related to actually applied RFSP or throughput changes.

The AF may request either directly or via NEF that the network slice replacement is requested for target UE. The AF Request may include the Replaced S-NSSAI and the Alternative S-NSSAI. If the AF requests the Network Slice replacement via a NEF, the AF provides slice replacement requirement defined by a pair (Replaced AF-Service-Identifier, Alternative AF-Service-Identifier) to the NEF and the NEF maps the AF-Service-Identifiers into Replaced S-NSSAI and Alternative S-NSSAI. The PCF triggers the network slice replacement based on the indication that slice replacement is requested, as described in clause 6.1.2.1. The PCF reports to the AF that the request was executed.6.1.2.6.2 AF request to influence on Access and Mobility related Policy Control

This clause applies to non-roaming and LBO roaming i.e. to cases where the involved entities (AF, PCF, SMF, AMF) belong to the Serving PLMN, or the AF belongs to a third party with which the Serving PLMN has an agreement. In LBO roaming, the AF request targets any inbound roaming UEs (identified by their home PLMN ID(s)) combined with DNN/S-NSSAI or External Application Identifier(s). AF influence on Access and Mobility related policy control does not apply in the case of Home Routed case.

The PCF for the UE may subscribe at UDR to notifications on change of "Application Data" and "AM influence information", e.g. when the AM Policy Association is established.

The AF may request notifications on outcome of service area coverage change, represented by a geographical area, may indicate that high throughput is desired for one or multiple target UEs, which may be associated to an Application Identifier(s) or to a (DNN,S-NSSAI) combination (if no Application Identifier(s) or (DNN,S-NSSAI) combination is provided, the request applies independently of the application traffic), the AF transaction identifier (allowing the AF to update or remove the AM influence data), a policy expiration time, and the Notification Correlation Id, then the NEF performs the following mappings where needed:

1) The geographical area(s) are mapped into a list of TAs determined by local configuration.

2) The GPSI, if provided, is mapped to a SUPI according to the subscription information received from UDM.

3) External Group Identifier(s) are mapped to Internal Group Identifier(s).

The NEF stores the AF request in the UDR as Data Set "Application Data" and Data Subset "AM influence information".

The PCF calculates the service area restrictions as defined in clause 6.1.2.6.1, including the notification to the AF on the service area coverage as described in clause 6.1.3.18, in this case it is implicit subscription, to the AF using the Notification Correlation Id.

The PCF calculates the RFSP index value as defined in clause 6.1.2.6.1.

When the expiration time of the policy is reached or when the PCF receives a notification from the UDR that the policy has been deleted, the PCF re-evaluates the policies without consideration of the AM influence data of the expired policy and applies policies as defined in clause 6.1.2.1.

The AF may request via NEF that the network slice replacement is requested for target UE that may or may not already be registered. The AF Request may include the Replaced S-NSSAI and the Alternative S-NSSAI, or the AF-Service-Identifiers. In this case the NEF maps the AF-Service-Identifiers into Replaced S-NSSAI and Alternative S-NSSAI. The PCF triggers the network slice replacement based on the indication that slice replacement is requested, as described in clause 6.1.2.1.

The AF may request via a network slice replacement for target UE via a NEF. The NEF stores the AF Request in the UDR which include the replaced S-NSSAI and the Alternative S-NSSAI, The AF requests the network slice replacement via a NEF by providing a slice replacement requirement defined by a pair (Replaced AF-Service-Identifier, Alternative AF-Service-Identifier) to the NEF and the NEF maps the AF-Service-Identifiers into Replaced S-NSSAI and Alternative S-NSSAI respectively. The PCF receives notification from the UDR of updated "AM influence information" and the PCF triggers the network slice replacement based on the indication that slice replacement is requested, as described in clause 6.1.2.1. The PCF reports to the AF that the request was executed.

\* \* \* Next Change \* \* \*

#### 6.1.3.18 Event reporting from the PCF

The AF may subscribe/unsubscribe to notifications of events from the PCF for the PDU Session to which the AF session is bound. The AF can either subscribe/unsubscribe directly at the PCF or indirectly via an NEF or a TSCTSF.

The PCF for the UE may subscribe/unsubscribe to notifications of events from the PCF for the PDU Session. Other NFs may subscribe/unsubscribe to notifications of events from the PCF for the PDU Session or from the PCF for the UE.

The events that can be subscribed by the AF and by other NFs are listed in Table 6.1.3.18-1.

Table 6.1.3.18-1: Events relevant for reporting from the PCF

| Event | Description | NF that can subscribe for reporting | Availability for Rx PDU Session (NOTE 2) | Availability for N5 per PDU Session | Availability for Bulk Subscription  (NOTE 1) | Availability for N43 per SUPI, DNN, S-NSSAI | Availability for N5 per UE  (NOTE 6) | Availability for N24 per UE  (NOTE 6) |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| PLMN Identifier Notification  (NOTE 5) | The PLMN identifier or SNPN identifier where the UE is currently located. | AF, PCF | Yes | Yes | Yes | No | No | Yes |
| Change of Access Type | The Access Type and, if applicable, the RAT Type of the PDU Session has changed. | AF | Yes | Yes | Yes | No | No | No |
| EPS fallback | EPS fallback is initiated | AF | Yes | Yes | No | No | No | No |
| Signalling path status | The status of the resources related to the signalling traffic of the AF session. | AF | Yes | Yes | No | No | No | No |
| Access Network Charging Correlation Information | The Access Network Charging Correlation Information of the resources allocated for the AF session. | AF | Yes | Yes | No | No | No | No |
| Access Network Information Notification | The user location and/or timezone when the PDU Session has changed in relation to the AF session. | AF | Yes | Yes | No | No | No | No |
| Reporting Usage for Sponsored Data Connectivity | The usage threshold provided by the AF has been reached; or the AF session is terminated. | AF | Yes | Yes | No | No | No | No |
| Service Data Flow deactivation | The resources related to the AF session are released. | AF, TSCTSF | Yes | Yes | No | No | No | No |
| Resource allocation outcome | The outcome of the resource allocation related to the AF session. | AF, TSCTSF | Yes | Yes | No | No | No | No |
| QoS targets can no longer (or can again) be fulfilled | The QoS targets can no longer (or can again) be fulfilled by the network for (a part of) the AF session. | AF | No | Yes | No | No | No | No |
| QoS Monitoring parameters | The QoS Monitoring parameter(s) (as defined in clause 5.45 of TS 23.501 [2]) are reported to the AF according to the subscription based on QoS Monitoring reports received from the SMF. | AF | No | Yes | No | No | No | No |
| Network support for QoS Monitoring | The QoS Monitoring can no longer (or can again) be performed by the network for the service data flow. | AF | No | Yes | No | No | No | No |
| Packet Delay Variation | Monitoring and reporting of 5GS Packet Delay Variation based on packet delay measured between UE and PSA UPF. | AF | No | Yes | No | No | No | No |
| Round-trip delay measurement over two service data flows | Measurements of round-trip delay considering the UL direction of a service data flow and the DL direction of another service data flow. It is derived from measurements of packet delay between UE and PSA UPF. | AF | No | Yes | No | No | No | No |
| Network support for ECN marking for L4S  (NOTE 8) | The ECN marking for L4S can no longer (or can again) be performed by the network for the service data flow. | AF | No | Yes | No | No | No | No |
| Out of credit | Credit is no longer available. | AF | Yes | Yes | No | No | No | No |
| Reallocation of credit | Credit has been reallocated after the former Out of credit indication. | AF | Yes | Yes | No | No | No | No |
| 5GS Bridge/Router information Notification  (NOTE 3) | 5GS Bridge/Router information that the PCF has received from the SMF. | TSN AF, TSCTSF | No | Yes | No | No | No | No |
| Notification on outcome of service area coverage change | The outcome of the request of service area coverage change. | AF | No | No | Yes | No | Yes | No |
| Notification on outcome of UE Policies delivery | The outcome of the request for UE policies delivery due to service specific parameter provisioning procedure. | AF | No | No | No | No | No | Yes |
| Start of application traffic detection and  Stop of application traffic detection | The start or the stop of application traffic has been detected. | PCF, AF | No | No | Yes | Yes  (NOTE 4) | No | No |
| UE reporting Connection Capabilities from associated URSP rule | The Connection Capability received from the UE during PDU Session Establishment or Modification, see clause 6.6.2.4. | PCF | No | No | No | Yes | No | Yes |
| Satellite backhaul category change | The backhaul has changed between different types of satellite backhaul, or the backhaul has changed between satellite backhaul and non-satellite backhaul. | AF | No | Yes | Yes | No | No | No |
| Change of PDUID | The PDUID assigned to a UE has changed. | 5G DDNMF | No | No | No | No | Yes | No |
| SM Policy Association established or terminated | The establishment or termination of a SM Policy Association is reported. | PCF | No | No | No | Yes  (NOTE 7) | No | No |
| Reporting of extra UE addresses | Reporting of the extra IP addresses or address ranges allocated for the given PDU Session resulting from framed routes or IPv6 prefix delegation. | TSCTSF | No | Yes | No | No | No |  |
| Notification on BAT offset | The PCF reports the BAT offset and optionally the adjusted periodicity that has been received from the SMF. | TSCTSF | No | Yes | No | No | No |  |
| UE reachability status change | The PCF reports when it receives an indication of a change of the UE reachability status. | AF | No | Yes | No | No | No | No |
| Result of UE Policy Container delivery via EPS | The PCF reports the result of UE policies delivery via EPS. | PCF | No | No | No | Yes  (NOTE 9) | No | No |
| Notification on outcome Network Slice Replacement | The PCF reports the outcome of Network Slice Replacement | AF | No | No | No | No | No | No |
| NOTE 1: Additional parameters for the subscription as well as reporting related to these events are described in TS 23.502 [3].  NOTE 2: Applicability of Rx is described in Annex C.  NOTE 3: 5GS Bridge/Router information is described in clause 6.1.3.5.  NOTE 4: Bulk subscription is implicit. NOTE 1 does not apply.  NOTE 5: For a PDU Session established over a SNPN, the combination of the PLMN id and the NID identifies the SNPN.  NOTE 6: This column contains also UE context related events that are reported to other consumers such as 5G DDNMF via other reference points than N5. The Conditions for reporting column indicates the respective consumer.  NOTE 7: This PCF for the UE subscribes to this Event via AMF and SMF.  NOTE 8: Subscription to this event is performed implicitly when AF provides the ECN marking for L4S support indication.  NOTE 9: This PCF for the UE subscribes to this Event to PCF for the PDU Session. | | | | | | | | |

If an AF requests the PCF to report the PLMN identifier where the UE is currently located, then the PCF shall provide the PLMN identifier or the SNPN identifier to the AF if available. Otherwise, the PCF shall provision the corresponding PCC rules, and the Policy Control Request Trigger to report PLMN change to the SMF. The PCF shall, upon receiving the PLMN identifier or the SNPN identifier from the SMF forward this information to the AF, including the PLMN Id and if available the NID. If the H-PCF requests to report the PLMN identifier where the UE is currently located, the V-PCF provisions the PCRT on "PLMN change" to the AMF as described in clause 6.1.2.5 and then forwards the PLMN ID received from the AMF to the H-PCF.

If an AF requests the PCF to report on the change of Access Type, the PCF shall provide the corresponding Policy Control Request Trigger to the SMF to enable the report of the Change in Access Type to the PCF. The PCF shall, upon reception of information about the Access Type the user is currently using and upon indication of change of Access Type, notify the AF on changes of the Access Type and forward the information received from the SMF to the AF. The change of the RAT Type shall also be reported to the AF, even if the Access Type is unchanged. For MA PDU Session the Access Type information may include two Access Type information that the user is currently using.

If an AF requests the PCF to report on the signalling path status, for the AF session, the PCF shall, upon indication of removal of PCC Rules identifying signalling traffic from the SMF report it to the AF.

If an AF requests the PCF to report Access Network Charging Correlation Information, the PCF shall provide to the AF the Access Network Charging Correlation Information, which allows to identify the usage reports that include measurements for the Service Data Flow(s), once the Access Network Charging Correlation Information is known at the PCF.

If an AF requests the PCF to report Access Network Information (i.e. the User Location Report and/or the UE Timezone Report) at AF session establishment, modification or termination, the PCF shall set the Access Network Information report parameters in the corresponding PCC rule(s) and provision them together with the corresponding Policy Control Request Trigger to the SMF. For those PCC rule(s) based on preliminary service information the PCF may assign the 5QI and ARP of the QoS Flow associated with the default QoS rule to avoid signalling to the UE.

NOTE 1: The PCF can also use the dynamic or pre-defined PCC Rules related to the IMS signalling to request Access Network Information reporting. This can be used to support e.g. regulatory requirements for SMS over IP, where the IMS network (i.e. P‑CSCF) needs to retrieve the user location and/or UE Time Zone information. Note that due to regulatory requirements, the Access Network Information can be requested for SMS over IP, impacting a large number of PDU Sessions, that can lead to significant increase in signalling load when the Access Network Information is requested from AMF.

The PCF shall, upon receiving an Access Network Information report corresponding to the AF session from the SMF, forward the Access Network Information as requested by the AF (if the SMF only reported the serving PLMN identifier or the SNPN identifier to the PCF, as described in clause 6.1.3.5, the PCF shall forward it to the AF). For AF session termination the communication between the AF and the PCF shall be kept alive until the PCF report is received.

If an AF requests the PCF to report the Usage for Sponsored Data Connectivity, the PCF shall provision the corresponding PCC rules, and the Policy Control Request Trigger to the SMF. If the usage threshold provided by the AF has been reached or the AF session is terminated, the PCF forwards such information to the AF.

If an AF or TSCTSF requests the PCF to report the Service Data Flow deactivation, the PCF shall report the release of resources corresponding to the AF session. The PCF shall, upon being notified of the removal of PCC Rules corresponding to the AF session from the SMF, forward this information to the AF. The PCF shall also forward, if available, the reason why the resources are released, the user location information and the UE Timezone.

If an AF or TSCTSF requests the PCF to report the Resource allocation outcome, the PCF shall report the outcome of the resource allocation of the Service Data Flow(s) related to the AF session. The AF or TSCTSF may request to be notified about successful or failed resource allocation. In this case, the PCF shall instruct the SMF to report the successful resource allocation trigger (see clause 6.1.3.5). If the SMF has notified the PCF that the resource allocation of a Service Data Flow is successful and the currently fulfilled QoS matches an Alternative QoS parameter set (as described in clause 6.2.2.1), the PCF shall also provide to the AF the QoS Reference parameter or the Requested Alternative QoS Parameter Set which corresponds to the Alternative QoS parameter set referenced by the SMF. If the SMF has notified the PCF about resource allocation failure together with an Access Type (as described in clause 6.1.3.5), the PCF shall only notify the AF when the PCC rule is removed and without forwarding any Access Type information. If the SMF has notified the PCF about resource allocation failure due to UE temporary unreachable together with a maximum waiting time, if available, (as described in clause 6.1.3.5), the PCF shall notify the AF on resource allocation failure and provide the UE temporary unreachable and the maximum waiting time, if available.

If an AF requests the PCF to report when the QoS targets can no longer (or can again) be fulfilled for a particular media flow, the PCF shall set the QNC indication in the corresponding PCC rule(s) that includes a GBR or delay critical GBR 5QI value and provision them together with the corresponding Policy Control Request Trigger to the SMF. At the time, the SMF notifies that GFBR can no longer (or can again) be guaranteed for a QoS Flow to which those PCC Rule(s) are bound, the PCF shall report to the AF the affected media flow and provides the indication that QoS targets can no longer (or can again) be fulfilled. If additional information is received with the notification from SMF (see clause 5.7.2.4 of TS 23.501 [2]), the PCF shall also provide to the AF the QoS Reference parameter or the Requested Alternative QoS Parameter Set which corresponds to the Alternative QoS parameter set referenced by the SMF. If the SMF has indicated that the lowest priority Alternative QoS parameter set cannot be fulfilled, the PCF shall indicate to the AF that the lowest priority QoS Reference or the lowest priority set of Requested Alternative QoS Parameters of the Alternative Service Requirements cannot be fulfilled.

If the AF subscribes to be notified of the QoS Monitoring reports, the PCF decides about the path for the QoS Monitoring reports and sets the QoS Monitoring Policy Control Request Trigger accordingly, as described in clause 6.1.3.21. The PCF sends the QoS Monitoring reports to AF based on the QoS Monitoring reports that it receives from the SMF, according to AF subscription and PCF selected notification path e.g. PCF does not report to AF if AF will receive the QoS Monitoring reports directly from the UPF.

NOTE 2: The QoS Monitoring report received by the PCF and the information sent to the AF can be different. The QoS Monitoring report (e.g. packer delay) may be used by PCF to calculate the requested QoS parameter (e.g. packet delay variation).

NOTE 3: This event can only be subscribed as part of an AF session with required QoS (described in clause 6.1.3.22) and as part of AF requested QoS for a UE or group of UEs not identified by a UE address (described in clause 6.1.3.28).

NOTE 4: If the service data flow is mapped to two QoS Flows (i.e. the UL traffic and DL traffic of the service data flow are separated into two QoS Flows respectively) in the same PDU Session, the PCF triggers QoS Monitoring for each direction packet delay of the individual QoS Flows respectively and generates the QoS Monitoring reports for the AF based on the packet delay monitored on the QoS Flow for each direction (as described in clause 5.37.4 of TS 23.501 [2]).

If the AF subscribes to be notified of Packet Delay Variation reports (the variation of UL/DL packet delay between UE and PSA UPF), the PCF triggers the QoS monitoring procedure, derives the 5GS Packet Delay Variation and reports the value to the AF, as described in clause 6.1.3.26.

NOTE 5: This event can only be subscribed as part of an AF session with required QoS (described in clause 6.1.3.22).

If the AF subscribes to Round-trip delay measurement over two service data flows considering the UL direction of a service data flows and the DL direction of another service data flow, PCF triggers the QoS monitoring procedure to derive the Round-Trip delay measurement for delay measurements on the individual QoS Flows respectively (as described in clause 6.1.3.27.1 and in clause 5.37.4 of TS 23.501 [2]. The PCF derives the Round-Trip delay based on the packet delay measurement reports of the QoS Flows of each direction and reports the results to the AF. PCF sets QoS Monitoring Policies for each of the individual service data flows and QoS Monitoring Policy Control Request Trigger as described in clause 6.1.3.21.

NOTE 6: This event can only be subscribed as part of an AF session with required QoS (described in clause 6.1.3.22).

If the AF subscribes to the event Network support for QoS Monitoring, the PCF sets the QoS Monitoring can no longer (or can again) be performed Policy Control Request Trigger in the SMF, if not done before. The PCF shall notify the AF that QoS Monitoring can no longer (or can again) be performed by the network whenever it receives from the SMF a notification that QoS Monitoring can no longer (or can again) be performed.

If the AF indicates ECN marking for L4S support by the application, PCF authorizes the request and sets the ECN marking for L4S can no longer (or can again) be performed trigger accordingly. PCF shall further send the notification it receives from the SMF to AF on whether the network can not (or can again) perform ECN marking for L4S, for example, if due to user mobility neither target RAN nor UPF PSA support ECN marking for L4S.

If an AF requests the PCF to report on the Out of credit event for the associated service data flow(s), the PCF shall inform the AF (when it gets informed by the SMF) that credit is no longer available for the services data flow(s) related to the AF session together with the applied termination action.

If an AF requests the PCF to report on the Reallocation of credit event for the associated service data flow(s), the PCF shall inform the AF (when it gets informed by the SMF) that credit has been reallocated after credit was no longer available and the termination action was applied for the service data flow(s) related to the AF session.

The PCF can arm the trigger of 5GS Bridge/Router information available to SMF based on local policy (i.e. without an AF request) or based on subscription request from TSCTSF. The PCF shall, upon reception of the 5GS Bridge/Router information (refer to clauses 6.1.3.23, 6.1.3.23a, 6.1.3.23b) from the SMF, forward this information to the TSN AF or the TSCTSF. When the PCF has received the User plane node Management Information Container or Port Management Information Container and related port number from SMF, the PCF also provides User plane node Management Information Container or Port Management Information Container and related port number to the TSN AF or TSCTSF. When SMF has reported the 5GS Bridge/Router information and no AF session exists, the PCF forward this information to a pre-configured TSN AF, or to a pre-configured TSCTSF or a TSCTSF discovered and selected via NRF. In the case of private IPv4 address being used for IP type PDU Session, the PCF shall additionally report DNN and S-NSSAI of the PDU Session to TSCTSF.

If the AF requests the PCF to report on the outcome of the service area coverage change, the PCF reports the outcome of the service area coverage change to the AF and notifies the current service area coverage to the AF. The outcome is the result of the execution of the request of service coverage change at the PCF; the outcome is successful if the request was executed, and includes the current service area coverage that may be the same or different from the service area coverage provided by the AF. The subscription may also be implicit. In this case there may be bulk subscription, either for an Internal-Group-Id or for any UE. In order to prevent massive notifications to the AF, the request for any UE is associated to a specific Application Identifier or DNN, S-NSSAI. For bulk subscription, when the AF request includes an expiration time, the PCF stops reporting to the AF when the expiration time is reached.

If the AF requests the (H-)PCF, via V-PCF when roaming, to report on the outcome of the UE Policies delivery due to service specific parameter provisioning procedure, the (H-)PCF reports the outcome of the related UE Policies provisioning procedure for the related traffic descriptor for the UE to the AF, via V-PCF when roaming. The outcome of the UE Policies provisioning procedure includes the success, the failure with an appropriate cause or the interim status report such as the UE is temporarily unreachable or that URSP Rules have not yet been delivered by the H-PCF (see clauses 4.15.6.7 and 5.2.5.7 of TS 23.502 [3]). The PCF reports the outcome of the UE Policy provisioning procedure for each of the UEs that were included as Target UEs in the service specific information Data Subset in UDR. When the AF requested the PCF for the UE to report on the outcome of the UE Policies delivery due to service specific parameter provisioning procedure targeting a single UE, the Result of UE Policy Container delivery via EPS event trigger shall be subscribed.

NOTE 7: An example reason for sending an interim status report that indicates that "URSP Rules have not yet been delivered by the H-PCF" may be that the UE does not support the VPLMN Specific URSP Rules feature and is not registered in the PLMN where the service parameters apply.

A request to report Start of application traffic detection and Stop of application traffic detection triggers the reporting when the PCF receives start of application traffic detection event or stop of application traffic detection event from SMF. The reception of a subscription to this event triggers the setting of the corresponding Policy Control Request Trigger to SMF, if not already subscribed.

A request to forward UE reporting Connection Capabilities from an associated URSP rule triggers the reporting when the PCF receives UE reporting of URSP rule enforcement information from the SMF matching specific Connection Capabilities (see clause 6.6.2.4). The request may include SUPI(s), DNN(s) and/or S-NSSAI(s) to which the request applies. The PCF reports the received Connection Capabilities and PDU Session information including the SUPI, UE requested DNN, Selected DNN, S-NSSAI, SSC Mode, PDU Session Type. The reception of a subscription to this event triggers the setting of the corresponding Policy Control Request Trigger to SMF, if not already subscribed.

If an AF requests the PCF to report Start of application traffic detection and Stop of application traffic detection via bulk subscription, the AF shall provide the application identifier together with the S-NSSAI and DNN. The PCF provides a PCC rule for the application identifier together with the corresponding Policy Control Request Trigger to the SMF for every PDU Session to this S-NSSAI and DNN. When the PCF receives start of application traffic detection event or stop of application traffic detection event for the PCC rule in a PDU Session, the PCF forwards the event to the AF together with the UE identifier and optionally the IP address of the PDU Session corresponding to this PCC rule. When the AF removes bulk subscription for this application identifier, then the PCF removes the Policy Control Request Trigger from the SMF for every PDU Session to this S-NSSAN and DNN, if it is not used for other purpose.

NOTE 8: The restriction of the bulk subscription to a specific combination of S-NSSAI and DNN avoids excessive signalling load.

If an AF requests the PCF to report on the change between different types of satellite backhaul or the change between satellite backhaul and non-satellite backhaul (as specified in clause 5.43.4 of TS 23.501 [2]), the PCF shall provide the corresponding Policy Control Request Trigger to the SMF to enable the report of satellite backhaul category change (see clause 6.1.3.5) to the PCF. The PCF shall, upon reception of information about the change of Satellite backhaul category, notify the AF on the Satellite backhaul category change event was met and forward the current Satellite backhaul category received from the SMF to the AF. When the satellite backhaul is no longer used, the Satellite backhaul category indicates that a non-satellite backhaul is used.

If 5G DDNMF requests the PCF to report on the Change of PDUID, the PCF shall notify whenever a new PDUID is allocated. Further details on how the 5G DDNMF retrieves and subscribes to notifications on Change of PDUID are defined in TS 23.304 [34].

A request to report SM Policy Association established or terminated triggers the reporting when the PCF receives the request for notification on the SM Policy Association from SMF. The PCF notifies on the EventID "SM Policy Association established/terminated", includes the PCF binding information of the PCF for the PDU Session of the UE, as described in clause 6.1.1.2.2.

If the TSCTSF requests the PCF notifications for reporting of extra UE addresses, the PCF shall provide the extra UE addresses allocated to the PDU Session due to Framed Routes or IPv6 prefix delegation. The report shall include the actual list of IPv4 address masks or a list of IPv6 prefixes as currently allocated.

If the AF provides the Capability for BAT adaptation or BAT Window and subscribes to PCF for Notification on BAT offset, the PCF will trigger the subscription to SMF for Notification on BAT offset defined in clause 6.1.3.5. When the Notification on BAT offset trigger is set and the PCF receives a BAT offset and optionally an adjusted periodicity from the SMF, the PCF identifies the affected AF session (based on the PCC rule indicated by the SMF) and forwards the BAT offset and optionally the adjusted periodicity for this AF session to the TSCTSF.

A request to report Result of UE Policy Container delivery via EPS triggers the reporting when the PCF for the PDU Session receives the UE Policy Container from the UE during UE Policy Container delivery via EPS, or a delivery failure result for UE Policy Container delivery via EPS with appropriate reason from the SMF. The reception of a subscription to this event triggers the setting of the corresponding Policy Control Request Trigger to SMF, if not already subscribed.

If an AF requests the PCF to report on the UE reachability status change, the PCF shall provide the corresponding Policy Control Request Trigger to the SMF to enable the report of the UE reachability status change to the PCF, if not already subscribed. The PCF shall, upon indication of change of reachability status, notify the AF and forward the information received from the SMF to the AF.

If an AF requests the PCF to report on the change between S-NSSAI and Alternative S-NSSAI, the PCF reports the outcome of the network slice replacement to the AF.

\* \* \* Next Change \* \* \*

## 6.5 Access and mobility related policy information

To enable the enforcement in the 5GC system of the access and mobility policy decisions made by the PCF for the control as described in clause 6.1.2.1, the 5GC system may provide the Access and mobility related policy information from the PCF to the AMF.

Table 6.5-1 lists the AMF access and mobility related policy information.

Table 6.5-1: Access and mobility related policy information

| Information name | Description | Category | PCF permitted to modify in a UE context in the AMF | Scope |
| --- | --- | --- | --- | --- |
| **Aggregate maximum bit rate** | *This part defines the aggregate maximum bit rate* |  |  |  |
| UE-AMBR | This defines the UE-AMBR value that applies for a UE | Conditional  (NOTE 5) | Yes | UE context |
| List of UE-Slice-MBR | This defines the List of UE-Slice-MBR (UL/DL) that each applies to the network slice of the UE. | Conditional  (NOTE 8) | Yes | UE context |
| **Service Area Restrictions** | *This part defines the service area restrictions* |  |  |  |
| List of allowed TAIs. | List of allowed TAIs  (NOTE 3) (NOTE 4). | Conditional  (NOTE 1) | Yes | UE context |
| List of non-allowed TAIs. | List of non-allowed TAIs  (NOTE 3). | Conditional  (NOTE 1) | Yes | UE context |
| Maximum number of allowed TAIs | The maximum number of allowed TAIs.  (NOTE 4) | Conditional  (NOTE 1) | Yes | UE context |
| **RFSP Index** | *This part defines the RFSP index related information* |  |  |  |
| RFSP Index for Allowed NSSAI | Defines the RFSP Index associated with Allowed NSSAI that applies for a UE | Conditional  (NOTE 2) | Yes | UE context |
| RFSP Index for Target NSSAI | Defines the RFSP Index associated with Target NSSAI that applies for a UE | Conditional  (NOTE 2) | Yes | UE context |
| RFSP Index in Use Validity Time | Defines the time by which the RFSP Index will be used in MME after 5GS to EPS mobility. | Conditional  (NOTE 2, NOTE 11) | Yes | UE context |
| **5G access stratum time distribution** | *This part defines the 5G access stratum time distribution* |  |  |  |
| 5G access stratum time distribution indication | Defines if 5G access stratum time distribution via Uu reference point is enabled or disabled | Conditional  (NOTE 9) | Yes | UE context |
| Uu interface time synchronization error budget | Indicates the Uu Time Synchronization error budget for 5G access stratum time distribution | Conditional  (NOTE 10) | Yes | UE context |
| Clock quality detail level | Defines which clock quality information (clock quality metrics or acceptable/not acceptable indication) to report to the UE as defined in clause 5.27.1.12 of TS 23.501 [2] | Conditional  (NOTE 9) | Yes | UE context |
| Clock quality acceptance criteria | Indicates the acceptable criteria as defined in clause 5.27.1.12 of TS 23.501 [2] | Conditional  (NOTE 9) | Yes | UE context |
| **SMF selection management** | This part defines the SMF selection management instructions |  |  |  |
| DNN replacement of unsupported DNNs | Defines if a UE requested unsupported DNN is requested for replacement by PCF | Conditional  (NOTE 6) | Yes | UE context |
| List of S-NSSAIs | Defines the list of S-NSSAIs containing DNN candidates for replacement by PCF | Conditional  (NOTE 6)  (NOTE 7) | Yes | UE context |
| Per S-NSSAI: List of DNNs | Defines UE requested DNN candidates for replacement by PCF | Conditional  (NOTE 6) | Yes | UE context |
| **Slice replacement management** | Defines slice replacement management |  | Yes | UE context |
| S-NSSAI availability information | Defines the S-NSSAI availability and/or alternative S-NSSAI for S-NSSAI | Conditional  (NOTE 12) | Yes | UE context |
| Indication of slice replacement triggered by AF | Indicates that the network slice replacement is triggered by AF | Conditional  (NOTE 12) | Yes | UE context |
| **Slice Related Restrictions** | Defines network policies for Slices subject to network control |  |  |  |
| List of S-NSSAIs | Defines the List of S-NSSAIs that are on demand | Conditional  (NOTE 13) | No | UE context |
| Per S-NSSAI:  Deregistration Inactivity Timer value | Defines the S-NSSAI deregistration inactivity timer value before removing the S-NSSAI from the Allowed Slices | (NOTE 14) | No | UE context |
| **Charging related information** | Defines information related to Charging |  |  |  |
| Charging information | Defines the containing CHF address and optionally the associated CHF instance ID and CHF set ID | Conditional  (NOTE 15) | Yes | UE context |
| NOTE 1: If management of service area restrictions by PCF is enabled.  NOTE 2: If management of RFSP index by PCF is enabled.  NOTE 3: Either the list of allowed TAIs or the list of non-allowed TAIs are provided by the PCF.  NOTE 4: Both the maximum number of allowed TAIs and the list of allowed TAIs may be sent by PCF.  NOTE 5: If management of UE-AMBR by PCF is enabled.  NOTE 6: If SMF selection management by PCF is enabled.  NOTE 7: The List of S-NSSAIs contains S-NSSAIs, valid in the serving network, of the Allowed NSSAI.  NOTE 8: If management of UE-Slice-MBR by PCF is enabled.  NOTE 9: If management of 5G access stratum time distribution is enabled.  NOTE 10: If 5G access stratum time distribution or (g)PTP time synchronization is enabled.  NOTE 11: If required based on operator policy when the RFSP index provided by the PCF indicates a change in priority from 5G access to E-UTRAN access.  NOTE 12: If slice replacement management by PCF is enabled.  NOTE 13: Includes only the list of subscribed slices with network restriction policies for slice use by the UE. The list is empty if there are no S-NSSAIs that are on demand or the timer value are not set by the PCF.  NOTE 14: The S-NSSAI deregistration timer is mandatory for every S-NSSAI in the list of S-NSSAIs that are on demand S-NSSAI.  NOTE 15: Shall be included If the home operator policies indicates that the same CHF is selected by the PCF for the UE and the AMF, otherwise optional. | | | | |

The *list of allowed TAIs* indicates the TAIs where the UE is allowed to be registered, see clause 5.3.4 of TS 23.501 [2] for the description on how AMF uses this information.

The *list of non-allowed TAIs* indicates the TAIs where the UE is not allowed to be registered, see clause 5.3.4 of TS 23.501 [2] for the description on how AMF uses this information.

The *Maximum number of allowed TAs* indicates the maximum number of allowed Tracking Areas, the list of TAI is defined in the AMF and not explicitly provided by the PCF.

The *RFSP Index for Allowed NSSAI* and *RFSP Index for Target NSSAI* defines the RFSP Index for radio resource management functionality.

*RFSP Index in Use Validity Time* defines the time for which the RFSP Index in use will be used in MME after 5GS to EPS mobility as specified in clause 5.17.2.2 of TS 23.501 [2].

The *UE-AMBR* limits the aggregated bit rate across all Non-GBR QoS Flows of a UE in the serving network.

The *list of UE-Slice-MBR* defines the list of authorized UE-Slice-MBR allocated for a UE, how it is enforced is described in clause 5.7.1.10 of TS 23.501 [2].

The *DNN replacement of unsupported DNNs* indicates that the AMF shall contact the PCF for replacement of an unsupported DNN requested by the UE.

The *List of S-NSSAIs* defines the S-NSSAIs, valid in the serving network, of the Allowed NSSAI that contain DNN candidates for replacement by PCF.

The *List of DNNs* defines the DNN candidates for which the AMF shall contact the PCF for replacement if such a DNN is requested by a UE.

The *5G access stratum time distribution* indicates the 5G access stratum time distribution parameters to be indicated to the NG-RAN via AMF.

The *S-NSSAI availability information* indicates whether the S-NSSAI is not available or is available, and/or an alternative S-NSSAI that the S-NSSAI can be replaced with.

The *Charging information* includes CHF address(es) and if available, the associated CHF instance ID(s) and/or CHF set ID(s). This is described in detail in clause 6.3.11 of TS 23.501 [2] and in clause 6.1.1.4.

\* \* \* End of Change \* \* \*