**3GPP TSG-WG SA2 Meeting # 164 *S2-2409192***

**August 19 - 23, 2024, Maastricht, Netherlands**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **23.503** | **CR** | **1351** | **rev** | **1** | **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 | **X** |

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| ***Title:***  | Support of MPQUIC-E for MA PDU Session and enabling correct header compression to be performed by NG-RAN |
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| ***Source to WG:*** | Samsung |
| ***Source to TSG:*** | SA2 |
|  |  |
| ***Work item code:*** | MASSS |  | ***Date:*** | 2024-08-21 |
|  |  |  |  |  |
| ***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 canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | As part of the Rel-19 study, it was concluded to define a new steering functionality called “MPQUIC-Ethernet steering functionality” based on connect-ethernner extension of HTTP protocol which can be used for proxying general Ethernet traffic between UE and UPF.MPQUIC-Ethernet steering functionality is based on the Rel-18 MPQUIC functionality which is used for proxying UDP flow only and is to be used for PDU Sessions of type Ethernet only.SMF indicates to the PCF the ATSSS capability of the PDU Session in order for the PCF to generate specific PCC rulesFurthermore in order for the SMF to determine the supported functionality for the PDU Session with respect to Header compression performed by NG-RAN, PCF should inform the SMF the selected ATSSS functionality so that SMF can inform the RAN correct  |
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| ***Summary of change:*** | The capability of MA PDU session (as indicated by SMF to PCF) can include MPQUIC-IP steering functionality. PCC rules provided by UE are enhanced so as the parameter Steering Functionality in the ATSSS control information can have the value “MPQUIC-ETHERNET functionality”  |
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| ***Consequences if not approved:*** | Feature not supported |
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| ***Clauses affected:*** | 6.1.3.20, 6.4 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ... |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ... |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ... |
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| ***Other comments:*** |  |
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| ***This CR's revision history:*** | Rev01 : * Marked ME impacts as NO.
* Removed Changes 2 related to PCC rules/ATSS information.
* Clarified that PCF is not permitted to modify this parameter during the lifetime of the PDU Session and the steering functionality is indeed for service data flows and not for the PDU Session (that are informed via the PCC rules).
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**\* \* \* 1st 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 the MPQUIC functionality 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.

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).

If the MA PDU Session is capable of supporting MPQUIC-E and ATSSS-LL with any Steering Mode (i.e. any Steering Mode allowed for ATSSS-LL) in the uplink and downlink; then the PCF may provide *N2 SM PDU Session type information for Header compression* in the PDU Session related policy information.

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).

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**\* \* \* 3rd Change\* \* \***

6.4 PDU Session related policy information

The purpose of the PDU Session related policy information is to provide policy and charging control related information that is applicable to a single Monitoring key or the whole PDU Session respectively. The PCF may provide PDU Session related policy information to the SMF together with PCC rules or separately.

Table 6.4-1 includes the PDU Session related policy information.

The differences with table 6.4 and table 6.6 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 6.4-1: PDU Session related policy information**

| **Attribute** | **Description** | **PCF permitted to modify for dynamically provided information** | **Scope** | **Differences compared with table 6.4. and 6.6** **in TS 23.203 [4]** |
| --- | --- | --- | --- | --- |
| Charging information | Defines the containing CHF address and optionally the associated CHF instance ID and CHF set ID. | No | PDU Session | None |
| Default charging method | Defines the default charging method for the PDU Session. | No | PDU Session | None |
| PDU Session with offline charging only | Indicates that the "online" charging method is never used for PCC rules in the PDU Session. | No | PDU Session | Added |
| Policy control request trigger | Defines the event(s) that shall cause a re-request of PCC rules for the PDU Session. | Yes | PDU Session | Explicitly subscribed by invoking Npcf\_SMPolicyControl service operation |
| Authorized QoS per bearer (UE-initiated IP‑CAN bearer activation/modification) | Defines the authorised QoS for the IP‑CAN bearer (QCI, GBR, MBR). | Yes | IP‑CAN bearer | Removed |
| Authorized MBR per QCI (network initiated IP‑CAN bearer activation/modification) | Defines the authorised MBR per QCI. | Yes | IP‑CAN session | Removed |
| Revalidation time limit | Defines the time period within which the SMF shall perform a PCC rules request. | Yes | PDU Session | None |
| PRA Identifier(s) | Defines the Presence Reporting Area(s) to monitor for the UE with respect to entering/leaving | Yes | PDU Session | None but only applicable to PCF |
| List(s) of Presence Reporting Area elements (NOTE 14) | Defines the elements of the Presence Reporting Area(s) | Yes | PDU Session | None but only applicable to PCF |
| Default NBIFOM access | The access to be used for all traffic that does not match any existing Routing Rule | Yes (only at the addition of an access to the IP-CAN session) | IP-CAN session | Removed |
| IP Index(NOTE 11) | Provided to SMF to assist in determining the IP Address allocation method (e.g. which IP pool to assign from) when a PDU Session requires an IP address – as defined in clause 5.8.2.2.1 of TS 23.501 [2]. | No | PDU Session | Added |
| Redundant PDU Session | Indicates that the PDU Session is a redundant PDU Session | No | PDU Session | New |
| Explicitly signalled QoS Characteristics (NOTE 1) | Defines a dynamically assigned 5QI value (from the non-standardized value range) and the associated 5G QoS characteristics as defined in clause 5.7.3 of TS 23.501 [2]. | No | PDU Session | Added |
| Reflective QoS Timer | Defines the lifetime of a UE derived QoS rule belonging to the PDU Session. | No | PDU Session | Added |
| Authorized Session-AMBR(NOTE 2) (NOTE 3) | Defines the Aggregate Maximum Bit Rate for the Non-GBR QoS Flows of the PDU Session. | Yes | PDU Session | Modified |
| Authorized default 5QI/ARP(NOTE 3) (NOTE 10) | Defines the default 5QI and ARP of the QoS Flow associated with the default QoS rule. | Yes | PDU Session | Modified |
| Time Condition (NOTE 4) | Defines the time at which the corresponding Subsequent Authorized Session-AMBR or Subsequent Authorized default 5QI/ARP shall be applied. | No (NOTE 5) | PDU Session | Modified |
| Subsequent Authorized Session-AMBR (NOTE 4) (NOTE 2) | Defines the Aggregate Maximum Bit Rate for the Non-GBR QoS Flows of the PDU Session when the Time Condition is reached. | No (NOTE 5) | PDU Session | Modified |
| Subsequent Authorized default 5QI/ARP (NOTE 4) (NOTE 10) | Defines the default 5QI and ARP when the Time Condition is reached. | No (NOTE 5) | PDU Session | Modified |
| PDU Session Inactivity Timer value (NOTE 16) | Defines the inactivity timer value for a PDU Session before releasing the PDU Session due to slice usage control. | Yes | PDU Session | New |
| N2 SM PDU Session type information for Header compression  | Defines what PDU Session type to be reported to NG-RAN for MA PDU Session of type Ethernet | NO | PDUSession | New |
| **Usage Monitoring Control related information****(NOTE 12) (NOTE 13)** | Defines the information that is required to enable user plane monitoring of resources for individual applications/services, groups of applications/services, for a PDU Session. |  |  |  |
| Monitoring key | The PCF uses the monitoring key to group services that share a common allowed usage. | No | PDU Session (NOTE 12) | None |
| Volume threshold(NOTE 7) | Defines the traffic volume value after which the SMF shall report usage to the PCF for this monitoring key. | Yes  | Monitoring key | None |
| Time threshold(NOTE 7) | Defines the resource time usage after which the SMF shall report usage to the PCF. | Yes | Monitoring key | None |
| Monitoring time | Defines the time at which the SMF shall reapply the Volume and/or Time Threshold. | No (NOTE 6) | Monitoring Key | None |
| Subsequent Volume threshold (NOTE 9)  | Defines the traffic volume value after which the SMF shall report usage to the PCF for this Monitoring key for the period after the Monitoring time. | No (NOTE 6) | Monitoring Key | None |
| Subsequent Time threshold (NOTE 9)  | Defines resource time usage after which the SMF shall report usage to the PCF for this Monitoring key for the period after the Monitoring time. | No (NOTE 6) | Monitoring Key | None |
| Inactivity Detection Time (NOTE 8) | Defines the period of time after which the time measurement shall stop, if no packets are received. | Yes | Monitoring Key | None |
| **Ethernet or IP port management related** |  |  |  |  |
| Port number | Port number for which Port Management Information Container is provided. | Yes | PDU Session | New |
| Port Management Information Container | Includes Ethernet/IP port management information. | Yes | PDU Session | New |
| User plane node Management Information Container | Includes User plane node management information. | Yes |  | New |
| Target of reporting | Target of reporting (indicated as Notification Target Address + Notification Correlation ID). | Yes | PDU Session | New |
| PDU Slice Inactivity Timer value (NOTE 16) | Defines the Slice inactivity timer value before releasing the PDU Session. |  |  |  |
| **VPLMN Specific Offloading Policy** | HR-SBO policy for the local part of DN in VPLMN. |  |  |  |
| IP range(s) | IP address range(s) allowed to be routed to the local part of DN in VPLMN. | Yes | PDU Session(NOTE 15) | New |
| FQDN(s) | FQDN(s) allowed to be routed to the local part of DN in VPLMN. | Yes | PDU Session(NOTE 15) | New |
| Authorized DL Session AMBR for Offloading | Defines the DL Aggregate Maximum Bit Rate for the Non-GBR QoS Flows of the PDU Session authorized for offloading to the local part of DN in VPLMN. | Yes | PDU Session(NOTE 15) | New |
| Offload Identifier | Identifies a certain VPLMN Specific Offloading Information to be generated based on this VPLMN Specific Offloading Policy. | Yes | PDU Session(NOTE 15) | New |
| NOTE 1: Multiple Non-standardized QoS Characteristics can be provided by the PCF. Operator configuration is assumed to ensure that the non-standardized 5QI to QoS characteristic relation is unique within the PLMN.NOTE 2: The Authorized Session-AMBR and the Subsequent Authorized Session-AMBR may be provided together with a list of Access Types possibly complemented by RAT types.NOTE 3: There is always an unconditional value for the Authorized Session-AMBR and Authorized default 5QI/ARP available at the SMF. The initial value is received as Subscribed Session-AMBR/Subscribed default 5QI/ARP, and the PCF can overwrite it with these parameters.NOTE 4: The Time Condition and Subsequent Authorized Session-AMBR/ Subsequent Authorized default 5QI/ARP are used together. The PCF may provide up to four instances of them. When multiple instances are provided, the values of the associated Time Condition have to be different.NOTE 5: The PCF may replace all instances that have been provided previously with a new instruction. A previously provided Time Condition and Subsequent Authorized Session-AMBR/ Subsequent Authorized default 5QI/ARP pair cannot be individually modified.NOTE 6: The PCF may replace all instances that have been provided previously with a new instruction. A previously provided Volume threshold/Time threshold and Monitoring Time pair cannot be individually modified.NOTE 7: This attribute is also used by the SMF, e.g. during PDU Session termination, to inform the PCF about the resources that have been consumed by the UE.NOTE 8: This attribute is applicable in presence of Time threshold only.NOTE 9: This attribute is applicable in presence of Monitoring Time only.NOTE 10: The Authorized default 5QI and the Subsequent Authorized default 5QI shall be of Non-GBR Resource Type.NOTE 11: This attribute is applicable only when no IP address/Prefix for the PDU Session is received from the SMF.NOTE 12: A Monitoring Key can either be used to monitor the traffic of a PDU Session, the traffic of a PDU Session per access (for a MA PDU Session) or the traffic of specific SDF(s) in the PCC Rule(s) that share the same Monitoring Key.NOTE 13: For a MA PDU Session, the PDU Session level Usage Monitoring shall be possible per access (i.e. 3GPP and/or Non-3GPP) and irrespective of the access.NOTE 14: The list of PRA elements shall be a short list of elements.NOTE 15: This attribute is applicable only for the PDU Session supporting HR-SBO. This attribute is applied only to the current serving VPLMN. This attributed shall not be forwarded to RAN or UE.NOTE 16: Included if the PDU Session Slice Inactivity Timer value is set by PCF. |

Upon the initial interaction with the SMF, the PCF may provide the following attributes to the SMF:

The *Charging information* contains addresses of the CHF that manages charging for the PDU Session and optionally the associated CHF instance ID and CHF set ID (see clause 6.3.1.0 of TS 23.501 [2]). If received, the SMF shall apply it as defined in clause 6.3.11 of TS 23.501 [2].

The *Default charging method* indicates what charging method shall be used in the PDU Session for every PCC rule where the charging method identifier is omitted, including predefined PCC rules that are activated by the SMF. If received by the SMF, it supersedes the *Default charging method* in the charging characteristics profile.

The *PDU Session with offline charging only* can be assigned to a PDU Session by the PCF to indicate that the online charging method is never set for any of the PCC Rules activated during the lifetime of the PDU Session nor provided as Default charging method.

NOTE 1: If this parameter is provided by the PCF or configured in the SMF charging characteristics the SMF can use the Nchf\_OfflineOnlyCharging service instead of the Nchf\_ConvergedCharging service for a PDU Session as defined in TS 32.255 [21].

NOTE 2: When the "PDU Session with offline charging only" indication is provisioned by the PCF, the PCF can set the charging method for a PCC rule within this PDU Session to either "offline" or "neither".

The *IP Index* indicates the IP Address/Prefix allocation method which is used by the SMF for IP Address/Prefix allocation during PDU Session Establishment procedure as defined in clause 5.8.2.2.1 of TS 23.501 [2].

Upon every interaction with the SMF, the PCF may provide the following attributes to the SMF:

The *Revalidation time limit* defines the time period within which the SMF shall trigger a request for PCC rules for an established PDU Session.

The *Reflective QoS Timer* defines the lifetime of a UE derived QoS rule belonging to the PDU Session. It is used in the UE as defined in clause 5.7.5.3 of TS 23.501 [2].

NOTE 3: The Reflective QoS Timer that is sent to the UE has to be in alignment with the corresponding timer configured in the UPF (defined in clause 5.7.5.3 of TS 23.501 [2]).

The *Authorized Session-AMBR* defines the UL/DL Aggregate Maximum Bit Rate for the Non-GBR QoS Flows of the PDU Session, which is enforced in the UPF as defined in clause 5.7.1 of TS 23.501 [2]. The PCF may provide the *Authorized Session-AMBR* in every interaction with the SMF. When the SMF receives it from the PDU Session policy, it is provided to the UPF over N4 interface for the enforcement.

The *Authorized default 5QI/ARP* defines the 5QI and ARP values of the QoS Flow associated with the default QoS rule as described in clause 6.2.2.4. The PCF may provide a 5QI Priority Level according to clause 5.7.3.3 of TS 23.501 [2] together with the Authorized default 5QI, when a 5QI Priority Level value different from the standardized Default Priority Level value in the QoS characteristics Table 5.7.4-1 of TS 23.501 [2] is required. The SMF applies the *Authorized default 5QI/ARP* also for the QoS Flow binding as described in clause 6.1.3.2.4.

The *Time Condition* and *Subsequent Authorized Session-AMBR / Subsequent Authorized default 5QI/ARP* are used together and up to four instances with different values of the *Time Condition* parameter may be provided by the PCF. *Time Condition* indicates that the associated *Subsequent Authorized Session-AMBR/ Subsequent Authorized default 5QI/ARP* is only applied when the time defined by this attribute is met. The PCF may provide a 5QI Priority Level according to clause 5.7.3.3 of TS 23.501 [2] together with the Subsequent Authorized default 5QI, when a 5QI Priority Level value different from the standardized Default Priority Level value in the QoS characteristics Table 5.7.4-1 of TS 23.501 [2] is required. When the SMF receives a *Time Condition* and *Subsequent Authorized Session-AMBR/ Subsequent Authorized default 5QI/ARP* pair, it stores it locally. The SMF shall discard any previously received *Subsequent Authorized Session-AMBR* / *Subsequent Authorized default 5QI/ARP* instances on explicit instruction as well as whenever the PCF provides a new instruction for one or more *Subsequent Authorized Session-AMBR* / *Subsequent Authorized default 5QI/ARP*. When the time defined by the *Time Condition* parameter is reached, the SMF shall apply (or instruct the UPF to apply) *Subsequent Authorized Session-AMBR/ Subsequent Authorized default 5QI/ARP*.

NOTE 4: In order to reduce the risk for signalling overload, the PCF should avoid simultaneous provisioning of the *Subsequent Authorized Session-AMBR/ Subsequent Authorized default 5QI/ARP* for many UEs (e.g. by spreading over time).

NOTE 5: In order to provide further *Subsequent Authorized Session-AMBR/ Subsequent Authorized default 5QI/ARP* in a timely fashion the PCF can use its own clock to issue the desired changes or use the Revalidation time limit parameter to trigger an SMF request for a policy decision.

NOTE 6: For services that depend on specific Session-AMBR and/or default 5QI/ARP (e.g. MPS session) the PCF is responsible to ensure that no *Subsequent Authorized Session-AMBR* or *Subsequent Authorized default 5QI/ARP* interfere with the service, e.g. by removing the *Subsequent Authorized Session-AMBR* or *Subsequent Authorized default 5QI/ARP* before the respective change time is reached.

The *N2 SM PDU Session type information for Header compression* specifies the type of PDU Session SMF should indicate in the N2 SM information, based on the type of Steering functionalities supported for the PDU Session. This parameter may be provided only if the Request type is MA PDU Session and the PDU Session type is Ethernet. PCF is not permitted to modify this information for the lifetime of the PDU Session. If PCF decides that only MPQUIC-Ethernet functionality needs to be applied for all the service data flow(s) of the PDU Session, the value of this parameter is set to “IP”. If the PCF decides that only ATSSS-LL needs to be applied for all the service data flow(s) of the PDU Session, the value of this parameter is set to “Ethernet”. If the PCF decides that both MPQUIC-Ethernet functionality and ATSSS-LL can be applied for different service data flow(s) of the PDU Session, the value of this parameter is set to “Unstructured”.

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.

It shall also be possible for an operator to use the *Monitoring Key* parameter to indicate usage monitoring on an PDU Session level or, in the case of an MA PDU Session, to indicate usage monitoring on PDU Session level for the 3GPP access and/or the Non-3GPP access.

Usage monitoring on PDU Session level is active when a PDU Session is active when a *Monitoring Key* for the PDU Session and a corresponding volume and/or time threshold value have been provided to the SMF. Usage monitoring on Monitoring key level is active when a volume and/or time threshold has been provided for a *Monitoring Key* to the SMF and there is at least one PCC rule active for the PDU Session that is associated with that *Monitoring Key*.

The *Volume threshold* indicates the overall user traffic volume value after which the SMF shall report the Usage threshold reached trigger to the PCF.

The *Time threshold* indicates the overall resource time usage after which the SMF shall report the Usage threshold reached trigger to the PCF.

The *Monitoring time* indicates the time at which the SMF shall store the accumulated usage information.

The *Subsequent Volume threshold* indicates the overall user traffic volume value measured after Monitoring time, after which the SMF shall report the Usage threshold reached trigger to the PCF.

The *Subsequent Time threshold* indicates the overall resource time usage measured after Monitoring time, after which the SMF shall report the Usage threshold reached trigger to the PCF.

The *Inactivity Detection Time* indicates the period of time after which the time measurement shall stop, if no packets are received during that time period.

The *Port Management Information Container* carries Ethernet or IP port management information for an Ethernet/IP port located in DS-TT or NW-TT. The port for which the container is provided is identified by the port number.

The *User plane node Management Information Container* carries User plane node management information for a 5GS Bridge or Router.

The VPLMN *specific offloading policy* carries the attributes for the traffic to be offloaded to the local part of DN in VPLMN. The following attributes under this policy is applicable only for the serving VPLMN. When the H-SMF receives it from PCF and HR-SBO is authorized, H-SMF shall generate VPLMN Specific Offloading Information based on this policy to the V-SMF as described in clause 6.7.2.2 of TS 23.548 [33]. The V-SMF may use this information to configure V-EASDF, ULCL/BP UPF and Local UPF.

The *IP range(s)* indicates one or more IPv4/IPv6 address range(s) that are allowed to be offloaded to the local part of the DN in VPLMN when the PDU Session is authorized for HR-SBO.

The *FQDN(s)* indicates one or more FQDN or FQDN range expressed by regular expression that are allowed to be offloaded to the local part of the DN in VPLMN when the PDU Session is authorized for HR-SBO.

The *Authorized DL Session AMBR for Offloading* defines the DL Aggregate Maximum Bit Rate for the Non-GBR QoS Flows applicable for the local traffic offloaded to the local part of DN in VPLMN of the PDU Session for HR-SBO.

The *Offload Identifier* is used to identify a certain VPLMN Specific Offloading Information to be generated based on this VPLMN Specific Offloading Policy and can be used in any subsequent HR-SBO PDU Sessions between V-SMF(s) and H-SMF(s), see details in clause 6.7.2 of TS 23.548 [33].

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