Technical Specification Group Services and System Aspects
Meeting #28, 06 - 08 June 2005,
Quebec, Canada

TSGS#28(05)0335

Source: **SA WG2**

Title: **CRs to TS 23.125: Various Technical Corrections (Rel-6)**

Document for: **Approval**

Agenda Item: **7.2.3**

SA Doc	TS No.	CR No	Rev	Rel	Cat	Subject	Vers Cur	SA2 Doc	WI	Clauses affected
SP-050335	23.125	0126	2	Rel-6	F	TPF behaviour in case of no charging rules for a bearer	6.4.0	S2-050930	CH-FBC	6.2.4, 7.2.1, 7.2.2, 7.3
SP-050335	23.125	0127	1	Rel-6	F	FBC Terminology amendments	6.4.0	S2-050840	CH-FBC	3, 5.2, 5.8.2, 6.1.2, 6.2.3, 6.2.4, 7.2.1, D.2.1
SP-050335	23.125	0128	1	Rel-6	F	Alignment of Re-authorisation triggers	6.4.0	S2-050838	CH-FBC	5.7
SP-050335	23.125	0129	1	Rel-6	F	OCS initiated bearer removal	6.4.0	S2-051369	CH-FBC	5.6, 5.9, 6.2.2, 6.2.4, 7.4

3GPP TSG-SA WG2 Meeting #45
Beijing, China, 4th – 8th April 2005

Tdoc ⌘S2-050930

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.125** **CR** **0126** ⌘ **rev** **2** ⌘ Current version: **6.4.0** ⌘

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Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	TPF behaviour in case of no charging rules for a bearer
Source:	⌘	SA WG2
Work item code:	⌘	CH-FBC
Date:	⌘	08/04/2005
Category:	⌘	**F**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
Ph2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*
Rel-7 *(Release 7)*

Reason for change:	⌘	FBC is based on the concept that traffic which does not fit to any of the charging rules that are installed for a bearer service is discarded. In other words, there is no usage for a bearer service for which no charging rules were installed including both the charging rules provided by the CRF as well as the pre-defined charging rules in the TPF. However, the current specification allows such situations.
Summary of change:	⌘	It is proposed to clarify that a bearer service can be only successfully established if there was at least a single charging rule installed for this bearer service. If no charging rule was installed for this bearer service the TPF shall reject the bearer service establishment. In situations where there is no charging rule for a successfully established bearer service at any later point in time (due to a bearer service modification or due to an unsolicited provisioning of charging rules by the CRF), the TPF may initiate a bearer service termination.
Consequences if not approved:	⌘	It is possible to activate bearer services that cannot be used for any service because no charging rules will be installed at the TPF. Thus resources would be allocated and thus wasted and the enduser cannot be charged for this behaviour.

Clauses affected:	⌘	6.2.4, 7.2.1, 7.2.2, 7.3

Other specs affected:	⌘	Y	N		⌘
			X	Other core specifications	
			X	Test specifications	
			X	O&M Specifications	

Other comments: ⌘

Start of 1st modified section

6.2.4 Traffic Plane Function

The TPF shall be capable of differentiating user data traffic belonging to different service data flows for the purpose of collecting offline charging data and performing online credit control.

The TPF shall support predefined charging rules, and predefined filters. See subclause 5.3 for further filtering and counting requirements.

In the case of online charging, the TPF shall not allow traffic unless network resource usage has been granted by the OCS.

For online charging, the TPF shall be capable of managing a pool of credit used for some or all of the service data flows of a user. The TPF shall also be capable of managing the credit of each individual service data flow of the user.

A TPF may be served by one or more CRF nodes. For GPRS, the TPF shall contact the appropriate CRF based on the APN , which is the primary mechanism. Optionally, the IMSI or MSISDN may in addition to the APN be used as input for selection of the appropriate CRF. For other IP-CANs the TPF shall contact the appropriate CRF based on the access point connected to and, optionally, a UE identity information that is applicable in that kind of IP-CAN.

NOTE 1: For GPRS the CRF address(es) are configured in the TPF (GGSN) per APN.

For GPRS, it shall be possible to provide flow based charging functions for different service data flows even if they are carried in the same PDP Context. For GPRS, the TPF is a logical function allocated to the GGSN.

For GPRS, the TPF/GGSN applies charging rules on a per PDP context basis.

For each PDP context, the TPF shall accept information during bearer establishment and modification relating to:

- The user and terminal (e.g. MSISDN, IMEISV)
- Bearer characteristics (e.g. QoS negotiated, APN, IM CN Subsystem signaling flag)
- Network related information (e.g. MCC and MNC)

The operator may apply different charging rules and rates depending on different PLMN. The TPF shall be able to provide MCC and MNC of the serving network (i.e. SGSN) to the CRF, which may be used by the CRF in order to select the charging rule to be applied.

The operator may configure whether Flow Based Charging is to be applied.

NOTE 2: For GPRS, PDP Contexts for specific APNs may not be applicable to Flow Based Charging, hence regular GPRS charging would apply for these PDP Contexts, and the TPF function would not be invoked (i.e. no CRF interaction would occur).

The TPF may use this information in the OCS request/reporting or request for charging rules.

For each PDP context, there shall be a separate OCS request/OCF reporting, so this allows the OCS and offline charging system to apply different rating depending on the PDP context.

The TPF shall identify packets that are charged according to service data flow based charging. The TPF shall report the data volume(s) charged according to service data flow based charging. In case of GPRS, the TPF shall report the service data flow based charging data for each charging rule on a per PDP context basis.

At initial bearer establishment the TPF shall request charging rules applicable for this bearer from the CRF. As part of the request, the TPF provides the relevant information to the CRF. The TPF shall use the charging rules received in the response from the CRF. In addition, the TPF shall use any applicable predefined charging rules. Predefined charging rules may apply for all bearers of all users or may be dynamically activated (or deactivated) by the CRF for a specific bearer. If no charging rule was installed for this bearer the TPF shall reject the bearer establishment.

If there is no charging rule installed for a successfully established bearer at any later point in time (due to a bearer service modification or due to an unsolicited provisioning of charging rules by the CRF), the TPF may initiate a bearer service termination.

If the bearer is modified, by changing the bearer characteristics, the TPF shall first use the event triggers to determine whether to request the charging rules for the new bearer characteristics from the CRF. Afterwards, the TPF shall use the re-authorisation triggers in order to determine whether to require re-authorisation for the charging rules that were either unaffected or modified.

If the TPF receives an unsolicited update of the charging rules from the CRF, the new charging rules shall be used.

If another bearer is established by the same user (e.g. for GPRS the Secondary PDP Context Activation procedure), the same procedures shall be applied by the TPF as described for the initial bearer. For a bearer, the TPF shall only apply the charging rules that are activated/associated with this bearer. Hence a charging rule is installed, modified and removed on a per PDP context basis. If multiple PDP contexts are active for a UE the CRF may decide that a charging rule is to be activated/associated with more than one PDP context.

The TPF shall evaluate received packets against the service data flow filters in the order according to the precedence for the charging rules. When a packet is matched against a SDF filter, the packet matching process for that packet is complete, and the charging rule for that SDF filter shall be applied. If there is no match against any SDF filter established for that bearer the packet shall be discarded.

End of 1st modified section

Start of 2nd modified section

7.2.1 Bearer Service Establishment

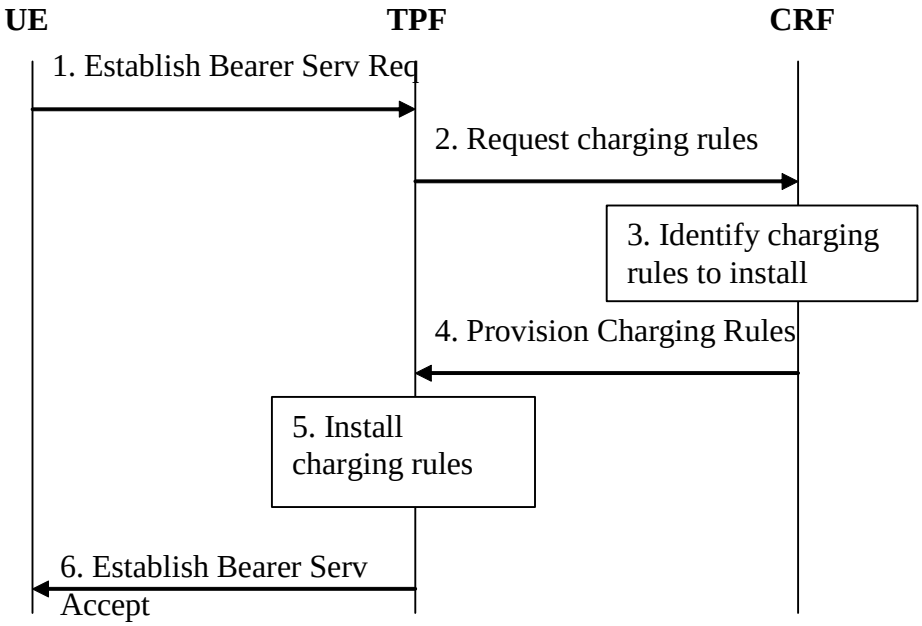

Figure 7.1: Bearer Service Establishment in case of offline charging

1 The TPF receives a request to establish a bearer service. For GPRS, it is the GGSN that receives a Create PDP context request from the SGSN.

2 The TPF requests the applicable charging rules, and provides relevant input information for the charging rule selection.

3 The CRF determines the charging rules to be provisioned, based on information available to the CRF (e.g. information may be available from the AF as described in 7.1 and the new information received from the TPF). Charging rules may need to be installed. In addition, the CRF also determines which event triggers shall be monitored by the TPF.

4 The CRF provides the charging rules to the TPF. For the first bearer service of an IP network connection the CRF may additionally provide event triggers, OCF and OCS addresses to the TPF. This message is flagged as the response to the TPF request.

5 The TPF performs charging rule actions as indicated, i.e. installing charging rules. During establishment of the bearer service the TPF also installs any predefined charging rules.

6 If at least one charging rule was installed in step 5, ~~T~~the TPF continues with the bearer service establishment procedure. Otherwise, the TPF rejects the bearer service establishment.

The TPF shall wait for the charging rules installation before accepting the Bearer establishment as shown in figure 7.1.

In case of online charging, in order to allow for Bearer establishment control upon credit check, the TPF shall wait for the credit control information before accepting the Bearer establishment as shown in figure 7.2.

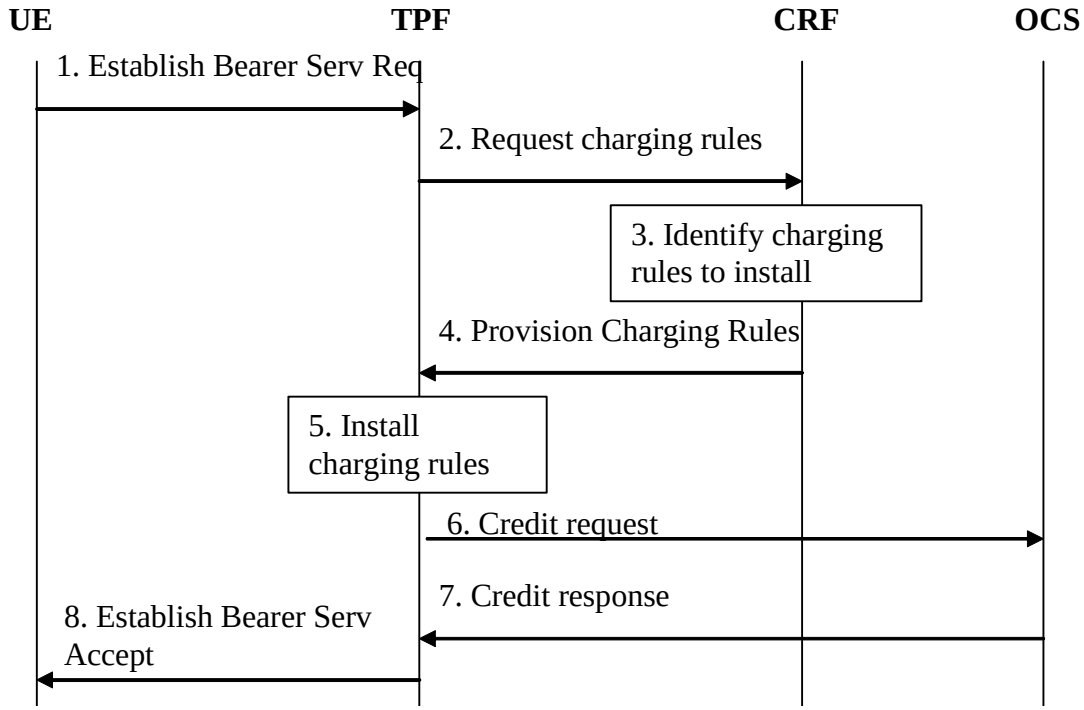

Figure 7.2: Bearer Service Establishment in case of online charging

1. The TPF receives a request to establish a bearer service. For GPRS, it is the GGSN that receives a Create PDP context request from the SGSN.

2. The TPF requests the applicable charging rules, and provides relevant input information for the charging rule decision.

3. The CRF determines the charging rules to be provisioned, based on information available to the CRF (e.g. information may be available from the AF as described in 7.1 and the new information received from the TPF). Charging rules may need to be installed. In addition, the CRF also determines which event triggers shall be monitored by the TPF.

4. The CRF provides the charging rules to the TPF. For the first bearer service of an IP network connection the CRF may additionally provide event triggers, OCF and OCS addresses to the TPF. This message is flagged as the response to the TPF request.

5. The TPF performs charging rule actions as indicated, i.e. installing charging rules. During establishment of the bearer service the TPF also installs any predefined charging rules.

6. If at least one charging rule was installed in step 5, ~~T~~the TPF requests credit for any charging key of the established charging rules (either predefined or newly installed) from the OCS, and provides relevant input information for the OCS decision.

7. The OCS provides the credit information to the TPF and may provide re-authorisation triggers for each of the credits.

8. If at least one charging rule was installed in step 5 and ~~I~~if credit is available at least for one charging key, the TPF accepts the bearer service establishment. ~~If no credit is available~~Otherwise, the TPF rejects the bearer service establishment.

NOTE: Further details of the credit control mechanism are expected to be specified by Stage 3.

End of 2nd modified section

Start of 3rd modified section

7.2.2 Bearer Service Modification

7.2.2.1 General

According to the Event triggers and Re-authorisation triggers, Bearer Service Modification may trigger the TPF to signal the CRF that a bearer has been modified and/or trigger the TPF to request re-authorisation (for online).

7.2.2.2 Bearer Service Modification in case of offline charging

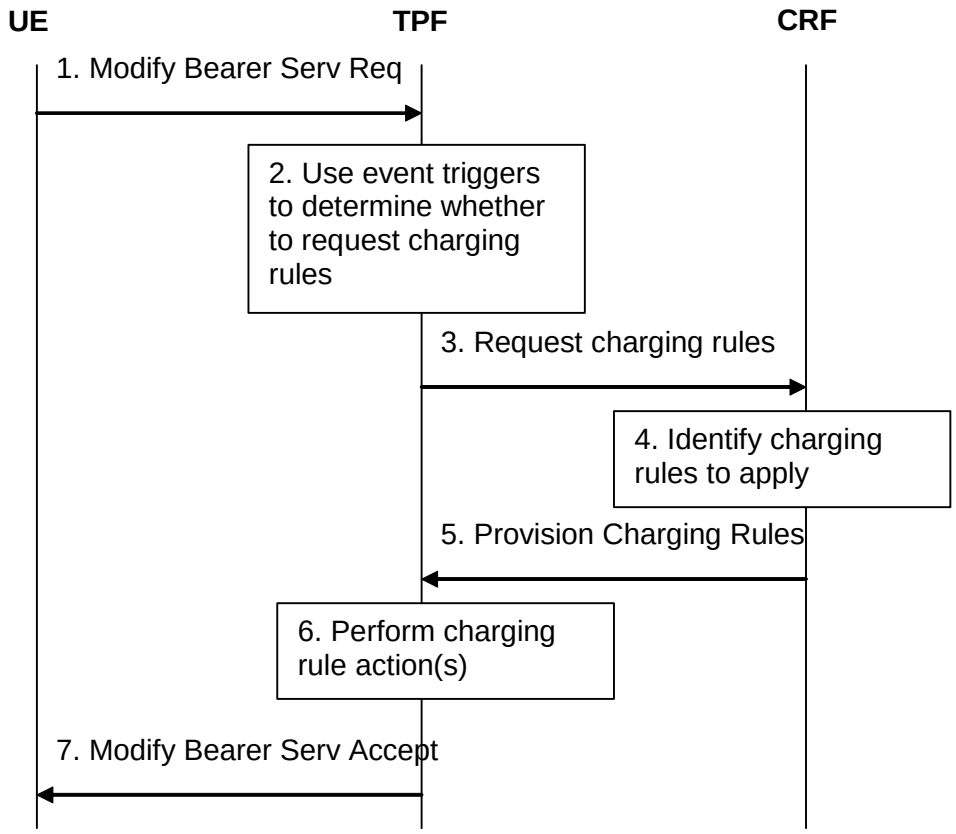

Figure 7.2a: Bearer Service Modification triggered Charging Rule Request

1. The TPF receives a request to modify a bearer service. For GPRS, the GGSN receives an Update PDP context request.
2. The TPF uses the event triggers in order to determine whether a request for charging rules is required
3. The TPF requests the applicable charging rules indicating a bearer modification, and provides relevant input information for the charging rule selection.
4. The CRF determines the charging rules to be provisioned, based on information available to the CRF (e.g. information may be available from the AF as described in 7.1 and the new information received from the TPF). Charging rules may need to be installed, and/or removed, and/or modified.
5. The CRF provides the charging rule information to the TPF. This message is flagged as the response to the TPF request.
6. The TPF performs charging rule actions as indicated, i.e. installing, modifying or removing charging rules.
7. The TPF continues with the bearer service modification procedure. If no charging rules remain after performing the charging rule actions, the TPF may initiate a bearer service termination.

NOTE 1: In the case of GPRS, the modification of the bearer service may also be initiated by other nodes such as the SGSN.

NOTE 2: The TPF shall wait for the charging rules installation before accepting the Bearer modification, as shown in figure 7.1.

7.2.2.3 Void

7.2.2.4 Bearer Service Modification in case of online charging

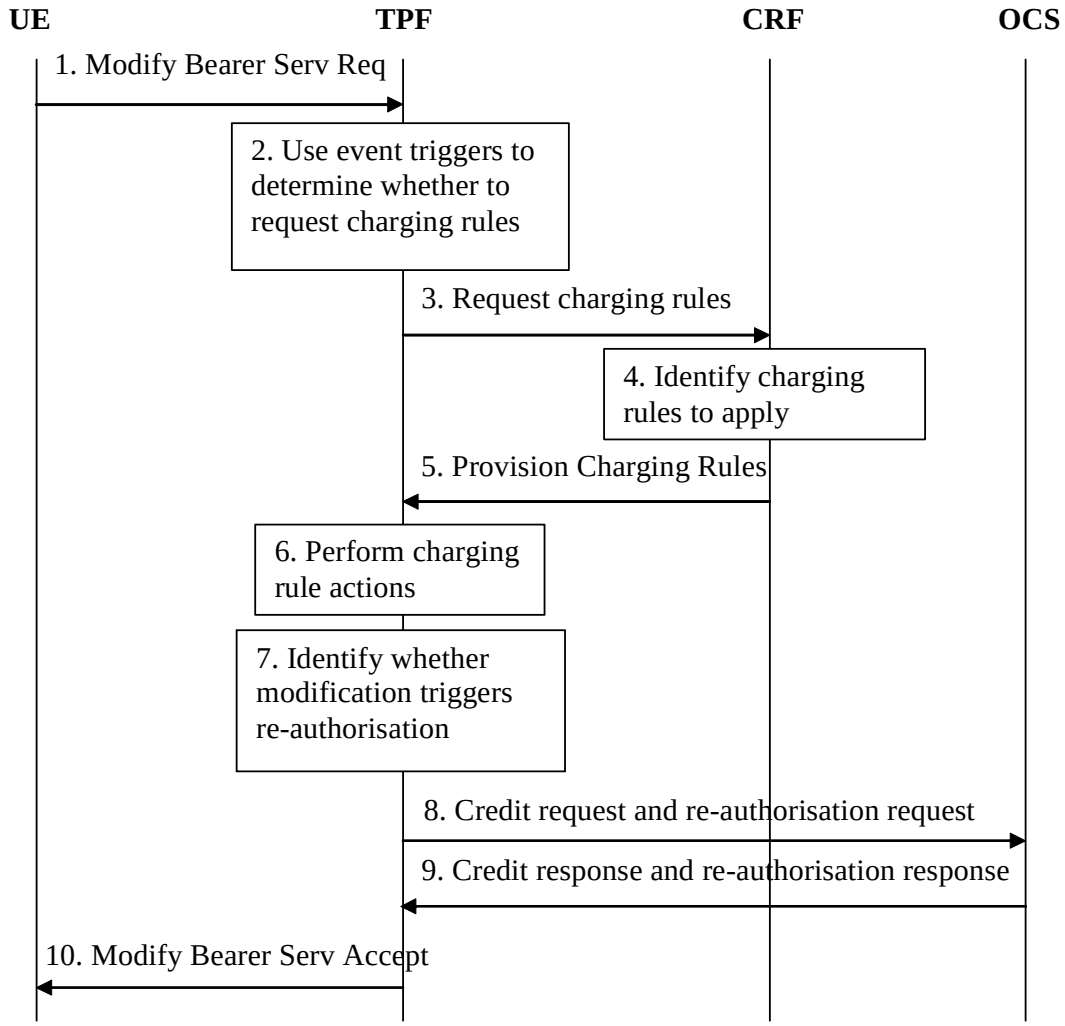

Figure 7.2c: Bearer Service Modification in case of online charging

1. The TPF receives a request to modify a bearer service. For GPRS, the GGSN receives an Update PDP context request.
2. The TPF uses the event triggers in order to determine whether a request for charging rules is required.
3. The TPF requests the applicable charging rules indicating a bearer modification, and provides relevant input information for the charging rule selection.
4. The CRF determines the charging rules to be provisioned, based on information available to the CRF (e.g. information may be available from the AF as described in 7.1 and the new information received from the TPF) Charging rules may need to be installed, and/or removed, and/or modified.
5. The CRF provides the charging rule information to the TPF. This message is flagged as the response to the TPF request.
6. The TPF performs charging rule actions as indicated, i.e. installing, modifying or removing charging rules.

7. The TPF identifies whether the bearer modification matches the re-authorisation trigger(s) of any charging key, which belongs to charging rules that have neither been installed nor removed in step 6.

8. The TPF interacts with the OCS if the set of charging keys has changed or if the bearer modification matches re-authorisation trigger(s) of any charging key in the step 7. The TPF requests credit for any new charging key, and provides relevant input information for the OCS decision. The TPF returns the remaining credit of any charging key for which the last charging rule has been removed (i.e. there is no longer a charging rule with this charging key). The TPF returns the unused credit(s) for any charging key (s) applicable for re-authorisation and requests re-authorisation of their credits.

9. The OCS answers to the TPF providing credits.

10. ~~If credit is available at least for one charging rule, t~~The TPF accepts the bearer modification. If no charging rules remain after performing the charging rule actions the TPF may initiate a bearer service termination.

NOTE: In the case of GPRS, the modification of the bearer service may also be initiated by other nodes such as the SGSN.

End of 3rd modified section

Start of 4th modified section

7.3 Provision of Charging Rules triggered by other event to the CRF

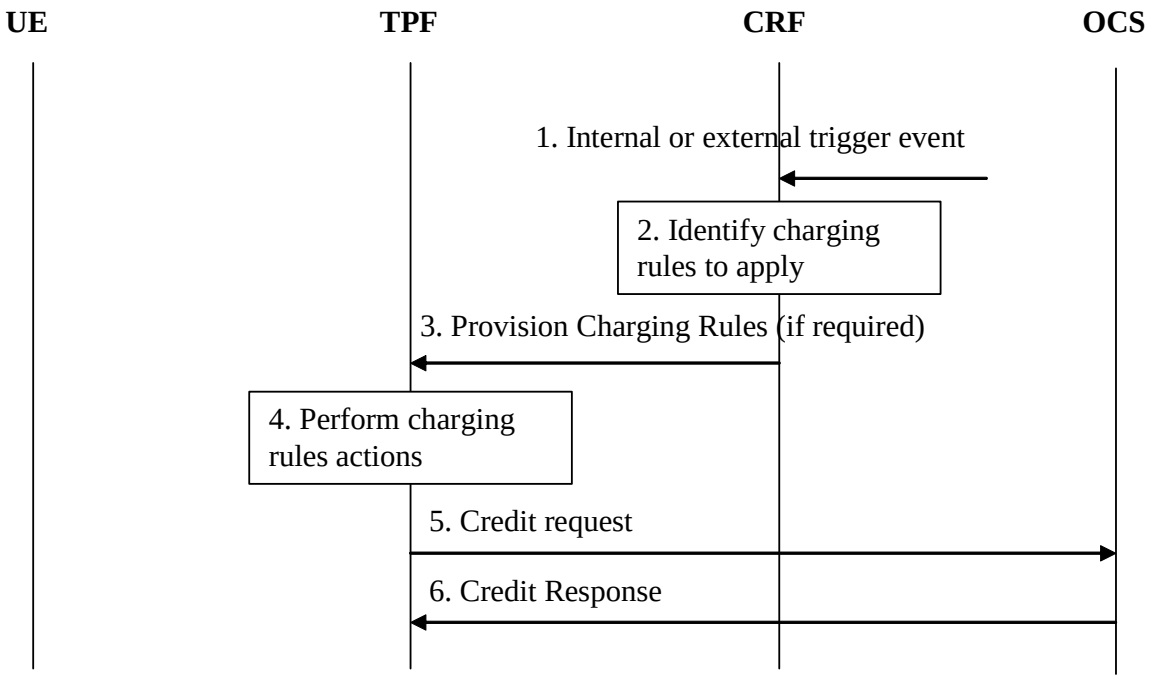

Figure 7.4: Provision of Charging Rules due to external or internal Trigger Event

1 The CRF receives a trigger event, with relevant information related to the event. One example event is an AF interaction as described in 7.1.

2 The CRF determines the charging rules to be provisioned, based on information available to the CRF (e.g. information may be available from the AF as described in 7.1 and the new information received from the trigger). Charging rules may need to be installed, and/or removed, and/or modified.

3 If required, the CRF provisions the charging rules to the TPF.

4 The TPF performs charging rule actions as indicated, i.e. installing, modifying or removing charging rules. If no charging rules remain after performing the charging rule actions, the TPF may initiate a bearer service termination.

5 In case of online charging, the TPF requests credit for any new charging key from the OCS, and provides relevant input information for the OCS decision. The TPF returns the remaining credit of any charging key for which the last charging rule has been removed (i.e. there is no longer a charging rule with this charging key).

6 In case of online charging, the OCS provides the credit information to the TPF and may provide re-authorisation triggers for each of the credits.

End of 4th modified section

3GPP TSG-SA WG2 Meeting #45
Beijing, P.R.China, 4th– 8th April 2005.

Tdoc ⌘S2-050840

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.125** **CR** **0127** ⌘**rev** **1** ⌘ Current version: **6.4.0** ⌘

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Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	FBC terminology amendments
Source:	⌘	SA WG2
Work item code:	⌘	CH-FBC
Date:	⌘	08/04/2005
Category:	⌘	**F**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
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Detailed explanations of the above categories can be found in 3GPP TR 21.900.

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Ph2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)
Rel-7 (Release 7)

Reason for change:	⌘	The CR S2-050480 intrduced the abbreviation OCF to designate an offline charging function, whereas the TS 32.240 "Telecommunication management; Charging management; Charging architecture and principles" defines an OCF to be "Online Charging Function". SA2 should according to agreed principles identify a term which is independent from the SA5 terminology
Summary of change:	⌘	Remove the abbreviation OCF, introducing the OFCS (Offline Charging Function System)
Consequences if not approved:	⌘	The TS 23.060 and TS 23.125 uses different designations for the same entity. The abbreviation OCF designates an offline charging function, which is in contradiction to what OCF designates in the TS 32.240.

Clauses affected:	⌘	3, 5.2, 5.8.2, 6.1.2, 6.2.3, 6.2.4, 7.2.1, D.2.1,

Other specs affected:	⌘	Y	N		⌘
			X	Other core specifications	
			X	Test specifications	
			X	O&M Specifications	

Other comments:	⌘	

****** 1st modified section ******

3 Definitions, symbols and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TS 21.905 [2] and in TS 32.251 [7] and the following apply:

Charging key: information used by the online and offline charging system for rating purposes.

Charging rule: a set of information including the service data flow filters, and the charging key, for a single service data flow (further details can be found in 5.2).

Dynamic charging rule: Charging rule where some of the data within the charging rule (e.g. service data flow filter information) is assigned via real-time analysis, which may use dynamic application derived criteria.

FBC Policy Functions: The charging rules may be configured in such a way to allow FBC for a certain usage that allows/disallows traffic to pass through the TPF (further details can be found in 5.8).

IP network connection: The unique UE association with an IP network (for GPRS, APN) and the allocated IP address at the TPF.

Packet flow: a specific user data flow carried through the TPF. A packet flow can be an IP flow.

Predefined charging rule: A charging rule which is predefined in the TPF. A predefined charging rule is either applicable for all bearers of all users or dynamically activated for an individual bearer.

Service identifier: An identifier for a service. The service identifier may designate an end user service, a part of an end user service or an arbitrarily formed group thereof. The service identifier provides the most detailed identification, specified for flow based charging, of a service data flow.

Service data flow: aggregate set of packet flows. In the case of GPRS, it shall be possible that a service data flow is more granular than a PDP context.

Service Data Flow Filter: a set of filter parameters used to identify one or more of the packet flows constituting a service data flow. At least the following means for the packet flow identification shall be supported: source and destination IP address+port, transport protocol, or application protocol.

TPF/CRF dialogue: A dialogue, between a TPF and a CRF, with a unique identity, There is one TPF/CRF dialogue per user and IP network connection.

3.2 Symbols

For the purposes of the present document, the following symbols apply:

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AF	Application Function
~~CDF~~	~~Charging Data Function~~
CDR	Charging Data Records
CGF	Charging Gateway Function
CRF	Charging Rules Function

CSCF	Call Session Control Function
FBC	Flow Based Charging
FTP	File Transfer Protocol
G-CDR	GGSN generated CDR
GGSN	Gateway GPRS Support Node
GPRS	General Packet Radio Service
gsmSCF	GSM Service Control Function
HPLMN	Home PLMN
HTTP	Hypertext Transfer Protocol
I-CSCF	Interrogating CSCF
IM	IP Multimedia
IMS	IP Multimedia Core Network Subsystem
IMSI	International Mobile Subscriber Identity
~~OCF~~	~~Offline Charging Function~~
OFCS	Offline Charging System
OCS	Online Charging System
P-CSCF	Proxy-CSCF
PDG	Packet Data Gateway
PLMN	Public Land Mobile Network
QoS	Quality of Service
SAI	Service Area Identity
S-CDR	SGSN generated CDR
S-CSCF	Serving-CSCF
SBLP	Service Based Local Policy
SDF	Service Data Flow
SGSN	Serving GPRS Support Node
SIP	Session Initiation Protocol
TPF	Traffic Plane Function
UE	User Equipment
WAP	Wireless Application Protocol
WLAN	Wireless LAN

****** 2nd modified section ******

5.2 Charging rules

Charging rules contain information that allow for filtering of traffic to identify the packets belonging to a particular service data flow, and allow for defining how the service data flow is to be charged. The following apply to charging rules:

- The operator defines the charging rules for bearer charging. A predefined charging rule is defined at the TPF only, but may be known at the CRF by reference.
- Charging rules are installed at the TPF for both offline and online charging.
- Multiple charging rules are supported simultaneously per user and bearer.
- Filtering information within an installed charging rule is applied through filtering functionality at the TPF to identify the packets belonging to a particular service data flow.
- The CRF may dynamically generate and install charging rules in order to cover IP service scenarios where the filtering information is dynamically negotiated (e.g. negotiated on the application level as for IMS).
- Predefined charging rules stored in the TPF are supported. The charging rule identifiers of the predefined charging rules shall be different from the charging rule identifiers allocated by the CRF.
- Predefined charging rules may include filters, which support extended capabilities, including enhanced capabilities to identify packets associated with application protocols.

- For GPRS an operator may optionally define predefined charging rules that operate only on MBMS bearer contexts, see TS 23.246 [13]. Pre-defined charging rules that operate on MBMS bearer contexts are not applicable to any PDP contexts. Pre-defined charging rules for MBMS Bearer contexts are not available to a CRF and hence they cannot be dynamically activated over the Gx reference point. For MBMS a GGSN may collect charging data records on a per MBMS bearer context basis. The report may depending on the configuration of the charging rule include volume- and/or time-usage for a certain MBMS service. The purpose of the reporting may include the collection of charging data records that can be used as a basis for charging a 3rd party supplier. Further since multiple users share an MBMS bearer context it is not possible to report on a per user basis.

- There may be overlap between the service data flow filter information of charging rules that are applicable. Overlap can occur between:

  - multiple predefined charging rules in the TPF;

  - multiple charging rules from the CRF;

  - charging rules predefined in the TPF and rules from the CRF, which can overlay the predefined rules in the TPF.

  The precedence identified with each charging rule shall resolve all overlap between the charging rules. When overlap occurs between a dynamically allocated charging rule and a predefined charging rule at the TPF, and they both share the same precedence, then the dynamically allocated charging rule shall be used.

NOTE 1: The operator shall ensure that overlap between the predefined charging rules can be resolved based on precedence of each predefined charging rule in the TPF. The CRF shall ensure that overlap between the dynamically allocated charging rules can be resolved based on precedence of each dynamically allocated charging rule.

- Charging rules contain information on:

  - How a particular service data flow is to be charged: online, offline or neither;

  - Indication of charging unit, in case of offline charging whether to record volume- or time-based charging information or both;

NOTE 2: In case of online charging, the indication of charging unit is passed as a part of credit control.

  - Charging key;

  - Service data flow filter(s);

  - Service identifier;

  - Precedence (used at the TPF to determine the order in which charging rules shall be applied to a service data flow);

  - Charging rule identifier (used between CRF and TPF for referencing charging rules);

  - Application Function Record Information;

  - Service identifier level reporting: mandated or not required.

- Event triggers may be used and are associated with all the charging rules of an IP network connection.

- An ~~OCF~~ OFCS and/or OCS address may be associated with an IP network connection.

- The charging rule identifiers allocated by the CRF shall be unique within a TPF/CRF dialogue.

- If it is provided by the AF and the rule filters are based on the AF provided information, the Application Function Record information is included in the charging rule, and in subsequently generated charging information generated as a result of the rule. It should be noted that, in order to associate a single Application Function Record with specific counts/credits, it is necessary that new counts/credits be generated for the user by the TPF each time the AF generates new Application Function Record information.

- Once the charging rule is installed at the TPF, the TPF applies the rule to detect the service data flow and counts the packets, categorised per the rule set in the charging rule.
- Separate charging rules can be provided for downlink and uplink.
- Charging rules can be configured for both user initiated and network initiated flows.
- The charging key value and, optionally, the service identifier value of the charging rule identifies the service data flow.
- Charging rules that were provided by the CRF and installed for a bearer can be modified by the CRF, e.g. for a previously established PDP context in the GPRS case, based on specific events (e.g. IM domain events or GPRS domain events, credit control events). Apart from the charging rule identifier and the charging method (online, offline, neither) all parts of a charging rule may be modified. Modification of a charging rule shall triggerequivalent TPF behaviour as the CRF simultaneously removing the old and installing the new (modified) charging rule.
- Different charging rules can be installed for different users.
- The same charging rule can be installed for multiple users.
- Different charging rules can be installed based on the location of the user (e.g. based on identity of the roamed to network).
- Installation of the charging rules can occur at bearer service establishment, modification and termination. For GPRS, charging rule installation can occur at PDP context activation, modification and deactivation.
- For GPRS at PDP context activation, modification and deactivation a CRF may decide to align the set of charging rules for any other active PDP context. The CRF considers in such a case this as an Internal Trigger Event as described in clause 7.3 for the interaction with the TPF.
- For GPRS, the charging rules can be dependent on the APN used.

****** 3rd modified section ******

5.8.2 Charging correlation

SBLP provides means to correlate bearer charging and application level charging by passing Charging Identifiers on the Go interface.

The FBC architecture passes the charging key applicable for the AF media flow to the OCS/~~OCF~~ OFCS, which is the input to the rating logic. Hence, AF media flows will be rated accordingly, but this provides no direct charging correlation between an AF session and the IP-CAN bearer its media flows use.

FBC provides the capability for charging correlation through the usage of Application Function Record information.

****** 4th modified section ******

6.1.2 Offline service data flow based bearer charging architecture

Figure 6.2 below presents the overall architecture for service data flow based offline bearer charging.

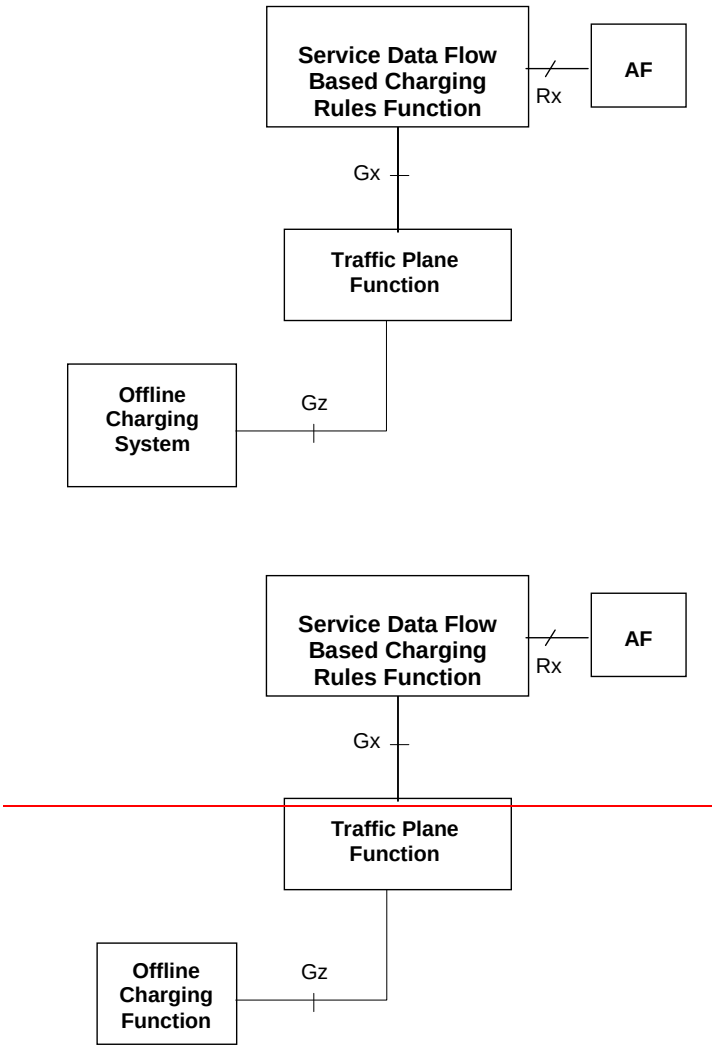

Figure 6.2: Overall architecture for service data flow based offline bearer charging

NOTE: The Offline Charging ~~Function~~ System (~~OCF~~OFCS) for Flow Based Charging ~~may be either a CGF or a CDF as defined in~~is further detailed in TS 32.240 [3].

****** 5th modified section ******

6.2.3 Offline Charging ~~Function~~System

The Offline Charging ~~Function~~ System is specified in TS 32.240 [3].

There may be several ~~OCF~~OFCSs in a PLMN. To allow for this case, ~~OCF~~ OFCS addresses (i.e. the primary address and secondary address) may be passed once per IP network connection from the CRF to the TPF. This information shall be locally pre-configured within the TPF for all users. The addresses provided by the CRF have higher priority than the pre-configured ones.

6.2.4 Traffic Plane Function

The TPF shall be capable of differentiating user data traffic belonging to different service data flows for the purpose of collecting offline charging data and performing online credit control.

The TPF shall support predefined charging rules, and predefined filters. See subclause 5.3 for further filtering and counting requirements.

In the case of online charging, the TPF shall not allow traffic unless network resource usage has been granted by the OCS.

For online charging, the TPF shall be capable of managing a pool of credit used for some or all of the service data flows of a user. The TPF shall also be capable of managing the credit of each individual service data flow of the user.

A TPF may be served by one or more CRF nodes. For GPRS, the TPF shall contact the appropriate CRF based on the APN , which is the primary mechanism. Optionally, the IMSI or MSISDN may in addition to the APN be used as input for selection of the appropriate CRF. For other IP-CANs the TPF shall contact the appropriate CRF based on the access point connected to and, optionally, a UE identity information that is applicable in that kind of IP-CAN.

NOTE 1: For GPRS the CRF address(es) are configured in the TPF (GGSN) per APN.

For GPRS, it shall be possible to provide flow based charging functions for different service data flows even if they are carried in the same PDP Context. For GPRS, the TPF is a logical function allocated to the GGSN.

For GPRS, the TPF/GGSN applies charging rules on a per PDP context basis.

For each PDP context, the TPF shall accept information during bearer establishment and modification relating to:

- The user and terminal (e.g. MSISDN, IMEISV)
- Bearer characteristics (e.g. QoS negotiated, APN, IM CN Subsystem signaling flag)
- Network related information (e.g. MCC and MNC)

The operator may apply different charging rules and rates depending on different PLMN. The TPF shall be able to provide MCC and MNC of the serving network (i.e. SGSN) to the CRF, which may be used by the CRF in order to select the charging rule to be applied.

The operator may configure whether Flow Based Charging is to be applied.

NOTE 2: For GPRS, PDP Contexts for specific APNs may not be applicable to Flow Based Charging, hence regular GPRS charging would apply for these PDP Contexts, and the TPF function would not be invoked (i.e. no CRF interaction would occur).

The TPF may use this information in the OCS request/reporting or request for charging rules.

For each PDP context, there shall be a separate OCS request/~~OCF~~ OFCS reporting, so this allows the OCS and offline charging system to apply different rating depending on the PDP context.

The TPF shall identify packets that are charged according to service data flow based charging. The TPF shall report the data volume(s) charged according to service data flow based charging. In case of GPRS, the TPF shall report the service data flow based charging data for each charging rule on a per PDP context basis.

At initial bearer establishment the TPF shall request charging rules applicable for this bearer from the CRF. As part of the request, the TPF provides the relevant information to the CRF. The TPF shall use the charging rules received in the response from the CRF. In addition, the TPF shall use any applicable predefined charging rules. Predefined charging rules may apply for all bearers of all users or may be dynamically activated (or deactivated) by the CRF for a specific bearer.

If the bearer is modified, by changing the bearer characteristics, the TPF shall first use the event triggers to determine whether to request the charging rules for the new bearer characteristics from the CRF. Afterwards, the TPF shall use the re-authorisation triggers in order to determine whether to require re-authorisation for the charging rules that were either unaffected or modified.

If the TPF receives an unsolicited update of the charging rules from the CRF, the new charging rules shall be used.

If another bearer is established by the same user (e.g. for GPRS the Secondary PDP Context Activation procedure), the same procedures shall be applied by the TPF as described for the initial bearer. For a bearer, the TPF shall only apply the charging rules that are activated/associated with this bearer. Hence a charging rule is installed, modified and

removed on a per PDP context basis. If multiple PDP contexts are active for a UE the CRF may decide that a charging rule is to be activated/associated with more than one PDP context.

The TPF shall evaluate received packets against the service data flow filters in the order according to the precedence for the charging rules. When a packet is matched against a SDF filter, the packet matching process for that packet is complete, and the charging rule for that SDF filter shall be applied. If there is no match against any SDF filter established for that bearer the packet shall be discarded.

****** 6th modified section ******

7.2.1 Bearer Service Establishment

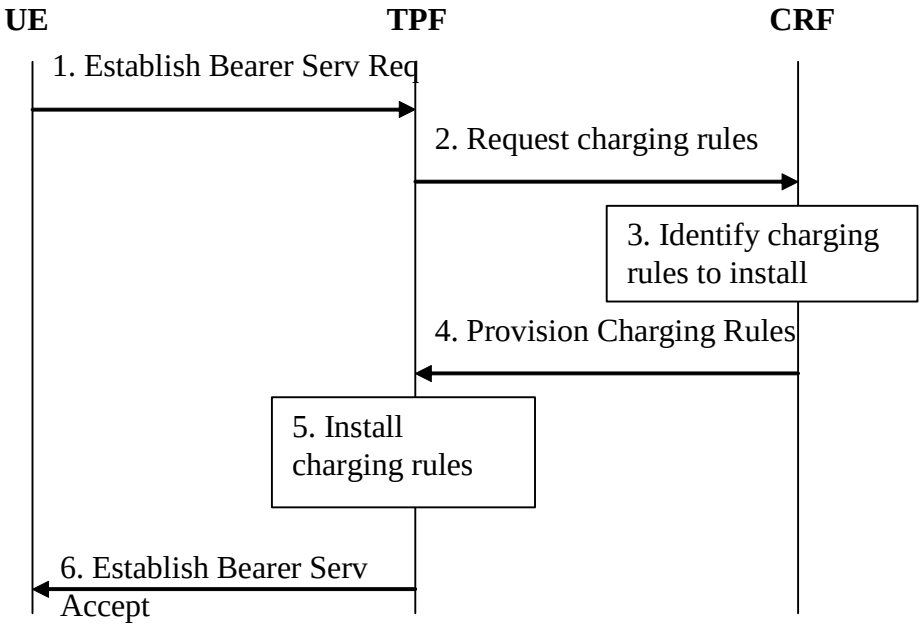

Figure 7.1: Bearer Service Establishment in case of offline charging

1 The TPF receives a request to establish a bearer service. For GPRS, it is the GGSN that receives a Create PDP context request from the SGSN.

2 The TPF requests the applicable charging rules, and provides relevant input information for the charging rule selection.

3 The CRF determines the charging rules to be provisioned, based on information available to the CRF (e.g. information may be available from the AF as described in 7.1 and the new information received from the TPF). Charging rules may need to be installed. In addition, the CRF also determines which event triggers shall be monitored by the TPF.

4 The CRF provides the charging rules to the TPF. For the first bearer service of an IP network connection the CRF may additionally provide event triggers, ~~OCF~~ OFCS and OCS addresses to the TPF. This message is flagged as the response to the TPF request.

5 The TPF performs charging rule actions as indicated, i.e. installing charging rules. During establishment of the bearer service the TPF also installs any predefined charging rules.

6 The TPF continues with the bearer service establishment procedure.

The TPF shall wait for the charging rules installation before accepting the Bearer establishment as shown in figure 7.1.

In case of online charging, in order to allow for Bearer establishment control upon credit check, the TPF shall wait for the credit control information before accepting the Bearer establishment as shown in figure 7.2.

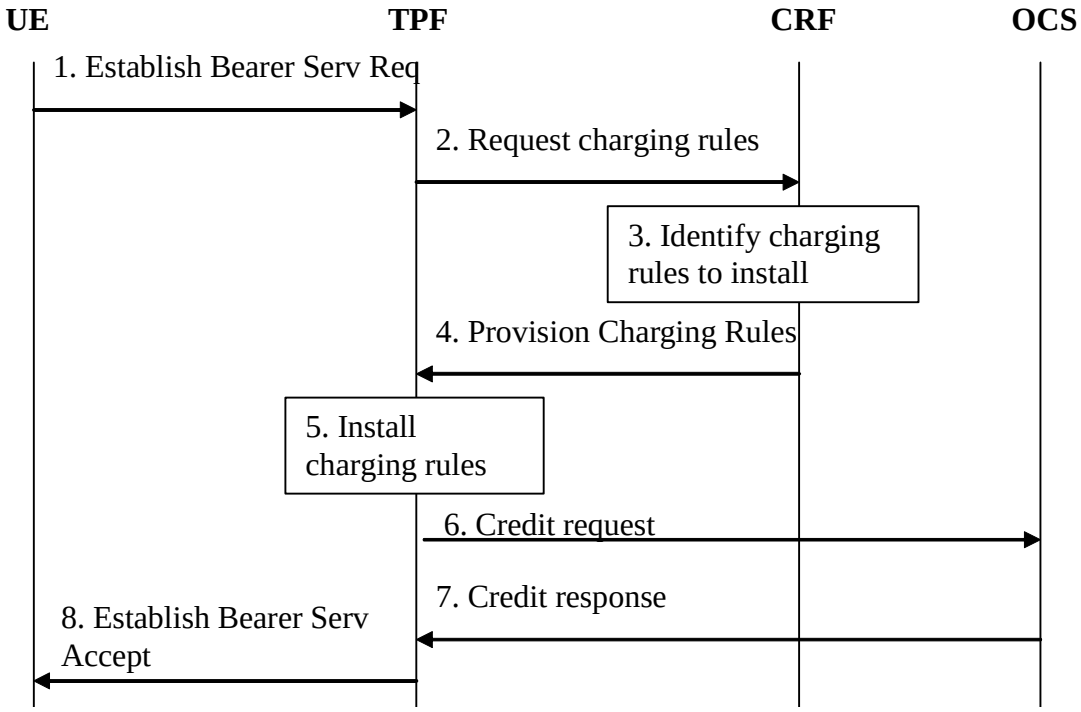

Figure 7.2: Bearer Service Establishment in case of online charging

1. The TPF receives a request to establish a bearer service. For GPRS, it is the GGSN that receives a Create PDP context request from the SGSN.

2. The TPF requests the applicable charging rules, and provides relevant input information for the charging rule decision.

3. The CRF determines the charging rules to be provisioned, based on information available to the CRF (e.g. information may be available from the AF as described in 7.1 and the new information received from the TPF). Charging rules may need to be installed. In addition, the CRF also determines which event triggers shall be monitored by the TPF.

4. The CRF provides the charging rules to the TPF. For the first bearer service of an IP network connection the CRF may additionally provide event triggers, ~~OCF~~ OFCS and OCS addresses to the TPF. This message is flagged as the response to the TPF request.

5. The TPF performs charging rule actions as indicated, i.e. installing charging rules. During establishment of the bearer service the TPF also installs any predefined charging rules.

6. The TPF requests credit for any charging key of the established charging rules (either predefined or newly installed) from the OCS, and provides relevant input information for the OCS decision.

7. The OCS provides the credit information to the TPF and may provide re-authorisation triggers for each of the credits.

8. If credit is available at least for one charging key, the TPF accepts the bearer service establishment. If no credit is available, the TPF rejects the bearer service establishment.

NOTE: Further details of the credit control mechanism are expected to be specified by Stage 3.

****** 7th modified section ******

D.2.1 Charging correlation

The FBC architecture provides an alternative bearer charging mechanism. The charging key passed to the OCS/~~OCF~~ OFCS is the only input to the rating logic (along with any AF/CSCF input about type of sessions, start/stop time of session etc. that may have come from Ro/Rf).

FBC provides the capability for charging correlation through the usage of Application Function Record information. In case of IMS the Application Function Record information should include the ICID and the flow ID(s).

Since the charging systems may need to be upgraded in this release to support FBC, we could use the FBC model and logic based on the charging key, instead of adding any correlation identifier (ICID) to Gx/Gy.

This function is part of this release.

****** End of document ******

3GPP TSG-SA2 meeting #45
Beijing, China, 4 – 8 April 2005

Tdoc ⌘S2-050838
Revised S2-050594

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.125** **CR** **0128** ⌘ **rev** **1** ⌘ Current version: **6.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	Alignment of Re-authorisation Triggers
Source:	⌘	SA WG2
Work item code:	⌘	CH-FBC
Date:	⌘	06/04/2005
Category:	⌘	**F**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
Ph2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*
Rel-7 *(Release 7)*

Reason for change:	⌘	The list of re-authorisation in online charging is not aligned with all possible triggers provided in charging specifications and also the change in charging key is not possible in both charging rule provisioning and in online quota management
Summary of change:	⌘	Removes change in charging key and adds a note that the protocol may provide more events.
Consequences if not approved:	⌘	The list of triggers for online charging re-authorisation is not correct

Clauses affected:	⌘	5.7

Other specs affected: ⌘	Y	N		⌘
		X	Other core specifications	
		X	Test specifications	
		X	O&M Specifications	

Other comments: ⌘

5.7 Re-authorisation and Event Triggers

Re-authorisation applies to online charging. For each charging key, the TPF receives re-authorisation trigger information from the OCS, which determines when the TPF shall perform a re-authorisation. The re-authorisation trigger detection will cause the TPF to request re-authorisation of the credit in the OCS. It shall be possible for the OCS to apply re-authorisation of credit in case of the following events:

- credit authorisation lifetime expiry;
- idle timeout;
- ~~charging key is changed;~~
- SGSN change;
- PLMN change;
- QoS changes;
- RAT type change.

Note: This list is not exhaustive. The protocol description may support additional events.

Event triggers apply to both offline and online charging. The event triggers are provided by the CRF to the TPF using Provision Charging Rule procedure. Event triggers are associated with all charging rules of an IP network connection. Event triggers determine when the TPF shall signal to the CRF that a bearer has been modified or a specific event has been detected.

Event triggers include the following events:

- SGSN change;
- PLMN change;
- QoS change;
- RAT type change;
- TFT change.

Event triggers apply after bearer establishment.

Bearer modifications, which do not match an event trigger shall cause no action at the TPF.

********** END OF CHANGES **********

3GPP TSG-SA WG2 Meeting #46
Athens, Greece, 9th – 13th May 2005

Tdoc ⌘S2-051369

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.125** **CR** **0129** ⌘**rev** **1** ⌘ Current version: **6.4.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ ☐ ME ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	OCS initiated bearer removal
Source:	⌘	SA WG2
Work item code:	⌘	CH-FBC
Date:	⌘	12/05/2005
Category:	⌘	**F**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
B *(addition of feature),*
C *(functional modification of feature)*
D *(editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
Ph2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
Rel-4 (Release 4)
Rel-5 (Release 5)
Rel-6 (Release 6)
Rel-7 (Release 7)

Reason for change: ⌘ The current specification is not clear whether and how FBC could lead to a TPF initiated bearer removal in case of online charging. There is just one statement in 5.6 (Termination Actions) that other procedures may be triggered, e.g. the bearer removal. No further details or conditions are specified. However, it is important to clarify this functionality to identify potential impacts on the protocol specifications and to have a complete standard of the TPF functionality.

In general for online charging, either the TPF or the OCS may be under control of the bearer removal in case of online charging. The TPF could be configured to initiate a bearer removal in case there is no credit available for any of the charging keys that have been installed for this bearer but only if all termination actions indicate a dropping of packets. Therefore, it would very complex to enforce a bearer removal from the OCS (by setting termination actions accordingly and taking away the remaining credit).

The better solution seems to be the direct OCS control of the bearer removal by means of an explicite Gy signaling. This solution allows an operator to directly enforce a bearer removal depending only on an internal decision of the OCS.

Summary of change: ⌘ A new section is added describing the dependencies between the FBC functionality and the related bearer service. The statement about a dependency on the termination actions is deleted. Instead, it is clarified that the OCS shall be able to initiate a bearer removal. Finally, a new message flow for a TPF initiated bearer removal is added.

Consequences if not approved: ⌘ The TPF functionality is not completely described which could lead to different implementations. Especially it is not clear how the relation between FBC functionality and bearer removal should work.

Clauses affected: ⌘ 5.6, 5.9, 6.2.2, 6.2.4, 7.4

Other specs affected: ⌘

Y	N	
	X	Other core specifications
	X	Test specifications
	X	O&M Specifications

⌘

Other comments: ⌘

Start of 1st modified section

5.6 Termination Action

The termination action applies only in case of online charging. The termination action indicates the action, which the TPF should perform when no more credit is granted. A packet that matches a charging rule, indicating a charging key for which no credit has been granted, is subject to a termination action.

The defined termination actions include:

- Allowing the packets, subject to the termination action, to pass through;
- Dropping the packets, subject to the termination action;
- The TPF Default Termination Action;
- The re-direction of packets, subject to the termination action, to an application server (e.g., defined in the termination action).

NOTE 1: Such a re-direction may cause an application protocol specific asynchronous close event and application protocol specific procedures may be required in the UE and/or AF in order to recover, e.g. as specified in RFC 2616 for HTTP.

The Default Termination Action for all charging keys , for which no more credit is granted and there is no specific termination action shall be pre-configured in the TPF according to operator's policy. For instance, the default behaviour may consist of allowing packets of any terminated service data flow to pass through the TPF.

The OCS may provide a termination action for each charging key over the Gy interface. Any previously provided termination action may be overwritten by the OCS.

NOTE 2: A termination action remains valid and shall be applied by the TPF until all the corresponding charging rules of that charging key are removed or the corresponding bearer is removed (for GPRS the PDP context).

The OCS shall provide the termination action to the TPF before denying credit; otherwise the TPF default termination action will be performed.

~~The termination action may trigger other procedures, e.g. the deactivation of a PDP context or the termination of a WLAN session.~~

End of 1st modified section

Start of 2nd modified section

5.9 Bearer Relation

This section refers to the dependencies between FBC functionality and the related bearer service. The following relations shall be supported:

- If there was no charging rule installed for a bearer service the TPF shall reject the bearer service establishment;
- If there is no charging rule installed for a successfully established bearer service at any later point in time (due to a bearer service modification or due to an unsolicited provisioning of charging rules by the CRF), the TPF may initiate a bearer service termination;
- In case of online charging, the OCS may trigger the TPF to initiate a bearer service termination at any point in time.

End of 2nd modified section

Start of 3rd modified section

6.2.2 Service Data Flow Based Credit Control Function

The Service Data Flow Based Credit Control Function performs online credit control functions together with the Online Charging System. It provides a new function within the Online Charging System.

The Online Charging System is specified in TS 32.240 [3]. The Service Data Flow Based Credit Control Function is considered as a new functional entity for release 6 within the Online Charging System.

The OCS may interact as an AF with a CRF to provide input to the CRF for charging rules selection.

The OCS may trigger the TPF to initiate a bearer service termination at any point in time.

NOTE 1: As the OCS performs the credit control functions on a per charging key basis (and thus has not necessarily the knowledge about the existence of any specific service data flow), it is recommended to use different charging keys for any service data flows that shall not be unintentionally interrupted.

There may be several OCSs in a PLMN. To allow for this case, OCS addresses (i.e. the primary address and secondary address) may be passed once per IP network connection from the CRF to the TPF. This information shall be locally pre-configured within the TPF for all users. The addresses provided by the CRF have higher priority than the pre-configured ones.

End of 3rd modified section

Start of 4th modified section

6.2.4 Traffic Plane Function

The TPF shall be capable of differentiating user data traffic belonging to different service data flows for the purpose of collecting offline charging data and performing online credit control.

The TPF shall support predefined charging rules~~, and predefined filters~~. See subclause 5.3 for further filtering and counting requirements.

In the case of online charging, the TPF shall not allow traffic unless ~~network resource usage~~credit has been granted by the OCS. If triggered by the OCS, the TPF shall initiate a bearer service termination.

For online charging, the TPF shall be capable of managing a pool of credit used for some or all of the service data flows of a user. The TPF shall also be capable of managing the credit of each individual service data flow of the user.

A TPF may be served by one or more CRF nodes. For GPRS, the TPF shall contact the appropriate CRF based on the APN , which is the primary mechanism. Optionally, the IMSI or MSISDN may in addition to the APN be used as input for selection of the appropriate CRF. For other IP-CANs the TPF shall contact the appropriate CRF based on the access point connected to and, optionally, a UE identity information that is applicable in that kind of IP-CAN.

NOTE 1: For GPRS the CRF address(es) are configured in the TPF (GGSN) per APN.

For GPRS, it shall be possible to provide flow based charging functions for different service data flows even if they are carried in the same PDP Context. For GPRS, the TPF is a logical function allocated to the GGSN.

For GPRS, the TPF/GGSN applies charging rules on a per PDP context basis.

For each PDP context, the TPF shall accept information during bearer establishment and modification relating to:

- The user and terminal (e.g. MSISDN, IMEISV)
- Bearer characteristics (e.g. QoS negotiated, APN, IM CN Subsystem signaling flag)
- Network related information (e.g. MCC and MNC)

The operator may apply different charging rules and rates depending on different PLMN. The TPF shall be able to provide MCC and MNC of the serving network (i.e. SGSN) to the CRF, which may be used by the CRF in order to select the charging rule to be applied.

The operator may configure whether Flow Based Charging is to be applied.

NOTE 2: For GPRS, PDP Contexts for specific APNs may not be applicable to Flow Based Charging, hence regular GPRS charging would apply for these PDP Contexts, and the TPF function would not be invoked (i.e. no CRF interaction would occur).

The TPF may use this information in the OCS request/reporting or request for charging rules.

For each PDP context, there shall be a separate OCS request/OCF reporting, so this allows the OCS and offline charging system to apply different rating depending on the PDP context.

The TPF shall identify packets that are charged according to service data flow based charging. The TPF shall report the data volume(s) charged according to service data flow based charging. In case of GPRS, the TPF shall report the service data flow based charging data for each charging rule on a per PDP context basis.

At initial bearer establishment the TPF shall request charging rules applicable for this bearer from the CRF. As part of the request, the TPF provides the relevant information to the CRF. The TPF shall use the charging rules received in the response from the CRF. In addition, the TPF shall use any applicable predefined charging rules. Predefined charging rules may apply for all bearers of all users or may be dynamically activated (or deactivated) by the CRF for a specific bearer.

If the bearer is modified, by changing the bearer characteristics, the TPF shall first use the event triggers to determine whether to request the charging rules for the new bearer characteristics from the CRF. Afterwards, the TPF shall use the re-authorisation triggers in order to determine whether to require re-authorisation for the charging rules that were either unaffected or modified.

If the TPF receives an unsolicited update of the charging rules from the CRF, the new charging rules shall be used.

If another bearer is established by the same user (e.g. for GPRS the Secondary PDP Context Activation procedure), the same procedures shall be applied by the TPF as described for the initial bearer. For a bearer, the TPF shall only apply the charging rules that are activated/associated with this bearer. Hence a charging rule is installed, modified and removed on a per PDP context basis. If multiple PDP contexts are active for a UE the CRF may decide that a charging rule is to be activated/associated with more than one PDP context.

The TPF shall evaluate received packets against the service data flow filters in the order according to the precedence for the charging rules. When a packet is matched against a SDF filter, the packet matching process for that packet is complete, and the charging rule for that SDF filter shall be applied. If there is no match against any SDF filter established for that bearer the packet shall be discarded.

End of 4th modified section

Start of 5th modified section

7.4 TPF initiated Bearer Service Termination

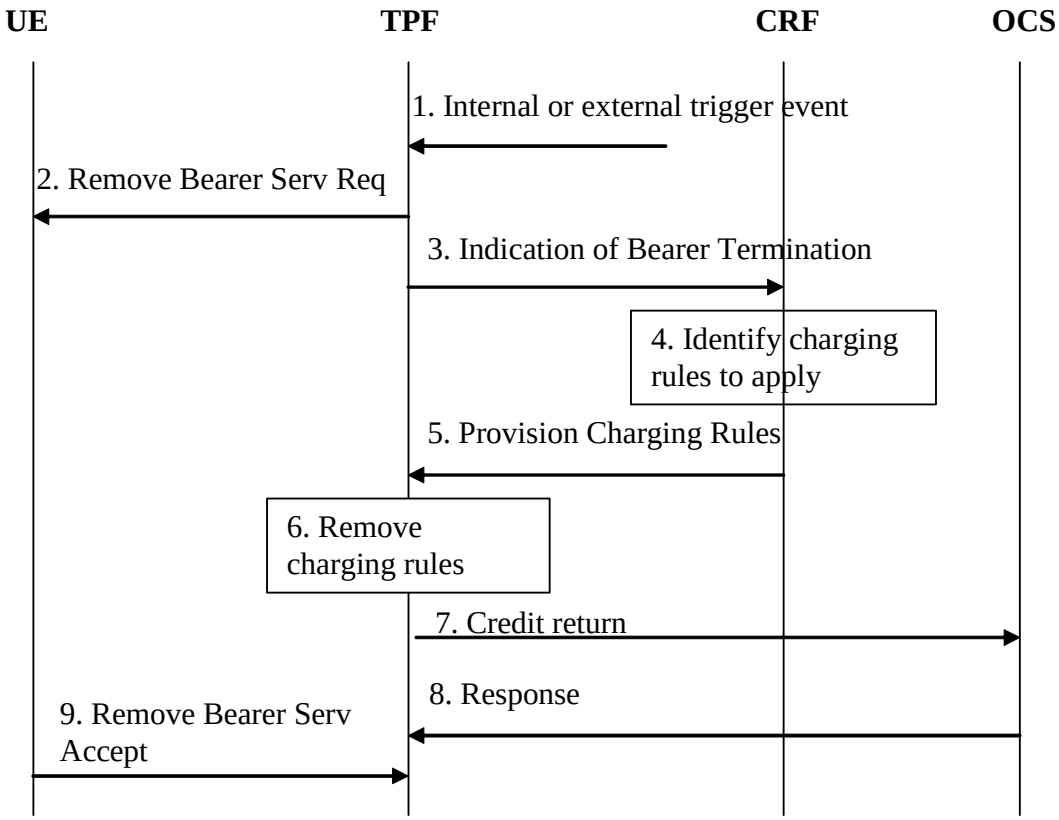

Figure 7.5: TPF initiated Bearer Service Termination

1. The TPF receives a trigger event. This can be the case if there is no charging rule installed for a successfully established bearer service (due to a bearer service modification or due to an unsolicited provisioning of charging rules by the CRF). In case of online charging, this can also be the case that the OCS triggers the TPF to initiate a bearer service termination.

2. The TPF initiates a request to remove a bearer service. For GPRS, this is the GGSN sending a delete PDP context request.

3. The TPF indicates that a bearer service (for GPRS, a PDP context) is being removed and provides relevant information for the CRF.

4. The CRF applies the indication of the bearer service termination to determine whether charging rules need to be provisioned for any other bearer service of the same IP network connection (using an unsolicited provision of charging rules by the CRF as described in 7.3). Charging rules may need to be removed for the terminated bearer service. However, there is no need for the CRF to remove charging rules explicitly.

5. The CRF provides the charging rule information to the TPF. This message is flagged as the response to the TPF request.

6. The TPF performs charging rule actions as indicated, i.e. removing charging rules.

7. In case of online charging, the TPF returns the remaining credit of every charging key to the OCS.

8. In case of online charging, the OCS acknowledges the report to the TPF.

9. The TPF completes the bearer service removal procedure.

NOTE 1: The sequence in the message flow is an example, i.e. the bearer service termination indication can proceed in parallel with the final usage reporting and the bearer service removal procedure. The final sequence will depend on the stage 3 protocol design.

NOTE 2: Further details of the credit control mechanism are expected to be specified by Stage 3.

End of 5th modified section