**3GPP SA WG2 Meeting #165 *S2-240xxxx***

**Hyderabad, IN, 14-18 October 2024 *(was S2-2408475)***

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **3** | **CR** | **1360** | **rev** | **1** | **Current version:** |  |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network | **x** |

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| ***Title:*** | XRM\_Ph2 KI#6 L4S support in non-3GPP access | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Charter Communications, CableLabs, Tencent?, Tencent Cloud?, Nokia?, Samsung? | | | | | | | | | |
| ***Source to TSG:*** | SA2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | XRM\_Ph2 | | | | |  | ***Date:*** | | | 2024-08-09 |
|  |  | | | |  | |  | | |  |
| ***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-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | The following R19 TR23700-70 conclusions for Key Issue #6 (i.e., clause 8.6) were agreed as principles for normative work:   1. Dedicated 5G QoS Flow(s) and non-3GPP access resources (e.g. IPsec Child SAs) are used for carrying L4S enabled IP traffic. 2. For wireline access:    1. ECN marking for L4S is supported in W-AGF. It is controlled via N2 signalling (Indication of ECN marking for L4S for a corresponding QoS Flow(s)) and applies to proper mapping between L4S-enabled QoS profile(s) and L4S-enabled W-UP resource(s).    2. ECN marking for L4S is supported in 5G-RG in UL. It is controlled via N1 signalling (Indication of ECN marking for L4S for a corresponding QoS Flow(s)) and applies to proper mapping between L4S-enabled QoS rule(s) and L4S-enabled W-UP resource(s). 3. For untrusted/trusted access:    1. ECN marking for L4S is supported in N3IWF/TNGF. It is controlled via N2 signalling (Indication of ECN marking for L4S for a corresponding QoS Flow(s)) and applies to proper mapping between L4S-enabled QoS profile(s) and L4S-enabled IPsec Child SAs.    2. N3IWF/TNGF in UL shall support and UE in DL can support the IP-in-IP tunnel behaviour of copying ECN bits between outer and inner headers as per IETF RFC 6040 [47].   NOTE: To support this functionality, the UE needs to support UL L4S feedback as described in IETF RFC 9330 [14] which is not in the scope of 3GPP. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Introduction of L4S functionality on non-3GPP access resources, according to KI#6 conclusion in TR23.700-70 clause 8.6 | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | New feature not implemented in the specification. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.1.3.5, 6.1.3.18 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 \* \* \* \*

6.1.3.5 Policy Control Request Triggers relevant for SMF

The Policy Control Request Triggers relevant for SMF define the conditions when the SMF shall interact again with PCF after a PDU Session establishment as defined in the Session Management Policy Establishment and Session Management Policy Modification procedure as defined in TS 23.502 [3].

The PCR triggers are not applicable any longer at termination of the SM Policy Association.

The access independent Policy Control Request Triggers relevant for SMF are listed in table 6.1.3.5-1.

The differences with table 6.2 and table A.4.3-2 in TS 23.203 [4] are shown, either "none" means that the parameter applies in 5GS or "removed" meaning that the parameter does not apply in 5GS, this is due to the lack of support in the 5GS for this feature or "modified" meaning that the parameter applies with some modifications defined in the parameter.

**Table 6.1.3.5-1: Access independent Policy Control Request Triggers relevant for SMF**

| **Policy Control Request Trigger** | **Description** | **Difference compared with table 6.2 and table A.4.3-2 in TS 23.203 [4]** | **Conditions for reporting** | **Motivation** |
| --- | --- | --- | --- | --- |
| PLMN change | The UE has moved to another operators' domain. | None | PCF |  |
| QoS change | The QoS parameters of the QoS Flow has changed. | Removed |  | Only applicable when binding of bearers was done in PCRF. |
| QoS change exceeding authorization | The QoS parameters of the QoS Flow has changed and exceeds the authorized QoS. | Removed |  | Only applicable when binding of bearers was done in PCRF. |
| Traffic mapping information change | The traffic mapping information of the QoS profile has changed. | Removed |  | Only applicable when binding of bearers was done in PCRF. |
| Resource modification request | A request for resource modification has been received by the SMF. | None | SMF always reports to PCF |  |
| Routing information change | The IP flow mobility routing information has changed (when IP flow mobility as specified in TS 23.261 [11] applies) or the PCEF has received Routing Rules from the UE (when NBIFOM as specified in TS 23.161 [10] applies). | Removed |  | Not in 5GS yet. |
| Change in Access Type  (NOTE 8)  (NOTE 11) | The Access Type or RAT Type or both Access Type and RAT Type of the PDU Session changed. | None | PCF |  |
| EPS Fallback | EPS fallback is initiated | Added | PCF |  |
| Loss/recovery of transmission resources | The Access type transmission resources are no longer usable/again usable. | Removed |  | Not in 5GS yet. |
| Location change (serving cell)  (NOTE 6) | The serving cell of the UE has changed. | None | PCF |  |
| Location change (serving area)  (NOTE 2) | The serving area of the UE has changed. | None | PCF |  |
| Location change  (serving CN node)  (NOTE 3) | The serving core network node of the UE has changed. | None | PCF |  |
| Change of UE presence in Presence Reporting Area (see NOTE 1) | The UE is entering/leaving a Presence Reporting Area. | None | PCF | Only applicable to PCF |
| Out of credit | Credit is no longer available. | None | PCF |  |
| Reallocation of credit | Credit has been reallocated after the former Out of credit indication. | Added | PCF |  |
| Enforced PCC rule request | SMF is performing a PCC rules request as instructed by the PCF. | None | PCF |  |
| Enforced ADC rule request | TDF is performing an ADC rules request as instructed by the PCRF. | Removed |  | ADC Rules are not applicable. |
| UE IP address change | A UE IP address has been allocated/released. | None | SMF always reports allocated or released UE IP addresses |  |
| UE MAC address change | A new UE MAC address is detected or a used UE MAC address is inactive for a specific period. | New | PCF |  |
| Access Network Charging Correlation Information | Access Network Charging Correlation Information has been assigned. | None | PCF |  |
| Usage report  (NOTE 4) | The PDU Session or the Monitoring key specific resources consumed by a UE either reached the threshold or needs to be reported for other reasons. | None | PCF |  |
| Start of application traffic detection and  Stop of application traffic detection  (NOTE 5) | The start or the stop of application traffic has been detected. | None | PCF |  |
| SRVCC CS to PS handover | A CS to PS handover has been detected. | Removed |  | No support in 5GS yet |
| Access Network Information report | Access information as specified in the Access Network Information Reporting part of a PCC rule. | None | PCF |  |
| Credit management session failure | Transient/Permanent failure as specified by the CHF. | None | PCF |  |
| Addition / removal of an access to an IP-CAN session | The PCEF reports when an access is added or removed. | Removed |  | No support in 5GS yet |
| Change of usability of an access | The PCEF reports that an access becomes unusable or usable again. | Removed |  | No support in 5GS yet |
| 3GPP PS Data Off status change | The SMF reports when the 3GPP PS Data Off status changes. | None | SMF always reports to PCF |  |
| Session AMBR change | The Session-AMBR has changed. | Added | SMF always reports to PCF |  |
| Default QoS change | The subscribed QoS has changed. | Added | SMF always reports to PCF |  |
| Removal of PCC rule | The SMF reports when the PCC rule is removed. | Added | SMF always reports to PCF |  |
| Successful resource allocation | The SMF reports to the PCF that the resources for a PCC rule have been successfully allocated. | Added | PCF |  |
| GFBR of the QoS Flow can no longer (or can again) be guaranteed | The SMF notifies the PCF when receiving notifications from RAN that GFBR of the QoS Flow can no longer (or can again) be guaranteed. | Added |  |  |
| UE resumed from suspend state | The SMF reports to the PCF when it detects that the UE is resumed from suspend state. | None | PCF | Only applicable to EPC IWK |
| Change of DN Authorization Profile Index | The DN Authorization Profile Index received from DN-AAA has changed. | Added | SMF always reports to PCF |  |
| 5GS Bridge/Router information available | SMF has detected new 5GS Bridge/Router information, which may contain, user-plane Node ID, UE-DS-TT residence time and Ethernet port (port number and MAC address) or IP address for the PDU Session, MTU size for IPv4 or MTU size for IPv6 and/or PMIC and/or UMIC. | Added | PCF |  |
| QoS Monitoring | The SMF notifies the PCF of the QoS Monitoring reports (as defined in clause 5.45 of TS 23.501 [2]). | Added | PCF |  |
| DDN Failure event Subscription with Traffic Descriptor | The SMF requests PCF to provide or remove policies if it received an event subscription or cancellation for DDN Failure event including traffic descriptors. The SMF provides the traffic descriptors to the PCF for policy evaluation. | Added | PCF |  |
| DDD Status event Subscription with Traffic Descriptor | The SMF requests PCF to provide or remove policies if it received an event subscription or cancellation for DDD Status event including traffic descriptors. The SMF provides the traffic descriptors and the requested type(s) of notifications (notifications about downlink packets being buffered, and/or discarded) to the PCF for policy evaluation. | Added | PCF |  |
| QoS constraints change | The QoS constraints in the VPLMN have been provided or changed. | Added | SMF always reports to PCF |  |
| Satellite backhaul category change | The backhaul is changed between different types of satellite backhaul, or between satellite backhaul and non-satellite backhaul. | Added | PCF |  |
| NWDAF info change | The NWDAF instance IDs used for the PDU session or associated Analytics IDs used for the PDU session and available in the SMF have changed. | Added | PCF |  |
| Request for reporting the PCF binding information  (NOTE 9) | The SMF reports the updated PCF binding information of the PCF for the UE. | Added | PCF |  |
| Notification on BAT offset | The SMF reports the BAT offset and optionally the adjusted periodicity provided by the RAN. | Added | PCF |  |
| UE reporting Connection Capabilities from associated URSP rule (NOTE 10) | The SMF has received from the UE reporting from an associated URSP rule via a PDU session establishment or PDU session modification request. | None | PCF |  |
| UE Policy Container received or delivery failure for UE Policy Container delivery via EPS | The SMF reports that a UE Policy Container has been received from the UE or a delivery failure for UE Policy Container delivery via EPS. | Added | SMF always reports to PCF |  |
| Change of HR-SBO support indication | The HR-SBO support indication has changed. | Added |  |  |
| Network Slice Replacement | The SMF reports the event of change between S-NSSAI and Alternative S-NSSAI to PCF when the SMF determines that the PDU Session and SM Policy Association can be retained. The SMF provides Alternative S-NSSAI when the PDU Session is transferred from S-NSSAI to Alternative S-NSSAI. | Added | PCF |  |
| ECN marking for L4S can no longer (or can again) be performed | The SMF notifies the PCF when ECN marking for L4S can no longer (or can again) be performed. | Added | PCF |  |
| QoS Monitoring can no longer (or can again) be performed | The SMF notifies the PCF when QoS Monitoring can no longer (or can again) be performed. | Added | PCF |  |
| UE reachability status change | The SMF reports to the PCF when it receives an indication of a change of the UE reachability status. | Added | PCF |  |
| NOTE 1: The maximum number of PRA(s) per UE per PDU Session is configured in the PCF. The PCF may have independent configuration of the maximum number for Core Network pre-configured PRAs and UE-dedicated PRAs. The exact number(s) should be determined by operator in deployment.  NOTE 2: This trigger reports change of Tracking Area in both 5GS and EPC interworking, or reports change of Routing Area for GERAN/UTRAN access (see Annex G of TS 23.502 [3]).  NOTE 3: This trigger reports change of AMF in 5GC, change between ePDG and Serving GW in EPC, change between Serving GWs in EPC, change between EPC and 5GC, change between Serving Gateway and SGSN in GERAN/UTRAN from/to E-UTRAN mobility, or change between SGSNs in the case of GERAN/UTRAN access. In HR roaming case, if the AMF change is unknown by the H-SMF, then the AMF change is not reported.  NOTE 4: Usage is defined as either volume or time of user plane traffic.  NOTE 5: The start and stop of application traffic detection are separate event triggers, but received under the same subscription from the PCF.  NOTE 6: Location change of serving cell can increase signalling load on multiple interfaces. Hence it is recommended that any such serving cell changes only applied for a limited number of subscribers avoiding extra signalling load. It also is applicable for GERAN/UTRAN access.  NOTE 7: Void.  NOTE 8: For 3GPP access the RAT type may refer to NR, E-UTRAN, and, when the SMF+PGW-C enhancements to support GERAN/UTRAN access via Gn/Gp interface as specified in Annex L of TS 23.501 [2] apply, to UTRAN or GERAN. For MA PDU Session this trigger reports the current used Access Type(s) and RAT type(s) upon any change of Access Type and RAT type.  NOTE 9: The PCF for the PDU Session knows the change of the PCF for the UE by this Policy Control Request Trigger based on the associated binding information of and notifies the PCF for the UE as described in clause 6.1.3.18.  NOTE 10: See clause 6.6.2.4.  NOTE 11: Multiple triggers are described in TS 29.512 [44] for this event. | | | | |

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

When the EPS Fallback trigger is armed by the PCF, the SMF shall report the event to the PCF when a QoS Flow with 5QI=1 is rejected due to EPS Fallback.

When the Location change trigger is armed, the SMF shall subscribe to the AMF for reports on changes in location to the level indicated by the trigger. If credit-authorization triggers and Policy Control Request Triggers require different levels of reporting of location change for a single UE, the location to be reported should be changed to the highest level of detail required. However, there should be no request being triggered for PCC rules update to the PCF if the report received is more detailed than requested by the PCF.

NOTE 2: The access network may be configured to report location changes only when transmission resources are established in the radio access network.

The Resource modification request trigger shall trigger the PCF interaction for all resource modification requests not tied to a specific QoS Flow received by SMF. The resource modification request received by SMF may include request for guaranteed bit rate changes for a traffic aggregate and/or the association/disassociation of the traffic aggregate with a 5QI and/or a modification of the traffic aggregate.

The enforced PCC rule request trigger shall trigger a SMF interaction to request PCC rules from the PCF for an established PDU Session. This SMF interaction shall take place within the Revalidation time limit set by the PCF in the PDU Session related policy information. The SMF reports that the enforced PCC rule request trigger was met and the enforced PCC Rules.

NOTE 3: The enforced PCC rule request trigger can be used to avoid signalling overload situations e.g. due to time of day based PCC rule changes.

The UE IP address change trigger shall trigger a SMF interaction with the PCF if a UE IP address is allocated or released during the lifetime of the PDU Session. The SMF reports that the UE IP address change trigger was met and the new or released UE IP address.

The UE MAC address change trigger shall trigger a SMF interaction with the PCF if a new UE MAC address is detected or a used UE MAC address is inactive for a specific period during the lifetime of the Ethernet type PDU Session. The SMF reports that the UE MAC address change trigger was met and the new or released UE MAC address.

NOTE 4: The SMF instructs the UPF to detect new UE MAC addresses or used UE MAC address is inactive for a specific period as described in TS 23.501 [2].

The Access Network Charging Correlation Information trigger shall trigger the SMF to report the assigned access network charging identifier for the PCC rules that are accompanied with a request for this trigger at activation. The SMF reports that the Access Network Charging Correlation Information trigger was met and the Access Network Charging Correlation Information.

If the Usage report trigger is set and the volume or the time thresholds, earlier provided by the PCF, are reached, the SMF shall report this situation to the PCF. If both volume and time thresholds were provided and the thresholds, for one of the measurements, are reached, the SMF shall report this situation to the PCF and the accumulated usage since last report shall be reported for both measurements.

The management of the Presence Reporting Area (PRA) functionality enables the PCF to subscribe to reporting change of UE presence in a particular Presence Reporting Area.

NOTE 5: PCF decides whether to subscribe to AMF or to SMF for those triggers that are present in both tables 6.1.2.5-2 and 6.1.3.5-1. If the Change of UE presence in Presence Reporting Area trigger is available on both AMF and SMF, PCF should not subscribe to both AMF and SMF simultaneously.

Upon every interaction with the SMF, the PCF may activate / deactivate reporting changes of UE presence in Presence Reporting Area by setting / unsetting the corresponding trigger by providing the PRA Identifier(s) and additionally the list(s) of elements comprising the Presence Reporting Area for UE-dedicated Presence Reporting Area(s).

The SMF shall subscribe to the UE Location Change notification from the AMF by providing an area of interest containing the PRA Identifier(s) and additionally the list(s) of elements provided by the PCF as specified in clause 5.6.11 of TS 23.501 [2] and in clause 5.2.2.3.1 of TS 23.502 [3].

When the Change of UE presence in Presence Reporting Area trigger is armed, i.e. when the PCF subscribes to reporting change of UE presence in a particular Presence Reporting Area and the reporting change of UE presence in this Presence Reporting Area was not activated before, the SMF subscribes to the UE mobility event notification service provided by the AMF for reporting of UE presence in Area of Interest which reports when the UE enters or leaves a Presence Reporting Area (an initial report is received when the PDU Session specific procedure is activated). The SMF reports the PRA Identifier(s) and indication(s) whether the UE is inside or outside the Presence Reporting Area(s), and indication(s) if the corresponding Presence Reporting Area(s) is set to inactive by the AMF to the PCF.

NOTE 6: The serving node (i.e. AMF in 5GC or MME in EPC/EUTRAN) can activate the reporting for the PRAs which are inactive as described in the TS 23.501 [2].

When PCF modifies the list of PRA id(s) to change of UE presence in Presence Reporting Area for a particular Presence Reporting Area(s), the SMF removes or adds the PRA id(s) provided in the UE mobility event notification service provided by AMF for reporting of UE presence in Area Of Interest. When the PCF unsubscribes to reporting change of UE presence in Presence reporting Area, the SMF unsubscribes to the UE mobility event notification service provided by AMF for reporting of UE presence in Area Of Interest, unless subscriptions to AMF remains due to other triggers.

The SMF stores PCF subscription to reporting for changes of UE presence in Presence Reporting Area and notifies the PCF with the PRA Identifier(s) and indication(s) whether the UE is inside or outside the Presence Reporting Area(s) based on UE location change notification in area of interest received from the serving node according to the corresponding subscription.

NOTE 7: The SMF can also be triggered by the CHF to subscribe to notification of UE presence in PRA from the AMF, and notifies the CHF when receiving reporting of UE presence in PRA from the AMF, referring to TS 32.291 [20].

If PCF is configured with a PRA identifier referring to the list of PRA Identifier(s) within a Set of Core Network predefined Presence Reporting Areas as defined in TS 23.501 [2], it activates the reporting of UE entering/leaving each individual PRA in the Set of Core Network predefined Presence Reporting Areas, without providing the complete set of individual PRAs.

When a PRA set identified by a PRA Identifier was subscribed to report changes of UE presence in Presence Reporting Area by the PCF, the SMF additionally receives the PRA Identifier of the PRA set from the AMF, along with the individual PRA Identifier(s) belonging to the PRA set and indication(s) of whether the UE is inside or outside the individual Presence Reporting Area(s), as described in TS 23.501 [2].

When the Out of credit detection trigger is set, the SMF shall inform the PCF about the PCC rules for which credit is no longer available together with the applied termination action.

When the Reallocation of credit detection trigger is set, the SMF shall inform the PCF about the PCC rules for which credit has been reallocated after credit was no longer available and the termination action was applied.

The Start of application traffic detection and Stop of application traffic detection triggers shall trigger an interaction with PCF once the requested application traffic is detected (i.e. Start of application traffic detection) or the end of the requested application traffic is detected (i.e. Stop of application traffic detection) unless it is requested within a specific PCC Rule to mute such interaction for solicited application reporting or unconditionally in the case of unsolicited application reporting. The application identifier and service data flow descriptions, if deducible, shall also be included in the report. An application instance identifier shall be included in the report both for Start and for Stop of application traffic detection when service data flow descriptions are deducible. This is done to unambiguously match the Start and the Stop events.

At PCC rule activation, modification and deactivation the SMF shall send, as specified in the PCC rule, the User Location Report and/or UE Timezone Report to the PCF.

NOTE 8: At PCC rule deactivation the User Location Report includes information on when the UE was last known to be in that location.

If the trigger for Access Network Information reporting is set, the SMF shall check the need for access network information reporting after successful installation/modification or removal of a PCC rule or upon termination of the PDU Session. The SMF shall check the Access Network Information report parameters (User Location Report, UE Timezone Report) of the PCC rules and report the access network information to the PCF. The SMF shall not report any subsequent access network information updates received from the PDU Session without any previous updates of related PCC rule unless the associated QoS Flow or PDU Session has been released.

If the SMF receives a request to install/modify or remove a PCC rule with Access Network Information report parameters (User Location Report, UE Timezone Report) set the SMF shall initiate a PDU Session modification to retrieve the current access network information of the UE and forward it to the PCF afterwards.

If the Access Network Information report parameter for the User Location Report is set and the user location (e.g. cell) is not available to the SMF, the SMF shall provide the serving PLMN identifier to the PCF.

The Credit management session failure trigger shall trigger a SMF interaction with the PCF to inform about a credit management session failure and to indicate the failure reason, and the affected PCC rules.

NOTE 9: As a result, the PCF may decide about e.g. PDU Session termination, perform gating of services, switch to offline charging, change rating group, etc.

NOTE 10: The Credit management session failure trigger applies to situations wherein the PDU Session is not terminated by the SMF due to the credit management session failure.

The default QoS change triggers shall trigger the PCF interaction for all changes in the default QoS data received in SMF from the UDM.

The Session AMBR change trigger shall trigger the SMF to provide the Session-AMBR to the PCF containing the DN authorised Session AMBR if received from the DN-AAA, or the Subscribed Session-AMBR received from the UDM as described in clause 5.6.6 of TS 23.501 [2].

The default QoS change trigger reports a change in the default 5QI/ARP retrieved by SMF from UDM, as explained in clause 5.7.2.7 of TS 23.501 [2].

If the PCC Rules bound to a QoS Flow are removed when the corresponding QoS Flow is removed or the PCC rules are failed to be enforced, the SMF shall report this situation to the PCF and may provide the reason for failure, if the reason for failure is that the UE is temporarily unreachable, the SMF may also provide the maximum waiting time to the PCF, in this case the PCF does not provide the same or updated PCC Rules for the established PDU Session before the maximum waiting time expires, the PCF may also subscribe to PCRT on change of UE reachability. In other failure scenarios, the PCF may then provide the same or updated PCC rules for the established PDU Session.

NOTE 11: The PCF can decide to provide PCC Rules when the maximum waiting time expires or send them later depending on implementation.

If the trigger for successful resource allocation is set and the PCF has also provided an indication that a specific PCC rule is subject to this trigger, the SMF shall report to the PCF when the resources associated to this PCC rule have been successfully allocated. The SMF shall report resource allocation failure always to the PCF, independently of this trigger. If the SMF reports resource allocation failure for a PCC rule containing MA PDU Session Control information with Redundant as Steering Mode (see clause 5.32.4 of TS 23.501 [2]), the SMF shall also indicate the respective Access Type.

If the GFBR of the QoS Flow can no longer (or can again) be guaranteed trigger is armed, the SMF shall check the need for reporting to the PCF when the SMF receives an explicit notification from (R)AN indicating that GFBR of the QoS Flow can no longer (or can again) be guaranteed or when the condition described in clause 5.7.2.4 of TS 23.501 [2] is met during the handover. The SMF shall report that GFBR of the QoS Flow can no longer (or can again) be guaranteed accordingly to the PCF for those PCC rules which are bound to the affected QoS Flow and have the QoS Notification Control (QNC) parameter set. If additional information is received with the notification from NG-RAN (see clause 5.7.2.4 of TS 23.501 [2]), the SMF shall also provide to the PCF the reference to the Alternative QoS parameter set corresponding to the Alternative QoS Profile referenced by NG-RAN. If NG-RAN has indicated that the lowest priority Alternative QoS Profile cannot be fulfilled, the SMF shall indicate to the PCF that the lowest priority Alternative QoS parameter set cannot be fulfilled.

In an interworking scenario between 5GS and EPC/E-UTRAN, as explained in clause 4.3 of TS 23.501 [2], the PCF may subscribe via the SMF also to the Policy Control Request Triggers described in clause 6.1.2.5 when the UE is served by the EPC/E-UTRAN.

The change of DN Authorization Profile Index shall trigger a SMF interaction to send DN Authorization Profile Index to retrieve a list of PCC Rules (as defined in clause 6.3) and/or PDU Session related policy (as defined in clause 6.4) for an established PDU Session.

If the trigger for 5GS Bridge/Router information available is armed, the SMF shall report the 5GS Bridge/Router information when the SMF has determined or updated the 5GS Bridge/Router information, e.g. when SMF has detected an Ethernet port which supports exchange of Ethernet Port Management Information Containers or received User plane node Management Information Container or Port Management Information Container. If a new manageable Ethernet DS-TT port is detected, the SMF provides User plane node ID, the port number and optionally MAC address of the related port of the related PDU Session to the PCF. If the SMF has received UE-DS-TT Residence Time then the SMF also provides UE-DS-TT Residence Time to the PCF. If the SMF has received the User plane node Management Information Container from NW-TT or Port Management Information Container from NW-TT or DS-TT, the SMF also provides User plane node Management Information Container or Port Management Information Container and related port number to the PCF. In the case of Deterministic Networking, the SMF may also provide the MTU size for IPv4 or the MTU size for IPv6.

When the QoS Monitoring trigger is set, the SMF shall, upon receiving the QoS Monitoring report from the UPF, send the measurement report to the PCF.

If the Policy Control Request Trigger "DDN Failure event subscription with Traffic Descriptor" or "DDD Status event subscription with Traffic Descriptor" is set, the SMF shall request policies if it received a subscription or cancellation of notifications for availability after DDN Failure event with traffic descriptor or DDD Status event with traffic descriptor, respectively. The SMF indicates whether it is a subscription or cancellation event and provides the received Traffic Descriptor as well as the requested type(s) of notifications (notifications about downlink packets being buffered, and/or discarded) to the PCF. When the SMF indicates a subscription event, the PCF checks whether an installed PCC rule exists for the received Traffic Descriptor and if so, the PCF sets the Downlink Data Notification Control information of that PCC rule according to the requested type(s) of notifications. Otherwise, the PCF provides a new PCC Rule with the received Traffic Descriptor in the SDF Template, the Downlink Data Notification Control information set according to the requested type(s) of notifications and other PCC Rule information set to the same values as in the existing PCC rule that previously matched the traffic. When the new PCC rule has to be bound to the QoS Flow associated with the default QoS rules, the PCF sets the "Bind to QoS Flow associated with the default QoS rule" parameter. From now on, the PCF needs to keep the PCC rule for the DDD event detection fully synchronized with the existing PCC rule that previously matched the traffic for all other policy and charging control settings to ensure the same user experience and traffic treatment according to the operator policy. When the SMF indicates a cancellation event, the PCF removes the Downlink Data Notification Control information in the installed PCC Rule or removes the PCC Rule if a new PCC rule has been provided during the subscription event and this PCC rule is no longer necessary for any other policy enforcement.

NOTE 12: Downlink Data Delivery (DDD) status event and DDN Failure event are specified in clause 4.15.3 of TS 23.502 [3].

The QoS constraints change trigger shall trigger a SMF interaction with the PCF if QoS constraints are received by the SMF during the lifetime of the PDU Session. The SMF reports that the QoS constraints change trigger was met and the new QoS constraints.

When the Satellite backhaul category change trigger is armed, the SMF reports to the PCF that the Satellite backhaul category change was met and the new Satellite backhaul category (including satellite backhaul is no longer used) when it becomes aware that there is a change of the backhaul which is used for the PDU Session between different types of satellite backhaul, or between satellite backhaul and a non-satellite backhaul. The SMF determines whether or not a satellite backhaul is used and whether there is a change of backhaul based on signalling from the AMF as specified in TS 23.501 [2].

NOTE 13: As specified in clause 5.43.4 of TS 23.501 [2], Satellite backhaul category refers to the type of the satellite (or non-satellite) used in the backhaul. Only a single backhaul category can be indicated.

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

The Request for reporting the PCF binding information indicates to the SMF to report to the PCF for the PDU Session that the trigger was met and the updated PCF binding information of the PCF for the UE received from the AMF.

When the Notification on BAT offset trigger is set, the SMF shall, upon receiving a BAT offset and optionally an adjusted periodicity from the RAN (in a notification that GFBR of the QoS Flow can no longer be guaranteed as defined in clause 5.27.2.5.3 of TS 23.501 [2]), report the BAT offset and optionally the adjusted periodicity to the PCF for the PCC rule which is bound to the QoS Flow for which the notification from RAN was received.

The UE reporting Connection Capabilities from associated URSP rule trigger indicates to the SMF that when a UE includes Connection Capabilities in the PDU Session Establishment Request or PDU Modification Request, the SMF shall forward this information to the PCF as described in clause 6.6.2.4, if the PCRT is set in the SMF.

The UE Policy Container received or delivery failure for UE Policy Container delivery via EPS trigger shall trigger a SMF interaction with the PCF, if a UE Policy Container is received from the UE via EPS or in case of a delivery failure for UE Policy Container delivery via EPS (with appropriate reason, e.g. UE is not reachable), as described in clause 4.11.0a.2a.10 of TS 23.502 [3].

NOTE 14: The UE Policy Container can include a list of provisioned PSIs and/or UE capabilities (e.g. indication of supporting URSP rules over EPS) or the result of the delivery of the UE Policy Container as well as the result of processing the content of the UE Policy Container by the UE.

When the Change of HR-SBO support indication trigger is armed, the H-SMF reports to the H-PCF that the HR-SBO support indication change was met. The H-SMF determines whether there is a change of HR-SBO support indication based on HR-SBO Request Indication from the V-SMF and/or the SM subscription data from UDM as described in clause 6.7.2.2 of TS 23.548 [33].

The Network Slice Replacement trigger shall trigger a SMF interaction with the PCF to notify change between S-NSSAI and Alternative S-NSSAI when the SMF determines that the existing PDU Session and existing SM Policy Association can be retained as described in clause 5.15.19 of TS 23.501 [2]. The SMF provides Alternative S-NSSAI if the PDU Session is transferred from a S-NSSAI to its Alternative S-NSSAI. The SMF indicates to the PCF that the PDU Session is transferred from the Alternative S-NSSAI to the replaced S-NSSAI, when the replaced S-NSSAI is available again and the PDU Session is transferred to the replaced S-NSSAI.

NOTE 15: The SMF reports to the PCF a PDU session transfer anytime when the PDU Session is transferred from one S-NSSAI to another S-NSSA.

If the "ECN marking for L4S can no longer (or can again) be performed" trigger is armed, the SMF shall report to the PCF for those PCC rules which have enabled ECN marking for L4S (explicitly or implicitly as described in clause 6.1.3.22) if neither 5G-AN nor UPF PSA ECN marking for L4S can be enabled on the affected QoS Flows, and when ECN marking for L4S can be enabled on the affected QoS Flows (again).

If the "QoS Monitoring can no longer (or can again) be performed trigger" is armed, the SMF shall report to the PCF for those PCC rules with QoS Monitoring Policy when the support for QoS monitoring has changed, i.e. from QoS monitoring is possible to QoS monitoring is not possible or vice versa. The SMF determines whether QoS monitoring is possible or not as described in clause 5.45.1 of TS 23.501 [2].

When the UE reachability status change is armed, the SMF subscribes to event of "UE reachability status" by using the Namf\_EventExposure\_Subscribe defined in clause 5.2.2.3.1 of TS 23.502 [3]. The SMF reports a change of the UE reachability status to the PCF.

\* \* \* \* Second 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 |
| 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 5G-AN 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.

\* \* \* End of changes \* \* \* \*