**3GPP TSG-2 Meeting #164 *S2-240xxxx***

**Maastricht, The Netherlands, August 19 – 23, 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **23.503** | **CR** | **X** | **rev** | **-** | **Current version:** | **19.0.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network |  |

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| ***Title:*** | Support for MPQUIC-IP and MPQUIC-E steering functionalities | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | SA2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | MASSS | | | | |  | ***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 FS\_MASSS study has agreed to enhance ATSSS to support MPQUIC using CONNECT-IP and CONNECT-Ethernet, by defining two new Steering Functionalities. This has not yet been captured in TS 23.501. | | | | | | | | |
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| ***Summary of change:*** | | Add support for two new Steering Funcitonalities for IP and Ethernet proxying using MPQUIC. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Missing functionality | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | TBD | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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 \*\*\*\*

#### 6.1.3.20 Access Traffic Steering, Switching and Splitting

As specified in TS 23.501 [2], the Access Traffic Steering, Switching and Splitting (ATSSS) feature is an optional feature that may be supported by the UE and the 5GC network.

The ATSSS feature enables a multi-access PDU Connectivity Service, which can exchange PDUs between the UE and a data network by simultaneously using one 3GPP access network and one non-3GPP access network (both connected to 5GC) when both accesses are allowed for the same S-NSSAI. The multi-access PDU Connectivity Service also supports the exchange of PDUs between the UE and a data network by simultaneously using one 3GPP access network in EPC and one non-3GPP access network in 5GC, or one 3GPP access network in 5GC and one non-3GPP access network in EPC, as described in TS 23.501 [2]. This enables a scenario where a MA PDU Session can simultaneously be associated with user-plane resources on 3GPP access network connected to 5GC or EPC and non-3GPP access connected to 5GC, or with user-plane resources on 3GPP access network connected to 5GC and non-3GPP access connected to EPC.

The PCF is informed of the ATSSS capabilities of a MA PDU Session by the SMF, as defined in clause 5.32.2 of TS 23.501 [2]. The ATSSS capabilities are both the Steering Mode and the Steering Functionality.

The PCF control of Access Traffic Steering, Switching and Splitting for a detected service data flow (SDF) is enabled by including Multi-Access PDU (MA PDU) Session Control information in the PCC rule. This allows the PCF to control:

- The Steering Mode that is used to steer/switch/split the detected SDF. The available Steering Modes are defined in TS 23.501 [2].

- The Steering Functionality that is used for the detected SDF, e.g. the MPTCP functionality or the ATSSS-LL functionality or one or more of the MPQUIC based functionalities defined in TS 23.501 [2].

- The Steering Mode Indicator authorized for the detected SDF.

- The Threshold values for RTT and Packet Loss Rate authorized for the detected SDF.

- The Charging information depending on what Access Type is used for a detected SDF.

- The Usage Monitoring information depending on what Access Type is used for a detected SDF.

- Transport Mode that is used for the detected SDF. The available Transport Modes are defined in TS 23.501 [2].

The rest of the information in the PCC Rule apply to the SDF as such and are not dependent on what Access Type is used for a packet.

The MA PDU Session Control information in the PCC rules is used by the SMF in order to create applicable N4 rules for the UPF and ATSSS rules for the UE, as described in TS 23.501 [2]. The ATSSS rules are sent to UE via NAS when the MA PDU Session is created or updated by the SMF/PCF, as described in TS 23.501 [2] and TS 23.502 [3].

When MA PDU Session Control Information is provided to the SMF within a PCC Rule, the (H-)PCF provides both the Service Data Flow templates to identify a Service Data Flow in the UPF and if the Service Data Flow template includes an application identifier, then the corresponding Application descriptors to identify the application traffic in the UE is also included.

The (H-) PCF may use the OSid stored in the UDR as DataSet "Policy Data" and Data Subset "UE context policy control data" to determine the OSAppId supported by the OSid. The (H-)PCF may also provide multiple Application descriptors to identify application traffic in the UE, this is determined by the (H-)PCF local policies that indicates e.g. the operating system supported by the UE. If no OSid is available in the UDR, the (H-)PCF may use the PEI to determine the OSid supported by the UE.

NOTE 1: If the (H-)PCF does not take into account the received PEI and/or OSId then the (H-)PCF can send PCC rules containing application traffic descriptors associated to multiple operating systems.

The Traffic Descriptor in the ATSSS rule is generated by the SMF from the SDF template of the PCC rule. If the SDF template contains SDF filters, the SMF uses the UL SDF filters for the generation of the IP descriptors or Non-IP descriptors, respectively. If the SDF template contains an application identifier, the SMF includes the Application descriptors received from the PCF as part of the MA PDU Session information in the PCC Rule within the Traffic Descriptors in the ATSSS rule.

For the Load-Balancing steering mode with fixed split percentages (i.e. without the Autonomous load-balance indicator or UE-assistance indicator), the PCF may provide one or more threshold values together with the split percentages. For the Priority-based steering mode, the PCF may provide one or more threshold values together with the priority of the accesses. For the Redundant steering mode, the PCF may provide one threshold value and/or a primary access. For the Load-Balancing and the Priority-based steering mode, one threshold value for the Round Trip Time (RTT) and/or one threshold value for the Packet Loss Rate (PLR) may be included in a PCC Rule. For the Redundant steering mode, either one threshold value for the Round Trip Time (RTT) or one threshold value for the Packet Loss Rate (PLR) may be included in a PCC Rule based on local configuration or QoS requirements received from AF as specified in clause 4.15.6.6 or clause 4.15.6.6a of TS 23.502 [3]. The threshold values are not dependent on what Access Type is used for a packet, i.e. a given threshold value is applicable to both accesses. The threshold values are applied by the UE and UPF as described in TS 23.501 [2].

NOTE 2: The Round Trip Time (RTT) threshold value can be determined based on the PDB of the 5QI authorized for the SDF, and the Packet Loss Rate (PLR) threshold value can be determined based on the PER of the 5QI authorized for the SDF.

The MA PDU Session Control information in a PCC rule may contain only one of the following Steering Mode Indicators:

- Autonomous load-balance indicator: This indicator may be included only when the Steering Mode is Load-Balancing and indicates whether autonomous load-balance operation is allowed. Further details are specified in clause 5.32.8 of TS 23.501 [2].

- UE-assistance indicator: It indicates that the UE can decide how to distribute the UL traffic based on its internal state (e.g. battery level), and that the UE can request from UPF to apply the same distribution for the DL traffic. Further details are specified in clause 5.32.8 of TS 23.501 [2].

The PCF may also provide URSP rules to the UE for instructing the UE to establish a MA PDU Session, as described in clause 6.6.2.

The PCF control of PDU Session level Usage Monitoring depending on what access type is used to carry the traffic is enabled by providing Usage Monitoring control related information per access in the PDU Session related policy control information (as described in clause 6.4).

The Transport Mode may be included in a PCC rule that is used for the detected SDF only when the Steering functionality is the MPQUIC functionality, the MPQUIC-IP functionality or the MPQUIC functionality.

Editor’s note: The remaining text in this clause needs further updates to support connect-ip and connect-e.

If the MA PDU Session is capable of supporting one of the following:

- MPTCP and ATSSS-LL with any Steering Mode (i.e. any Steering Mode allowed for ATSSS-LL) in the downlink and MPTCP and ATSSS-LL with Active-Standby in the uplink;

- MPQUIC and ATSSS-LL with any Steering Mode (i.e. any Steering Mode allowed for ATSSS-LL) in the downlink and MPQUIC and ATSSS-LL with Active-Standby in the uplink;

- MPTCP, MPQUIC and ATSSS-LL with any Steering Mode (i.e. any Steering Mode allowed for ATSSS-LL) in the downlink and MPTCP, MPQUIC and ATSSS-LL with Active-Standby in the uplink,

then the PCF shall provide a PCC Rule for "match all" traffic. This PCC Rule contains a "match all" SDF template, the lowest precedence, the Steering Functionality set to "ATSSS-LL" and the Steering Mode set to "Active-Standby" for the uplink direction, and the Steering Functionality set to "ATSSS-LL" and the Steering Mode set to any supported steering mode (i.e. any Steering Mode allowed for ATSSS-LL) for the downlink direction.

If the MA PDU Session is capable of supporting one of the following:

- MPTCP with any Steering Mode in the downlink, ATSSS-LL with any steering mode except Smallest Delay steering mode and Redundant steering mode in the downlink, and MPTCP and ATSSS-LL with Active-Standby in the uplink;

- MPQUIC with any Steering Mode in the downlink, ATSSS-LL with any steering mode except Smallest Delay steering mode and Redundant steering mode in the downlink, and MPQUIC and ATSSS-LL with Active-Standby in the uplink;

- Both MPTCP and MPQUIC with any Steering Mode in the downlink, ATSSS-LL with any steering mode except Smallest Delay steering mode and Redundant steering mode in the downlink, and MPTCP, MPQUIC and ATSSS-LL with Active-Standby in the uplink,

then the PCF shall provide a PCC Rule for "match all" traffic. This PCC Rule contains a "match all" SDF template, the lowest precedence, the Steering Functionality set to "ATSSS-LL" and the Steering Mode set to "Active-Standby" for the uplink direction, and the Steering Functionality set to "ATSSS-LL" and the Steering Mode set to any supported steering mode except Smallest Delay steering mode and Redundant steering mode for the downlink direction.

If the MA PDU Session is capable of supporting one of the following:

- MPTCP and ATSSS-LL with Active-Standby in the uplink and downlink;

- MPQUIC and ATSSS-LL with Active-Standby in the uplink and downlink;

- MPTCP, MPQUIC and ATSSS-LL with Active-Standby in the uplink and downlink,

then the PCF shall provide a PCC Rule for "match all" traffic. This PCC Rule contains a "match all" SDF template, the lowest precedence, the Steering Functionality set to "ATSSS-LL" and the Steering Mode set to "Active-Standby" for the uplink direction and the downlink direction.

If the MA PDU Session is capable of supporting one of the following:

- MPTCP and ATSSS-LL with any Steering Mode (i.e. any Steering Mode allowed for ATSSS-LL) in the uplink and downlink;

- MPQUIC and ATSSS-LL with any Steering Mode (i.e. any Steering Mode allowed for ATSSS-LL) in the uplink and downlink;

- MPTCP, MPQUIC and ATSSS-LL with any Steering Mode (i.e. any Steering Mode allowed for ATSSS-LL) in the uplink and downlink,

then the PCF shall provide a PCC Rule for "match all" traffic. This PCC Rule may contain a "match all" SDF template, the lowest precedence, the Steering Functionality set to "ATSSS-LL" and the Steering Mode set to any supported steering mode for the uplink direction and for the downlink direction (i.e. any Steering Mode allowed for ATSSS-LL).

The Steering functionality "ATSSS-LL" shall not be provided together with Steering Mode "Redundant".

These PCC Rules are used by the SMF to generate an ATSSS rule for the UE and an N4 rule for the UPF to route the "match all" traffic of the MA PDU Session in the uplink and downlink direction respectively.

NOTE 3: The PCF can also use the ATSSS capability of the MA PDU Session to provide PCC Rules containing SDF template for some specific non-MPTCP traffic or non-MPQUIC traffic other than the PCC Rule containing a "match all" SDF template. This allows the operator to apply different policies e.g. charging key to non-MPTCP traffic or non-MPQUIC traffic other than the non-MPTCP traffic or non-MPQUIC matching the "match all" PCC Rule.

When the Redundant steering mode is used and resources are not available in one access, the SMF will notify the PCF about the resource allocation failure and indicate the respective Access Type (as described in clause 6.1.3.5). The PCF can then determine by implementation specific means how to proceed with such a GBR SDF for which redundant traffic transmission is no longer possible.

NOTE 4: The PCF can e.g. provide the PCC rule again in order to trigger another resource allocation, modify the MA PDU Session Control information in the PCC rule or remove the PCC rule (and inform the AF accordingly).

\*\*\*\* Next 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 clause 5.7.6.3 of TS 23.501 [2]. | 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 or 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 (MDBV) | 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 25) | Yes | Added |
| Precedence for TFT packet filter allocation | Determines the order of TFT packet filter allocation for PCC rules | Conditional (NOTE 28) | Yes | Added |
| ECN marking for L4S  (NOTE 32) | The ECN marking for L4S indicates the UL and/or DL of the service data flow, detected by the service data flow template, supports ECN marking for L4S and to enable ECN marking for L4S for the service data flow. | Conditional | 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 |
| Metadata | Data provided by AF and included by UPF when forwarding traffic to N6-LAN. |  | Yes | Added |
| **Application Function influence on traffic routing Enforcement Control (NOTE 18)** | *This part describes information required for Application Function influence on traffic routing.* |  |  |  |
| Data Network Access Identifier | Identifier(s) of the target Data Network Access (DNAI). It is defined in clause 5.6.7 of TS 23.501 [2]. |  | 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 clause 5.6.7 of TS 23.501 [2] (NOTE 19). |  | Yes | Added |
| Information on AF subscription to UP change events | Indicates whether notifications in the case of change of UP path are requested and optionally indicates whether acknowledgment to the notifications shall be expected (as defined in clause 5.6.7 of TS 23.501 [2]). |  | Yes | Added |
| Indication of UE IP address preservation | Indicates UE IP address should be preserved. It is defined in clause 5.6.7 of TS 23.501 [2]. |  | Yes | Added |
| Indication of traffic correlation  (NOTE 29) | Indicates that the target PDU Sessions should be correlated via a common DNAI in the user plane. It is described in clause 5.6.7 of TS 23.501 [2]. |  | Yes | Added |
| Information on User Plane Latency requirements | Indicates the user plane latency requirements. It is defined in clause 6.3.6 of TS 23.548 [33]. |  | Yes | Added |
| Indication for Simultaneous Connectivity at Edge Relocation | Indicates request for simultaneous connectivity over source and target PSA from the AF (see clause 5.6.7 of TS 23.501 [2]). |  | Yes | Added |
| Information for EAS IP Replacement in 5GC | Indicates the Source EAS identifier and Target EAS identifier, (i.e. IP addresses and port numbers of the source and target EAS). (see clause 5.6.7 of TS 23.501 [2]). |  | Yes | Added |
| EAS Correlation indication | Indicates selecting a common EAS for the application identified by Service data flow template accessed by the UEs with the same Traffic Correlation ID. |  | Yes | Added |
| Traffic Correlation ID | Identification of a set of UEs accessing the application identified by the Service data flow template (see clause 5.6.7 of TS 23.501 [2]). |  | Yes | Added |
| Common EAS IP address | IP address of the common EAS for the application identified by the Traffic Description for the UEs the AF request aims at (as defined in clause 5.6.7 of TS 23.501 [2]). |  | Yes | Added |
| Common DNAI | Common DNAI applicable to the set of UEs identified by a traffic correlation ID. |  | Yes | Added |
| FQDN(s) | FQDN(s) for the application indicated in the PCC rule (see clause 5.6.7 of TS 23.501 [2]). |  | Yes | Added |
| NEF information | Notification Endpoint of NEF subscription to be notified with information related to UE members of the set of UEs identified by traffic correlation ID. |  | 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 clause 5.7.2.8 of TS 23.501 [2]. | 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 clause 5.7.2.8 of TS 23.501 [2]. | Conditional (NOTE 13) | Yes | None |
| **MA PDU Session Control**  **(NOTE 20)** | *This part defines information supporting control of MA PDU Sessions* |  | Yes | New |
| Application descriptors | Identifies the application traffic for which MA PDU Session control is required based on the Steering Functionality, the Steering Mode, Steering Mode Indicator and Threshold Values. It is described in clause 5.32.8 of TS 23.501 [2]. | Conditional (NOTE 27) | Yes | New |
| Steering Functionality | Indicates the applicable traffic steering functionality. | Conditional (NOTE 21, NOTE 31) | Yes | New |
| Steering Mode | Indicates the rule for distributing traffic between accesses together with associated steering parameters (if any). | Conditional (NOTE 21, NOTE 31) | Yes | New |
| Steering Mode Indicator | Indicates either autonomous load-balance operation or UE-assistance operation, if the Steering Mode is set to "Load Balancing", as defined in TS 23.501 [2]. |  | Yes | New |
| Threshold Values  (NOTE 30) | A Maximum RTT or a Maximum Packet Loss Rate or both. |  | Yes | New |
| Transport Mode  (NOTE 33) | Indicates the transport mode that should be used for the matching traffic, as defined in TS 23.501 [2]. |  | 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** | *This part describes PCC rule information related with QoS Monitoring.* |  |  |  |
| QoS Monitoring parameter(s) | Indicates the QoS Monitoring parameter(s) for which QoS Monitoring can be enabled as defined in clause 5.45 of TS 23.501 [2]. |  | Yes | Added |
| Reporting frequency | Defines the frequency for the reporting, such as event triggered, periodic. |  | Yes | Added |
| Target of reporting | Defines the target of the QoS Monitoring reports, it can be the NEF, the AF or the Local NEF. |  | Yes | Added |
| Indication of direct event notification | Indicates that the QoS Monitoring event shall be reported by the UPF directly to the NF indicated by the Target of reporting. |  | Yes | Added |
| **DataCollection\_ApplicationIdentifier** | Identifier used in SMF to decide whether this PCC Rule corresponds to an event exposure subscription (see clause 4.15.4.4 of TS 23.502 [3]). |  | No | Added |
| **Alternative QoS Parameter Sets**  **(NOTE 24)**  **(NOTE 26)** | *This part defines Alternative QoS Parameter Sets for the service data flow.* |  |  |  |
| Packet Delay Budget | The Packet Delay Budget in this Alternative QoS Parameter Set. |  | Yes | Added |
| Packet Error Rate | The Packet Error Rate 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 |
| Maximum Data Burst Volume (MDBV) | The Maximum Data Burst Volume (MDBV) in this Alternative QoS Parameter Set. |  | Yes | Added |
| **TSC Assistance Container** | *This part defines parameters provided by TSN AF or TSCTSF. The parameters are defined in clause 5.27.2 of TS 23.501 [2].* |  | No | Added |
| **Traffic Parameter Information** | *This part describes PCC rule information related with Traffic Parameter Information* *for power saving as specified in clause 5.37.8 of TS 23.501 [2].* |  |  |  |
| Periodicity | Indicates the time period between start of two data bursts in UL and/or DL direction. |  | Yes | Added |
| **Traffic Parameter Measurement** | *This part describes PCC rule information related with Traffic Parameter Measurement for power saving as specified in clause 5.37.8 of TS 23.501 [2].* |  |  |  |
| Traffic Parameter to be measured | Indicates to measure the N6 jitter range associated with DL Periodicity and optionally, the UL/DL periodicity. |  | Yes | Added |
| Reporting condition | Defines the condition for the reporting, such as event triggered or periodic, frequency. |  | Yes | Added |
| **Downlink Data Notification Control** | *This part describes information required for controlling the sending of Downlink data delivery status event and DDN Failure event notifications as specified in clause 4.15.3 of TS 23.502 [3].* |  |  |  |
| Notification control for DDD status | Indicates that notifications of downlink data delivery status are required and the requested type of such notifications. |  | Yes | Added |
| Notification Control for DDN Failure | Indicates that notifications of DDN Failure are required. |  | Yes | Added |
| **PDU Set Control Information** | Information needed to support the delivery of PDU Sets of a service data flow. |  |  |  |
| PDU Set QoS Parameters (UL/DL) | See clause 5.7.7 of TS 23.501 [2]. |  | Yes | Added |
| **Data Burst Handling Information** | *This part describes Data Burst Handling Information* |  |  |  |
| End of Data Burst Marking Indication | Indicates to detect last PDU of the data burst and to mark End of Data Burst Indication (See clause 5.37.8 of TS 23.501 [2]) on the last PDU. |  | Yes | Added |
| **Protocol Description Information** | Information needed to support identifying PDU Set Information for packets and/or last packet of a Data Burst. |  |  |  |
| Protocol Description (UL/DL) | Indicates the protocol, e.g. which is used to detect PDU Set Information of packets and/or last packet of the Data Burst.  (See TS 23.501 [2] clause 5.37.5, clause 5.37.8 and TS 26.522 [40]). |  | 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, if the service data flow template consists of a set of service data flow filters. NO if 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: None, one of the two or both may 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 Section (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 25: Optional and applicable only for GBR service data flow for which Alternative QoS Parameter Set(s) are provided.  NOTE 26: 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.  NOTE 27: Mandatory in MA PDU Session Control information only when there is application identifier in the service data flow template.  NOTE 28: If this parameter is used, it has to be present in every PCC rule of the PDU Session.  NOTE 29: The use of traffic correlation is defined in TS 23.501 [2], clauses 5.6.7.1 and 5.29.  NOTE 30: If Steering Mode is set to "Redundant", either a Maximum RTT or a Maximum Packet Loss Rate may be provided, but not both.  NOTE 31: The Steering functionality "ATSSS-LL" shall not be provided together with Steering Mode "Redundant".  NOTE 32: This parameter is only provided when the PCF is configured to provide an explicit indicator to the SMF to enable ECN marking for L4S for the traffic identified by the SDF template.  NOTE 33: The Transport Mode may be included when the Steering Functionality is the MPQUIC-UDP functionality, the MPQUIC-IP functionality or the MPQUIC-E functionality. | | | | |

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 clause 5.7.6 of TS 23.501 [2]). 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 or offline charging is 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.

NOTE 6: With converged charging architecture for 5GC, online charging method also includes usage reporting from the SMF to the CHF. Hence, setting the charging method to online will also result in usage reports and thus allow for offline charging being performed by the CHF.

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 7: 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 8: 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*, MDBV, 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 9: 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 *Precedence for TFT packet filter allocation* parameter determines the order in which TFT packet filters are allocated for PCC rules. The PCF may include this parameter if there is a possibility to run into a restriction regarding the number of TFT packet filters that can be allocated for the PDU Session and interworking with EPS with N26 deployment is supported (see also clause 4.11.1 of TS 23.502 [3]).

NOTE 10: PCF can know that interworking with EPS with N26 is supported based on DNN and S-NSSAI of the PDU Session.

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 clause 5.7.5 of TS 23.501 [2].

NOTE 11: 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 or a third party, and optional Metadata if received from AF due to Application Function influence on Service Function Chaining as described in clause 5.6.16 of TS 23.501 [2].

The *ECN marking for L4S* indicates that the service data flow supports ECN marking for L4S to be performed.

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 *Application Function influence on traffic routing Enforcement Control* may contain:

*- 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 request, as described in clause 5.6.7 of TS 23.501 [2]), or;

- an *AF subscription to UP change events* parameter which contains subscription information defined in clause 5.2.8.3 of TS 23.502 [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 clause 4.15.1 of TS 23.502 [3]) and optionally an indication of "AF acknowledgment to be expected" to the corresponding notifications as described in clause 5.6.7 of TS 23.501 [2].

- a *user plane latency requirements* parameter which contains AF requested information on the requirements for user plane latency defined in TS 23.548 [33].

- an *indication for Simultaneous Connectivity at Edge Relocation*, which includes *Keep existing PSA* indication to provide guidance to the network on whether to provide simultaneous connectivity over source and target PSA at edge relocation; also, optionally a related *Keep existing PSA timer* that indicates the minimum time interval to be considered for inactivity for the traffic described before the connectivity over the source PSA may be removed, as defined in TS 23.548 [33].

- an *EAS Correlation indication*, which indicates selecting a common EAS for a set of UEs identified by Traffic Correlation ID and accessing the application identified by Service data flow template or FQDN(s).

- a *Traffic Correlation ID*, identifying a set of UEs accessing the application identified by the Service data flow template or FQDN(s). See more in clause 5.6.7 of TS 23.501 [2].

- a *Common EAS IP address*, IP address of the common EAS accessed by the UEs with the same Traffic Correlation ID, for the application identified by the Service data flow template.

- *FQDN(s)*, FQDN(s) for the application traffic identified by the Service data flow template, and used for influencing EASDF-based DNS query procedure as defined in TS 23.548 [33].

- NEF Information, Notification Endpoint of the NEF responsible of the set of UEs associated with the Traffic correlation ID.

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 clause 5.6.7 of TS 23.501 [2].

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 *Application descriptors* provides one or several instances of the OSId and OSAppId combination. It is used by the UE to identify the application traffic for which steering is required based on the Steering Functionality, the Steering Mode, the Steering Mode Indicator and the Threshold Values.

The *Steering Functionality* indicates the method for how traffic matching the SDF template in the UPF or a Traffic descriptor in the UE 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 method MPQUIC-UDP indicates that traffic matching the SDF template is sent over the MA PDU Session using MPQUIC. The method MPQUIC-IP indicates that traffic matching the SDF template is sent over the MA PDU Session using MPQUIC-IP. The method MPQUIC-E indicates that traffic matching the SDF template is sent over the MA PDU Session using MPQUIC-E.

The *Steering Mode* indicates the rule for distributing downlink SDFs in the UPF or uplink traffic in the UE between accesses, together with the associated steering parameters. The PCF may indicate separate values for uplink and downlink directions. The available Steering Modes are defined in TS 23.501 [2].

The *Steering Mode Indicator* indicates that the UE or the UPF or both may change the steering parameters provided in the Steering Mode and may adjust the traffic steering based on their own decisions, as further defined in TS 23.501 [2]. When the PCF selects the Load-Balancing Steering Mode for both the uplink and the downlink, and the PCF provides a *Steering Mode Indicator* for the uplink equal to UE-assistance operation, then the PCF shall provide the same *Steering Mode Indicator* for the downlink.

The *Threshold Values* indicate the authorized RTT or Packet Loss Rate for a SDF. Depending on the Steering Mode value, the PCF may include, per SDF, one threshold value for RTT or one threshold value for Packet Loss Rate, or both. The PCF may indicate separate values for uplink and downlink directions. The Steering Modes that may use the threshold values and how the UE and UPF enforces them are defined in TS 23.501 [2].

The *Transport Mode* indicates one of the Transport Modes as defined in TS 23.501 [2] that should be applied for transmitting a UDP flow between UE and UPF. The Transport Mode may be included when the MPQUIC-UDP functionality, MPQUIC-IP functionality or MPQUIC-E functionality is selected as the Steering Functionality.

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 Monitoring parameter(s)* indicates the QoS Monitoring parameter(s) for which QoS Monitoring can be enabled for a service data flow as defined in clause 5.45 of TS 23.501 [2], e.g. the UL packet delay, DL packet delay or round trip packet delay between the UE and the UPF.

The *Reporting frequency* indicates the frequency for the reporting, such as event triggered, periodic. The following applies:

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

- The *reporting period* shall also be used for reporting measurement failure in any of the *Reporting frequency* modes "periodic" or "event triggered".

NOTE 12: The indication of a measurement failure is not possible or not supported for some *QoS Monitoring parameter(s)* (as described in the respective clauses of clause 5.45 of TS 23.501 [2]).

- If the *Reporting frequency* indicates "event triggered", the *reporting period*, *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 Monitoring parameter(s)*. The *minimum waiting time* indicates the minimum time interval between subsequent reports.

The *Target of reporting* indicates the target for the QoS Monitoring reports sent as notifications. It can be either the NEF, the AF or the Local NEF, indicated as Notification Target Address + Notification Correlation ID.

The *Indication of direct event notification* indicates that the QoS Monitoring reports shall be sent by the UPF directly to the NF indicated by the Target of reporting (i.e. to the Local NEF or the AF as described in clause 5.8.2.18 of TS 23.501 [2]).

The *DataCollection\_ApplicationIdentifier* is provided to assist the SMF when it needs to decide whether this PCC Rule corresponds to an event exposure subscription (see clause 4.15.4.4 of TS 23.502 [3]).

The *Alternative QoS Parameter Set(s)* define alternative set(s) of QoS parameters for the service data flow. Every set consists of a PER, a PDB, as well as an UL and a DL guaranteed bitrate QoS parameter. For delay-critical service data flow, every Alternative QoS Parameter Set may also include a Maximum Data Burst Volume (MDBV).

The content of the *TSC Assistance Container* is defined in clause 5.27.2 of TS 23.501 [2].

The *Traffic Parameter Information* applies to the power saving as specified in clause 5.37.8 of TS 23.501 [2]. The following parameters are included:

- *Periodicity*:

- indicates the time period between start of two data bursts in UL and/or DL direction.

- this parameter is only included when PCF receives the periodicity information from AF.

The *Traffic Parameter Measurement* applies to the power saving as specified in clause 5.37.8 of TS 23.501 [2]. The following parameters are included:

- *Traffic Parameter to be measured*:

- UL and/or DL periodicity. This parameter is only included when PCF does not receive the periodicity information from AF.

- N6 jitter range associated with DL Periodicity.

- *reporting condition* can be optionally included to define the condition for the reporting, such as event triggered or periodic, frequency.

The *Downlink Data Notification Control* applies to the control of subscription to Downlink Data Delivery status event notifications and DDN Failure event notifications as specified in clause 4.15.3 of TS 23.502 [3]. The following parameters are included:

- The *Notification control for DDD status* applies as described in clause 4.15.3.2.8 of TS 23.502 [3] and contains the following parameters:

- indication that notifications of Downlink Data Delivery status are required; and

- the requested type of such notifications (notifications about downlink packets being buffered, and/or discarded).

- The *Notification Control for DDN Failure* applies as described in clause 4.15.3.2.9 of TS 23.502 [3] and contains the following parameters:

- indication that notifications of DDN Failure are required.

NOTE 12: Downlink Data Notification Control information is provided to assist the SMF in the generation/update of N4 information. The PCF will not be notified about the Downlink data delivery status events or the DDN Failure events.

The *PDU Set Control Information* is needed to support the delivery of PDU Sets for a service data flow. The parameter values for UL and DL may be different (see clause 5.37.5 of TS 23.501 [2]).

The *Protocol Description Information* needed to support identifying PDU Set Information for DL/UL packets and/or last packet of a DL Data Burst. The Protocol Descriptions for UL and DL may be different (see clause 5.37.5 of TS 23.501 [2]).

The *Data Burst Handling Information* is needed to support detecting last PDU of the Data Burst and marking End of Data Burst Indication on the last packet of the Data Burst (see clause 5.37.8 of TS 23.501 [2]).

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

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

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

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