**3GPP TSG-SA5 Rapporteur call *S5-22xxxx***

**e-meeting, 16 March 2022**

**Source: Ericsson AB**

**Title: Function for interaction with two CHFs**

**Document for: Discussion**

**Agenda Item: Roaming**

# 1 Decision/action requested

**Agree on the way forward for the applicability of the functions when interacting with two CHFs..**

# 2 References

[1] 3GPP TS 32.290: "Telecommunication management; Charging management; 5G system; Services, operations and procedures of charging using Service Based Interface (SBI)"

[2] 3GPP TS 32.255: "Charging management; 5G data connectivity domain charging; Stage 2"

# 3 Rationale

How the functions would be impacted for the case of one CTF interacting with two CHFs using the same service (in this case the converged charging service), needs to be defined.

The main issue would be that there is only one set of thresholds, triggers etc. common for the CHFs, meaning that one CHF can overwrite the values set by the other CHF. This is very much like the current handling of the trigger setting in the charging roaming profile. For the trigger handling this would mean that having implicit setting of triggers would be difficult to describe when two CHFs could enable and disable the same triggers. This would imply that there is a need to be able to explicitly enable and disable triggers.

There may be triggers on other levels than rating group or service level however the handling of these service specific level triggers (e.g., QoS flow) are described in the service specific specifications (e.g., TS 32.255 [2]).

See proposed changes to TS 32.290 [1] in clause 4.

# 4 Detailed proposal

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| **First change** |

### 5.4.3 Termination action

The NF Service Producer (CHF) may use the Final Unit Indication to the NF Service Consumer (CTF) to indicate the expected behaviour on consumption of the final granted units, or zero units granted in the first place; this is known as termination action.

The CTF should perform the action indicated in the Final Unit Indication, which may be to terminate, redirect or to restrict access, when any final granted units have been used. If the granted units contain no units it means that the action should be performed immediately.

If the action is:

- terminate: then the CTF may terminate all the services belonging to the rating group

- redirect: then the CTF may redirect all access to the services belonging to the rating group to the destination indicated, if filter rules are provided it may also restrict the access towards the new destination

- restrict access: then the CTF may restrict access to the services belonging to the rating group based on filter rules

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| **Second change** |

### 5.4.4 Service termination

The NF Service Producer (CHF) may determine that a service requires termination. The NF Service Producer (CTF) may perform this termination synchronously if it has a request pending processing by returning response.

If the CHF does not have a pending request (asynchronous), the CHF may trigger an abort notification to terminate the charging session. On reception of an abort notification, the CTF shall terminate the associated charging session by sending a Nchf\_ConvergedCharging\_Release. If the associated charging session is not currently active or CTF does not terminate the charging session for any other reason, the corresponding error response is returned.

The CTF may determine service termination. For session based charging the termination request shall include the used units if any. For event based charging there may be no used unit reported.

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| **Third change** |

### 5.4.5 Trigger Mechanism

There are a number of mid-session service events, defined as triggers, which could affect the rating of the current service usage, e.g. QoS changes or end user location updates. The details for this these triggers are defined in the service specific document (middle tier TS). The relationship between service session and charging session is 1:1.

There are two levels of triggers: service session and rating group. The service session level triggers are applicable for all rating groups within a charging session, whereas a rating group level trigger is only applicable to that rating group. Any limit or threshold set on the service session level is the total limit for the service session including all the rating groups. The behaviour at trigger detection is specified by the middle tier TS.

Triggers enabled or disabled by default by the NF service consumer (CTF), may be enabled or disabled by NF service producer (CHF) in response to the CTF.

The CHF may enable one or more triggers at the CTF, by responding with a list of triggers, there may be one list of triggers on session level and one list of triggers for each rating group. In each triggers list each individual trigger can only occur once. The enabled and disabled trigger setting for the service session or rating group shall remain in effect until new triggers are received by the CTF from the CHF i.e., not sending any triggers information element. There are two ways of enabling and disabling triggers from the CHF:

- implicit: in this case triggers to be enabled shall be included and triggers to be dissabled shall be omitted in the response from the CHF. The CHF may dissable all triggers, for a service session or rating group, by omitting all triggers i.e., a triggers information element without any trigger type.

- explicit: in this case both triggers to be enabled and dissabled shall be included in the response from the CHF. If the omitts all triggers, for a service session or rating group (i.e., a triggers information element without any trigger type), the CTF may use its own defualt setting for the triggers.

The default is the implicit and shall be supported.

There are two categories of chargeable events:

- immediate report: chargeable events for which, when occurring, the current counts are closed and sent together with the charging data generated by the CTF towards the CHF in a Charging Data Request message. Counts indicating zero usage may be reported. New counts are started by the NF consumer.

- deferred report: chargeable events for which, when occurring, the current counts are closed and stored together with the charging data generated by the CTF. Counts indicating zero usage may be included. The stored counts will be sent to the CHF in next a Charging Data Request message. New counts are started by the CTF.

CHF may change the category of one or more triggers by using the Triggers element containing category information in the response message.

For the rating group: the rating group level triggers and category take precedence over the service session level triggers and category.

If there is a request for quota management outstanding for a rating group i.e., the request has not been responded to, any new request for quota management for the same rating group should be postponed until after the response has been received.

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| **Fourth change** |

### 5.4.x Interaction with two CHFs

One NF service consumer (CTF) may interact with two different NF service producers (CHFs) for the same chargeable event and consuming the same service from both NF service producers (CHFs).

In this case the following applies for:

- reauthorization: any of the CHFs may trigger a reauthorization request, and NF Service Consumer may receive a new Charging Notify Request (from the other CHF) before it has sent the Charging Data Request. In this case the CTF shall not send a new Charging Data Request.

- threshold based re-authorization: any of the CHF may set a threshold, if both CHFs sets a threshold for the same trigger only the second CHF values shall apply.

- termination action: only the action of terminate is applicable and any of the CHF may set a termination action, if both CHFs sets a termination action only the second CHF action shall apply.

- service termination: any of the CHF may determine termination of a service, in this case the service shall be terminated independent of which CHF. If the CTF have a Charging Data Request pending, this shall be completed before any Charging Data request for the termination is sent.

- trigger mechanism: only explicit enabling and disabling of triggers is possible, and any of the CHF may enable or disable triggers. If both CHFs enables or disables the same trigger only the second CHF settings shall apply.

- CHF-controlled quota management: shall only be allowed when a CTF interacts with only one CHF

- charging identifier: the same charging identifier shall be used towards both CHFs; this implies that the charging identifier must be unique for both CHFs.

- protocol versions: the CTF may use the same version of the protocol towards both CHFs, this means that both CHFs must support the same major version of the protocol as well as explicit trigger handling.

- supported feature: the CTF must use the lowest common denominator of supported features between the CHFs and its own.

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| **Fifth change** |

# 7 Message contents

Converged charging or offline only charging is performed by NF (CTF) consuming service operations exposed by CHF, achieved using Charging Data Request and Charging Data Response.

The information structure used for these services operations is composed of two parts:

- Common structures specified in the present document.

- NF (CTF) consumer specific structures specified in the middle tier TSs.

Table 7.1 describes the data structure which is common to operations in request semantics.

Table 7.1: Common Data structure of Charging Data Request

| **Information Element** | **Converged Charging**  **Category** | **Offline Only Charging Category** | **Description** |
| --- | --- | --- | --- |
| Session Identifier | OC | OC | This field identifies the charging session. |
| Subscriber Identifier | OM | OM | This field contains the identification of the individual subscriber that uses the requested service. |
| NF Consumer Identification | M | M | This is a grouped field which contains a set of information identifying the NF consumer of the charging service. |
| NF Functionality | M | M | This field contains the function of the node. |
| NF Name | OC | OC | This fields holds the name (i.e., UUID) of the NF consumer. At least one of the NF Address or NF Name shall be present. |
| NF Address | OC | OC | This field holds the address (i.e., IP address and/or FQDN) of NF consumer. At least one of the NF Address or NF Name shall be present. |
| NF PLMN ID | OC | OC | This field holds the PLMN ID of the network the NF consumer belongs to. |
| Charging Identifier | OM | - | This field contains the charging identifier allowing correlation of charging information. Only applicable if not provided in the NF (CTF) consumer specific structure. |
| Invocation Timestamp | M | M | This field holds the timestamp of the charging service invocation by the NF consumer |
| Invocation Sequence Number | M | M | This field contains the sequence number of the charging service invocation by the NF consumer in a charging session. |
| Retransmission Indicator | OC | OC | This field indicates if included, this is a retransmitted request message. |
| One-time Event | OC | - | This field indicates, if included, that this is event based charging and whether this is a one-time event in that there will be no update or termination. |
| One-time Event Type | OC | - | This field indicated the type of the one-time event, i.e., Immediate or Post event charging. |
| Notify URI | OC | - | This field contains URI to which notifications are sent by the CHF. The latest received value shall always be used at notifications. |
| Supported Features | OC | - | This field indicates the features supported by the NF consumer. |
| Service Specification Information | OC | - | This field identifies the technical specification for the service (e.g. TS 32.255) and release version (e.g. Release 16) that applies to the request. It is for information. |
| Triggers | OC | OC | This field identifies the event(s) triggering the request and is common to all Multiple Unit Usage occurrences. |
| Trigger Type | OC | OC | This field identifies the chargeable event that triggered the charging data to be generated by the NF |
| Trigger Category | M | M | This field indicates whether the trigger type was the reason for sending the charging data request or not, towards the CHF. |
| Multiple Unit Usage | OC | OC | This field contains the parameters for the quota management request and/or usage reporting. It may have multiple occurrences. |
| Rating Group | M | M | This field holds the identifier of a rating group. |
| Requested Unit | OC | - | This field indicates, if included, that quota management is required. It may additionally contain the amount of requested service units for a particular category. |
| Time | OC | - | This field holds the amount of requested time. |
| Total Volume | OC | - | This field holds the amount of requested volume in both uplink and downlink directions. |
| Uplink Volume | OC | - | This field holds the amount of requested volume in uplink direction. |
| Downlink Volume | OC | - | This field holds the amount of requested volume in downlink direction. |
| Service Specific Units | OC | - | This field holds the amount of requested service specific units. |
| Used Unit Container | OC | OC | This field contains the amount of used non-monetary service units measured up to the triggers and trigger timestamp. It may have multiple occurrences. |
| Service Identifier | OC | OC | This field holds the Service Identifier. |
| Quota management Indicator | OC | - | This field holds an indicator on whether the reported used units are with quota management control, without quota management control or with quota management control temporary suspended. If the field is not present, it indicates the used unit is without quota management applied. |
| Triggers | OC | Oc | This field holds reason for charging information reporting or closing for the used unit container. |
| Trigger Timestamp | OC | OC | This field holds the timestamp of the trigger. |
| Time | OC | OC | This field holds the amount of used time. |
| Total Volume | OC | OC | This field holds the amount of used volume in both uplink and downlink directions. |
| Uplink Volume | OC | OC | This field holds the amount of used volume in uplink direction. |
| Downlink Volume | OC | OC | This field holds the amount of used volume in downlink direction. |
| Service Specific Unit | OC | OC | This field holds the amount of used service specific units. |
| Event Time Stamps | OC | OC | This field holds the timestamps of the event reported in the Service Specific Units, if the reported units are event based. |
| Local Sequence Number | OM | OM | This field holds the container sequence number. |

Table 7.2 describes the data structure which is common to operations in response semantics.

Table 7.2: Common Data structure of Charging Data Response

| **Information Element** | **Converged Charging**  **Category** | **Offline Only Charging Category** | **Description** |
| --- | --- | --- | --- |
| Session Identifier | OC | OC | This field identifies the charging session. |
| Invocation Timestamp | M | M | This field holds the timestamp of the charging service response from the CHF. |
| Invocation Result | OC | OC | This field holds the failure handling and in case of unsuccessful result of the charging service invocation by the NF consumer the result code. |
| Invocation Result Code | OC | OC | This field contains the result code in case of failure. |
| Failed parameter | OC | OC | This field holds missing and/or unsupported parameter that caused the failure. |
| Failure Handling | OC | OC | This field holds the failure handling to be performed by the NF consumer when failure. |
| Invocation Sequence Number | M | M | This field holds the sequence number of the charging service invocation by the NF consumer. |
| Session Failover | OC | OC | This field indicates whether alternative CHF is supported for ongoing charging service failover handling by NF consumer. |
| Supported Features | OC | - | This field indicates from the supported features indicated by the NF consumer, those supported by the CHF. |
| Trigger Handling | OC | - | This field indicates if the trigger setting is explicit or implicit, if not included it will be interpreted as implicit. |
| Triggers | OC | OC | This field holds the triggers supplied from the CHF for the charging session that are independent of rating group for quota management and without quota management. |
| Trigger Type | OC | OC | This field identifies the chargeable event that shall trigger the new charging data to be generated by the NF |
| Trigger Category | OM | OM | This field indicates whether, for the trigger type, the NF shall send a charging data request or not towards the CHF. |
| Trigger Setting | OC | - | This field indicates whether the trigger type shall be enabled or disabled, only used for explicit trigger handling |
| Multiple Unit Information | OC | - | This field holds the parameters for the quota management and/or usage reporting information. It may have multiple occurrences. |
| Result Code | OC | - | This field contains the result of the Rating Group quota allocation. |
| Rating Group | OM | - | The identifier of a rating group. |
| Granted Unit | OC | - | This field holds the granted quota. |
| Tariff Time Change | OC | - | This field contains the switch time when the tariff will be changed. |
| Time | OC | - | This field holds the amount of granted time. |
| Total Volume | OC | - | This field holds the amount of granted volume in both uplink and downlink directions. |
| Uplink Volume | OC | - | This field holds the amount of granted volume in uplink direction. |
| Downlink Volume | OC | - | This field holds the amount of granted volume in downlink direction. |
| Service Specific Units | OC | - | This field holds the amount of granted requested service specific units. |
| Validity Time | OC | - | This field defines the time in order to limit the validity of the granted quota for a given category instance. |
| Final Unit Indication | OC | - | This field indicates the granted final units for the service. |
| Time Quota Threshold | OC | - | This field indicates the threshold in seconds when the granted quota is time |
| Volume Quota Threshold | OC | - | This field indicates the threshold in octets when the granted quota is volume |
| Unit Quota Threshold | OC | - | This field indicates the threshold in service specific units, that are defined in the service specific documents, when the granted quota is service specific |
| Quota Holding Time | OC | - | This field holds the quota holding time in seconds. |
| Triggers | OC | OC | This field holds triggers for usage reporting associated to the rating group, which is supplied from the CHF. |

The CTF NF consumer specific structures which are specified in the middle tier TSs, are defined as extensions of:

- common part structure of Charging Data Request and Charging Data Response.

- structure of Multiple Unit Usage.

- structure of Multiple Unit Information.

Table 7.3 describes the data structure which is common to Charging Notify Request.

Table 7.3: Common Data structure of Charging Notify Request

| Information Element | Converged Charging  Category | Description |
| --- | --- | --- |
| Notify URI | M | This field holds the URI previously supplied by the CHF for notifications associated to the charging session. |
| Notification type | M | This field holds the type of notification indicating re-authorization or termination. |
| Reauthorization Details | OC | This field holds the details of re-authorization.  It’s only present when type of notification is re-authorization.If not present and type of notification is re-authorization, the re-authorization notification applies to all units. |
| Service Identifier | OC | This field holds the Service Identifier to which re-authorization notification applies. If present, the rating group shall also be present. If not present the re-authorization notification applies to all service identifiers. |
| Rating Group | OC | This field holds the rating group to which re-authorization notification applies. If not present the re-authorization notification applies to all rating groups. |
| Quota management Indicator | OC | This field holds an indicator on whether the re-authorization notification is for quota management control or not. If not present the re-authorization notification applies to both units with and without quota management. |

Table 7.4 describes the data structure which is common to Charging Notify Response.

Table 7.4: Common Data structure of Charging Notify Response

| Information Element | Category | Description |
| --- | --- | --- |
| Invocation Result | OC | This field holds the result code in case of unsuccessful result of the charging notify request. |
| Invocation Result Code | OC | This field contains the result code in case of failure. |
| Failed parameter | OC | This field holds missing and/or unsupported parameter that caused the failure. |

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| **End of changes** |