**3GPP TSG-SA5 Meeting #133e *S5-205078***

**e-meeting 12th Oct-21st Oct 2020** Revision of S5-20xxxx

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| *CR-Form-v11.4* |
| **CHANGE REQUEST** |
|  |
|  | **32.255** | **CR** | **0252** | **rev** | **-** | **Current version:** | **16.6.1** |  |
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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:***  | Add the enhanced Diagnostics for 5G Charging |
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| ***Source to WG:*** | Huawei |
| ***Source to TSG:*** | S5 |
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| ***Work item code:*** | TEI16,5GS\_Ph1-DCH |  | ***Date:*** | 2020-10-01 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-16 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories 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-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
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| ***Reason for change:*** | As per the TS 32.291 for 5G charging in Rel16, the attribute of diagnostics is integer.The enhanced Diagnostics for other data type is required.  |
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| ***Summary of change:*** | Add the enhanced Diagnostics in PDU session charging information. |
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| ***Consequences if not approved:*** | The enhanced Diagnostics is absent. |
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| ***Clauses affected:*** | 6.1.3.2,6.1.3.3,6.2.1.2,6.2.2 |
|  |  |
|  | **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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| **First change** |

#### 6.1.3.2 PDU session charging CHF CDR data

If enabled, CHF CDRs for PDU session charging shall be produced for each PDU session. In roaming Home routed scenario, the PDU session charging CHF CDR shall cover both Flow based Charging and Qos flow Based Charging (QBC) from H-SMF.

The fields of PDU session charging CHF CDR are specified in table 6.1.3.2.1.

Table 6.1.3.2.1: PDU session charging CHF record data

| Field | Category | Description |
| --- | --- | --- |
| Record Type  | M | CHF record. |
| Recording Network Function ID | OM | This field holds the name of the recording entity, i.e. the CHF id. |
| Subscriber Identifier | OM | This field holds the Subscription Permanent Identifier (SUPI) of the served party. This fields should be present except for emergency session. The detail of SUPI is specified in clause 5.9.2 of TS 23.501 [200] |
| NF Consumer Information | M | This field holds the information of the SMF that used the charging service. |
| NF Functionality | M | This field contains the function of the node (i.e. SMF) |
| NF Name | OC | This field holds the name of the SMF used. |
| NF Address | OC | This fields holds the IP Address of the SMF used. |
| NF PLMN ID | OC | This field holds the PLMN identifier (MCC MNC) of the SMF. |
| List of Multiple Unit Usage  | OM | This field holds a list of changes in charging conditions for all service data flows within this PDU session.This list is categorized per rating group or per combination of rating group and service id or per combination of rating group, sponsor identity and application service provider identity. In addition, usage is differentiated between with and without quota management. Each change is time stamped. Charging conditions are used to categorize traffic volumes, elapsed time and number of events, such as per tariff period.  |
| Rating Group | OM | This filed holds the rating group.  |
| Used Unit Container | OC | This field holds the used units and information connected to the reported units. |
| Service Identifier | OC | This field holds the Service Identifier. |
| Quota management Indicator | OM | This field holds an indicator on whether the used units are with or without quota management. |
| Triggers | OC | This field holds the reason for closing the used unit container. |
| Trigger Timestamp | OC | This field holds the timestamp of the trigger. |
| Time | OC | This field holds the amount of used time. |
| Total Volume | OC | This field holds the amount of used volume in both uplink and downlink directions. |
| Uplink Volume | OC | This field holds the amount of used volume in uplink direction. |
| Downlink Volume | OC | This field holds the amount of used volume in downlink direction. |
| Service Specific Unit | OC | This field holds the amount of used service specific units. |
| Event Time Stamps | OC | This field holds the timestamps of the event reported in the Service Specific Units, if the reported units are event based. |
| Rating Indicator | OC | This field indicates if the units have been rated or not. |
| Local Sequence Number | M | This field holds the container sequence number. |
| PDU Container Information | OC | This field holds the 5G data connectivity specific information defined in clause 6.2.1.3. |
| UPF ID | OC | This field holds the UPF identifier used to identify the UPF when reporting the usage for the UPF. |
| Record Opening Time | M | Time stamp when the PDU session is activated in the SMF or record opening time on subsequent partial records. |
| Duration | M | This field holds the duration of this record. |
| Record Sequence Number | C | Partial record sequence number, only present in case of partial records. |
| Cause for Record Closing  | M | The reason for the release of the record. |
| Diagnostics | OM | This field holds a more detailed reason for the release of the PDU session, when a single cause is applicable. |
| Local Record Sequence Number | OM | Consecutive record number created by the CDF. The number is allocated sequentially including all CDR types. |
| Record Extensions | OC | A set of network operator/manufacturer specific extensions to the record. Conditioned upon the existence of an extension. |
| PDU Session Charging Information | OM | This field holds the 5G data connectivity specific information defined in clause 6.2.1.2. |
| Roaming QBC information | OC | This field holds the roaming QBC specific information defined in clause 6.2.1.4, when applicable. |

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| **Next change** |

#### 6.1.3.3 Roaming QBC CHF CDR data

If enabled, CHF CDRs for Roaming QBC shall be produced in VPLMN for each PDU session established for an in-bound roamer. The fields of Roaming QBC CHF CDR are specified in table 6.1.3.3.1.

Table 6.1.3.3.1: Roaming QBC CHF record data

| Field | Category | Description |
| --- | --- | --- |
| Record Type  | M | CHF record. |
| Recording Network Function ID | OM | This field holds the name of the recording entity, i.e. the CHF id. |
| Subscriber Identifier | M | This field holds the 5G Subscription Permanent Identifier (SUPI) of the served party, if available. |
| NF Information | OC | This field holds the information of the V-SMF that used the charging service. |
| NF Functionality | M | This field contains the function of the node. |
| NF Name | OC | This field holds the name of the V-SMF used. |
| NF Address | OC | This fields holds the IP Address of the V-SMF used. |
| NF PLMN ID | OC | This field holds the PLMN identifier (MCC MNC) of the V-SMF. |
| Record Opening Time | M | Time stamp when the PDU session is activated in the SMF or record opening time on subsequent partial records. |
| Duration | M | This field holds the duration of this record. |
| Record Sequence Number | C | Partial record sequence number, only present in case of partial records. |
| Cause for Record Closing  | M | The reason for the release of the record. |
| Diagnostics | OM | This field holds a more detailed reason for the release of the PDU session, when a single cause is applicable. |
| Local Record Sequence Number | OM | Consecutive record number created by the CHF. The number is allocated sequentially including all CDR types. |
| Record Extensions | OC | A set of network operator/manufacturer specific extensions to the record. Conditioned upon the existence of an extension. |
| PDU Session Charging Information | OM | This field holds the 5G data connectivity specific information defined in clause 6.2.1.2. |
| Roaming QBC Information | OM | This field holds the 5G data connectivity Roaming QBC specific information defined in clause 6.2.1.4 |

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| **Next change** |

#### 6.2.1.2 Definition of PDU session charging information

PDU session specific charging information used for 5G data connectivity charging is provided within the PDU session charging Information.

The detailed structure of the PDU Session Charging Information can be found in table 6.2.1.2.1.

Table 6.2.1.2.1: Structure of PDU Session Charging Information

|  |  |  |
| --- | --- | --- |
| Information Element | Category | Description |
| Charging Id | OM | This field holds the Charging Id for PDU session. |
| Home Provided Charging Id | OC | This field holds the Charging Id generated by H-SMF.This field is only applicable in V-SMF in the home routed roaming scenario for EPS to 5GS interworking. |
| User Information | OM | Group of user information. |
| User Identifier | OC | This field contains the identification of the user (i.e. GPSI). |
| User Equipment Info  | OC | This field holds the identification of the terminal (i.e. PEI, MAC Address) It is used for identifying the user in case SUPI is not present during emergency service. The detail identification of the wireline access is specified in clause 4.7.7 of TS 23.316 [203]. |
| unauthenticatedFlag | OC | This field indicates the served SUPI is not authenticated. |
| Roamer In Out  | OC | This field holds an indication if the roamer is in-bound or out-bound. This field is present only if UE is identified as a roamer. |
| User Location Info | OC | This field indicates details of where the UE is currently located (access-specific user location information).For MA PDU session, this field holds the user location associated to the 3GPP access |
| MA PDU Non 3GPP User Location info | OC | This field holds the user location associated to the non 3GPP access for MA PDU session. |
| User Location Time | OC | The NTP time at which the UE was last known to be in the location.For MA PDU session, this field holds the user location time associated to the 3GPP access. |
| MA PDU Non 3GPP User Location Time | OC | This field holds the user location time associated to the non 3GPP access for MA PDU session. |
| UE Time Zone | OC | This field holds the Time Zone of where the UE is located, if available where the UE currently resides. |
| Presence Reporting Area Information | OC | This field contains part of the Presence Reporting Area Information of UE as defined in TS 23.501[200], comprising the Presence Reporting Area identifier(s) and an indication on whether the UE is inside or outside the Presence Reporting Area, if available.  |
| PDU Session Information | M | Group of PDU session information. |
| PDU Session ID | M | This field holds identifier of PDU session. |
| Network Slice Instance Identifier  | OM | This field holds network slice information the PDU session belongs to. |
| PDU Type | OM | This field holds the type of PDU session.  |
| PDU Address | OC | Group of UE IP address.  |
| PDU Ipv4 Address | OC | This field holds the IP Address of the served SUPI allocated for PDU session, i.e. IPv4 address. |
| PDU IPv6 Address with Prefix | OC | This field holds the IP Address of the served SUPI allocated for PDU session, i.e. IPv6 prefix. |
| PDU Address prefix length | OC | PDP/PDN Address prefix length of an IPv6 typed Served PDU Address. The field needs not available for prefix length of 64 bits. |
| IPv4 Dynamic Address Flag | OC | This field indicates whether served PDP/PDN address for IPv4 is dynamically allocated. This field is missing if address is static. |
| IPv6 Dynamic Address Flag | OC | This field indicates whether served PDP/PDN address for IPv6 is dynamically allocated. This field is missing if address is static. |
| SSC Mode | OC | This field holds SSC mode of PDU session. |
| MA PDU session information | OC | This field holds information associated to the MA PDU session.  |
| MA PDU session indicator | OC | This field indicates the PDU session is a MA PDU session requested by the UE or requested by Network modification based ATSSS capabilities provided by the UE and the Network. |
| ATSSS capability | OC | This field holds the ATSSS capability supported by the MA PDU session |
| SUPI PLMN ID | OC | This field holds PLMN ID of the SUPI. |
| Serving Network Function ID  | OC | Group of serving Network Function identifier |
| Serving Network Function Functionality | M | This field holds the functionality of the Serving Network Function: i.e. AMF, SMF, SGW, I-SMF, ePDG.When this field holds "AMF" then it is related to AMF in the same PLMN as the SMF consuming the charging service. When this field holds "SMF" then it is related to V-SMF for home routed roaming.This field holds "I-SMF" when a PDU session is served by SMF + I-SMF.This field holds "ePDG" when handover between EPC/ePDG and 5GS. |
| Serving Network Function Name | OC | This field holds the name of the serving Network Function (i.e. AMF). |
| Serving Network Function Addresses | OC | This field holds the IP Addresses of the Serving Network Function. |
| Serving Network Function FQDN | OC | This field holds the FQDN the Serving Network Function. When the the Serving Network Function is an AMF, this FQDN is the AMF name as defined in subclause 5.9.5 of 3GPP TS 23.501 [200].  |
| Serving Network Function PLMN ID | OC | This field holds the PLMN ID of the network the Serving Network Function belongs to. |
| AMF Identifier | OC | This field holds the AMF identifier. |
| Serving CN PLMN ID | OC | This field holds the serving Core Network Operator PLMN ID selected by the UE if different from SMF PLMN ID. |
| RAT Type | OC | This field holds the Radio Access Technology (RAT) currently serving the UE.For MA PDU session, this field holds the Radio Access Technology (RAT) associated to the 3GPP access |
| MA PDU Non 3GPP RAT Type | OC | This field holds the Radio Access Technology (RAT) serving the UE in non 3GPP access for MA PDU session. |
| Data Network Name Identifier | M | This field contains the identifier of the DNN the user is connected to. |
| DNN Selection Mode | OC | This field indicates whether the requested DNN corresponds to an explicitly subscribed DNN or to the usage of a wildcard subscription. |
| Authorized QoS Information | OC | This field holds the authorized QoS applied to PDU session. |
| Subscribed QoS Information | OC | This field holds the subscribed default QoS for the PDU session. |
| Authorized Session-AMBR | OC | This field holds the authorized Session-AMBR for the PDU session. |
| Subscribed Session-AMBR | OC | This field holds the subscribed Session-AMBR for the PDU session. |
| PDU session start Time | OC | This field holds the timestamp when PDU session starts. |
| PDU session stop Time | OC | This field holds the timestamp when PDU session terminates. |
| Diagnostics | OC | This field holds a detailed reason for the release of the PDU session and complements the "Change Condition" information. |
| Enhanced Diagnostics | OC | This field holds a more detailed reason for the release of the PDU session, when a set of causes are applicable. |
| Charging Characteristics | OC | This field holds the Charging Characteristics for this PDU session. |
| Charging CharacteristicsSelection Mode | OC | This field holds information about how the "Charging Characteristics" was selected.  |
| 3GPP PS Data Off Status | OC | This field holds the 3GPP Data off Status when UE's 3GPP Data Off status is Activated or Deactivated. |
| Session Stop Indicator | OC | This field indicates to the CHF that the PDU session has been terminated. |
| Unit Count Inactivity Timer | OC | This field holds the threshold for the time period when no units has been counted by the SMF. It holds either the value configured in SMF, if it is supported, or the value to be used as received from the CHF. A value of zero indicates that this mechanism shall not be used.This field is not applicable to QBC. |
| RAN Secondary RAT Usage Report | OC | This field holds the secondary RAT usage reported from NG-RAN. |
| NG RAN Secondary RAT Type | OC | This field holds the value of Secondary RAT Type, as provided by the NG-RAN.  |
| Qos Flows Usage Reports | OC | This field holds a list of containers per QFI with volumes reported, each container is time stamped. |
| QoS Flow Id | OM | This field holds the QoS flow Identifier (QFI) |
| Start Timestamp | OC | This field holds the start timestamp of the collected usage. |
| End Timestamp | OC | This field holds the end timestamp of the collected usage. |
| Downlink Volume | OC | This field holds the amount of used volume in downlink direction. |
| Uplink Volume | OC | This field holds the amount of used volume in uplink direction. |

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| **Next change** |

### 6.2.2 Detailed message format for converged charging

The following clause specifies per Operation Type the charging data that are sent by SMF for 5G data connectivity converged charging or offline only charging.

The Operation Types are listed in the following order: I (Initial)/U (Update)/T (Termination)/E (Event). Therefore, when all Operation Types are possible it is marked as IUTE. If only some Operation Types are allowed for a node, only the appropriate letters are used (i.e. IUT or E) as indicated in the table heading. The omission of an Operation Type for a particular field is marked with "-" (i.e. IU-E). Also, when an entire field is not allowed in a node the entire cell is marked as "-".

Table 6.2.2.1 defines the basic structure of the supported fields in the *Charging Data* Request message for 5G data connectivity converged charging or offline only charging.

Table 6.2.2.1: Supported fields in *Charging Data Request* message

| Information Element | Functionality of SMF | FBC | QBC | FBC | QBC |
| --- | --- | --- | --- | --- | --- |
| Charging Service | Converged Charging | Converged Charging | Offline Only Charging | Offline Only Charging |
| Supported Operation Types | I/U/T/E | I/U/T/E | I/U/T/E | I/U/T/E |
| Session Identifier | -UT- | -UT- | -UT- | -UT- |
| Subscriber Identifier | IUT- | IUT- | IUT- | IUT- |
| NF Consumer Identification | IUT- | IUT- | IUT- | IUT- |
| Invocation Timestamp | IUT- | IUT- | IUT- | IUT- |
| Invocation Sequence Number | IUT- | IUT- | IUT- | IUT- |
| Retransmission Indicator | IUT- | IUT- | IUT- | IUT- |
| Notify URI | IU- | IU- | IU- | IU- |
| Supported Features | IU- | IU- | - | - |
| Service Specification Information | IUT- | IUT- | IUT- | IUT- |
| Triggers | -UT- | -UT- | -UT- | -UT- |
| Multiple Unit Usage | IUT- | - | IUT- | - |
| Rating Group | IUT- | - | IUT- | - |
| Requested Unit | IU-- | - | - | - |
| Used Unit Container | -UT- | - | -UT- | - |
| Triggers | -UT- | - | -UT- | - |
| PDU Container Information  | -UT- | - | -UT- | - |
| UPF ID | IUT- | IUT- | IUT- | IUT- |
| PDU Session Charging Information | IUT- | IUT- | IUT- | IUT- |
| Charging Id | IUT- | IUT- | IUT- | IUT- |
| Home Provided Charging Id | -UT- | -UT- | -UT- | -UT- |
| User Information | IUT- | IUT- | IUT- | IUT- |
| User Location Info | IUT- | IUT- | IUT- | IUT- |
| MA PDU Non 3GPP User Location Info | IUT- | IUT- | IUT- | IUT- |
| UE Time Zone | IUT- | IUT- | IUT- | IUT- |
| Presence Reporting Area Information | -UT- | -UT- | -UT- | -UT- |
| PDU Session Information | IUT- | IUT- | IUT- | IUT- |
| PDU Session ID | IUT- | IUT- | IUT- | IUT- |
| Network Slice Instance Identifier  | IUT- | IUT- | IUT- | IUT- |
| PDU Type | IUT- | IUT- | IUT- | IUT- |
| PDU Address | IUT- | IUT- | IUT- | IUT- |
| SSC Mode | IUT- | IUT- | IUT- | IUT- |
| MA PDU session information | IUT- | IUT- | IUT- | IUT- |
| SUPI PLMN ID | IUT- | IUT- | IUT- | IUT- |
| Serving Network Function ID  | IUT- | IUT- | IUT- | IUT- |
| Serving CN PLMN ID | IUT- | IUT- | IUT- | IUT- |
| RAT Type | IUT- | IUT- | IUT- | IUT- |
| MA PDU Non 3GPP RAT Type | IUT- | IUT- | IUT- | IUT- |
| Data Network Name Identifier | IUT- | IUT- | IUT- | IUT- |
| DNN Selection Mode | IUT- | IUT- | IUT- | IUT- |
| Authorized QoS Information | IUT- | IUT- |  |  |
| Subscribed QoS Information | IUT- | IUT- |  |  |
| Authorized Session-AMBR | IUT- | IUT- |  |  |
| Subscribed Session-AMBR | IUT- | IUT- |  |  |
| PDU session start Time | I--- | I--- | I--- | I--- |
| PDU session stop Time | --T- | --T- | --T- | --T- |
| Diagnostics | --T- | --T- | --T- | --T- |
| Enhanced Diagnostics | --T- | --T- | --T- | --T- |
| Charging Characteristics | IUT- | IUT- | IUT- | IUT- |
| Charging Characteristics Selection Mode | IUT- | IUT- | IUT- | IUT- |
| 3GPP PS Data Off Status | IUT- | IUT- | IUT- | IUT- |
| Session Stop Indicator | --T- | --T- | --T- | --T- |
| Unit Count Inactivity Timer | IU-- | - | IU-- | - |
| RAN Secondary RAT Usage Report | -UT- | -UT- | -UT- | -UT- |
| Roaming QBC information | - | IUT- | - | IUT- |
| Multiple QFI container | - | IUT- | - | IUT- |
| UPF ID | - | IUT- | - | IUT- |
| Roaming Charging Profile | - | IU-- | - | IU-- |

Table 6.2.2.2 defines the basic structure of the supported fields in the *Charging Data* Response message for 5G data connectivity converged charging or offline only charging.

Table 6.2.2.2: Supported fields in *Charging Data Response* message

| Information Element | Functionality of SMF | FBC | QBC | FBC | QBC |
| --- | --- | --- | --- | --- | --- |
| Charging Service | Converged Charging | Converged Charging  | Offline Only Charging | Offline Only Charging |
| Supported Operation Types | I/U/T/E | I/U/T/E | I/U/T/E | I/U/T/E |
| Session Identifier | I--- | I--- | I--- | I--- |
| Invocation Timestamp | IUT- | IUT- | IUT- | IUT- |
| Invocation Result | IUT- | IUT- | IUT- | IUT- |
| Invocation Sequence Number | IUT- | IUT- | IUT- | IUT- |
| Session Failover  | IU-- | IUT- | IU-- | IUT- |
| Supported Features | IU-- | IU-- | - | - |
| Triggers | IU-- | IU-- | IU-- | IU-- |
| Multiple Unit information  | IU-- | - | IU-- | - |
| Result Code | IU-- | - | IU-- | - |
| Rating Group | IU-- | - | IU-- | - |
| UPF ID | IU-- | - | IU-- | - |
| Granted Unit | IU-- | - | - | - |
| Validity Time | IU-- | - | - | - |
| Final Unit Indication | IU-- | - | - | - |
| Time Quota Threshold  | IU-- | - | - | - |
| Volume Quota Threshold  | IU-- | - | - | - |
| Unit Quota Threshold  | IU-- | - | - | - |
| Quota Holding Time | IU-- | - | - | - |
| Triggers | IU-- | - | IU-- | - |
| PDU Session Charging Information | IU-- | IU-- | IU-- | IU-- |
| Charging Id | - | - | - | - |
| Home Provided Charging Id | - | - | - | - |
| User Information | - | - | - | - |
| User Location Info | - | - | - | - |
| MA PDU Non 3GPP User Location info | - | - | - | - |
| UE Time Zone | - | - | - | - |
| Presence Reporting Area Information | IU-- | IU-- | IU-- | IU-- |
| PDU Session Information | - | - | - | - |
| PDU Session ID | - | - | - | - |
| Network Slice Instance Identifier  | - | - | - | - |
| PDU Type | - | - | - | - |
| PDU Address | - | - | - | - |
| SSC Mode | - | - | - | - |
| MA PDU session information | - | - | - | - |
| SUPI PLMN ID | - | - | - | - |
| Serving Network Function ID  | - | - | - | - |
| Serving CN PLMN ID | - | - | - | - |
| RAT Type | - | - | - | - |
| MA PDU Non 3GPP RAT Type | - | - | - | - |
| Data Network Name Identifier | - | - | - | - |
| DNN Selection Mode | - | - | - | - |
| Authorized QoS Information | - | - | - | - |
| Subscribed QoS Information | - | - | - | - |
| Authorized Session-AMBR | - | - | - | - |
| Subscribed Session-AMBR | - | - | - | - |
| PDU session start Time | - | - | - | - |
| PDU session stop Time | - | - | - | - |
| Diagnostics | - | - | - | - |
| Enhanced Diagnostics | - | - | - | - |
| Charging Characteristics | - | - | - | - |
| Charging Characteristics Selection Mode | - | - | - | - |
| Charging Rule Base Name | - | - | - | - |
| 3GPP PS Data Off Status | - | - | - | - |
| Session Stop Indicator | - | - | - | - |
| Unit Count Inactivity Timer | IU-- | - | - | - |
| RAN Secondary RAT Usage Report | - | - | - | - |
| Roaming QBC information | - | IU-- | - | IU-- |
| Multiple QFI container | - | - | - | - |
| UPF ID | - | - | - | - |
| Roaming Charging Profile | - | IU-- | - | IU-- |

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| **End of change** |