

Event-Based Monitoring

Ericsson Service-Aware Policy Controller

FACILITY DESCRIPTION

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1 Event-Based Monitoring Introduction

This document describes the events and parameters provided by the Event-Based Monitoring (EBM) feature in the Service Aware Policy Controller (SAPC).

EBM provides an additional source of business and operational intelligence based on subscriber and service events in real time. EBM complements other existing performance management counters and logs.

1.1 Document Purpose and Scope

This document describes EBM functionality, working principles, supported EBM events, and event information.

1.2 Concepts

Event

An event is an observable and meaningful change within the activity of a single subscriber, such as when a user connects or disconnects to data services, moves within the network, runs traffic, or changes service type. Failures are also considered as events. Events are observable for all subscribers. Examples of relevant events are as follows:

- Installation of PCC rule
- Granted quota
- Accumulated usage limit surpassed
- Gx and Rx related transactions

1.3 Typographic Conventions

Typographic conventions can be found in the following document:

- [Typographic Conventions](#)

2 Functional Overview

EBM functionality enables the SAPC to record the event information in a formatted report. The formatted event report is then streamed in near-real time to

an external post-processing system. The external post-processing system is also referred to as the EBM server.

The availability of this function in SAPC is under license control and is supported in mobile deployments for Gx, Gx+ and Rx Release 9 onwards related events.

Figure 1 shows the EBM high-level architecture.

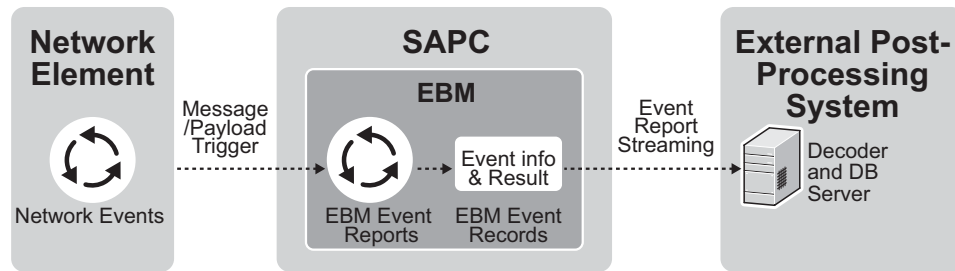


Figure 1 EBM High-Level Architecture

The SAPC provides an EBM client, produces internal EBM event reports, formats them into EBM event records and streams them over TCP connection to an external post-processing system or any customer analytic tool that can decode the EBM event record. These data can be used to generate customized analytic end-user reports.

The EBM event report contains the data produced by event monitoring, this event report is encoded in EBM specific format in the EBM event record. The EBM client sets up and maintains the states of multiple EBM streaming interface connections towards the EBM server.

Events are produced by Gx and Rx transactions, and each transaction can generate more than one event.

Attention!

The EBM event records can contain sensitive private and personal data. Access to EBM events must be restricted to security authorized personnel that handle the information obtained in accordance with national legislation on privacy. The communication channel between the SAPC and the EBM server need be protected for security reasons.

2.1 Events and Parameters

The following sections describe the events and parameters supported by the EBM feature.

The supported EBM specification is FFV = 2 and FIV = 10.



The maximum size of an EBM event record is 65535 bytes. If the event record maximum size is surpassed, the SAPC drops it and increases the corresponding counter.

Note: Some structures can be repeated from 0 to several times within an event, where a structure length of 0 means that no information is present in the event.

2.1.1 Supported Events for Gx Interface

In the following events, all values in the structures **PDN_INFO** and **UE_INFO** correspond with values received in CCR message.

In the following events, all values in the parameter **CAUSE_CODE** refer to Cause Codes and Events.

2.1.1.1 GX_CCR_CCA_TRANSACTION

The event contains the information about a Gx CCR-CCA transaction in the SAPC and generated upon CCA delivery.

Table 1 shows the structures and parameters associated with the GX_CCR_CCA_TRANSACTION event.

Values of **TIME_HOUR**, **TIME_MINUTE**, **TIME_SECOND** and **TIME_MILLISECOND** correspond with the time of CCR reception.



Table 1 Event Parameters for GX_CCR_CCA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
HEADER		EVENT_ID	Event identity	ENUM: 8 bits • 1: GX_CCR_CCA_TRANSACTION
		EVENT_RESULT	Result of the event procedure SUCCESS if Result-Code AVP in CCA message indicates success (2001). Otherwise, REJECT	ENUM: 2 bits • 0: SUCCESS • 1: REJECT
		TIME_HOUR	UTC time stamp in hours at the time when the signaling procedure for the event started (HH)	UINT: 5 bits Range: 0-23
		TIME_MINUTE	UTC time stamp in minutes at the time when the signaling procedure for the event started (MM)	UINT: 6 bits Range: 0-59
		TIME_SECOND	Time stamp in seconds at the time when the signaling procedure for the event started (SS)	UINT: 6 bits Range: 0-60
		TIME_MILLISECOND	Time stamp in milliseconds at the time when the signaling procedure for the event started (MSS)	UINT: 10 bits Range: 0-999
		DURATION	The time period between CCR message received and CCA message sent	UINT: 24 bits
-		CAUSE_PROTOCOL	The underlying protocol that triggers the event	ENUM: 3 bits • 1: GX
-		CAUSE_CODE	Reason for acceptance or rejection contained in AVP Result-Code or Experimental-Result of CCA message	UINT: 13 bits



Table 1 Event Parameters for GX_CCR_CCA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
EVENT_TRIGGERS ₍₂₎	-	[EVENT_TRIGGER]	Event triggers sent in CCA message	ENUM: 8 bits <ul style="list-style-type: none"> • 0: SGSN_CHANGE • 1: QOS_CHANGE • 2: RAT_CHANGE • 4: PLMN_CHANGE • 7: IP-CAN CHANGE • 12: RAI_CHANGE • 13: USER_LOCATION_CHANGE • 15: OUT_OF_CREDIT • 16: REALLOCATION_OF_CREDIT • 17: REVALIDATION_TIMEOUT • 20: DEFAULT_EPS_BEARER_QOS_CHANGE • 21: AN_GW_CHANGE • 22: SUCCESSFUL_RESOURCE_ALLOCATION • 25: UE_TIME_ZONE_CHANGE_TRIGGER • 26: TAI_CHANGE • 27: ECGI_CHANGE • 29: APN_AMBR_MODIFICATION_FAILURE • 33: USAGE_REPORTING • 34: DEFAULT_EPS_BEARER_QOS_CHANGE_FAILURE • 39: APPLICATION_START • 40: APPLICATION_STOP • 45: ACCESS_NETWORK_INFO_REPORT • 48: PRA_CHANGE



Table 1 Event Parameters for GX_CCR_CCA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
PDN_INFO	-	[DEFAULT_BEARER_ID]	Applicable for Default Bearer ID in UE_ONLY mode in GPRS network	STRING: 255 bytes
		[APN] ⁽³⁾	Access Point Name	DNSNAME: 127 bytes
	ALLOCATED_UE_ADDRESS	[IPv4] ⁽³⁾	IPv4 address	IPADDRESS
		[IPv6] ⁽³⁾	IPv6 address prefix (64 bits)	IPADDRESSV6
	-	[RULE_SPACE]	Rule Space name. It is only applicable for Gx+ protocol It is only set when the EVENT_RESULT is SUCCESS	BYTEARRAY: 127 bytes
UE_INFO	-	[IMSI] ⁽³⁾	International Mobile Subscriber Identity	TBCD: 64 bits
		[IMEISV] ⁽³⁾	International Mobile Station Equipment Identity Software Version	TBCD: 64 bits
		[MSISDN] ⁽³⁾	Mobile Subscriber ISDN Number	TBCD: 72 bits
-		[RAT_TYPE]	Type of Radio Access Technology serving the UE	ENUM: 5 bits <ul style="list-style-type: none"> • 1: UTRAN • 2: GERAN • 3: WLAN • 4: GAN • 5: HSPA_EVOLUTION • 6: EUTRAN • 7: CDMA_1X • 8: HRPD • 9: UMB • 10: EHRPD • 11: VIRTUAL • 12: EUTRAN-NB-IOT
-		[IPCANTYPE]	Type of IP-Connectivity Access Network	ENUM: 3 bits <ul style="list-style-type: none"> • 0: 3GPP_GPRS • 1: DOCSIS • 2: XDSL • 3: WIMAX • 4: 3GPP2 • 5: 3GPP_EPS • 6: NON_3GPP_EPS



Table 1 Event Parameters for GX_CCR_CCA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
QOS ⁽⁴⁾	-	[BEARER_QCI]	QoS class identifier of the default bearer	UINT: 8 bits
		[ARP_PRIORITY_LEVEL]	Priority Level of Allocation and Retention Priority for the default bearer	UINT: 4 bits Range: 1-15
		[ARP_PCI]	Pre-emption-Capability of Allocation and Retention Priority for the default bearer	ENUM: 1 bits • 0: ENABLED • 1: DISABLED
		[ARP_PVI]	Pre-emption-Vulnerability of Allocation and Retention Priority for the default bearer	ENUM: 1 bits • 0: ENABLED • 1: DISABLED
		[BEARER_MBR_UL]	Maximum Bit Rate (bps) in uplink direction	UINT: 32 bits
		[BEARER_MBR_DL]	Maximum Bit Rate (bps) in downlink direction	UINT: 32 bits
		[BEARER_GBR_UL]	Guaranteed Bit Rate (bps) in uplink direction	UINT: 32 bits
		[BEARER_GBR_DL]	Guaranteed Bit Rate (bps) in downlink direction	UINT: 32 bits
		[APN_AMBR_UL]	Aggregated Maximum Bit Rate (bps) in uplink direction across all non-GBR bearers related to the same APN	UINT: 32 bits
		[APN_AMBR_DL]	Aggregated Maximum Bit Rate (bps) in downlink direction across all non-GBR bearers related to the same APN	UINT: 32 bits
-	-	[BEARER_CONTROL_MODE]	Bearer control mode selected by the SAPC	ENUM: 2 bits • 0: UE_ONLY • 1: RESERVED • 2: UE_NW



Table 1 Event Parameters for GX_CCR_CCA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
LOCATION_INFO	-	[COUNTRY_CODE]	Country Code	UINT: 12 bits
		[NETWORK_CODE]	Network Code	UINT: 12 bits
		[TRACKING_AREA_CODE]	Tracking Area Code for LTE scenario	UINT: 16 bits
		[EUTRAN_CELL_IDENTITY]	E-UTRAN Cell Identifier for LTE scenarios	UINT: 28 bits
		[LOCATION_AREA_CODE]	Location Area Code for non-LTE scenarios	UINT: 16 bits
		[ROUTING_AREA_CODE]	Routing Area Code	UINT: 16 bits
		[CELL_IDENTITY]	Cell Identifier	UINT: 16 bits
		[SERVICE_AREA_CODE]	Service Area Code	UINT: 16 bits
		[SYSTEM_IDENTIFIER] ⁽⁵⁾	System Identifier in 3GPP2 network	UINT: 16 bits
		[NETWORK_IDENTIFIER] ⁽⁵⁾	Network Identifier in 3GPP2 network	UINT: 16 bits
	SGSN_ADDRESS	[IPv4]	IPv4 address	IPADDRESS
		[IPv6]	IPv6 address	IPADDRESSV6
-		SESSION_ID	Session ID of Diameter protocol	STRING: 255 bytes
-		OPERATION_TYPE	Type of the operation	ENUM: 2 bits • 0: INITIAL • 1: UPDATE • 2: TERMINATION
-		[QOS_PROFILE_ID] ⁽⁵⁾	AVP sent from the SAPC to the PCEF. It is used to select a local charging profile identifier	UINT: 32 bits
-		[CHARGING_PROFILE_ID] ⁽⁵⁾	AVP sent from the SAPC to the PCEF. It is used to select a local content filtering profile identifier	UINT: 32 bits
-		[CONTENT_FILTERING_PROFILE_ID] ⁽⁶⁾	AVP sent from the SAPC to the PCEF. It is used to select a local content filtering profile ID	UINT: 32 bits



Table 1 Event Parameters for GX_CCR_CCA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
SUBSCRIPTION_DATA ⁽⁷⁾	-	[SUBSCRIBERID] ⁽⁸⁾	Subscriber Administrative Identifier	STRING: 127 bytes
	SUBSCRIBERGROUPS ⁽²⁾	[SUBSCRIBERGROUP]	Active Subscriber Group associated to the subscriber	STRING: 127 bytes
	OPERATOR_SPECIFIC_INFO_LIST ⁽²⁾	[OPERATOR_SPECIFIC_INFO]	Operator Specific Information provisioned for the subscriber	STRING: 127 bytes
		[FAMILY_ID]	The identifier of the family to which the subscriber belongs	STRING: 127 bytes
		[CUSTOMER_ID]	The identifier is inserted in the HTTP headers because of Header Enrichment. It is only present in CCR_CCA-Initial transaction event if Customer-ID AVP is included in Gx+ CCA-I message	STRING: 127 bytes
	MPS_INFO	[MPS_PRIORITY_LEVEL]	Priority level for multimedia priority services	UINT: 64 bits
		[MPS_TYPE]	Priority type of the multimedia priority services	STRING: 127 bytes
	AUTHORIZED_SERVICES ⁽²⁾	[AUTHORIZED_SERVICE_ID]	Authorized service ID for the subscriber session It may refer to dynamic service because of Rx	STRING: 127 bytes
SUBSCRIBER_CHARGING_INFO ⁽⁹⁾		[PRIMARY_OCS]	Address (DiameterURI) of the primary online charging system	STRING: 127 bytes
		[SECONDARY_OCS]	Address (DiameterURI) of the secondary online charging system	STRING: 127 bytes
		[PRIMARY_OFCS]	Address (DiameterURI) of the primary offline charging system	STRING: 127 bytes
		[SECONDARY_OFCS]	Address (DiameterURI) of the secondary offline charging system	STRING: 127 bytes
		[ONLINE]	Default charging method for online transaction	ENUM: 1 bit • 0: DISABLE_ONLINE • 1: ENABLE_ONLINE
		[OFFLINE]	Default charging method for offline transaction	ENUM: 1 bit • 0: DISABLE_OFFLINE • 1: ENABLE_OFFLINE
		[CHARGING_CHARS]	Subscriber charging characteristics	UINT: 16 bits



Table 1 Event Parameters for GX_CCR_CCA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
-		[REVALIDATION_TIME]	NTP time before which the PCEF has to request PCC rules again	UINT: 32 bits
TIME_ZONE_INFO		[MS_TIMEZONE]	The offset between universal and local time defined in 15 minute intervals of where the MS resides currently	UINT: 16 bits
ACCESS_NETWORK_CHARGING_IDENTIFIER_GX ⁽⁵⁾		[ACCESS_NETWORK_CHARGING_IDENTIFIERS_VALUE]	The access network charging identifier information required for the AF session	STRING: 127 bytes
	[CHARGING_RULE_NAMES]	[RULE_ID]	Identifier of the PCC Rule	STRING: 255 bytes
-		[USER_LOCATION_INFO_TIME]	Indicates the time of the last known location of the UE during bearer deactivation or IP-CAN session termination	UINT: 32 bits
RECEIVED_EVENT_TRIGGERS ⁽²⁾	-	[EVENT_TRIGGER]	Event triggers received in CCR-U message	ENUM: 8 bits <List of Event Triggers>
APPLICATION_DETECTION_INFORMATION ⁽¹⁰⁾	-	[TDF_APPLICATION_ID]	The TDF-Application-Id identifier received in the Application-Detection-Information AVP in CCR-U message	STRING: 255 bytes
-		[AN_TRUSTED]	It indicates whether the access network is reliable or unreliable for the Non-3GPP access network in CCR-U message	ENUM: 1 bit • 0: TRUSTED • 1: UNTRUSTED
SUBSCRIBERGROUPS_PRIORITY ⁽²⁾ ⁽¹¹⁾	-	[SUBSCRIBERGROUP_PRIORITY]	It indicates the subscriber group priority	UINT: 32 bits

(1) Square brackets indicate that the parameter is conditionally logged for the event.

(2) This structure can be repeated maximum 50 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 50 elements.

(3) This parameter is returned in the transaction that produces the event in all cases, in case it was received during session establishment.

(4) All values in this structure correspond with values received in CCR message.

(5) This parameter is not set in this event.

(6) It is set if the EVENT_RESULT is SUCCESS, and there is a content filtering profile ID associated with the session.

(7) All fields in the structure are included if the corresponding data is provisioned for the subscriber. Exception: SUBSCRIBERGROUP is set only if there are active subscriber groups and SERVICE is set with the authorized services. In CCR_CCA-Termination transaction AUTHORIZED_SERVICES is not set.

(8) It is always present with the exceptional scenario where the subscriber is only provisioned in the OCS. It is set to Unknown when the Subscriber Unknown profile applies to the subscriber.

(9) It is only present in CCR_CCA Initial transaction events.

(10) This structure can be repeated maximum 25 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 25 elements.

(11) The priority of an active subscriber group follows the same order as its active subscriber group listed in the SUBSCRIPTION_DATA structure.



2.1.1.2 GX_RAR_RAA_TRANSACTION

The event contains the information about a Gx RAR-RAA transaction in the SAPC and generated upon RAA reception.

Table 2 details the structures and parameters associated with the GX_RAR_RAA_TRANSACTION event.

Values of **TIME_HOUR**, **TIME_MINUTE**, **TIME_SECOND** and **TIME_MILLISECOND** correspond with the time of RAR delivery.

Table 2 Event Parameters for GX_RAR_RAA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
HEADER		EVENT_ID	Event identity	ENUM: 8 bits • 2: GX_RAR_RAA_TRANSACTION
		EVENT_RESULT	Result of the event procedure SUCCESS if Result-Code AVP in RAA message indicates success (2001). Otherwise, REJECT	ENUM: 2 bits • 0: SUCCESS • 1: REJECT
		TIME_HOUR	UTC time stamp in hours at the time when the signaling procedure for the event was started (HH)	UINT: 5 bits Range: 0-23
		TIME_MINUTE	UTC time stamp in minutes at the time when the signaling procedure for the event was started (MM)	UINT: 6 bits Range: 0-59
		TIME_SECOND	Time stamp in seconds at the time when the signaling procedure for the event was started (SS)	UINT: 6 bits Range: 0-60
		TIME_MILLISECOND	Time stamp in milliseconds at the time when the signaling procedure for the event was started (MSS)	UINT: 10 bits Range: 0-999
		DURATION	The time period between RAR sent and RAA received	UINT: 24 bits
-		CAUSE_PROTOCOL	The underlying protocol that triggers the event	ENUM: 3 bits • 1: GX



Table 2 Event Parameters for GX_RAR_RAA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
-		CAUSE_CODE	Reason for acceptance or rejection contained in AVP Result-Code or Experimental-Result of RAA message	UINT: 13 bits
PDN_INFO	-	[DEFAULT_BEARER_ID]	Applicable for Default Bearer ID in UE_Only mode in GPRS network	STRING: 255 bytes
		[APN] ⁽²⁾	Access Point Name	DNSNAME: 127 bytes
	ALLOCATED_UE_ADDRESS	[IPv4] ⁽²⁾	IPv4 address	IPADDRESS
		[IPv6] ⁽²⁾	IPv6 address prefix (64 bits)	IPADDRESSV6
	-	[RULE_SPACE]	Rule Space name and only applicable for Gx+ protocol	BYTEARRAY: 127 bytes
-		SESSION_ID	Session ID of Diameter protocol	STRING: 255 bytes
UE_INFO	-	[IMSI] ⁽²⁾	International Mobile Subscriber Identity	TBCD: 64 bits
		[IMEISV] ⁽²⁾	International Mobile Station Equipment Identity Software Version	TBCD: 64 bits
		[MSISDN] ⁽²⁾	Mobile Subscriber ISDN Number	TBCD: 72 bits



Table 2 Event Parameters for GX_RAR_RAA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
SUBSCRIPTION_DATA ⁽⁵⁾	-	[SUBSCRIBERID] ⁽⁴⁾	Subscriber Administrative Identifier	STRING: 127 bytes
	SUBSCRIBERGROUPS ⁽⁵⁾	[SUBSCRIBERGROUP]	Active Subscriber Group associated to the subscriber	STRING: 127 bytes
	OPERATOR_SPECIFIC_INFO_LIST ⁽⁵⁾	[OPERATOR_SPECIFIC_INFO]	Operator Specific Information for the subscriber	STRING: 127 bytes
	-	[FAMILY_ID]	The identifier of the family to which the subscriber belongs	STRING: 127 bytes
		[CUSTOMER_ID] ⁽⁶⁾	The identifier is inserted in the HTTP headers because of Header Enrichment	STRING: 127 bytes
	MPS_INFO	[MPS_PRIORITY_LEVEL]	Priority level for multimedia priority services	UINT: 64 bits
		[MPS_TYPE]	Priority type of the multimedia priority services	STRING: 127 bytes
	AUTHORIZED_SERVICES ⁽⁵⁾	[AUTHORIZED_SERVICE_ID]	Authorized service ID for the subscriber session	STRING: 127 bytes
-		[REVALIDATION_TIME]	NTP time before which the PCEF has to request PCC rules again	UINT: 32 bits
-		[CONTENT_FILTERING_PROFILE_ID] ⁽⁷⁾	AVP sent from the SAPC to the PCEF and used to select a local content filtering profile identifier	UINT: 32 bits
-		[NETLOC_ACCESS_SUPPORT]	Level of support for NetLoc procedures provided by the current access network	UINT: 32 bits • 0: NETLOC_ACCESS_NOT_SUPPORTED



Table 2 Event Parameters for GX_RAR_RAA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
EVENT_TRIGGER S ⁽⁵⁾	-	[EVENT_TRIGGER]	Event triggers sent in RAR message	ENUM: 8 bits <ul style="list-style-type: none">• 0: SGSN_CHANGE• 1: QOS_CHANGE• 2: RAT_CHANGE• 4: PLMN_CHANGE• 7: IP-CAN CHANGE• 12: RAI_CHANGE• 13: USER_LOCATION_CHANGE• 15: OUT_OF_CREDIT• 16: REALLOCATION_OF_CREDIT• 17: REVALIDATION_TIMEOUT• 20: DEFAULT_EPS_BEARER_QOS_CHANGE• 21: AN_GW_CHANGE• 22: SUCCESSFUL_RESOURCE_ALLOCATION• 25: UE_TIME_ZONE_CHANGE_TRIGGER• 26: TAI_CHANGE• 27: ECGI_CHANGE• 29: APN_AMBR_MODIFICATION_FAILURE• 33: USAGE_REPORTING• 34: DEFAULT_EPS_BEARER_QOS_CHANGE_FAILURE• 39: APPLICATION_START• 40: APPLICATION_STOP• 45: ACCESS_NETWORK_INFO_REPORT• 48: PRA_CHANGE



Table 2 Event Parameters for GX_RAR_RAA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
-	-	[SESSION_RELEASE_CAUSE]	The cause of the IP-CAN session termination initiated by the SAPC	ENUM: 3 bits • 1: UE_SUBSCRIPTION_REASON
SUBSCRIBERGR_QOS_PRIORITY ⁽⁵⁾⁽⁸⁾	-	[SUBSCRIBERGROUP_PRIORITY]	It indicates the subscriber group priority	UINT: 32 bits

(1) Square brackets indicate that the parameter is conditionally logged for the event.

(2) This parameter is returned in the transaction that produces the event in all cases, presuming it was received during session establishment.

(3) All fields in the structure are included if the corresponding data is provisioned for the subscriber. Exception: SUBSCRIBERGROUP is set only if there are active subscriber groups and SERVICE is set with the authorized services.

(4) It is always present with the exceptional scenario where the subscriber is only provisioned in the OCS. It is set to Unknown when the Subscriber Unknown profile applies to the subscriber.

(5) This structure can be repeated maximum 50 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 50 elements.

(6) This parameter is not set in this event.

(7) It is only set if a content filtering profile ID is updated for the session.

(8) The priority of an active subscriber group follows the same order as its active subscriber group listed in the SUBSCRIPTION_DATA structure.

2.1.1.3 QOS_ASSIGNED_TO_DEFAULT_BEARER

This event is generated on successful CCA delivery or any RAA reception when the CCA or corresponding RAR includes QoS data for the default bearer.

Table 3 details the structures and parameters associated with the QOS_ASSIGNED_TO_DEFAULT_BEARER event.

Values of **TIME_HOUR**, **TIME_MINUTE**, **TIME_SECOND** and **TIME_MILLISECOND** correspond with the time upon CCR reception or RAR delivery.



Table 3 Event Parameters for QOS_ASSIGNED_TO_DEFAULT_BEARER

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
HEADER		EVENT_ID	Event identity	ENUM: 8 bits • 11: QOS_ASSIGNED_TO_DEFAULT_BEARER
		EVENT_RESULT	Result of the event procedure SUCCESS if Result-Code AVP in CCA or RAA message indicates success (2001). Otherwise, REJECT	ENUM: 2 bits • 0: SUCCESS • 1: REJECT
		TIME_HOUR	UTC time stamp in hours at the time when the signaling procedure for the event was started (HH)	UINT: 5 bits Range: 0-23
		TIME_MINUTE	UTC time stamp in minutes at the time when the signaling procedure for the event was started (MM)	UINT: 6 bits Range: 0-59
		TIME_SECOND	Time stamp in seconds at the time when the signaling procedure for the event was started (SS)	UINT: 6 bits Range: 0-60
		TIME_MILLISECOND	Time stamp in milliseconds at the time when the signaling procedure for the event was started (MSS)	UINT: 10 bits Range: 0-999
		DURATION	Not applicable and it is set to 0	UINT: 24 bits
-		CAUSE_PROTOCOL	The underlying protocol that triggers the event	ENUM: 3 bits • 1: GX
-		CAUSE_CODE	Reason for acceptance or rejection contained in AVP Result-Code or Experimental-Result of CCA or RAA message	UINT: 13 bits



Table 3 Event Parameters for QOS_ASSIGNED_TO_DEFAULT_BEARER

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
PDN_INFO	-	[DEFAULT_BEARER_ID]	Applicable for Default Bearer ID in UE_Only mode in GPRS network	STRING: 255 bytes
		[APN] ⁽²⁾	Access Point Name	DNSNAME: 127 bytes
	ALLOCATE_D_UE_ADDRESS	[IPV4] ⁽²⁾	IPv4 address	IPADDRESS
		[IPV6] ⁽²⁾	IPv6 address prefix (64 bits)	IPADDRESSV6
	-	[RULE_SPACE]	Rule Space name and only applicable for Gx+ protocol	BYTEARRAY: 127 bytes
UE_INFO	-	[IMSI] ⁽²⁾	International Mobile Subscriber Identity	TBCD: 64 bits
		[IMEISV] ⁽²⁾	International Mobile Station Equipment Identity Software Version	TBCD: 64 bits
		[MSISDN] ⁽²⁾	Mobile Subscriber ISDN Number	TBCD: 72 bits
-		SESSION_ID	Session ID of Diameter protocol	STRING: 255 bytes



Table 3 Event Parameters for QOS_ASSIGNED_TO_DEFAULT_BEARER

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
QOS	-	[BEARER_QCI]	QoS class identifier of the default bearer	UINT: 8 bits
		[ARP_PRIORITY_LEVEL]	Priority Level of Allocation and Retention Priority for the default bearer	UINT: 4 bits Range: 1-15
		[ARP_PCI]	Pre-emption-Capability of Allocation and Retention Priority for the default bearer	ENUM: 1 bits • 0: ENABLED • 1: DISABLED
		[ARP_PVI]	Pre-emption-Vulnerability of Allocation and Retention Priority for each bearer	ENUM: 1 bits • 0: ENABLED • 1: DISABLED
		[BEARER_MBR_UL]	Maximum Bit Rate (bps) in uplink direction	UINT: 32 bits
		[BEARER_MBR_DL]	Maximum Bit Rate (bps) in downlink direction	UINT: 32 bits
		[BEARER_GBR_UL] ⁽³⁾	Guaranteed Bit Rate (bps) in uplink direction	UINT: 32 bits
		[BEARER_GBR_DL] ⁽³⁾	Guaranteed Bit Rate (bps) in downlink direction	UINT: 32 bits
		[APN_AMBR_UL]	Aggregated Maximum Bit Rate (bps) in uplink direction across all non-GBR bearers related to the same APN	UINT: 32 bits
		[APN_AMBR_DL]	Aggregated Maximum Bit Rate (bps) in downlink direction across all non-GBR bearers related to the same APN	UINT: 32 bits

(1) Square brackets indicate that the parameter is conditionally logged for the event.

(2) This parameter is returned in the transaction that produces the event in all cases, presuming it was received during session establishment.

(3) This parameter is not set in this event.

2.1.1.4 RULE_INSTALLED

This event is generated on successful CCA delivery or any RAA reception when the CCA or corresponding RAR includes rules to be installed.

Table 4 details the structures and parameters associated with the RULE_INSTALLED event.



Values of **TIME_HOUR**, **TIME_MINUTE**, **TIME_SECOND** and **TIME_MILLISECOND** correspond with the time of CCR reception or RAR delivery.

Table 4 Event Parameters for RULE_INSTALLED

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
HEADER		EVENT_ID	Event identity	ENUM: 8 bits • 12: RULE_INSTALLED
		EVENT_RESULT	Result of the event procedure SUCCESS if Result-Code AVP in CCA or RAA message indicates success (2001). Otherwise, REJECT	ENUM: 2 bits • 0: SUCCESS • 1: REJECT
		TIME_HOUR	UTC time stamp in hours at the time when the signaling procedure for the event was started (HH)	UINT: 5 bits Range: 0-23
		TIME_MINUTE	UTC time stamp in minutes at the time when the signaling procedure for the event was started (MM)	UINT: 6 bits Range: 0-59
		TIME_SECOND	Time stamp in seconds at the time when the signaling procedure for the event was started (SS)	UINT: 6 bits Range: 0-60
		TIME_MILLISECOND	Time stamp in milliseconds at the time when the signaling procedure for the event was started (MSS)	UINT: 10 bits Range: 0-999
		DURATION	Not applicable and it is set to 0	UINT: 24 bits
-		CAUSE_PROTOCOL	The underlying protocol that triggers the event	ENUM: 3 bits • 1: GX
-		CAUSE_CODE	Reason for acceptance or rejection contained in AVP Result-Code or Experimental-Result of CCA or RAA message	UINT: 13 bits



Table 4 Event Parameters for RULE_INSTALLED

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
PDN_INFO	-	[DEFAULT_BEARER_ID]	Applicable for Default Bearer ID in UE_Only mode in GPRS network	STRING: 255 bytes
		[APN] ⁽²⁾	Access Point Name	DNSNAME: 127 bytes
	ALLOCATE_D_UE_ADDRESS	[IPv4] ⁽²⁾	IPv4 address	IPADDRESS
		[IPv6] ⁽²⁾	IPv6 address prefix (64 bits)	IPADDRESSV6
	-	[RULE_SPACE]	Rule Space name and only applicable for Gx+ protocol	BYTEARRAY: 127 bytes
UE_INFO	-	[IMSI] ⁽²⁾	International Mobile Subscriber Identity	TBCD: 64 bits
		[IMEISV] ⁽²⁾	International Mobile Station Equipment Identity Software Version	TBCD: 64 bits
		[MSISDN] ⁽²⁾	Mobile Subscriber ISDN Number	TBCD: 72 bits
-		SESSION_ID	Session ID of Diameter protocol	STRING: 255 bytes



Table 4 Event Parameters for RULE_INSTALLED

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
RULE_INFORMATION ⁽⁵⁾	-	RULE_ID	Identifier of the PCC rule	STRING: 255 bytes
		[ACTIVATION_TIME]	Rule activation time	UINT: 32 bits
		[DEACTIVATION_TIME]	Rule deactivation time	UINT: 32 bits
		[AUTHORIZATION_STATE]	The authorization state and reason for non-authorization It is only applicable for Gx+	ENUM: 4 bits <ul style="list-style-type: none"> • 0: AUTHORIZED • 1: DENIED_CALENDAR_TIME • 2: DENIED_ROAMING • 3: DENIED_QUALITY_OF_SERVICE • 4: DENIED_BLACKLISTED • 5: DENIED_TERMINAL • 6: DENIED_OPERATOR_REASON_ONE • 7: DENIED_OPERATOR_REASON_TWO • 8: DENIED_OPERATOR_REASON_THREE • 9: DENIED_OPERATOR_REASON_FOUR • 10: DENIED_OPERATOR_REASON_FIVE • 11: DENIED_UNKNOWN • 12: DENIED_USAGE_CONTROL
		[FAILURE_CODE] ⁽⁴⁾	The reason for unsuccessful installation, activation, or enforcement of a rule	UINT: 32 bits
		[ONE_TIME_REDIRECT]	OneTimeRedirect information of the PCC rule It is only applicable for Gx+	ENUM: 2 bits <ul style="list-style-type: none"> • 0: FALSE • 1: TRUE
		[BEARER_QCI]	QoS class identifier of each bearer	UINT: 8 bits
	QoS	[ARP_PRIORITY_LEVEL]	Priority Level of Allocation and Retention Priority for each bearer	UINT: 4 bits Range: 1-15
		[ARP_PCI]	Pre-emption-Capability of Allocation and Retention Priority for each bearer	ENUM: 1 bits <ul style="list-style-type: none"> • 0: ENABLED • 1: DISABLED
		[ARP_PVI]	Pre-emption-Vulnerability of Allocation and Retention Priority for each bearer	ENUM: 1 bits <ul style="list-style-type: none"> • 0: ENABLED • 1: DISABLED
		[BEARER_MBR_UL]	Maximum Bit Rate (bps) in uplink direction	UINT: 32 bits
		[BEARER_MBR_DL]	Maximum Bit Rate (bps) in downlink direction	UINT: 32 bits
		[BEARER_GBR_UL]	Guaranteed Bit Rate (bps) in uplink direction	UINT: 32 bits



Table 4 Event Parameters for RULE_INSTALLED

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
-	-	[CHARGING_CORRELATION_INDICATOR] ⁽⁴⁾	Indicates that the PCEF provides the assigned access network charging identifier for the dynamic PCC Rules	ENUM: 3 bits <ul style="list-style-type: none">• 0: CHARGING_IDENTIFIER_REQUIRED
PCC_ADC_INFORMATION ⁽³⁾	-	TDF_APP_ID	The TDF-Application-Identifier of the application	STRING: 255 Bytes
		RULE_ID	Identifier of the PCC rule. It used to match the RULE_INFORMATION event	STRING: 255 Bytes
		[REDIRECT_SUPPORT]	Support for ADC redirection	ENUM: 2 bits <ul style="list-style-type: none">• 0: DISABLED• 1: ENABLED
		[REDIRECT_SERVER_ADDRESS]	The server address of redirection destination	STRING: 255 Bytes
		[MUTE_NOTIFICATIONS]	Mute notifications for detected applications	ENUM: 2 bits <ul style="list-style-type: none">• 0: MUTED• 1: UNMUTED

(1) Square brackets indicate that the parameter is conditionally logged for the event.

(2) This parameter is returned in the transaction that produces the event in all cases, presuming it was received during session establishment.

(3) This structure can be repeated maximum 40 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 40 elements.

(4) This parameter is not set in this event.

(5) This structure can be repeated maximum 5 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 5 elements.

2.1.1.5 RULE_INSTALLATION_FAILURE

This event is generated when CCR has been received indicating Rule Installation Failure. For example, if a PCC rule has been reported as inactive by the PCEF, or there has been an installation with lower QoS in which rules are active, but with Rule-Failure-Code (UNSUCCESSFUL_QOS_VALIDATION).

See Table 5 for details about the structure and parameters associated with the RULE_INSTALLATION_FAILURE event.

Values of **TIME_HOUR**, **TIME_MINUTE**, **TIME_SECOND** and **TIME_MILLISECOND** correspond with the time of CCR reception.



Table 5 Event Parameters for RULE_INSTALLATION_FAILURE

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
HEADER		EVENT_ID	Event identity	ENUM: 8 bits • 13: RULE_INSTALLATION_FAILURE
		EVENT_RESULT	Result of the event procedure SUCCESS if Result-Code AVP in CCA message indicates success (2001). Otherwise, REJECT	ENUM: 2 bits • 0: SUCCESS • 1: REJECT
		TIME_HOUR	UTC time stamp in hours at the time when the signaling procedure for the event was started (HH)	UINT: 5 bits Range: 0-23
		TIME_MINUTE	UTC time stamp in minutes at the time when the signaling procedure for the event was started (MM)	UINT: 6 bits Range: 0-59
		TIME_SECOND	Time stamp in seconds at the time when the signaling procedure for the event was started (SS)	UINT: 6 bits Range: 0-60
		TIME_MILLISECOND	Time stamp in milliseconds at the time when the signaling procedure for the event was started (MSS)	UINT: 10 bits Range: 0-999
		DURATION	Not applicable and it is set to 0	UINT: 24 bits
-	-	CAUSE_PROTOCOL	The underlying protocol that triggers the event	ENUM: 3 bits • 1: GX
-	-	CAUSE_CODE	Reason for acceptance or rejection contained in AVP Result-Code or Experimental-Result of CCA message	UINT: 13 bits
PDN_INFO	-	[DEFAULT_BEARER_ID]	Applicable for Default Bearer ID in UE_Only mode in GPRS network	STRING: 255 bytes
		[APN] ⁽²⁾	Access Point Name	DNSNAME: 127 bytes
	ALLOCATED UE_ADDRESS	[IPv4] ⁽²⁾	IPv4 address	IPADDRESS
		[IPv6] ⁽²⁾	IPv6 address prefix (64 bits)	IPADDRESSV6
	-	[RULE_SPACE]	Rule Space name and only applicable for Gx+ protocol	BYTEARRAY: 127 bytes



Table 5 Event Parameters for RULE_INSTALLATION_FAILURE

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
UE_INFO	-	[IMSI] ⁽²⁾	International Mobile Subscriber Identity	TBCD: 64 bits
		[IMEISV] ⁽²⁾	International Mobile Station Equipment Identity Software Version	TBCD: 64 bits
		[MSISDN] ⁽²⁾	Mobile Subscriber ISDN Number	TBCD: 72 bits
-		SESSION_ID	Session ID of Diameter protocol	STRING: 255 bytes



Table 5 Event Parameters for RULE_INSTALLATION_FAILURE

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
RULE_INFORMATION ⁽⁵⁾	-	RULE_ID	Identifier of the PCC rule	STRING: 255 bytes
		[ACTIVATION_TIME] ⁽⁴⁾	Rule activation time	UINT: 32 bits
		[DEACTIVATION_TIME] ⁽⁴⁾	Rule deactivation time	UINT: 32 bits
		[AUTHORIZATION_STATE] ⁽⁴⁾	The authorization state and reason for non-authorization It is only applicable for Gx+	ENUM: 4 bits <ul style="list-style-type: none"> • 0: AUTHORIZED • 1: DENIED_CALENDAR_TIME • 2: DENIED_ROAMING • 3: DENIED_QUALITY_OF_SERVICE • 4: DENIED_BLACKLISTED • 5: DENIED_TERMINAL • 6: DENIED_OPERATOR_REASON_ONE • 7: DENIED_OPERATOR_REASON_TWO • 8: DENIED_OPERATOR_REASON_THREE • 9: DENIED_OPERATOR_REASON_FOUR • 10: DENIED_OPERATOR_REASON_FIVE • 11: DENIED_UNKNOWNN • 12: DENIED_USAGE_CONTROL
		[FAILURE_CODE]	The reason for unsuccessful installation, activation, or enforcement of a rule	UINT: 32 bits
		[ONE_TIME_REDIRECT] ⁽⁴⁾	OneTimeRedirect information of the PCC rule It is only applicable for Gx+	ENUM: 2 bits <ul style="list-style-type: none"> • 0: FALSE • 1: TRUE
	QoS ⁽⁴⁾	[BEARER_QCI]	QoS class identifier of each bearer	UINT: 8 bits
		[ARP_PRIORITY_LEVEL]	Priority Level of Allocation and Retention Priority for each bearer	UINT: 4 bits Range: 1-15
		[ARP_PCI]	Pre-emption-Capability of Allocation and Retention Priority for each bearer	ENUM: 1 bits <ul style="list-style-type: none"> • 0: ENABLED • 1: DISABLED
		[ARP_PVI]	Pre-emption-Vulnerability of Allocation and Retention Priority for each bearer	ENUM: 1 bits <ul style="list-style-type: none"> • 0: ENABLED • 1: DISABLED
		[BEARER_MBR_UL]	Maximum Bit Rate (bps) in uplink direction	UINT: 32 bits
		[BEARER_MBR_DL]	Maximum Bit Rate (bps) in downlink direction	UINT: 32 bits
		[BEARER_GBR_UL]	Guaranteed Bit Rate (bps) in uplink direction	UINT: 32 bits



Table 5 Event Parameters for RULE_INSTALLATION_FAILURE

- (1) Square brackets indicate that the parameter is conditionally logged for the event.
- (2) This parameter is returned in the transaction that produces the event in all cases, presuming it was received during session establishment.
- (3) This structure can be repeated maximum 40 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 40 elements.
- (4) This parameter is not set in this event.
- (5) This structure can be repeated maximum 5 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 5 elements.

2.1.1.6 RULE_REMOVED

This event is generated on successful CCA delivery or any RAA reception when the CCA or the corresponding RAR includes rules to be removed.

See Table 6 for details about the structure and parameters associated with the RULE_REMOVED event.

Values of **TIME_HOUR**, **TIME_MINUTE**, **TIME_SECOND** and **TIME_MILLISECOND** correspond with the time of CCR reception or RAR delivery.



Table 6 Event Parameters for RULE_REMOVED

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
HEADER		EVENT_ID	Event identity	ENUM: 8 bits • 14: RULE_REMOVED
		EVENT_RESULT	Result of the event procedure SUCCESS if Result-Code AVP in CCA or RAA message indicates success (2001). Otherwise, REJECT	ENUM: 2 bits • 0: SUCCESS • 1: REJECT
		TIME_HOUR	UTC time stamp in hours at the time when the signaling procedure for the event was started (HH)	UINT: 5 bits Range: 0-23
		TIME_MINUTE	UTC time stamp in minutes at the time when the signaling procedure for the event was started (MM)	UINT: 6 bits Range: 0-59
		TIME_SECOND	Time stamp in seconds at the time when the signaling procedure for the event was started (SS)	UINT: 6 bits Range: 0-60
		TIME_MILLISECOND	Time stamp in milliseconds at the time when the signaling procedure for the event was started (MSS)	UINT: 10 bits Range: 0-999
		DURATION	Not applicable and it is set to 0	UINT: 24 bits
-		CAUSE_PROTOCOL	The underlying protocol that triggers the event	ENUM: 3 bits • 1: GX
-		CAUSE_CODE	Reason for acceptance or rejection contained in AVP Result-Code or Experimental-Result of CCA or RAA message	UINT: 13 bits



Table 6 Event Parameters for RULE_REMOVED

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
PDN_INFO	-	[DEFAULT_BEARER_ID]	Applicable for Default Bearer ID in UE_Only mode in GPRS network	STRING: 255 bytes
		[APN] ⁽²⁾	Access Point Name	DNSNAME: 127 bytes
	ALLOCATE_D_UE_ADDRESS	[IPv4] ⁽²⁾	IPv4 address	IPADDRESS
		[IPv6] ⁽²⁾	IPv6 address prefix (64 bits)	IPADDRESSV6
	-	[RULE_SPACE]	Rule Space name and only applicable for Gx+ protocol	BYTEARRAY: 127 bytes
UE_INFO	-	[IMSI] ⁽²⁾	International Mobile Subscriber Identity	TBCD: 64 bits
		[IMEISV] ⁽²⁾	International Mobile Station Equipment Identity Software Version	TBCD: 64 bits
		[MSISDN] ⁽²⁾	Mobile Subscriber ISDN Number	TBCD: 72 bits
-		SESSION_ID	Session ID of Diameter protocol	STRING: 255 bytes



Table 6 Event Parameters for RULE_REMOVED

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
RULE_INFORMATION ⁽⁵⁾	-	RULE_ID	Identifier of the PCC rule	STRING: 255 bytes
		[ACTIVATION_TIME] ⁽⁴⁾	Rule activation time	UINT: 32 bits
		[DEACTIVATION_TIME] ⁽⁴⁾	Rule deactivation time	UINT: 32 bits
		[AUTHORIZATION_STATE] ⁽⁴⁾	The authorization state and reason for non-authorization It is only applicable for Gx+	ENUM: 4 bits <ul style="list-style-type: none"> • 0: AUTHORIZED • 1: DENIED_CALENDAR_TIME • 2: DENIED_ROAMING • 3: DENIED_QUALITY_OF_SERVICE • 4: DENIED_BLACKLISTED • 5: DENIED_TERMINAL • 6: DENIED_OPERATOR_REASON_ONE • 7: DENIED_OPERATOR_REASON_TWO • 8: DENIED_OPERATOR_REASON_THREE • 9: DENIED_OPERATOR_REASON_FOUR • 10: DENIED_OPERATOR_REASON_FIVE • 11: DENIED_UNKNOWN • 12: DENIED_USAGE_CONTROL
		[FAILURE_CODE] ⁽⁴⁾	The reason for unsuccessful installation, activation, or enforcement of a rule	UINT: 32 bits
		[ONE_TIME_REDIRECT] ⁽⁴⁾	OneTimeRedirect information of the PCC rule It is only applicable for Gx+	ENUM: 2 bits <ul style="list-style-type: none"> • 0: FALSE • 1: TRUE
	QoS ⁽⁴⁾	[BEARER_QCI]	QoS class identifier of each bearer	UINT: 8 bits
		[ARP_PRIORITY_LEVEL]	Priority Level of Allocation and Retention Priority for each bearer	UINT: 4 bits Range: 1-15
		[ARP_PCI]	Pre-emption-Capability of Allocation and Retention Priority for each bearer	ENUM: 1 bits <ul style="list-style-type: none"> • 0: ENABLED • 1: DISABLED
		[ARP_PVI]	Pre-emption-Vulnerability of Allocation and Retention Priority for each bearer	ENUM: 1 bits <ul style="list-style-type: none"> • 0: ENABLED • 1: DISABLED
		[BEARER_MBR_UL]	Maximum Bit Rate (bps) in uplink direction	UINT: 32 bits
		[BEARER_MBR_DL]	Maximum Bit Rate (bps) in downlink direction	UINT: 32 bits
		[BEARER_GBR_UL]	Guaranteed Bit Rate (bps) in uplink direction	UINT: 32 bits



Table 6 Event Parameters for RULE_REMOVED

- (1) Square brackets indicate that the parameter is conditionally logged for the event.
- (2) This parameter is returned in the transaction that produces the event in all cases, presuming it was received during session establishment.
- (3) This structure can be repeated maximum 40 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 40 elements.
- (4) This parameter is not set in this event.
- (5) This structure can be repeated maximum 5 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 5 elements.

2.1.1.7 QUOTA_GRANTED

This event is generated on successful CCA delivery or any RAA reception when the CCA or the corresponding RAR includes the information of granted quota.

Table 7 details the structures and parameters associated with the QOUTA_GRANTED event.

Values of **TIME_HOUR**, **TIME_MINUTE**, **TIME_SECOND** and **TIME_MILLISECOND** correspond with the time of CCR reception or RAR delivery.



Table 7 Event Parameters for QUOTA_GRANTED

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
HEADER		EVENT_ID	Event identity	ENUM: 8 bits • 8: QUOTA_GRANTED
		EVENT_RESULT	Result of the event procedure SUCCESS if Result-Code AVP in CCA or RAA message indicates success (2001). Otherwise, REJECT	ENUM: 2 bits • 0: SUCCESS • 1: REJECT
		TIME_HOUR	UTC time stamp in hours at the time when the signaling procedure for the event was started (HH)	UINT: 5 bits Range: 0-23
		TIME_MINUTE	UTC time stamp in minutes at the time when the signaling procedure for the event was started (MM)	UINT: 6 bits Range: 0-59
		TIME_SECOND	Time stamp in seconds at the time when the signaling procedure for the event was started (SS)	UINT: 6 bits Range: 0-60
		TIME_MILLISECOND	Time stamp in milliseconds at the time when the signaling procedure for the event was started (MSS)	UINT: 10 bits Range: 0-999
		DURATION	Not applicable and it is set to 0	UINT: 24 bits
-		CAUSE_PROTOCOL	The underlying protocol that triggers the event	ENUM: 3 bits • 1: GX
-		CAUSE_CODE	Reason for acceptance or rejection contained in AVP Result-Code or Experimental-Result of CCA or RAA message	UINT: 13 bits



Table 7 Event Parameters for QUOTA_GRANTED

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
PDN_INFO	-	[DEFAULT_BEARER_ID]	Applicable for Default Bearer ID in UE_Only mode in GPRS network	STRING: 255 bytes
		[APN] ⁽²⁾	Access Point Name	DNSNAME: 127 bytes
	ALLOCATE_D_UE_ADDRESS	[IPv4] ⁽²⁾	IPv4 address	IPADDRESS
		[IPv6] ⁽²⁾	IPv6 address prefix (64 bits)	IPADDRESSV6
	-	[RULE_SPACE]	Rule Space name and only applicable for Gx+ protocol	BYTEARRAY: 127 bytes
UE_INFO	-	[IMSI] ⁽²⁾	International Mobile Subscriber Identity	TBCD: 64 bits
		[IMEISV] ⁽²⁾	International Mobile Station Equipment Identity Software Version	TBCD: 64 bits
		[MSISDN] ⁽²⁾	Mobile Subscriber ISDN Number	TBCD: 72 bits
-		SESSION_ID	Session ID of Diameter protocol	STRING: 255 bytes
REPORTING_GROUP_QUOTA_INFO ⁽³⁾	-	[MONITORING_KEY]	An identifier of the Reporting Group	STRING: 255 bytes
	REPORTING_GROUP_QUOTA	[QUOTA_VOLUME_UPLINK]	Granted volume units for the Reporting Group in the uplink direction	UINT: 64 bits
		[QUOTA_VOLUME_DOWNLINK]	Granted volume units for the Reporting Group in the downlink direction	UINT: 64 bits
		[QUOTA_VOLUME_BIDIRECTIONAL]	Granted volume units for the Reporting Group in both uplink and downlink directions	UINT: 64 bits
		[QUOTA_TIME_DURATION]	Granted time units for the Reporting Group	UINT: 64 bits

(1) Square brackets indicate that the parameter is conditionally logged for the event.

(2) This parameter is returned in the transaction that produces the event in all cases, presuming it was received during session establishment.

(3) This structure can be repeated maximum 50 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 50 elements.

2.1.1.8 REPORTED_USAGE

This event is generated on CCA delivery when the CCR contains the usage information reported by the PCEF.



Table 8 details the structures and parameters associated with the REPORTED_USAGE event.

Values of **TIME_HOUR**, **TIME_MINUTE**, **TIME_SECOND** and **TIME_MILLISECOND** correspond with the time of CCR reception.

Table 8 Event parameters for REPORTED_USAGE

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
HEADER		EVENT_ID	Event identity	ENUM: 8 bits • 7: REPORTED_USAGE
		EVENT_RESULT	Result of the event procedure SUCCESS if Result-Code AVP in CCA message indicates success (2001). Otherwise, REJECT	ENUM: 2 bits • 0: SUCCESS • 1: REJECT
		TIME_HOUR	UTC time stamp in hours at the time when the signaling procedure for the event was started (HH)	UINT: 5 bits Range: 0-23
		TIME_MINUTE	UTC time stamp in minutes at the time when the signaling procedure for the event was started (MM)	UINT: 6 bits Range: 0-59
		TIME_SECOND	Time stamp in seconds at the time when the signaling procedure for the event was started (SS)	UINT: 6 bits Range: 0-60
		TIME_MILLISECOND	Time stamp in milliseconds at the time when the signaling procedure for the event was started (MSS)	UINT: 10 bits Range: 0-999
		CAUSE_PROTOCOL	The underlying protocol that triggers the event	ENUM: 3 bits • 1: GX
		CAUSE_CODE	Reason for acceptance or rejection contained in AVP Result-Code or Experimental-Result of CCA message	UINT: 13 bits
		DURATION	Not applicable and it is set to 0	UINT: 24 bits
-		CAUSE_PROTOCOL	The underlying protocol that triggers the event	ENUM: 3 bits • 1: GX



Table 8 Event parameters for REPORTED_USAGE

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
-	-	CAUSE_CODE	Reason for acceptance or rejection contained in AVP Result-Code or Experimental-Result of CCA message	UINT: 13 bits
PDN_INFO	-	[DEFAULT_BEARER_ID]	Applicable for Default Bearer ID in UE-Only mode in GPRS network	STRING: 255 bytes
		[APN] ⁽²⁾	Access Point Name	DNSNAME: 127 bytes
	ALLOCATED_UE_ADDRESS	[IPv4] ⁽²⁾	IPv4 address	IPADDRESS
		[IPv6] ⁽²⁾	IPv6 address prefix (64 bits)	IPADDRESSV6
	-	[RULE_SPACE]	Rule Space name and only applicable for Gx+ protocol	BYTEARRAY: 127 bytes
UE_INFO	-	[IMSI] ⁽²⁾	International Mobile Subscriber Identity	TBCD: 64 bits
		[IMEISV] ⁽²⁾	International Mobile Station Equipment Identity Software Version	TBCD: 64 bits
		[MSISDN] ⁽²⁾	Mobile Subscriber ISDN Number	TBCD: 72 bits
-	-	SESSION_ID	Session ID of Diameter protocol	STRING: 255 bytes
REPORTING_GROUP_USAGE_INFO ⁽³⁾	-	[MONITORING_KEY]	An identifier of the Reporting Group	STRING: 255 bytes
	REPORTING_GROUP_USAGE	[FAIR_USAGE_VOLUME_UPLINK] ⁽⁴⁾	Reported usage of volume units for the Reporting Group in the uplink direction	UINT: 64 bits
		[FAIR_USAGE_VOLUME_DOWNLINK] ⁽⁴⁾	Reported usage of volume units for the Reporting Group in the downlink direction	UINT: 64 bits
		[FAIR_USAGE_VOLUME_BIDIRECTIONAL] ⁽⁴⁾	Reported usage of volume units for the Reporting Group in bidirectional traffic	UINT: 64 bits
		[FAIR_USAGE_TIME_DURATION] ⁽⁵⁾	Reported usage of time units for the Reporting Group	UINT: 64 bits

(1) Square brackets indicate that the parameter is conditionally logged for the event.

(2) This parameter is returned in the transaction that produces the event in all cases, presuming it was received during session establishment.

(3) This structure can be repeated maximum 50 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 50 elements.

(4) If the Granted-Service-Unit AVP is received, but not the AVP of the corresponding parameter, the value sent is 0.

(5) The value 0 is always sent.



2.1.1.9 ACCUM_USAGE_LIMIT_SURPASSED

This event is generated on CCA delivery when one of the usage limits of a subscriber is surpassed. The usage limit can be intermediate, conditional, complementary, absolute, or IP session limit.

When multiple counters are applicable, an event is generated for each counter of which the limit is surpassed.

Table 9 details the structures and parameters associated with the ACCUM_USAGE_LIMIT_SURPASSED event.

Values of **TIME_HOUR**, **TIME_MINUTE**, **TIME_SECOND** and **TIME_MILLISECOND** correspond with the time of CCR reception or RAR delivery.

Table 9 Event Parameters for ACCUM_USAGE_LIMIT_SURPASSED

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
HEADER		EVENT_ID	Event identity	ENUM: 8 bits • 9: ACCUM_USAGE_LIMIT_SURPASSED
		EVENT_RESULT	Result of the event procedure SUCCESS if Result-Code AVP in CCA or RAA message indicates success (2001). Otherwise, REJECT	ENUM: 2 bits • 0: SUCCESS • 1: REJECT
		TIME_HOUR	UTC time stamp in hours at the time when the signaling procedure for the event was started (HH)	UINT: 5 bits Range: 0-23
		TIME_MINUTE	UTC time stamp in minutes at the time when the signaling procedure for the event was started (MM)	UINT: 6 bits Range: 0-59
		TIME_SECOND	Time stamp in seconds at the time when the signaling procedure for the event was started (SS)	UINT: 6 bits Range: 0-60
		TIME_MILLISECOND	Time stamp in milliseconds at the time when the signaling procedure for the event was started (MSS)	UINT: 10 bits Range: 0-999
		DURATION	Not applicable and it is set to 0	UINT: 24 bits
-		CAUSE_PROTOCOL	The underlying protocol that triggers the event	ENUM: 3 bits • 1: GX



Table 9 Event Parameters for ACCUM_USAGE_LIMIT_SURPASSED

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
-	-	CAUSE_CODE	Reason for acceptance or rejection contained in AVP Result-Code or Experimental-Result of CCA or RAA message	UINT: 13 bits
PDN_INFO	-	[DEFAULT_BEARER_ID]	Applicable for Default Bearer ID in UE_Only mode in GPRS network	STRING: 255 bytes
		[APN] ⁽²⁾	Access Point Name	DNSNAME: 127 bytes
	ALLOCATED_UE_ADDRESS	[IPv4] ⁽²⁾	IPv4 address	IPADDRESS
		[IPv6] ⁽²⁾	IPv6 address prefix (64 bits)	IPADDRESSV6
	-	[RULE_SPACE]	Rule Space name and only applicable for Gx+ protocol	BYTEARRAY: 127 bytes
UE_INFO	-	[IMSI] ⁽²⁾	International Mobile Subscriber Identity	TBCD: 64 bits
		[IMEISV] ⁽²⁾	International Mobile Station Equipment Identity Software Version	TBCD: 64 bits
		[MSISDN] ⁽²⁾	Mobile Subscriber ISDN Number	TBCD: 72 bits
-	-	SESSION_ID	Session ID of Diameter protocol	STRING: 255 bytes
-	-	[ACTIVESUBSCRIBERGROUP]	Active subscriber group for the Reporting Group	STRING: 127 bytes
-	-	MONITORING_KEY	An identifier of the Reporting Group	STRING: 255 bytes
-	-	[COUNTER]	Accumulator in the fair usage functionality	STRING: 255 bytes
-	-	LIMIT_TYPE	Limit type of the Reporting Group	ENUM: 1 bits • 0: VOLUME • 1: TIME
-	-	LIMIT_VALUE	The limit value	UINT: 32 bits
-	-	SUBSCRIPTION_TYPE	The type of subscription payment	ENUM: 2 bits • 0: POSTPAID • 1: PREPAID

(1) Square brackets indicate that the parameter is conditionally logged for the event.

(2) This parameter is returned in the transaction that produces the event in all cases, presuming it was received during session establishment.



2.1.1.10 ACCUMULATED_USAGE_RESET

This event is generated in the following cases:

- When the expiration date of the absolute usage accumulator for postpaid subscriptions is reached
- When subscription date of a Reporting Group is changed
- When the start date of the subscriber group to which the Reporting Group is assigned is updated

Table 10 details the structures and parameters associated with the ACCUMULATED_USAGE_RESET event.

Values of **TIME_HOUR**, **TIME_MINUTE**, **TIME_SECOND** and **TIME_MILLISECOND** correspond with the time of CCR reception or RAR delivery.

Table 10 Event Parameters for ACCUMULATED_USAGE_RESET

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
HEADER		EVENT_ID	Event identity	ENUM: 8 bits • 10: ACCUMULATED_USAGE_RESET
		EVENT_RESULT	Result of the event procedure SUCCESS if Result-Code AVP in CCA or RAA message indicates success (2001). Otherwise, REJECT	ENUM: 2 bits • 0: SUCCESS • 1: REJECT
		TIME_HOUR	UTC time stamp in hours at the time when the signaling procedure for the event was started (HH)	UINT: 5 bits Range: 0-23
		TIME_MINUTE	UTC time stamp in minutes at the time when the signaling procedure for the event was started (MM)	UINT: 6 bits Range: 0-59
		TIME_SECOND	Time stamp in seconds at the time when the signaling procedure for the event was started (SS)	UINT: 6 bits Range: 0-60
		TIME_MILLISECOND	Time stamp in milliseconds at the time when the signaling procedure for the event was started (MSS)	UINT: 10 bits Range: 0-999
		DURATION	Not applicable and it is set to 0	UINT: 24 bits



Table 10 Event Parameters for ACCUMULATED_USAGE_RESET

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
-	-	CAUSE_PROTOCOL	The underlying protocol that triggers the event	ENUM: 3 bits • 0: INTERNAL
-	-	CAUSE_CODE	Reason for acceptance or rejection contained in AVP Result-Code or Experimental-Result of CCA or RAA message	UINT: 13 bits
PDN_INFO	-	[DEFAULT_BEARER_ID]	Applicable for Default Bearer ID in UE_Only mode in GPRS network	STRING: 255 bytes
		[APN] ⁽²⁾	Access Point Name	DNSNAME: 127 bytes
	ALLOCATED_UE_ADDRESS	[IPv4] ⁽²⁾	IPv4 address	IPADDRESS
		[IPv6] ⁽²⁾	IPv6 address prefix (64 bits)	IPADDRESSV6
	-	[RULE_SPACE]	Rule Space name and only applicable for Gx+ protocol	BYTEARRAY: 127 bytes
UE_INFO	-	[IMSI] ⁽²⁾	International Mobile Subscriber Identity	TBCD: 64 bits
		[IMEISV] ⁽²⁾	International Mobile Station Equipment Identity Software Version	TBCD: 64 bits
		[MSISDN] ⁽²⁾	Mobile Subscriber ISDN Number	TBCD: 72 bits
-	-	SESSION_ID	Session ID of Diameter protocol	STRING: 255 bytes
-	-	[ACTIVESUBSCRIBERGROUP]	Active subscriber group for the Reporting Group	STRING: 127 bytes
-	-	MONITORING_KEY	An identifier of the Reporting Group	STRING: 255 bytes
-	-	SUBSCRIPTION_TYPE	The type of subscription payment	ENUM: 2 bits • 0: POSTPAID • 1: PREPAID
COUNTERS ⁽³⁾	-	[COUNTER] ⁽⁴⁾	Accumulator in the fair usage functionality	STRING: 255 bytes

(1) Square brackets indicate that the parameter is conditionally logged for the event.

(2) This parameter is returned in the transaction that produces the event in all cases, presuming it was received during session establishment.

(3) This structure can be repeated maximum 50 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 50 elements.

(4) Reset can happen at Monitoring Key level or at complementary usage accumulator level. If a complementary counter is reset because of a lifecycle counter independence, or the absolute usage accumulator is reset, it is included in the list of counters.



2.1.1.11 FAIR_USAGE_INFO_SUBSCRIPTION_DATA

This event is generated on successful CCA delivery or any RAA reception when the CCA or corresponding RAR includes at least one active Reporting Group for the subscriber.

Table 11 details the structures and parameters associated with the FAIR_USAGE_INFO_SUBSCRIPTION_DATA event.

Values of **TIME_HOUR**, **TIME_MINUTE**, **TIME_SECOND** and **TIME_MILLISECOND** correspond with the time of CCR reception or RAR delivery.

Table 11 Event Parameters for FAIR_USAGE_INFO_SUBSCRIPTION_DATA

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
HEADER		EVENT_ID	Event identity	ENUM: 8 bits • 15: FAIR_USAGE_INFO_SUBSCRIPTION_DATA
		EVENT_RESULT	Result of the event procedure SUCCESS if Result-Code AVP in CCA or RAA message indicates success (2001). Otherwise, REJECT	ENUM: 2 bits • 0: SUCCESS • 1: REJECT
		TIME_HOUR	UTC time stamp in hours at the time when the signaling procedure for the event was started (HH)	UINT: 5 bits Range: 0-23
		TIME_MINUTE	UTC time stamp in minutes at the time when the signaling procedure for the event was started (MM)	UINT: 6 bits Range: 0-59
		TIME_SECOND	Time stamp in seconds at the time when the signaling procedure for the event was started (SS)	UINT: 6 bits Range: 0-60
		TIME_MILLISECOND	Time stamp in milliseconds at the time when the signaling procedure for the event was started (MSS)	UINT: 10 bits Range: 0-999
		DURATION	It is not applicable, value is set to 0	UINT: 24 bits
-		CAUSE_PROTOCOL	The underlying protocol that triggers the event	ENUM: 3 bits • 1: GX



Table 11 Event Parameters for FAIR_USAGE_INFO_SUBSCRIPTION_DATA

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
-	-	CAUSE_CODE	Reason for acceptance or rejection contained in AVP Result-Code or Experimental-Result of CCA or RAA message	UINT: 13 bits
UE_INFO	-	[IMSI] ⁽²⁾	International Mobile Subscriber Identity	TBCD: 64 bits
		[IMEISV] ⁽²⁾	International Mobile Station Equipment Identity Software Version	TBCD: 64 bits
		[MSISDN] ⁽²⁾	Mobile Subscriber ISDN Number	TBCD: 72 bits
-	-	SESSION_ID	Session ID of Diameter protocol	STRING: 255 bytes
REPORTING_GROUP_PROFILE_INFO ⁽³⁾⁽⁴⁾	-	USAGE_LIMIT	The usage limit for active reporting group identified by MONITORING_KEY. This field uses JSON format, and it matches the provisioning information of the SAPC	STRING: 65535 bytes
		USAGE_ACCUMULATION	The usage accumulation of the subscriber for the reporting group identified by MONITORING_KEY. This field uses JSON format, and it matches the provisioning information of the SAPC. This information contains absolute and complementary counters	STRING: 65535 bytes

(1) Square brackets indicate that the parameter is conditionally logged for the event.

(2) This parameter is returned in the transaction that produces the event in all cases, presuming it was received during session establishment.

(3) This structure can be repeated maximum 50 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 50 elements.

(4) This structure contains the information about the limit and accumulators for an active Reporting Group identified by a Monitoring Key. More than one structure is present for the same Monitoring Key if the Reporting Group is defined for the subscriber, and one or more subscriber groups.

2.1.1.12 PRESENCE_REPORTING_AREA_INFO

The event contains the information about a Presence Reporting Area Event in the SAPC, and it is generated on successful CCA delivery when the corresponding CCR receives PRA status.



Table 12 details the structures and parameters associated with the PRESENCE_REPORTING_AREA_INFO event.

Values of **TIME_HOUR**, **TIME_MINUTE**, **TIME_SECOND** and **TIME_MILLISECOND** correspond with the time of CCR reception.

Table 12 Event Parameters for PRESENCE_REPORTING_AREA_INFO

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
HEADER		EVENT_ID	Event identity	ENUM: 8 bits • 16: PRESENCE_REPORTING_AREA_INFO
		EVENT_RESULT	Result of the event procedure SUCCESS if Result-Code AVP in CCA message indicates success (2001). Otherwise, REJECT	ENUM: 2 bits • 0: SUCCESS • 1: REJECT
		TIME_HOUR	UTC time stamp in hours at the time when the signaling procedure for the event was started (HH)	UINT: 5 bits Range: 0-23
		TIME_MINUTE	UTC time stamp in minutes at the time when the signaling procedure for the event was started (MM)	UINT: 6 bits Range: 0-59
		TIME_SECOND	Time stamp in seconds at the time when the signaling procedure for the event was started (SS)	UINT: 6 bits Range: 0-60
		TIME_MILLISECOND	Time stamp in milliseconds at the time when the signaling procedure for the event was started (MSS)	UINT: 10 bits Range: 0-999
		DURATION	It is not applicable, value is set to 0	UINT: 24 bits
-		CAUSE_PROTOCOL	The underlying protocol that triggers the event	ENUM: 3 bits • 1: GX
-		CAUSE_CODE	Reason for acceptance or rejection contained in AVP Result-Code or Experimental-Result of CCA message	UINT: 13 bits
PDN_INFO	-	[DEFAULT_BEARER_ID]	Applicable for Default Bearer ID in UE_ONLY mode in GPRS network	STRING: 255 bytes
		[APN] ⁽²⁾	Access Point Name	DNSNAME: 127 bytes
	ALLOCATED_UE_ADDRESS	[IPv4] ⁽²⁾	IPv4 address	IPADDRESS
		[IPv6] ⁽²⁾	IPv6 address prefix (64 bits)	IPADDRESSV6
	-	[RULE_SPACE]	Rule Space name and only applicable for Gx+ protocol It is only set when EVENT_RESULT is SUCCESS	BYTEARRAY: 127 bytes



Table 12 Event Parameters for PRESENCE_REPORTING_AREA_INFO

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
UE_INFO	-	[IMSI] ⁽²⁾	International Mobile Subscriber Identity	TBCD: 64 bits
		[IMEISV] ⁽²⁾	International Mobile Station Equipment Identity Software Version	TBCD: 64 bits
		[MSISDN] ⁽²⁾	Mobile Subscriber ISDN Number	TBCD: 72 bits
-		SESSION_ID	Session ID of Diameter protocol	STRING: 255 bytes
[PRA_STAT US_INFO] ⁽³⁾	-	PRA_ID	It indicates PRA Identifier	STRING: 127 bytes
		PRA_STATUS	It indicates PRA status	ENUM: 2 bits • 0: IN • 1: OUT



Table 12 Event Parameters for PRESENCE_REPORTING_AREA_INFO

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
[PRA_ELEMENT_INFO] ⁽⁵⁾	[ECGIS] ⁽⁴⁾	PRA_ID	It indicates the PRA Identifier	STRING: 127 bytes
		MCC	It indicates the country code	UINT: 12 bits
		MNC	It indicates the network code	UINT: 12 bits
	[TAIS] ⁽⁵⁾	ECI	It indicates the eUTRAN cell identity	UINT: 28 bits
		MCC	It indicates the country code	UINT: 12 bits
		MNC	It indicates the network code	UINT: 12 bits
		TAC	It indicates the tracking area code	UINT: 16 bits
	[HOME_ENODEB_IDS] ⁽⁴⁾	MCC	It indicates the country code	UINT: 12 bits
		MNC	It indicates the network code	UINT: 12 bits
		HOME_ENODEB_ID	It indicates the ID of the home eNodeB	UINT: 28 bits
	[MACRO_ENODEB_IDS] ⁽⁴⁾	MCC	It indicates the country code	UINT: 12 bits
		MNC	It indicates the network code	UINT: 12 bits
		MACRO_ENODEB_ID	It indicates the ID of the macro eNodeB	UINT: 20 bits
	[CGIS] ⁽⁴⁾	MCC	It indicates the country code	UINT: 12 bits
		MNC	It indicates the network code	UINT: 12 bits
		LAC	It indicates the location area code	UINT: 16 bits
		CI	It indicates the cell identity	UINT: 16 bits
	[SAIS] ⁽⁴⁾	MCC	It indicates the country code	UINT: 12 bits
		MNC	It indicates the network code	UINT: 12 bits
		LAC	It indicates the location area code	UINT: 16 bits
		SAC	It indicates the service area code	UINT: 16 bits
	[RAIS] ⁽⁵⁾	MCC	It indicates the country code	UINT: 12 bits
		MNC	It indicates the network code	UINT: 12 bits
		LAC	It indicates the location area code	UINT: 16bits
		RAC	It indicates the routing area code	UINT: 16 bits



Table 12 Event Parameters for PRESENCE_REPORTING_AREA_INFO

- (1) Square brackets indicate that the parameter is conditionally logged for the event.
- (2) This parameter is returned in the transaction that produces the event in all cases, presuming it was received during session establishment.
- (3) This structure can be repeated maximum 20 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 20 elements.
- (4) This structure can be repeated maximum 63 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 63 elements.
- (5) This structure can be repeated maximum 15 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 15 elements.

2.1.2 Supported Events for Rx Interface

Except for **DEFAULT_BEARER_ID** and **RULE_SPACE**, all values in structure **PDN_INFO** corresponds with values received in AAR message

In the following events, all values in parameter **CAUSE_CODE** refer to *Cause Codes and Events*.

2.1.2.1 RX_AAR_AAA_TRANSACTION

The event contains the information about an Rx AAR-AAA transaction in the SAPC and generated upon AAA delivery.

Table 13 details the structures and parameters associated with the **RX_AAR_AAA_TRANSACTION** event.

Values of **TIME_HOUR**, **TIME_MINUTE**, **TIME_SECOND** and **TIME_MILLISECOND** correspond with the time of AAR reception.



Table 13 Event Parameters for RX_AAR_AAA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
HEADER		EVENT_ID	Event identity	ENUM: 8 bits • 3: RX_AAR_AAA_TRANSACTION
		EVENT_RESULT	Result of the event procedure SUCCESS if Result-Code AVP in AAA message indicates success (2001). Otherwise, REJECT	ENUM: 2 bits • 0: SUCCESS • 1: REJECT
		TIME_HOUR	UTC time stamp in hours at the time when the signaling procedure for the event was started (HH)	UINT: 5 bits Range: 0-23
		TIME_MINUTE	UTC time stamp in minutes at the time when the signaling procedure for the event was started (MM)	UINT: 6 bits Range: 0-59
		TIME_SECOND	Time stamp in seconds at the time when the signaling procedure for the event was started (SS)	UINT: 6 bits Range: 0-60
		TIME_MILLISECOND	Time stamp in milliseconds at the time when the signaling procedure for the event was started (MSS)	UINT: 10 bits Range: 0-999
		DURATION	The time period between AAR received and AAA sent	UINT: 24 bits
-		CAUSE_PROTOCOL	The underlying protocol that triggers the event	ENUM: 3 bits • 2: RX
-		CAUSE_CODE	Reason for acceptance or rejection contained in AVP Result-Code or Experimental-Result of AAA message	UINT: 13 bits
-		RX_SESSION_ID	Session ID of Rx Diameter protocol	STRING: 255 bytes
		[GX_SESSION_ID]	Session ID of Gx Diameter protocol bound to the Rx Session Id	STRING: 255 bytes
		OPERATION_TYPE ⁽²⁾	Type of the operation	ENUM: 2 bits • 0: INITIAL • 1: UPDATE • 3: PCEF_RESTORATION
PDN_INFO	-	[DEFAULT_BEARER_ID] ⁽³⁾	Applicable for Default Bearer ID in UE_Only mode in GPRS network	STRING: 255 bytes
	-	[APN] ⁽⁴⁾	Access Point Name	DNSNAME: 127 bytes
	ALLOCATED_U E_ADDRESS	[IPv4] ⁽⁴⁾	IPv4 address	IPADDRESS
		[IPv6] ⁽⁴⁾	IPv6 address prefix (64 bits)	IPADDRESSV6
	-	[RULE_SPACE] ⁽³⁾	Rule Space name and only applicable for Gx+ protocol	BYTEARRAY: 127 bytes



Table 13 Event Parameters for RX_AAR_AAA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
UE_INFO ⁽⁵⁾	-	[IMSI]	International Mobile Subscriber Identity	TBCD: 64 bits
		[IMEISV]	International Mobile Station Equipment Identity Software Version	TBCD: 64 bits
		[MSISDN]	Mobile Subscriber ISDN Number	TBCD: 72 bits
-	-	[AF_APPLICATION_ID] ⁽⁶⁾	Identifier of the AF Application	STRING: 255 bytes
-	-	[AF_CHARGING_IDENTIFIER] ⁽⁶⁾	AF Charging Identifier sent by the AF	STRING: 127 bytes
SPECIFIC_ACTIONS ⁽⁷⁾	-	[SPECIFIC_ACTION]	Within an initial AA request, the AF can use the Specific-Action AVP to request specific actions from SAPC at the bearer events, and to limit the contact to such bearer events where specific action is required. Values are received at Rx protocol level	ENUM: 8 bits <ul style="list-style-type: none">• 4: INDICATION_OF_RELEASE_OF_BEARER• 6: IP-CAN_CHANGE• 8: INDICATION_OF_SUCCESSFUL_RESOURCES_ALLOCATION• 9: INDICATION_OF_FAILED_RESOURCES_ALLOCATION• 12: ACCESS_NETWORK_INFO_REPORT
-	-	[SERVICE_URN]	The P-CSCF indicates that the new AF session relates to emergency traffic by setting the Service-URN AVP to a top-level service type of sos (for example sos.ambulance, sos.police). The information conveyed by the parameter is the content of the Service-URN AVP	STRING: 255 bytes
-	-	[MPS_IDENTIFIER]	It indicates that an AF session relates to a multimedia priority service and contains the MPS service name, for example NGN Priority Service	STRING: 255 bytes



Table 13 Event Parameters for RX_AAR_AAA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
MEDIA_COMPONENTS ⁽⁸⁾	-	[AF_APPLICATION_ID] ⁽⁶⁾	Identifier of the AF Application	STRING: 255 bytes
	-	[MAX_REQUESTED_BANDWIDTH_UL]	It indicates the maximum bandwidth in bits per second for an uplink IP flow	UINT: 32 bits
	-	[MAX_REQUESTED_BANDWIDTH_DL]	It indicates the maximum bandwidth in bits per second for a downlink IP flow	UINT: 32 bits
	SERVICE_IDS ⁽⁹⁾	[SERVICE_ID]	Service identifier obtained as result of dynamic service classification policy evaluation	STRING: 255 bytes
	-	[FLOW_STATUS] ⁽⁶⁾	It describes whether the IP flows are enabled or disabled	ENUM: 3 bits <ul style="list-style-type: none"> • 0: ENABLED-UPLINK • 1: ENABLED-DOWNLINK • 2: ENABLED • 3: DISABLED • 4: REMOVED
	-	[MEDIA_TYPE]	It determines the media type of a media component	ENUM: 3 bits <ul style="list-style-type: none"> • 0: AUDIO • 1: VIDEO • 2: DATA • 3: APPLICATION • 4: CONTROL • 5: TEXT • 6: MESSAGE • 7: OTHERS
	-	MEDIA_COMPONENT_NUMBER	It contains the ordinal number of the media component	UINT: 7 bits
	-	[RESULT_OF_DYNAMIC_SERVICE_CLASSIFICATION]	It indicates the result of the dynamic service classification for the media component The result of the dynamic service classification is FALSE if the request fails before the dynamic service classification is performed	ENUM: 1 bit <ul style="list-style-type: none"> • 0: FALSE • 1: TRUE
	MEDIA_SUBCOMPONENTS ⁽⁹⁾	FLOW_NUMBER	It contains the ordinal number of the IP flows	UINT: 4 bits
		[FLOW_DESCRIPTIONS] ⁽¹⁰⁾	It defines a packet filter for an IP flow. The value conveyed in the parameter is the value received from the Rx protocol	STRING: 511 bytes
		[MAX_REQUESTED_BANDWIDTH_UL]	It indicates the maximum bandwidth in bits per second for an uplink IP flow	UINT: 32 bits
		[MAX_REQUESTED_BANDWIDTH_DL]	It indicates the maximum bandwidth in bits per second for a downlink IP flow	UINT: 32 bits
		[FLOW_STATUS] ⁽⁶⁾	It describes whether the IP flows are enabled or disabled	ENUM: 3 bits <ul style="list-style-type: none"> • 0: ENABLED-UPLINK • 1: ENABLED-DOWNLINK • 2: ENABLED • 3: DISABLED • 4: REMOVED



Table 13 Event Parameters for RX_AAR_AAA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
REQUIRED_ACCESS_INFO_LIST ⁽⁺¹⁾	-	[REQUIRED_ACCESS_INFO]	The access network information required for the AF session	ENUM: 3 bits <ul style="list-style-type: none">• 0: USER_LOCATION• 1: MS_TIME_ZONE
-	-	[NETLOC_ACCESS_SUPPORT]	Level of support for NetLoc procedures provided by the current access network	UINT: 32 bits <ul style="list-style-type: none">• 0: NETLOC_ACCESS_NOT_SUPPORTED
IPCAN_TYPE_INFO	-	[IPCANTYPE]	Type of IP-Connectivity Access Network included in AAA message	UINT: 3bits <ul style="list-style-type: none">• 0: 3GPP_GPRS• 1: DOCSIS• 2: XDSL• 3: WIMAX• 4: 3GPP2• 5: 3GPP_EPS• 6: NON_3GPP_EPS
		[RAT_TYPE]	Type of Radio Access Technology serving the UE included in AAA message	ENUM: 5 bits <ul style="list-style-type: none">• 1: UTRAN• 2: GERAN• 3: WLAN• 4: GAN• 5: HSPA_EVOLUTION• 6: EUTRAN• 7: CDMA_1X• 8: HRPD• 9: UMB• 10: EHRPD• 11: VIRTUAL• 12: EUTRAN_NB_IOT
		[AN_TRUSTED]	It indicates whether the access network is reliable or unreliable for the Non-3GPP access network in AAA message	ENUM: 1 bit <ul style="list-style-type: none">• 0: TRUSTED• 1: UNTRUSTED



Table 13 Event Parameters for RX_AAR_AAA_TRANSACTION

- (1) Square brackets indicate that the parameter is conditionally logged for the event.
- (2) The value is decided by the value of Rx-Request-Type AVP. If the Rx-Request-Type AVP does not exist in AAR, it is deducted from the following logic: if the session exists when the request is received, the value is UPDATE. Otherwise, it is INITIAL.
- (3) This parameter is not set in this event.
- (4) This parameter is returned in the transaction that produces the event in all cases, presuming it was received during session establishment.
- (5) Only one of the IMSI or MSISDN optional fields is included, and only if the Subscriber-Id AVP is received in Rx AAR message.
- (6) This parameter is not included if not received in the AAR message.
- (7) This structure can be repeated maximum 255 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 255 elements.
- (8) This structure can be repeated maximum 100 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 100 elements.
- (9) This structure can be repeated maximum 10 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 10 elements.
- (10) This structure can be repeated maximum 2 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 2 elements.
- (11) This structure can be repeated maximum 5 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 5 elements.

2.1.2.2 RX_RAR_RAA_TRANSACTION

The event contains the information about an Rx RAR-RAA transaction in the SAPC and generated upon RAA reception.

Table 14 details the structures and parameters associated with the RX_RAR_RAA_TRANSACTION event.

Values of **TIME_HOUR**, **TIME_MINUTE**, **TIME_SECOND** and **TIME_MILLISECOND** correspond with the time of RAR delivery.



Table 14 Event Parameters for RX_RAR_RAA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
HEADER		EVENT_ID	Event identity	ENUM: 8 bits • 4: RX_RAR_RAA_TRANSACTION
		EVENT_RESULT	Result of the event procedure SUCCESS if Result-Code AVP in RAA message indicates success (2001). Otherwise, REJECT	ENUM: 2 bits • 0: SUCCESS • 1: REJECT
		TIME_HOUR	UTC time stamp in hours at the time when the signaling procedure for the event was started (HH)	UINT: 5 bits Range: 0-23
		TIME_MINUTE	UTC time stamp in minutes at the time when the signaling procedure for the event was started (MM)	UINT: 6 bits Range: 0-59
		TIME_SECOND	Time stamp in seconds at the time when the signaling procedure for the event was started (SS)	UINT: 6 bits Range: 0-60
		TIME_MILLISECOND	Time stamp in milliseconds at the time when the signaling procedure for the event was started (MSS)	UINT: 10 bits Range: 0-999
		DURATION	The time period between RAR sent and RAA received	UINT: 24 bits
-		CAUSE_PROTOCOL	The underlying protocol that triggers the event	ENUM: 3 bits • 2: RX
-		CAUSE_CODE	Reason for acceptance or rejection contained in AVP Result-Code or Experimental-Result of RAA message	UINT: 13 bits
-		RX_SESSION_ID	Session ID of Rx Diameter protocol	STRING: 255 bytes
PDN_INFO	-	[DEFAULT_BEARER_ID] ⁽²⁾	Applicable for Default Bearer ID in UE_Only mode in GPRS network	STRING: 255 bytes
	-	[APN] ⁽²⁾	Access Point Name	DNSNAME: 127 bytes
	ALLOCATED_UE_ADDRESS	[IPV4] ⁽³⁾	IPv4 address	IPADDRESS
		[IPV6] ⁽³⁾	IPv6 address prefix (64 bits)	IPADDRESSV6
	-	[RULE_SPACE] ⁽²⁾	Rule Space name and only applicable for Gx+ protocol	BYTEARRAY: 127 bytes



Table 14 Event Parameters for RX_RAR_RAA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
SPECIFIC_ACTION ⁽⁴⁾	-	[SPECIFIC_ACTION]	Within a RAR, the SAPC uses Specific-Action AVP to notify the AF of the bearer event where specific action is required in AAR message. Values are the ones sent at Rx protocol level	ENUM: 8 bits <ul style="list-style-type: none"> 4: INDICATION_OF_RELEASE_OF_BEARER 6: IP-CAN_CHANGE 8: INDICATION_OF_SUCCESSFUL_RESOURCE_ALLOCATION 9: INDICATION_OF_FAILED_RESOURCES_ALLOCATION 12: ACCESS_NETWORK_INFO_REPORT 14: INDICATION_OF_ACCESS_NETWORK_INFO_REPORTING_FAILURE
-	-	[ABORT_CAUSE]	It determines the cause of an abort session request (ASR) or a Reauthorization Request (RAR)	ENUM: 4 bits <ul style="list-style-type: none"> 0: BEARER_RELEASED 3: PS_TO_CS_HANDOVER
FLOWS ⁽⁵⁾	-	MEDIA_COMPONENT_NUMBER	It contains the ordinal number of the media component	UINT: 7 bits
	FLOW_NUMBERS ⁽⁶⁾	[FLOW_NUMBER]	It contains the ordinal number of the IP flows	UINT: 4 bits
LOCATION_INFO	-	[COUNTRY_CODE]	Country Code	UINT: 12 bits
		[NETWORK_CODE]	Network Code	UINT: 12 bits
		[TRACKING_AREA_CODE]	Tracking Area Code for LTE scenario	UINT: 16 bits
		[EUTRAN_CELL_IDENTITY]	E-UTRAN Cell Identifier for LTE scenarios	UINT: 28 bits
		[LOCATION_AREA_CODE]	Location Area Code for non-LTE scenarios	UINT: 16 bits
		[ROUTING_AREA_CODE]	Routing Area Code	UINT: 16 bits
		[CELL_IDENTITY]	Cell Identifier	UINT: 16 bits
		[SERVICE_AREA_CODE]	Service Area Code	UINT: 16 bits
TIME_ZONE_INFO	-	[MS_TIMEZONE]	The offset between universal and local time defined in 15 minute intervals of where the MS resides currently	UINT: 16 bits
-	-	[NETLOC_ACCESS_SUPPORT]	Level of support for NetLoc procedures provided by the current access network	UINT: 32 bits <ul style="list-style-type: none"> 0: NETLOC_ACCESS_NOT_SUPPORTED
ACCESS_NETWORK_CHARGING_IDENTIFIER ⁽²⁾	-	[ACCESS_NETWORK_CHARGING_IDENTIFIER_VALUE]	The access network charging identifier information is required for the AF session	STRING: 127 bytes
	FLOWINFOS ⁽⁷⁾		It contains details of the IP flows	



Table 14 Event Parameters for RX_RAR_RAA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
-		[USER_LOCATION_INFO_TIME]	Indicates the time of the last known location of the UE during bearer deactivation or IP-CAN session termination	UINT: 32 bits



Table 14 Event Parameters for RX_RAR_RAA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
IPCAN_TYPE_INFO		[IPCANTYPE]	Type of IP-Connectivity Access Network included in RAR message	UINT: 3bits • 0: 3GPP_GPRS • 1: DOCSIS • 2: XDSL • 3: WIMAX • 4: 3GPP2 • 5: 3GPP_EPS • 6: NON_3GPP_EPS
		[RAT_TYPE]	Type of Radio Access Technology serving the UE included in RAR message	ENUM: 5 bits • 1: UTRAN • 2: GERAN • 3: WLAN • 4: GAN • 5: HSPA_EVOLUTION • 6: EUTRAN • 7: CDMA_1X • 8: HRPD • 9: UMB • 10: EHRPD • 11: VIRTUAL • 12: EUTRAN_NB_IOT
		[AN_TRUSTED]	Indicates whether the access network is reliable or unreliable for the Non-3GPP access network in RAR message	ENUM: 1 bit • 0: TRUSTED • 1: UNTRUSTED
SPECIFIC_ACTIONS ⁽⁸⁾		[SPECIFIC_ACTION]	Within a RAR, the SAPC uses Specific-Action AVP to notify the AF of the bearer event where specific action is required in AAR message	ENUM: 8 bits • 4: INDICATION_OF_RELEASE_OF_BEARER • 6: IP_CAN_CHANGE • 8: INDICATION_OF_SUCCESSFUL_RESOURCES_ALLOCATION • 9: INDICATION_OF_FAILED_RESOURCES_ALLOCATION • 12: ACCESS_NETWORK_INFO_REPORT • 14: INDICATION_OF_ACCESS_NETWORK_INFO_REPORTING_FAILURE



Table 14 Event Parameters for RX_RAR_RAA_TRANSACTION

- (1) Square brackets indicate that the parameter is conditionally logged for the event.
- (2) This parameter is not set in this event.
- (3) The value to send in this event is the value stored in the Gx Session.
- (4) This parameter will be deprecated in next releases.
- (5) This structure can be repeated maximum 100 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 100 elements.
- (6) This structure can be repeated maximum 10 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 10 elements.
- (7) This structure can be repeated maximum 25 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 25 elements.
- (8) This structure can be repeated maximum 255 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 255 elements.

2.1.2.3 RX_ASR_ASA_TRANSACTION

The event contains the information about an Rx ASR-ASA transaction in the SAPC and generated upon ASA reception.

Table 15 details the structures and parameters associated with the RX_ASR_ASA_TRANSACTION event.

Values of **TIME_HOUR**, **TIME_MINUTE**, **TIME_SECOND** and **TIME_MILLISECOND** correspond with the time of ASR delivery.

Table 15 Event Parameters for RX_ASR_ASA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
HEADER		EVENT_ID	Event identity	ENUM: 8 bits • 5: RX_ASR_ASA_TRANSACTION
		EVENT_RESULT	Result of the event procedure SUCCESS if Result-Code AVP in ASA message indicates success (2001). Otherwise, REJECT	ENUM: 2 bits • 0: SUCCESS • 1: REJECT
		TIME_HOUR	UTC time stamp in hours at the time when the signaling procedure for the event was started (HH)	UINT: 5 bits Range: 0-23
		TIME_MINUTE	UTC time stamp in minutes at the time when the signaling procedure for the event was started (MM)	UINT: 6 bits Range: 0-59
		TIME_SECOND	Time stamp in seconds at the time when the signaling procedure for the event was started (SS)	UINT: 6 bits Range: 0-60
		TIME_MILLISECOND	Time stamp in milliseconds at the time when the signaling procedure for the event was started (MSS)	UINT: 10 bits Range: 0-999
		DURATION	The time period between ASR sent and ASA received	UINT: 24 bits



Table 15 Event Parameters for RX_ASR_ASA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
-		CAUSE_PROTOCOL	The underlying protocol that triggers the event	ENUM: 3 bits • 2: RX
-		CAUSE_CODE	Reason for acceptance or rejection contained in AVP Result-Code or Experimental-Result of ASA message	UINT: 13 bits
-		RX_SESSION_ID	Session ID of Rx Diameter protocol	STRING: 255 bytes
		[ABORT_CAUSE] ⁽²⁾	It determines the cause of an ASR or in a RAR	ENUM: 4 bits • 0: BEARER_RELEASED • 3: PS_TO_CS_HANDOVER
PDN_INFO	-	[DEFAULT_BEARER_ID] ⁽³⁾	Applicable for Default Bearer ID in UE_Only mode in GPRS network	STRING: 255 bytes
	-	[APN] ⁽³⁾	Access Point Name	DNSNAME: 127 bytes
	ALLOCATED_UE_ADDRESS	[IPv4] ⁽⁴⁾	IPv4 address	IPADDRESS
		[IPv6] ⁽⁴⁾	IPv6 address prefix (64 bits)	IPADDRESSV6
	-	[RULE_SPACE] ⁽³⁾	Rule Space name and only applicable for Gx+ protocol	BYTEARRAY: 127 bytes

(1) Square brackets indicate that the parameter is conditionally logged for the event.

(2) ASR messages are sent by the SAPC. Only values 0 and 3 are supported.

(3) This parameter is not set in this event.

(4) The value to send in this event is the value stored in the Gx Session.

2.1.2.4 RX_STR_STA_TRANSACTION

The event contains the information about an Rx STR-STA transaction in the SAPC and generated upon STA delivery.

Table 16 details the structures and parameters associated with the RX_STR_STA_TRANSACTION event.

Values of **TIME_HOUR**, **TIME_MINUTE**, **TIME_SECOND** and **TIME_MILLISECOND** correspond with the time of STR reception.



Table 16 Event Parameters for RX_STR_STA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
HEADER		EVENT_ID	Event identity	ENUM: 8 bits • 6: RX_STR_STA_TRANSACTION
		EVENT_RESULT	Result of the event procedure SUCCESS if Result-Code AVP in STA message indicates success (2001). Otherwise, REJECT	ENUM: 2 bits • 0: SUCCESS • 1: REJECT
		TIME_HOUR	UTC time stamp in hours at the time when the signaling procedure for the event was started (HH)	UINT: 5 bits Range: 0-23
		TIME_MINUTE	UTC time stamp in minutes at the time when the signaling procedure for the event was started (MM)	UINT: 6 bits Range: 0-59
		TIME_SECOND	Time stamp in seconds at the time when the signaling procedure for the event was started (SS)	UINT: 6 bits Range: 0-60
		TIME_MILLISECOND	Time stamp in milliseconds at the time when the signaling procedure for the event was started (MSS)	UINT: 10 bits Range: 0-999
		DURATION	The time period between STR received and STA sent	UINT: 24 bits
-		CAUSE_PROTOCOL	The underlying protocol that triggers the event	ENUM: 3 bits • 2: RX
-		CAUSE_CODE	Reason for acceptance or rejection contained in AVP Result-Code or Experimental-Result of STA message	UINT: 13 bits
-		RX_SESSION_ID	Session ID of Rx Diameter protocol	STRING: 255 bytes
PDN_INFO	-	[DEFAULT_BEARER_ID] ⁽²⁾	Applicable for Default Bearer ID in UE_Only mode in GPRS network	STRING: 255 bytes
	-	[APN] ⁽²⁾	Access Point Name	DNSNAME: 127 bytes
	ALLOCATED_UE_ADDRESS	[IPv4] ⁽³⁾	IPv4 address	IPADDRESS
		[IPv6] ⁽³⁾	IPv6 address prefix (64 bits)	IPADDRESSV6
	-	[RULE_SPACE] ⁽²⁾	Rule Space name and only applicable for Gx+ protocol	BYTEARRAY: 127 bytes
LOCATION_INFO		[COUNTRY_CODE]	Country Code	UINT: 12 bits
		[NETWORK_CODE]	Network Code	UINT: 12 bits
		[TRACKING_AREA_CODE]	Tracking Area Code for LTE scenario	UINT: 16 bits
		[EUTRAN_CELL_IDENTITY]	E-UTRAN Cell Identifier for LTE scenarios	UINT: 28 bits
		[LOCATION_AREA_CODE]	Location Area Code for non-LTE scenarios	UINT: 16 bits
		[ROUTING_AREA_CODE]	Routing Area Code	UINT: 16 bits
		[CELL_IDENTITY]	Cell Identifier	UINT: 16 bits
		[SERVICE_AREA_CODE]	Service Area Code	UINT: 16 bits



Table 16 Event Parameters for RX_STR_STA_TRANSACTION

Structure	Sub-Structure	Parameter ⁽¹⁾	Description	Type and Value Range
TIME_ZONE_INFO	-	[MS_TIMEZONE]	The offset between universal and local time defined in 15 minute intervals of where the MS resides currently	UINT: 16 bits
-	-	[NETLOC_ACCESS_SUPPORT]	Level of support for NetLoc procedures provided by the current access network	UINT: 32 bits • 0: NETLOC_ACCESS_NOT_SUPPORTED
REQUIRED_ACCESS_INFO_LIST ⁽⁴⁾	-	[REQUIRED_ACCESS_INFO]	The access network information required for the AF session	UINT: 3 bits • 0: USER_LOCATION • 1: MS_TIME_ZONE
-	-	[USER_LOCATION_INFO_TIME]	Indicates the time of the last known location of the UE during bearer deactivation or IP-CAN session termination	UINT: 32 bits

(1) Square brackets indicate that the parameter is conditionally logged for the event.

(2) This parameter is not set in this event.

(3) The value to send in this event is the value stored in the Gx Session.

(4) This structure can be repeated maximum 5 times within an event. If the list in SAPC contains more elements, it will be truncated including the first 5 elements.

2.2 Event-Based Monitoring Key Performance Indicators

The chapter provides examples of Key Performance Indicator (KPI) definitions related to Event-Based Monitoring (EBM). In some cases, definitions do not exactly match the Performance Management (PM) based KPIs, so this document also defines some new KPIs that are not listed in the Key Performance Indicators document. Refer to [Key Performance Indicators](#) for more details.

2.2.1 KPI Calculations

The EBM server post-processes the incoming EBM events in order to obtain the required information (KPI). This post-processing include, but not limited to filtering events, value summaries or value interpretations.

Concepts and formulas used in the post-processing course:

— Concepts

- S stands for Success = the number of events fulfilling both filter expression and success condition
- T (Total) = the number of events fulfilling the filter expression

— Formulas



- Failure Ratio [%] = $(1 - S/T) * 100$
- Success Ratio [%] = $S/T * 100$

Table 17 EBM KPIs

KPI	Description	Event ID	Filter Expression	Success Condition	Comment
UsageLimitReachedPerSubscriberGroup	This KPI filters for events generated by the SAPC, where the Active Subscriber Group equals to the specified value, or input value, providing the Monitoring Key, the Counter, the Limit Type, the Limit Value and the Subscription Type parameters whose Usage Limit is reached	ACCUM_USAGE_LIMIT_SURPASSED	EVENT_RESULT==SUCCESS && ACTIVESSUBSCRIBERGROUP == <input value>	S	<p>The ACTIVESSUBSCRIBERGROUP field conveys the SUBSCRIBER GROUP identifier of which the subscriber belongs to and whose usage limit of the Monitoring Key has been surpassed. The post-processing server filters the incoming EBM events by subscriber group using the ACTIVESSUBSCRIBERGROUP field</p> <p>The ACCUM_USAGE_LIMIT_SURPASSED event is raised for all types of limit: absolute, intermediate, conditional, complementary or session limit. Only for Monitoring Key with absolute and conditional limits, this KPI makes sense. Otherwise, the event will be raised each time an intermediate limit is reached, and it cannot be distinguished from the situation where the absolute limit is surpassed</p> <p>If the subscriber has several Monitoring Keys this KPI will be raised for each of them</p>



Table 17 EBM KPIs

KPI	Description	Event ID	Filter Expression	Success Condition	Comment
TerminalTypeDistributionPerSubscriberGroup	This KPI filters for events generated by the SAPC selecting the events whose Active Subscriber Group is equal to the specified value, or input value, and whose OPERATION_TYPE is equal to INITIAL, which is the value used in CCR-I requests, providing the IMEISV, or output of the subscriber at the moment of receiving the CCR-Initial request	GX_CCR_CCA_TRANSACTION	EVENT_RESULT==SUCCESS && SUBSCRIBERGROUP==<input value> && OPERATION_TYPE==INITIAL	S	<p>The SUBSCRIBERGROUP conveys the subscriber group where distribution of terminal types is inquired, that is the input value. The UE_INFO.IMEISV field of the GX_CCR_CCA_TRANSACTION event uses the International Mobile Equipment Identity Software Version of the terminal</p> <p>This KPI provides the distribution of the terminal type using the information received in the CCR-I request. This information may vary along the session of the subscriber, as different Subscriber Groups can be assigned to the subscriber during the subscriber session lifecycle</p> <p>Every IMEISV distinct value maps to a different phone model or brand. It is the responsibility of the external post-processing system to resolve this relation</p>
UsageLimitReachedPerTerminalTypeAndReportingGroup	This KPI filters for events generated by the SAPC selecting events whose IMEISV and MONITORING_KEY equal to the specified value, or input value, providing the Monitoring Key, Counter, Limit Type, Limit Value and the Subscription Type parameters whose Usage Limit has been reached	ACCUM_USAGE_LIMIT_SURPASSED	EVENT_RESULT==SUCCESS && UE_INFO.IMEISV == <input value> && MONITORING_KEY == <input value>	S	<p>The UE_INFO.IMEISV conveys the International Mobile Equipment Identity Software Version of the terminal where the usage limit is reached</p> <p>Every IMEISV distinct value maps to a different phone model or brand. It is the responsibility of the external post-processing system to resolve this relation</p> <p>The ACCUM_USAGE_LIMIT_SURPASSED event is raised for all types of limit: absolute, intermediate, conditional, complementary or session limit. Only for Monitoring Key with absolute and conditional limits, this KPI makes sense. Otherwise, the event will be raised each time an intermediate limit is reached, and it cannot be distinguished from the situation where the absolute limit is surpassed</p>



Table 17 EBM KPIs

KPI	Description	Event ID	Filter Expression	Success Condition	Comment
ReportedUsagePerTerminalType	This KPI filters the events generated by the SAPC selecting events whose IMEISV is equal to the specified value, or input, providing the Reported Usage Info for the subscriber, or the output	REPORTED_USAGE	EVENT_RESULT== SUCCESS && UE_INFO.IMEISV== <input value>	S	<p>The UE_INFO.IMEISV conveys the International Mobile Equipment Identity Software Version of the terminal where the usage limit is reached and for which the reported usage is obtained</p> <p>Every IMEISV distinct value maps to a different phone model or brand. It is the responsibility of the external post-processing system to resolve this relation</p> <p>The REPORTING_GROUP_USAGE_INFO field conveys the FAIR_USAGE_VOLUME_UPLINK, the FAIR_USAGE_VOLUME_DOWNLINK, the FAIR_USAGE_VOLUME_BIDIRECTIONAL, and the FAIR_USAGE_TIME_DURATION fields. The total value of the uplink, downlink, or bidirectional volume or time can be obtained depending on the selected field</p>



Table 17 EBM KPIs

KPI	Description	Event ID	Filter Expression	Success Condition	Comment
ReportedUsagePerMonitoringKeyAndTerminalType	This KPI filters for events generated by the SAPC selecting events whose IMEISV and MONITORING_KEY equal to the specified value, or input value, providing the Reported Usage Info for the subscriber, or output	REPORTED_USAGE	EVENT_RESULT==SUCCESS && UE_INFO.IMEISV== <input value> && REPORTING_GROUP_USAGE.MONITORING_KEY == <input value>	S	<p>The UE_INFO.IMEISV conveys the International Mobile Equipment Identity Software Version of the terminal where the usage limit is reached and for which the reported usage is obtained</p> <p>Every IMEISV distinct value maps to a different phone model or brand. It is the responsibility of the external post-processing system to resolve this relation</p> <p>The MONITORING_KEY conveys the Reporting Group identifier for which the Reported Usage is calculated</p> <p>The REPORTING_GROUP_USAGE_INFO field conveys the FAIR_USAGE_VOLUME_UPLINK, the FAIR_USAGE_VOLUME_DOWNLINK, the FAIR_USAGE_VOLUME_BIDIRECTIONAL, and the FAIR_USAGE_TIME_DURATION fields. The total value of the uplink, downlink, or bidirectional volume or time can be obtained depending on the selected field</p>
ReportedUsagePerAPN	This KPI filters the events generated by the SAPC selecting events whose APN is equal to the specified value, or input value, providing the Reported Usage Info for the subscriber, or output	REPORTED_USAGE	EVENT_RESULT==SUCCESS && PDN_INFO.APN == <input value>	S	<p>The PDN_INFO.APN conveys the APN for which the reported usage is obtained</p> <p>The REPORTING_GROUP_USAGE_INFO field conveys the FAIR_USAGE_VOLUME_UPLINK, the FAIR_USAGE_VOLUME_DOWNLINK, the FAIR_USAGE_VOLUME_BIDIRECTIONAL, and the FAIR_USAGE_TIME_DURATION fields. The total value of the uplink, downlink, or bidirectional volume or time can be obtained depending on the selected field</p>
NumberOfPccInstallationFailuresPerApn	This KPI provides the number of PCC Installation Failures per APN	RULE_INSTALLATION_FAILURE	EVENT_RESULT==SUCCESS && PDN_INFO.APN == <input_value>	S	The PDN_INFO.APN specifies the APN of the PCC Rule, where installation has failed
NumberOfPccInstallationFailuresPerFailureCode	This KPI provides the number of PCC Installation Failures per failure code	RULE_INSTALLATION_FAILURE	EVENT_RESULT==SUCCESS && RULE_INFORMATION.FAILURE_CODE == <input_value>	S	The RULE_INFORMATION.FAILURE_CODE specifies the Failure Code of the PCC Rule, where installation has failed

3 Traffic Case

Figure 2 shows an EBM use case. Refer to [EBM Interface Description](#) for detailed information of **Header Record**, **Event Record**, and **Error Record**.

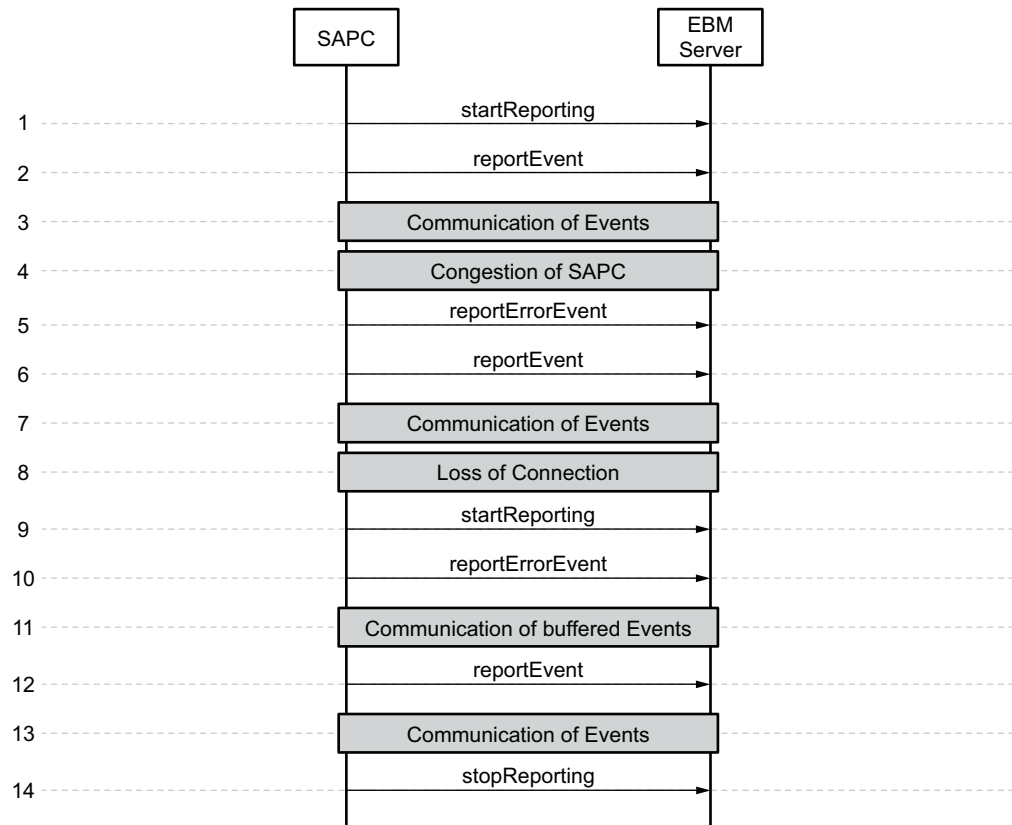


Figure 2 EBM Use Case

1. The SAPC establishes 50 connections per PL with the EBM server, and a **Header Record** is sent to start the event reporting function for each connection. This step is executed when the SAPC restarts or when a new connection is established. The SAPC distributes the events among different connections towards the EBM server.
2. The SAPC sends **Event Records** to the EBM server.

The SAPC checks for inactivity in each connection every 5 minutes. This means if no events are sent to the EBM server, and this interval is more than 5 minutes, the SAPC closes the connection toward the EBM server.

The SAPC checks the value of the configuration of the EBM feature before the EBM event report is produced. The configuration can be enabled or not. If the EBM feature is not set to enabled, the SAPC stops the event reporting function.



If it is set to enabled, the SAPC restarts the event reporting function. If no events are sent to the EBM server in case of inactivity longer than 5 minutes, the SAPC closes the connection toward the EBM server independently of the configuration of the EBM feature, enabled or not.

3. The flow of events from the SAPC to the EBM server continues.
4. The congestion occurs when the SAPC generates more EBM events than the amount that can be sent to the EBM server, or due to an internal error that prevents sending the events to the EBM server. Events are dropped because of congestion. Refer to *Availability and Scalability* for more information.
5. Once the congestion is restored, an **Error Record** is sent to the EBM server in each connection. The **Error Record** contains the amount of dropped events from the time the congestion first occurred.
6. The SAPC sends **Event Records** to the EBM server as usual.
7. The flow of events from the SAPC to the EBM server continues.
8. A connection error happens that prevents sending the events to the EBM server. The buffer in the connection stores events generated in the latest 10 seconds. Refer to *Availability and Scalability* for detailed information.
9. Once the connection is re-established between the SAPC and the EBM server, the SAPC tries to create 50 connections per each PL which lost the connection, and a **Header Record** is sent to each TCP socket established to start the event reporting function.
10. An **Error Record** is sent to the EBM server. The **Error Record** contains the amount of dropped events from the time the communication error occurred.
11. The SAPC sends out all events buffered at step 8.
12. The SAPC sends **Event Records** to the EBM server as usual.
13. The flow of events from the SAPC to the EBM server continues.
14. When the SAPC detects an inactivity time that lasted for more than 5 minutes, it closes the communication with the EBM server.