**SA WG2 Meeting #S2-137E *S2-2002292r06***

**Elbonia, 24 - 28 February, 2020, Electronic meeting (revision of S2-200xxxx)**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **23.503** | **CR** | **0429** | **rev** | **-** | **Current version:** | **16.3.0** |  |
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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 | **X** | Core Network | **X** |

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| ***Title:*** | UE notification due to Alternative QoS Profile | | | | | | | | | |
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| ***Source to WG:*** | Nokia, Nokia Shanghai Bell, Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | SA2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | 5G\_URLLC, eV2XARC | | | | |  | ***Date:*** | | | 2020-02-18 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *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-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | It is stated in 5.7.2.4.1b of TS 23.501 that PCF may disable NAS signalling to UE about the change of QoS parameters for Notification control or handover.   |  | | --- | | *If the PCF has not indicated differently, the SMF uses NAS signalling (that is sent transparently through the RAN) to inform the UE about changes in the QoS parameters (i.e., 5QI, GFBR, MFBR) that the NG-RAN is currently fulfilling for the QoS Flow after Notification control or handover related signalling has occurred.* |   This is to save the N2 and RRC signalling.  However, it is unclear on how PCF can determine and how to disable the NAS signalling.  The following solution is proposed:   * PCF determines to disable the NAS signalling based on the AF input.   + AF provides an indicator on disabling the notification in the AF request. * PCF includes the indicator to disable NAS signalling to UE in the PCC rule.   Additionally, Alternative QoS profile only applies to GBR QoS flows, Resource type of the 5QI in an Alternative QoS Profile has to be GBR.  Finally, it is proposed to enable a different ARP parameter setting in the Alternative QoS Parameter Sets so that the ARP priority level can be decreased (compared to the value in the QoS profile) for the Alternative QoS Parameter with the lowest priority (which results in a higher priority for the admission control decision). This would improve the chances for being accepted in a fully loaded cell. | | | | | | | | |
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| ***Summary of change:*** | | Add a parameter in the PCC rule for disabling NAS notification to UE on the change of QoS parameters.  Clarify that 5QI value in an alternative QoS Profile is consistant with that of the QoS Profile.  Add the description on how AF provides indicator of disabling NAS notification to UE on the change of QoS parameters.  The ARP parameter is added to the Alternative QoS Parameter Set. | | | | | | | | |
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| ***Consequences if not approved:*** | | Inconsistent feature description. Not possible for PCF to disable NAS signaling to UE. | | | | | | | | |
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| ***Clauses affected:*** | | 6.1.3.22, 6.2.2.4, 6.3.1 | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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

#### 6.1.3.22 AF session with required QoS

The AF may request that a data session to a UE is set up with a specific QoS (e.g. low latency or jitter) and priority handling. The AF can request the network to provide QoS for the AF session based on the service requirements with the help of a QoS reference parameter which refers to pre-defined QoS information. When the PCF authorizes the service information from the AF and generates a PCC rule, it derives the QoS parameters of the PCC rule based on the service information and the indicated QoS reference parameter.

NOTE 1: A SLA has to be in place between the operator and the ASP defining the possible QoS levels and their charging rates. For each of the possible pre-defined QoS information sets, the PCF needs to be configured with the corresponding QoS parameters and their values as well as the appropriate Charging key (or receive this information from the UDR).

The AF may change the QoS by providing a different QoS reference parameter while the AF session is ongoing. If this happens, the PCF shall update the related QoS parameter sets in the PCC rule accordingly.

If the PCF gets informed about Policy Control Request Triggers relevant for the AF session, the PCF shall inform the AF about it as defined in clause 6.1.3.18.

If an AF session can adjust to different QoS parameter combinations, the AF may provide Alternative Service Requirements containing one or more QoS reference parameters in a prioritized order (which indicates the preference of the QoS requirements with which the service can operate). If so, the AF shall also subscribe to receive notifications when the QoS targets can no longer (or can again) be fulfilled from the PCF as described in clause 6.1.3.18.

When the PCF authorizes the service information from the AF and generates a PCC rule, it shall also derive Alternative QoS parameter sets for this PCC rule based on the QoS reference parameters in the Alternative Service Requirements.

The PCF shall enable QoS Notification Control and include the derived Alternative QoS parameter sets (in the same prioritized order indicated by the AF) in the PCC rule sent to the SMF. When the PCF notifies the AF that QoS targets can no longer (or can again) be fulfilled (as described in clause 6.1.3.18) the PCF shall include the QoS reference parameter corresponding to the Alternative QoS parameter set referenced by the SMF.

NOTE 2: The AF behaviour is out of the scope of this TS but can include adaptation to the change of QoS (e.g. rate adaptation) as well as application layer signalling with the UE.

The AF may change the Alternative Service Requirements while the AF session is ongoing. If this happens, the PCF shall update the Alternative QoS parameter sets in the PCC rule accordingly.

The AF may indicate to the PCF that the UE does not need to be informed about changes related to Alternative QoS Profiles. With this indication received from AF, the PCF decides whether or not to disable the notifications to the UE when changes related to the Alternative QoS Profiles occur and sets the Disable UE notifications at change related to Alternative QoS Profiles parameter in the PCC rule accordingly.

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

#### 6.2.2.4 QoS control

The SMF receives the authorized QoS for a service data flow in the PCC rule. The SMF derives the QoS parameters for a QoS Flow (other than the QoS Flow associated with the default QoS rule) based on the PCC rule information of the PCC rule(s) bound to this QoS Flow:

- The SMF shall set the QoS Flow parameters 5QI and ARP to the values of the corresponding PCC rule parameters.

- For the QoS Flow parameters QNC, Priority Level, Averaging Window and Maximum Data Burst Volume, the SMF shall use the corresponding PCC rule parameters if they are available in the PCC rule.

- For GBR QoS Flows, the SMF should set the GFBR to the sum of the GBRs of all PCC rules that are active and bound to that QoS Flow and the MFBR to the sum of the MBRs of all PCC rules that are active and bound to that GBR QoS Flow. If a set of PCC Rules is subject to resource sharing as specified in clause 6.1.3.13 the SMF should use, for each applicable direction, the highest GBR from the set of PCC Rules sharing resources as input for calculating the GFBR and may use, for each applicable direction, the highest MBR from the set of PCC Rules as input for calculating the MFBR.

- For GBR QoS Flows, the SMF shall set the QoS Flow parameter Maximum Packet Loss Rate for UL and DL if the corresponding PCC rule parameters are available in the PCC rule. In the case multiple PCC Rules are bound to the QoS Flow and the SMF received multiple Maximum Packet Loss Rates, the SMF chooses the lowest value per direction in all these PCC rules.

- If the PCC rule contains a non-standardized 5QI, the SMF shall also provide the corresponding 5G QoS characteristics parameters (as received in the PDU Session related information Explicitly signalled QoS Characteristics) for the QoS Flow.

- If the PCC rule contains Alternative QoS Parameter Sets, the SMF shall provide their attributes as Alternative QoS Profile(s) (see TS 23.501 [2] clause 5.7.1.2a) in the same prioritized order (in which they occur in the PCC rule) in addition to the QoS parameters for the QoS Flow.

The SMF shall set the QoS parameters of the QoS Flow associated with the default QoS rule to:

- the PCC rule parameters contained in the PCC rule that is bound to this QoS Flow (in the way it is described above) if the PCC rule attribute Bind to QoS Flow associated with the default QoS rule and apply PCC rule parameters is present; or otherwise

- the Authorized default 5QI/ARP received in the PDU Session related information. If the Authorized default 5QI contains a non-standardized 5QI, the SMF shall also provide the corresponding 5G QoS characteristics parameters (as received in the PDU Session related information Explicitly signalled QoS Characteristics) for the QoS Flow associated with the default QoS rule.

The SMF receives the authorized Session AMBR in the PDU Session related information. The SMF ensures that the authorized Session AMBR for a PDU Session is enforced for bandwidth policing at the UPF(s) as described in TS 23.501 [2] clause 5.7.1.

The SMF generates QoS rule(s) as described in TS 23.501 [2]. For a PDU session of unstructured type, only one PCC Rule allowing all packets is to be activated in the SMF and only the QoS Flow associated with the default QoS rule exists as described in TS 23.501 [2] clause 5.7.1.

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

### 6.3.1 General

The Policy and charging control rule (PCC rule) comprises the information that is required to enable the user plane detection of, the policy control and proper charging for a service data flow. The packets detected by applying the service data flow template of a PCC rule form a service data flow.

Two different types of PCC rules exist: Dynamic rules and predefined rules. The dynamic PCC rules are provisioned by the PCF to the SMF, while the predefined PCC rules are configured into the SMF, as described in TS 23.501 [2], and only referenced by the PCF.

NOTE 1: The procedure for provisioning predefined PCC rules is out of scope for this specification.

The operator defines the PCC rules.

Table 6.3.1 lists the information contained in a PCC rule, including the information name, the description and whether the PCF may modify this information in a dynamic PCC rule which is active in the SMF. The Category field indicates if a certain piece of information is mandatory or not for the construction of a PCC rule, i.e. if it is possible to construct a PCC rule without it.

The differences with table 6.3 in TS 23.203 [4] are shown, either "none" means that the IE applies in 5GS or "removed" meaning that the IE does not apply in 5GS, this is due to the lack of support in the 5GS for this feature or "modified" meaning that the IE applies with some modifications defined in the IE.

Table 6.3.1: The PCC rule information in 5GC

| Information name | Description | Category | PCF permitted to modify for a dynamic PCC rule in the SMF | Differences compared with table 6.3. in TS 23.203 [4] |
| --- | --- | --- | --- | --- |
| Rule identifier | Uniquely identifies the PCC rule, within a PDU Session.  It is used between PCF and SMF for referencing PCC rules. | Mandatory | No | None |
| **Service data flow detection** | *This part defines the method for detecting packets belonging to a service data flow.* |  |  |  |
| Precedence | Determines the order, in which the service data flow templates are applied at service data flow detection, enforcement and charging. (NOTE 1). | Conditional (NOTE 2) | Yes | None |
| Service data flow template | For IP PDU traffic: Either a list of service data flow filters or an application identifier that references the corresponding application detection filter for the detection of the service data flow.  For Ethernet PDU traffic: Combination of traffic patterns of the Ethernet PDU traffic.  It is defined in TS 23.501 [2], clause 5.7.6.3 | Mandatory (NOTE 3) | Conditional  (NOTE 4) | Modified  (packet filters for Ethernet PDU traffic added) |
| Mute for notification | Defines whether application's start or stop notification is to be muted. | Conditional (NOTE 5) | No | None |
| **Charging** | *This part defines identities and instructions for charging and accounting that is required for an access point where flow based charging is configured* |  |  |  |
| Charging key  (NOTE 22) | The charging system (CHF) uses the charging key to determine the tariff to apply to the service data flow. |  | Yes | None |
| Service identifier | The identity of the service or service component the service data flow in a rule relates to. |  | Yes | None |
| Sponsor Identifier | An identifier, provided from the AF which identifies the Sponsor, used for sponsored flows to correlate measurements from different users for accounting purposes. | Conditional  (NOTE 6) | Yes | None |
| Application Service Provider Identifier | An identifier, provided from the AF which identifies the Application Service Provider, used for sponsored flows to correlate measurements from different users for accounting purposes. | Conditional  (NOTE 6) | Yes | None |
| Charging method | Indicates the required charging method for the PCC rule.  Values: online, offline or neither. | Conditional (NOTE 7) | No | None |
| Service Data flow handling while requesting credit | Indicates whether the service data flow is allowed to start while the SMF is waiting for the response to the credit request.  Only applicable for charging method online.  Values: blocking or non-blocking |  | No | New |
| Measurement method | Indicates whether the service data flow data volume, duration, combined volume/duration or event shall be measured.  This is applicable to reporting, if the charging method is online or offline.  Note: Event based charging is only applicable to predefined PCC rules and PCC rules used for application detection filter (i.e. with an application identifier). |  | Yes | None |
| Application Function Record Information | An identifier, provided from the AF, correlating the measurement for the Charging key/Service identifier values in this PCC rule with application level reports. |  | No | None |
| Service Identifier Level Reporting | Indicates that separate usage reports shall be generated for this Service Identifier.  Values: mandated or not required |  | Yes | None |
| **Policy control** | *This part defines how to apply policy control for the service data flow.* |  |  |  |
| Gate status | The gate status indicates whether the service data flow, detected by the service data flow template, may pass (Gate is open) or shall be discarded (Gate is closed). |  | Yes | None |
| 5G QoS Identifier (5QI) | The 5QI authorized for the service data flow. | Conditional (NOTE 10) | Yes | Modified  (corresponds to QCI in TS 23.203 [4]) |
| QoS Notification Control (QNC) | Indicates whether notifications are requested from 3GPP RAN when the GFBR can no longer (or can again) be guaranteed for a QoS Flow during the lifetime of the QoS Flow. | Conditional (NOTE 15) | Yes | Added |
| Reflective QoS Control | Indicates to apply reflective QoS for the SDF. |  | Yes | Added |
| UL-maximum bitrate | The uplink maximum bitrate authorized for the service data flow |  | Yes | None |
| DL-maximum bitrate | The downlink maximum bitrate authorized for the service data flow |  | Yes | None |
| UL-guaranteed bitrate | The uplink guaranteed bitrate authorized for the service data flow |  | Yes | None |
| DL-guaranteed bitrate | The downlink guaranteed bitrate authorized for the service data flow |  | Yes | None |
| UL sharing indication | Indicates resource sharing in uplink direction with service data flows having the same value in their PCC rule |  | No | None |
| DL sharing indication | Indicates resource sharing in downlink direction with service data flows having the same value in their PCC rule |  | No | None |
| Redirect | Redirect state of the service data flow (enabled/disabled) | Conditional (NOTE 8) | Yes | None |
| Redirect Destination | Controlled Address to which the service data flow is redirected when redirect is enabled | Conditional  (NOTE 9) | Yes | None |
| ARP | The Allocation and Retention Priority for the service data flow consisting of the priority level, the pre-emption capability and the pre-emption vulnerability | Conditional (NOTE 10) | Yes | None |
| Bind to QoS Flow associated with the default QoS rule | Indicates that the dynamic PCC rule shall always have its binding with the QoS Flow associated with the default QoS rule (NOTE 11). |  | Yes | Modified (corresponds to bind to the default bearer in TS 23.203 [4]) |
| Bind to QoS Flow associated with the default QoS rule and apply PCC rule parameters | Indicates that the dynamic PCC rule shall always have its binding with the QoS Flow associated with the default QoS rule.  It also indicates that the that the QoS related attributes of the PCC rule shall be applied to derive the QoS parameters of the QoS Flow associated with the default QoS rule instead of the PDU Session related parameters Authorized default 5QI/ARP. | Conditional (NOTE 17) | Yes | Added |
| PS to CS session continuity | Indicates whether the service data flow is a candidate for vSRVCC. |  |  | Removed |
| Priority Level | Indicates a priority in scheduling resources among QoS Flows (NOTE 14). |  | Yes | Added |
| Averaging Window | Represents the duration over which the guaranteed and maximum bitrate shall be calculated (NOTE 14). |  | Yes | Added |
| Maximum Data Burst Volume | Denotes the largest amount of data that is required to be transferred within a period of 5G-AN PDB (NOTE 14). |  | Yes | Added |
| Disable UE notifications at changes related to Alternative QoS Profiles | Indicates to disable QoS flow parameters signalling to the UE when the SMF is notified by the NG-RAN of changes in the fulfilled QoS situation. The fulfilled situation is either the QoS profile or an Alternative QoS Profile. | Conditional (NOTE X) | Yes | Added |
| **Access Network Information Reporting** | *This part describes access network information to be reported for the PCC rule when the corresponding QoS Flow is established, modified or terminated.* |  |  |  |
| User Location Report | The serving cell of the UE is to be reported. When the corresponding QoS Flow is deactivated, and if available, information on when the UE was last known to be in that location is also to be reported. |  | Yes | None |
| UE Timezone Report | The time zone of the UE is to be reported. |  | Yes | None |
| **Usage Monitoring Control** | *This part describes identities required for Usage Monitoring Control.* |  |  | None |
| Monitoring key  (NOTE 23) | The PCF uses the monitoring key to group services that share a common allowed usage. |  | Yes | None |
| Indication of exclusion from session level monitoring | Indicates that the service data flow shall be excluded from PDU Session usage monitoring |  | Yes | None |
| **N6-LAN Traffic Steering Enforcement Control (NOTE 18)** | *This part describes information required for N6-LAN Traffic Steering.* |  |  |  |
| Traffic steering policy identifier(s) | Reference to a pre-configured traffic steering policy at the SMF  (NOTE 12). |  | Yes | None |
| **AF influenced Traffic Steering Enforcement Control (NOTE 18)** | *This part describes information required for AF influenced Traffic Steering.* |  |  |  |
| Data Network Access Identifier | Identifier(s) of the target Data Network Access (DNAI). It is defined in TS 23.501 [2], clause 5.6.7. |  | Yes | Added |
| Per DNAI: Traffic steering policy identifier | Reference to a pre-configured traffic steering policy at the SMF  (NOTE 19). |  | Yes | Added |
| Per DNAI: N6 traffic routing information | Describes the information necessary for traffic steering to the DNAI. It is described in TS 23.501 [2], clause 5.6.7 (NOTE 19). |  | Yes | Added |
| Information on AF subscription to UP change events | Indicates whether notifications in case of change of UP path are requested and optionally indicates whether acknowledgment to the notifications shall be expected (as defined in TS 23.501 [2] clause 5.6.7). |  | Yes | Added |
| Indication of UE IP address preservation | Indicates UE IP address should be preserved. It is defined in TS 23.501 [2], clause 5.6.7. |  | Yes | Added |
| Indication of traffic correlation | Indicates that the target PDU Sessions should be correlated via a common DNAI in the user plane. It is described in TS 23.501 [2], clause 5.6.7. |  | Yes | Added |
| **NBIFOM related control Information** | *This part describes PCC rule information related with NBIFOM* |  |  |  |
| Allowed Access Type | The access to be used for traffic identified by the PCC rule |  |  | Removed |
| **RAN support information** | *This part defines information supporting the RAN for e.g. handover threshold decision.* |  |  |  |
| UL Maximum Packet Loss Rate | The maximum rate for lost packets that can be tolerated in the uplink direction for the service data flow. It is defined in TS 23.501 [2], clause 5.7.2.8. | Conditional (NOTE 13) | Yes | None |
| DL Maximum Packet Loss Rate | The maximum rate for lost packets that can be tolerated in the downlink direction for the service data flow. It is defined in TS 23.501 [2], clause 5.7.2.8. | Conditional (NOTE 13) | Yes | None |
| **MA PDU Session Control**  **(NOTE 20)** | *This part defines information supporting control of MA PDU Sessions* |  | Yes | New |
| Steering Functionality | Indicates the applicable traffic steering functionality. | Conditional (NOTE 21) | Yes | New |
| Steering mode | Indicates the rule for distributing traffic between accesses together with associated parameters (if any). | Conditional (NOTE 21) | Yes | New |
| Charging key for Non-3GPP access  (NOTE 22) | Indicates the Charging key used for charging packets carried via Non-3GPP access for a MA PDU Session. |  | Yes | New |
| Monitoring key for Non-3GPP access  (NOTE 23) | Indicates the Monitoring key used to monitor usage of the packets carried via Non-3GPP access for a MA PDU Session. |  | Yes | New |
| **QoS Monitoring for URLLC** | *This part describes PCC rule information related with QoS Monitoring for URLLC.* |  |  |  |
| QoS parameter(s) to be measured | UL packet delay, DL packet delay or round trip packet delay. |  | Yes | Added |
| Reporting frequency | Defines the frequency for the reporting, such as event triggered, periodic, or when the PDU Session is released. |  | Yes | Added |
| Target of reporting | Defines the target of the QoS Monitoring reports, it can be either the PCF or the AF, decided by the PCF. |  | Yes | Added |
| **Alternative QoS Parameter Sets**  **(NOTE 24)**  **(NOTE Y)** | *This part defines Alternative QoS Parameter Sets for the service data flow.* |  |  |  |
| 5G QoS Identifier (5QI) | The 5QI in this Alternative QoS Parameter Set. |  | Yes | Added |
| UL-maximum bitrate | The uplink maximum bitrate in this Alternative QoS Parameter Set. |  | Yes | Added |
| DL-maximum bitrate | The downlink maximum bitrate in this Alternative QoS Parameter Set. |  | Yes | Added |
| UL-guaranteed bitrate | The uplink guaranteed bitrate in this Alternative QoS Parameter Set. |  | Yes | Added |
| DL-guaranteed bitrate | The downlink guaranteed bitrate in this Alternative QoS Parameter Set. |  | Yes | Added |
|  |  |  |  |  |
| **TSN AF QoS container** | *This part defines parameters provided by TSN AF. Following are the parameters:*  *- Burst Arrival Time - Indicates the burst arrival time in reference to TSN GM and ingress port.*  *- Periodicity The time period (in reference to TSN GM) between start of two bursts.*  *- Flow Direction: Direction of the flow.* |  | No | Added |
| NOTE 1: For PCC rules based on an application detection filter, the precedence is only relevant for the enforcement, i.e. when multiple PCC rules overlap, only the enforcement, reporting of application starts and stops, monitoring, and charging actions of the PCC rule with the highest precedence shall be applied.  NOTE 2: The Precedence is mandatory for PCC rules with SDF template containing SDF filter(s). For dynamic PCC rules with SDF template containing an application identifier, the precedence is either preconfigured in SMF or provided in the PCC rule from PCF.  NOTE 3: Either service data flow filter(s) or application identifier shall be defined per each rule.  NOTE 4: YES, in case the service data flow template consists of a set of service data flow filters. NO in case the service data flow template consists of an application identifier  NOTE 5: Optional and applicable only if application identifier exists within the rule.  NOTE 6: Applicable to sponsored data connectivity.  NOTE 7: Mandatory if there is no default charging method for the PDU Session.  NOTE 8: Optional and applicable only if application identifier exists within the rule.  NOTE 9: If Redirect is enabled.  NOTE 10: Mandatory when Bind to QoS Flow associated with the default QoS rule is not present.  NOTE 11: The presence of this attribute causes the 5QI/ARP/QNC/Priority Level/Averaging Window/Maximum Data Burst Volume of the rule to be ignored for the QoS Flow binding.  NOTE 12: The Traffic steering policy identifier can be different for uplink and downlink direction. If two Traffic steering policy identifiers are provided, then one is for uplink direction, while the other one is for downlink direction.  NOTE 13: Optional and applicable only for voice service data flow in this release.  NOTE 14: Optional and applicable only when a value different from the standardized value for this 5QI in Table 5.7.4-1 TS 23.501 [2] is required.  NOTE 15: Optional and applicable only for GBR service data flow.  NOTE 16: Usage of the charging information in described in TS 32.255 [21].  NOTE 17: Only one PCC rule can contain this attribute and this PCC rule shall not contain the attribute Bind to QoS Flow associated with the default QoS rule.  NOTE 18: Only one of the two shall be present in a PCC rule.  NOTE 19: Per DNAI, a Traffic steering policy identifier and/or N6 traffic routing information can be provided. If the pre-configured traffic steering policy (that is referenced by the Traffic steering policy identifier) contains information that is overlapping with the N6 traffic routing information, the N6 traffic routing information shall take precedence.  NOTE 20: Only applicable to a PCC Rules provided to a MA PDU session.  NOTE 21: Mandatory when MA PDU Session Control information is provided.  NOTE 22: When a Charging key for Non-3GPP access is provided, the parameters in the Charging Clause (other than the Charging key) apply to both accesses and the Charging key (in the Charging Section) shall be used for charging packets carried via the 3GPP access.  NOTE 23: When a Monitoring key for Non-3GPP access is provided, the Monitoring key (in the Usage Monitoring Control Section) shall be used to monitor usage of the packets carried via the 3GPP access.  NOTE 24: Optional and applicable only for GBR service data flow with QoS Notification Control enabled.  NOTE X: Optional and applicable only for GBR service data flow for which Alternative QoS Parameter Set(s) are provided.  NOTE Y: One or more Alternative QoS Parameter Sets can be provided in a prioritized order starting with the Alternative QoS Parameter Set that has the highest priority. | | | | |

The Rule identifier shall be unique for a PCC rule within a PDU Session. A dynamically provided PCC rule that has the same Rule identifier value as a predefined PCC rule shall replace the predefined rule within the same PDU Session.

The Precedence defines in what order the activated PCC rules within the same PDU Session shall be applied at the UPF for service data flow detection. When a dynamic PCC rule and a predefined PCC rule have the same precedence, the dynamic PCC rule takes precedence.

NOTE 2: The operator shall ensure that overlap between the predefined PCC rules can be resolved based on precedence of each predefined PCC rule in the SMF. The PCF shall ensure that overlap between the dynamically allocated PCC rules can be resolved based on precedence of each dynamically allocated PCC rule.

For downlink packets all the service data flow templates, activated for the PDU Session shall be applied for service data flow detection and for the mapping to the correct QoS Flow. For uplink packets the service data flow templates activated on their QoS Flow shall be applied for service data flow detection (further details are provided in clause 6.2.2.2).

The *Service data flow template* may comprise any number of *Service data flow filters* or an *application identifier* as is defined in table 6.3.1.

NOTE 3: Predefined PCC rules may include service data flow templates, which support extended capabilities, including enhanced capabilities to identify events associated with application protocols.

A Service data flow filter contains information for matching user plane packets for IP PDU traffic or Ethernet PDU traffic. All Service data flow filters of a Service data flow template shall be of the same type, i.e. either Packet Filters for IP or Ethernet PDU traffic (defined in TS 23.501 [2] clause 5.7.6). The Service data flow template information within an activated PCC rule is applied by the SMF to instruct the UPF to identify the packets belonging to a particular service data flow.

For the IP PDU Session type only, the Service data flow template may consist of an application identifier that references an application detection filter that is used for matching user plane packets. The application identifier is also identifying the application, for which the rule applies. The same application identifier value can occur in a dynamic PCC rule and one or multiple predefined PCC rules. If so, the PCF shall ensure that there is at most one PCC rule active per application identifier value at any time.

The *Mute for notification* defines whether notification to the PCF of application's starts or stops shall be muted. Absence of this parameter means that start/stop notifications shall be sent.

The *Charging key* is the reference to the tariff for the service data flow. Any number of PCC Rules may share the same charging key value. The Charging key values for each service shall be operator configurable.

NOTE 4: Assigning the same Charging key for several service data flows implies that the charging does not require the credit management to be handled separately.

The *Service identifier* identifies the service. PCC Rules may share the same service identifier value. The service identifier provides the most detailed identification, specified for flow-based charging, of a service data flow.

NOTE 5: The PCC rule service identifier need not have any relationship to service identifiers used on the AF level, i.e. is an operator policy option.

The *Sponsor Identifier* indicates the (3rd) party organization willing to pay for the operator's charge for connectivity required to deliver a service to the end user.

The *Application Service Provider Identifier* indicates the (3rd) party organization delivering a service to the end user.

The *Charging method* indicates whether online charging, offline charging, or both are required, or the service data flow is not subject to any end user charging. If the charging method identifies that the service data flow is not subject to any end user charging, a Charging key shall not be included in the PCC rule for that service data flow, along with other charging related parameters. If the charging method is omitted the SMF shall apply the default charging method provided within the PDU Session related policy information (see clause 6.4). The Charging method is mandatory if there is no default charging method for the PDU Session.

The *Service Data Flow handling while requesting credit* indicates either "blocking" if a credit for the Charging Key needs to be granted as a condition for the PCC Rule to be active or "non-blocking" if a credit for the Charging Key has been requested as a condition for the PCC Rule to be active.

The *Measurement method* indicates what measurements apply to charging for a PCC rule.

The *Service Identifier Level Reporting* indicates whether the SMF shall generate reports per Service Identifier. The SMF shall accumulate the measurements from all PCC rules with the same combination of Charging key/Service Identifier values in a single report.

The *Application Function Record Information* identifies an instance of service usage. A subsequently generated usage report (i.e. CDR), generated as a result of the PCC rule by the SMF, may include the Application Function Record Information, if available. The Application Function Record Information may contain the AF Charging Identifier and/or the Flow identifiers. If exclusive charging information related to the Application function record information is required, the PCF shall provide a service identifier, not used by any other PCC rule of the PDU Session at this point in time, for the AF session.

NOTE 6: For example, the PCF may be configured to maintain a range of service identifier values for each service which require exclusive per instance charging information. Whenever a separate counting or credit management for an AF session is required, the PCF shall select a value, which is not used at this point in time, within that range. The uniqueness of the service identifier in the SMF ensures a separate accounting/credit management while the AF record information identifies the instance of the service.

The *Gate* indicates whether the SMF shall instruct the UPF to let a packet identified by the PCC rule pass through (gate is open) to discard the packet (gate is closed).

NOTE 7: A packet, matching a PCC Rule with an open gate, may be discarded due to credit management reasons.

The *5G QoS Identifier*, 5QI, represents the QoS parameters for the service data flow. The 5G QoS identifier is scalar and accommodates the need for differentiating QoS in both 3GPP and non-3GPP access type.

The bitrates indicate the authorized bitrates at the IP packet level of the SDF, i.e. the bitrates of the IP packets before any access specific compression or encapsulation.

The *UL maximum-bitrate* indicates the authorized maximum bitrate for the uplink component of the service data flow.

The *DL maximum-bitrate* indicates the authorized maximum bitrate for the downlink component of the service data flow.

The *UL guaranteed-bitrate* indicates the authorized guaranteed bitrate for the uplink component of the service data flow.

The *DL guaranteed-bitrate* indicates the authorized guaranteed bitrate for the downlink component of the service data flow.

The 'Maximum bitrate' is used for enforcement of the maximum bit rate that the SDF may consume, while the 'Guaranteed bitrate' is used by the SMF to determine resource allocation demands.

The *UL sharing indication* indicates that resource sharing in uplink direction for service data flows with the same value in their PCC rule shall be applied by the SMF as described in clause 6.2.2.4.

The *DL sharing indication* indicates that resource sharing in downlink direction for service data flows with the same value in their PCC rule shall be applied by the SMF as described in clause 6.2.2.4.

The *Allocation and Retention Priority* indicates the allocation, retention and priority of the service data flow. The ARP contains information about the priority level, the pre-emption capability and the pre-emption vulnerability. The Allocation and Retention Priority resolves conflicts of demands for network resources.

The *Priority Level* is signalled together with the 5QI to the (R)AN and UPF, only when a value different from the standardized value in the QoS characteristics Table 5.7.4-1 in TS 23.501 [2] is required.

The *Averaging Window* is signalled together with the 5QI to the (R)AN and UPF, only when a value different from the standardized value in the QoS characteristics Table 5.7.4-1 in TS 23.501 [2] is required.

The *Maximum Data Burst Volume* is signalled together with the 5QI to the (R)AN, only when a value different from the standardized value in the QoS characteristics Table 5.7.4-1 in TS 23.501 [2] is required.

The *Bind to QoS Flow associated with the default QoS rule* indicates that the SDF shall be bound to the QoS Flow associated with the default QoS rule. The presence of this parameter attribute causes the 5QI/ARP of the rule to be ignored by the SMF during the QoS Flow binding.

The *Bind to QoS Flow associated with the default QoS rule and apply PCC rule parameters* indicates that the SDF shall be bound to the QoS Flow associated with the default QoS rule and that the QoS related attributes of the PCC rule shall be applied by the SMF to derive the QoS parameters of the QoS Flow associated with the default QoS rule instead of the PDU Session related information Authorized default 5QI/ARP.

NOTE 8: The Bind to QoS Flow associated with the default QoS rule and apply PCC rule parameters Indication has to be used whenever the PDU Session related information Authorized default 5QI/ARP (as described in clause 6.3.1) cannot be directly used as the QoS parameters of the QoS Flow associated with the default QoS rule, for example when a GBR 5QI is used or the 5QI priority level has to be changed.

The *QoS Notification Control,* QNC*,* indicates whether notifications are requested from the access network (i.e. 3GPP RAN) when the GFBR can no longer (or can again) be guaranteed for a QoS Flow during the lifetime of the QoS Flow. If it is set and the GFBR can no longer (or can again) be guaranteed, the access network (i.e. 3GPP RAN) sends a notification towards the SMF, which then notifies the PCF.

The *Disable UE notifications at changes related to Alternative QoS Profiles* parameter indicates to disable QoS flow parameters signalling to the UE when the SMF is notified by the NG-RAN of changes in the fulfilled QoS situation. The fulfilled situation is either the QoS profile or an Alternative QoS Profile.

The *Reflective QoS Control* indicates to apply reflective QoS for the service data flow. The indication is used to control the RQI marking in the DL packets of the service data flow and may trigger the sending of the RQA parameter for the QoS Flow the service data flow is bound to. Reflective QoS is defined in TS 23.501 [2] clause 5.7.5.

NOTE 9: While the UE applies a standardized value for the precedence of all UE derived QoS rules, PCC rules require different precedence values and PCF configuration has to ensure that there is a large enough value range for the precedence of PCC rules corresponding to UE derived QoS rules. To avoid that the precedence of network provided QoS rules need to be changed when Reflective QoS is activated and filters are overlapping, the PCF will take the standardized value for the precedence of UE derived QoS rules into account when setting the precedence value of PCC rules subject to Reflective QoS.

The *Reflective QoS Control* parameter shall not be used for the PCC rule with match-all SDF template. If PCC rule with match-all SDF template is present, the *Reflective QoS Control* parameter shall not be used for PCC rules which contain the *Bind to QoS Flow of the default QoS rule* parameter, either.

The *N6-LAN Traffic Steering Enforcement Control* contains *Traffic steering policy identifier(s)* for steering traffic onto N6-LAN to the appropriate N6 service functions deployed by the operator.

The access network information reporting parameters (*User Location Report*, *UE Timezone Report*) instruct the SMF about what information to forward to the PCF when the PCC rule is activated, modified or removed.

The *Monitoring Key* is the reference to a resource threshold. Any number of PCC Rules may share the same monitoring key value. The monitoring key values for each service shall be operator configurable.

The *Indication of exclusion from session level monitoring* indicates that the service data flow shall be excluded from the PDU Session usage monitoring.

The *AF influenced Traffic Steering Enforcement Control* contains:

*- a set of DNAI(s)* (i.e. a reference to the DNAI(s) the SMF needs to consider for UPF selection/reselection), an optional Indication of traffic correlation and, per DNAI, a corresponding Traffic steering policy identifier (i.e. a reference to a pre-configured traffic steering policy at the SMF), and/or a corresponding N6 traffic routing information (when the N6 traffic routing information is provided explicitly as part of the AF influence request, as described in TS 23.501 [2], clause 5.6.7), or;

- an *AF subscription to UP change events* parameter which contains subscription information defined in TS 23.502 [3] clause 5.2.8.3 for the change of UP path Event Id i.e. an *Indication of early and/or late notification* and information on where to provide the corresponding notifications (Notification Target Address + Notification Correlation ID as specified in TS 23.502 [3] clause 4.15.1) and optionally an indication of "AF acknowledgment to be expected" to the corresponding notifications as described in TS 23.501 [2], clause 5.6.7.

The *Traffic Steering Enforcement Control* may contain Indication of UE IP address preservation. The SMF takes this indication into account when determining whether to reselect PSA UPF, as specified in TS 23.501 [2], clause 5.6.7.

The *Redirect* indicates whether the uplink part of the service data flow should be redirected to a controlled address.

The *Redirect Destination* indicates the target redirect address when *Redirect* is enabled.

The *UL Maximum Packet Loss Rate* indicates the maximum rate for lost packets that can be tolerated in the uplink direction.

The *DL Maximum Packet Loss Rate* indicates the maximum rate for lost packets that can be tolerated in the downlink direction.

The *Steering Functionality* indicates the method for how traffic matching the SDF template is sent over the MA PDU Session. The method ATSSS\_LL indicates that the traffic matching the SDF template is sent over the MA PDU Session without additional tunnelling, e.g. with IP flow switching. The method MPTCP indicates that the traffic matching the SDF template is sent over the MA PDU Session using MPTCP.

The *Steering mode* indicates the rule for distributing traffic between accesses, together with the associated parameters. The PCF may indicate separate values for up-link and down-link directions. The available steering modes are defined in TS 23.501 [2].

The *Charging key for Non-3GPP access* indicates the Charging key that shall be used for charging the detected service data flow traffic carried via Non-3GPP access. The other charging related parameters apply for both accesses.

The *Monitoring key for Non-3GPP access* indicates the Monitoring key that shall be used for monitoring the usage of the detected service data flow traffic carried via Non-3GPP access.

The *QoS parameter(s) to be measured* indicates the UL packet delay, DL packet delay or round trip packet delay between the UE and the UPF is to be monitored when the QoS Monitoring for URLLC is enabled for the service data flow.

The *Reporting frequency* indicates the frequency for the reporting, such as event triggered, periodic, or when the PDU Session is released. The following applies:

- If the *Reporting frequency* indicates "periodic", the reporting time period shall also be included in the PCC rule.

- If the *Reporting frequency* indicates "event triggered", the *Reporting threshold(s)* and the *minimum waiting time* shall also be included in the PCC rule. The *Reporting threshold(s)* indicates the measurement threshold for each of the included *QoS parameter(s)* to be measured, i.e. the UL packet delay, DL packet delay or round trip packet delay. When *Reporting threshold(s)* is exceeded, the UPF shall report to the SMF and the SMF shall report to the PCF or to the AF. If more than one value is received at one given point of time for UL packet delay, DL packet delay or round trip packet delay respectively, the SMF reports the minimum and maximum packet delays to the PCF or the AF. The SMF sends the first report when the *Reporting threshold* is exceeded and the minimum waiting time is applied for the subsequent report (if the threshold is exceeded after the waiting time).

The *Target of reporting* indicates the target for the QoS Monitoring reports sent as notifications. It can be either the PCF or the AF (the NEF may be on the path between SMF and AF). The PCF shall include Notification Target Address + Notification Correlation ID as specified in TS 23.502 [3] clause 4.15.1.

The *Alternative QoS Parameter Set(s)* define alternative set(s) of QoS parameters for the service data flow. Every set consists of a 5QI, an UL and a DL maximum-bitrate as well as an UL and a DL guaranteed-bitrate QoS parameter.

The TSN AF container contains the following parameters:

- The Burst Arrival Time is sent to the SMF to indicate burst arrival time at the ingress port of 5GS for a given flow direction (DS-TT for UL, NW-TT for DL). It is used by the SMF to determine TSCAI burst arrival time as defined in TS 23.501 [2], clause 5.27.2 to assist transmission of deterministic flows on Uu.

The Periodicity is sent to the SMF to indicate the time between bursts. It is used by the SMF to forward to RAN as part of TSCAI in order to assist transmission of deterministic flows on Uu.

- The Flow direction is sent to SMF to indicate the direction of the flow (UL or DL).

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