Technical Specification Group Services and System Aspects **TSGS#27(05)0106**
Meeting #27, 14 - 17 March 2005,Tokyo, Japan

Source: **TSG SA WG2**

Title: **CR(s) to 23.125**

Agenda item: **7.2.3**

Document for: **APPROVAL**

S2 Tdoc	Title	Spec	CR	Rev	Cat	C_Ver	Rel	WI
S2-050476	Application Function Record information	23.125	110	2	F	6.3.0	Rel-6	CH-FBC
S2-050479	FBC flows for bearer event reporting	23.125	112	3	F	6.3.0	Rel-6	CH-FBC
S2-050470	Update of Annex B.4	23.125	113	2	F	6.3.0	Rel-6	CH-FBC
S2-050411	Updates to service data flow identification	23.125	115	1	F	6.3.0	Rel-6	CH-FBC
S2-050474	FBC and MBMS and collection of statistics	23.125	117	2	F	6.3.0	Rel-6	CH-FBC
S2-050477	Removal of the Ry reference point	23.125	118	2	F	6.3.0	Rel-6	CH-FBC
S2-050480	Editorial and readability amendments	23.125	119	2	D	6.3.0	Rel-6	CH-FBC
S2-050475	Introduction of predefined handling in TPF	23.125	122	1	F	6.3.0	Rel-6	CH-FBC
S2-050518	Clarification on the handling of the CRF to the input from the AF	23.125	123	2	F	6.3.0	Rel-6	CH-FBC
S2-050410	Indication of Charging Unit y	23.125	124		F	6.3.0	Rel-6	CH-FBC
S2-050524	FBC and MBMS and changes to requirements on contacting CRF	23.125	125		F	6.6.0	Rel-6	CH-FBC

3GPP TSG-SA Meeting #44 *Tdoc ⌘S2-050476*
Budapest, Hungary, 26th January – 2nd February 2005

CR-Form-v7.1

CHANGE REQUEST

⌘	**23.125**	**CR 110**	⌘**rev**	**2**	⌘ Current version:	**6.3.0** ⌘

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Proposed change affects:	UICC apps⌘ [ ]	ME [ ]	Radio Access Network [ ]	Core Network [X]

Title:	⌘	Application Function Record information		
Source:	⌘	3GPP TSG_SA WG2		
Work item code:	⌘	CH	***Date:*** ⌘	26/01/2005
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:	⌘	Chapter 5.2 refers to “e.g. ICID and flows” for the Application function record information. The “e.g.” is confusing and anyway appropriate detailed information contained in the record information, should be looked for in stage 3. Also this was specified as optional therefore “may” is used.
Summary of change:	⌘	Remove “e.g. ICID and flows” when describing the appliction function record information, and rearrange the text to clarify that the application function record information is optional.
Consequences if not approved:	⌘	Unclear what the application function record information consists of.

Clauses affected:	⌘	5.2			
		Y	**N**		
Other specs affected:	⌘		X	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

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 charging rules for bearer charging are defined by the operator.
- These charging rules are made available to the TPF for both offline and online charging.
- Multiple charging rules are supported simultaneously per user.
- Filtering information within a charging rule is applied through filtering functionality at the TPF to identify the packets belonging to a particular service data flow.
- Charging rules with dynamically provisioned filtering information (i.e. made available to the TPF) are supported in order to cover IP service scenarios where the filtering information is dynamically negotiated (e.g. negotiated on the application level (e.g. 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 filters that are part of the predefined charging rules may support extended capabilities, including enhanced capabilities to identify packets associated with application protocols.
- 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: It's operators' responsibility to ensure that overlap between the predefined charging rules can be resolved based on precedence of each predefined charging rule in the TPF. It's CRF's responsibility to 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;
    - In case of offline charging whether to record volume- or time-based charging information or both;
    - 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 associated with all the charging rules of an IP network connection.

- A CCF 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, t~~T~~he Application Function Record information ~~(e.g. ICID and flow ID(s))~~ is included in the charging rule, and in subsequently generated charging information generated as a result of the rule.~~, if it is provided by an AF and the rule filters are based on the AF provided information.~~ 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 determined it is applied to the service data flow at the TPF and packets are counted and 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 established for a bearer can be modified by the CRF later on, 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 trigger the same TPF behaviour as the simultaneous removal of the old and instalment of the new (modified) charging rule.
- Different charging rules can be applied for different users.
- The same charging rule can be applied for multiple users.
- Different charging rules can be applied based on the location of the user (e.g. based on identity of the roamed to network).
- \- Charging rule assignment can occur at bearer service establishment, modification and termination. For GPRS, charging rule assignment 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 7.3 for the interaction with the TPF.
- For GPRS, the charging rules can be dependent on the APN used.

CR-Form-v7.1

CHANGE REQUEST

⌘	**23.125**	**CR**	**112**	⌘ **rev**	**3**	⌘	Current version:	**6.3.0** ⌘

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Proposed change affects:	UICC apps⌘ [ ]	ME [ ]	Radio Access Network [ ]	Core Network [X]

Title:	⌘	FBC flows for bearer event reporting		
Source:	⌘	3GPP TSG_SA WG2		
Work item code:	⌘	CH-FBC	***Date:*** ⌘	26/01/2005
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:	⌘	Flow based charging supports the feature of notification to the AF of bearer events for the case where the service flow applies to a particular bearer and for the case where all bearers for a UE have been removed. There is currently no flow in the document that supports such notification. This needs to be added.
Summary of change:	⌘	Text is added indicating that the AF can inform the CRF if it wants to be notified of bearer events. A flow is added aligning with the text in 5.8.5 indicating that the CRF may contact the AF for the reporting of bearer events.
Consequences if not approved:	⌘	The document is unclear on how this feature is to be supported.

Clauses affected:	⌘	5.8.5 and new clause 7.2.4				
		Y	**N**			
Other specs affected:	⌘		**X**	Other core specifications	⌘	
			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘					

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

****** First Change ******

5.8.5 Bearer events

SBLP provides means for the Policy Enforcement Function to indicate certain bearer events (e.g. loss of bearer connection) to the Application Function via the Go and Gq interfaces.

In the FBC architecture charging rules are downloaded to the TPF upon bearer events, see clause 7.2 for details. A charging rule either only applies to that particular bearer, or may apply to two or more bearers of a UE IP address:

- In case a charging rule for an AF service flow applies to a particular bearer, it is possible for the CRF to inform the AF about events related to that bearer. Hence, it is possible for the AF to initiate AF session actions accordingly.
- In case a charging rule for an AF service flow applies to more than one bearer of a UE IP address, the CRF informs the AF when all these bearers of a UE IP address have been removed. Hence, when a Charging Rule for a particular service is allowed for multiple bearers, the AF is not aware of the removal of individual bearers.
- The AF shall indicate to the CRF whether or not the CRF shall forward bearer indications (e.g. bearer release indication).

****** Next Change ******

7.2.3 Bearer Service Termination

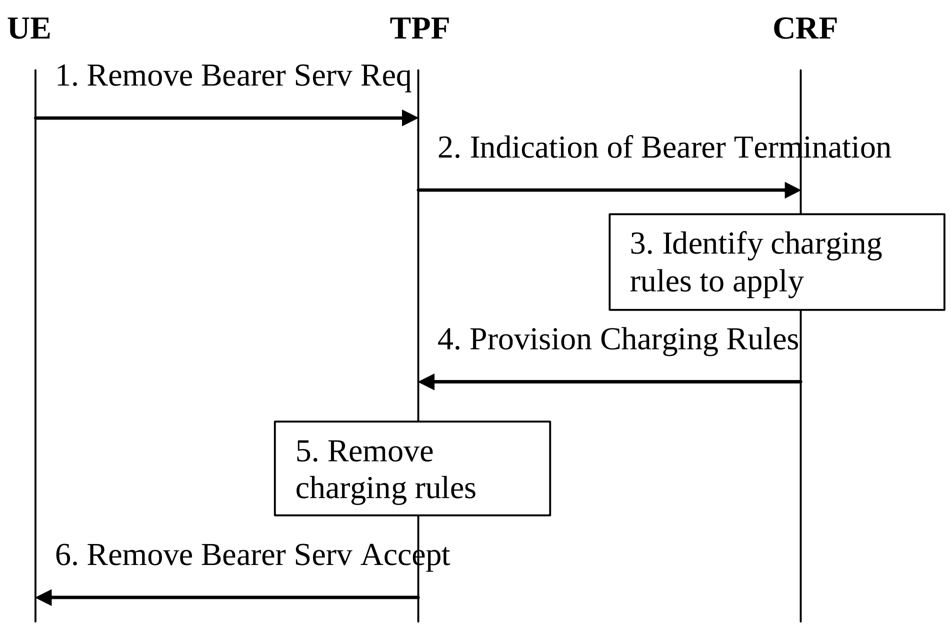

Figure 7.3: Bearer Service Termination in case of offline charging

1 The TPF receives a request to remove a bearer service. For GPRS, this is the GGSN that receives a delete PDP context request.

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

3 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.

4 The CRF provides the charging rule information 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. removing charging rules.

6 The TPF continues with the bearer service removal procedure.

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

Note: The bearer service removal procedure can proceed in parallel with the indication of bearer service termination.

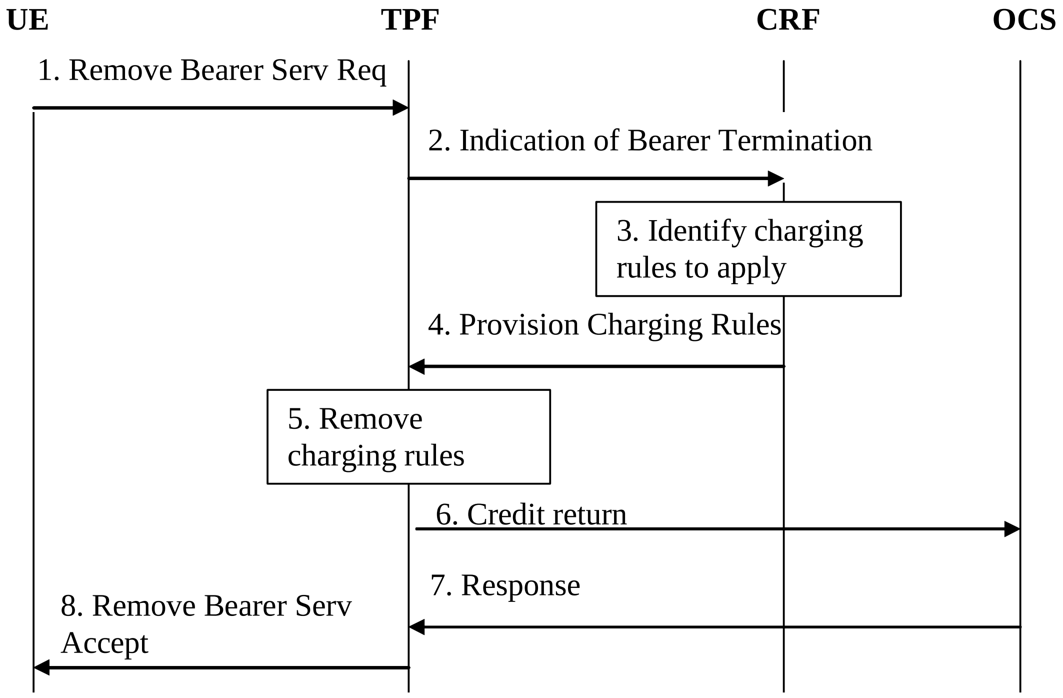

Figure 7.3a: Bearer Service Termination in case of online charging

1. The TPF receives a request to remove a bearer service. For GPRS, this is the GGSN that receives a delete PDP context request.
2. The TPF indicates that a bearer service (for GPRS, a PDP context) is being removed and provides relevant information for the CRF.
3. 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.
4. The CRF provides the charging rule information 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. removing charging rules.

6. The TPF returns the remaining credit of every charging key to the OCS.
7. The OCS acknowledges the report to the TPF.
8. The TPF continues with the bearer service removal procedure.

Note: The bearer service termination indication can proceed in parallel with the final usage reporting and the bearer service removal procedure.

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

7.2.4 Notification of AF on bearer events

Clause 5.8.5 identifies that the CRF may notify the AF of bearer events under certain conditions. This is shown by the flow in Figure 7.3b.

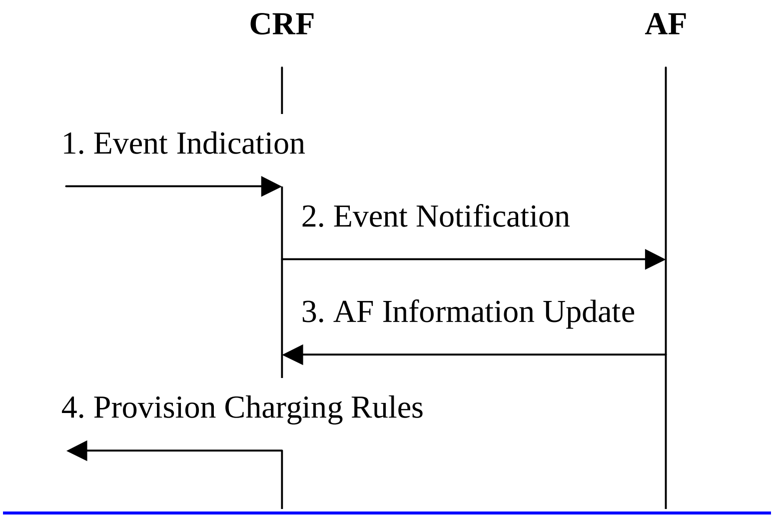

Figure 7.3b: Notification of AF on bearer events

1 The CRF receives an indication from a TPF of a bearer event (see 5.8.5).

2 For the case where the CRF is able to determine that the bearer relates to a specific AF, and the AF has notified the CRF that it wishes to be informed of bearer events, the CRF sends an event notification to the related AF.

3 The AF may initiate any appropriate application actions and responds with any updated information that it may have as input to charging rules selection.

4 Based on the input of the AF and other information, the CRF may update the charging rules to the TPF.

3GPP TSG-SA WG2 Meeting #44 **Tdoc ⌘ S2-050470**
Budapest, Hungary. 26th Jan. - 2nd Feb. 2005.

CR-Form-v7.1

CHANGE REQUEST

⌘	23.125	CR	113	⌘ rev	2	⌘	Current version:	6.3.0	⌘

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Proposed change affects:	UICC apps⌘ [ ]	ME [ ]	Radio Access Network [ ]	Core Network [X]

Title:	⌘	Update of Annex B.4		
Source:	⌘	3GPP TSG_SA WG2		
Work item code:	⌘	CH-FBC	***Date:*** ⌘	02/02/2005
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 specification contains in the informative Annex B.4 a rough message flow describing the simultaneous usage of SBLP and FBC for the same AF session. However, no details are described, especially regarding the relation of SBLP gates and charging rules, the GGSN actions and other impacts on the reference points or the architecture. Therefore, this Annex should be updated to clarify the details of the combination for Rel-6 to have clear requirements for stage 3 work.
Summary of change:	⌘	The Annex B.4 is updated by deleting the rough message flow. Instead a statement is added that the simultaneous use of FBC and SBLP for a single AF session is neither explicitly supported nor explicitly prohibited in this release.
Consequences if not approved:	⌘	The rough message flow may be understood as a requirement to specify the simultaneous usage of SBLP and FBC for the same AF session and thus the same PDP context even although this combination is not part of this release.

Clauses affected:	⌘	Annex B.4				
		Y	**N**			
Other specs affected:	⌘		X	Other core specifications	⌘	
			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘					

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Start of modified section

B.4 Rx/Gx functions and SBLP usage

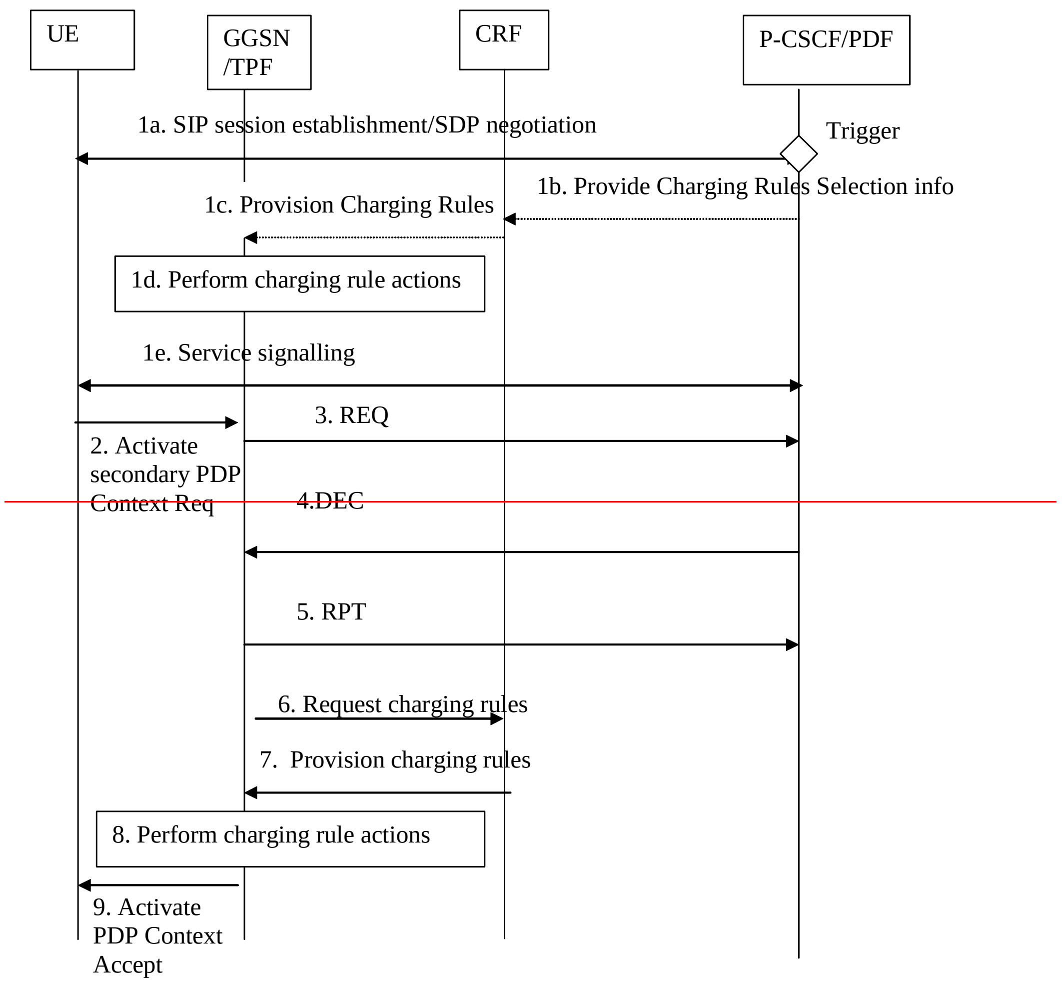
Dynamic media stream filter information for QoS policy and charging correlation may be provided to the GGSN via the Gq and Go interfaces. This is described in TS 23.207 and TR 23.917.

Dynamic and static media stream filter information for charging (data for the charging rules) may be provided to the Traffic Plane Function (GGSN in the case of GPRS) via the Rx and Gx interfaces. This is described in this TS.

These two functions are independent and thus can be provided separately. The simultaneous use of FBC and SBLP for a single AF session is neither explicitly supported nor explicitly prohibited in this Release.

Note: It is considered to be a rare use case and it is expected that the work in future Releases may consider this topic.

~~Mechanisms used for Rx/Gx functions and SBLP can be efficiently used for IMS bearer flow charging as the following description shows.~~



~~**Scenario 1. PDF is co-located with P-CSCF**~~

~~1a. The UE interacts with P-CSCF to establish a SIP session and negotiates the SDP parameters end to end.~~

~~1b. During SIP session establishment, P-CSCF may be triggered to provide charging rules selection info to CRF .~~

~~1c. If required, the CRF installs charging rules for the session's media components for the already active bearers (PDP Contexts) to the TPF.~~

~~1d. The TPF performs charging rule actions as indicated.~~

~~1e. The P-CSCF forwards the service signaling message containing the session description. The P-CSCF shall include the authorization token in this service signaling message.~~

~~2. UE sends activate secondary PDP Context request.~~

~~3. The GGSN sends a COPS REQ message with the Binding Information to the PDF in order to obtain relevant policy information.~~

~~4. The PDF sends a COPS DEC message back to the GGSN/TPF.~~

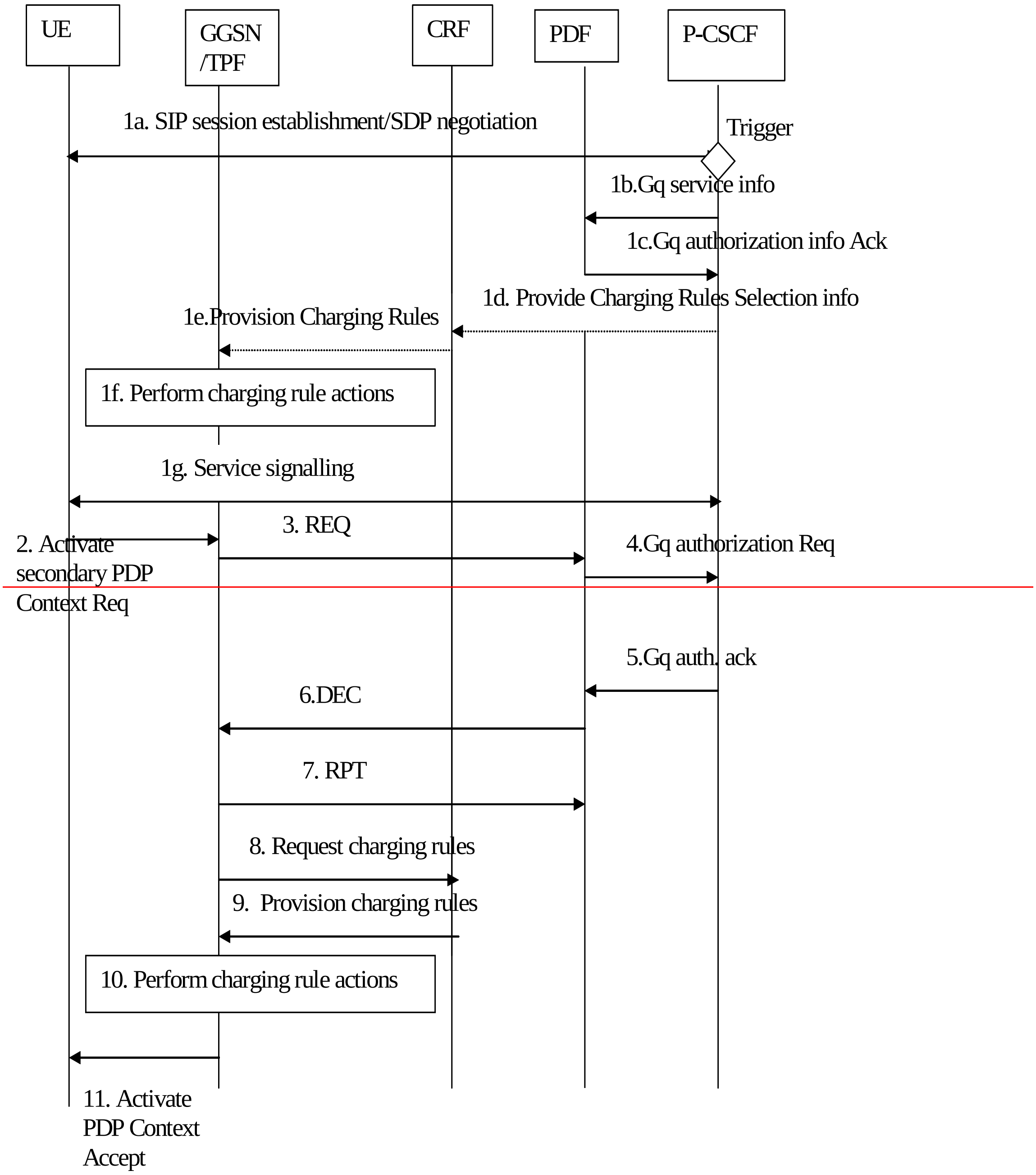
~~5. The GGSN sends a COPS RPT message back to the PDF.~~

~~6. GGSN/TPF requests charging rules from CRF.~~

~~7. CRF provides charging rules to GGSN/TPF.~~

~~8. The TPF performs charging rule actions as indicated.~~

~~9. GGSN sends activate PDP context accept to confirm that bearer service is ready.~~



~~**Scenario 2. Gq interface is used**~~

~~1a. The UE interacts with P-CSCF to establish a SIP session and negotiates the SDP parameters end to end.~~

~~1b~1c. During SIP session establishment, P-CSCF may be triggered to send a request for authorization token to the PDF with full service information, which includes session description information based on the session signaling.~~

~~1d. Based on SIP session information and local policy, P-CSCF may provide charging rules selection info to CRF immediately after Gq interface interaction.~~

~~1e. If required, the CRF installs charging rules for the session's media components for the already active bearers (PDP Contexts) to the TPF.~~

~~1f. The TPF performs charging rule actions as indicated.~~

~~1g. The P-CSCF forwards the service signaling message containing the session description. The P-CSCF shall include the authorization token in this service signaling message.~~

~~2. UE sends activate secondary PDP Context request.~~

~~3. The GGSN sends a COPS REQ message with the Binding Information to the PDF in order to obtain relevant policy information.~~

~~4. Further interaction between the P-CSCF and the PDF to provide the full service information is needed. PDF sends an authorisation request to P-CSCF.~~

~~5. P-CSCF responds to PDF's request.~~

~~Note: step 4,5 only happen when further interaction between PDF and P-CSCF is needed.~~

~~6. PDF sends a COPS DEC message back to the GGSN/TPF.~~

~~7. GGSN sends a COPS RPT message back to the PDF.~~

~~8. GGSN/TPF requests charging rules from CRF.~~

~~9. CRF provides charging rules to GGSN/TPF.~~

~~10. The TPF performs charging rule actions as indicated.~~

~~11. GGSN sends activate PDP context accept to confirm that bearer service is ready.~~

End of modified section

3GPP TSG-SA WG2 Meeting #44 **Tdoc ⌘S2-050411**
Budapest, Hungary, 26th January – 2nd February 2005.

CR-Form-v7.1

CHANGE REQUEST

⌘	**23.125**	**CR**	**115**	⌘**rev**	**1**	⌘	Current version:	**6.3.0**	⌘

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

Title:	⌘	Updates to service data flow identification		
Source:	⌘	3GPP TSG_SA WG2		
Work item code:	⌘	CH-FBC	***Date:*** ⌘	01/02/2005
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:	⌘	A charging key may not uniquely identify a service. It can only identify a service uniquely when it is unique for that services. The current text in the TS 23.125 can be interpreted in a way that a Charging Key could uniquely identify a service which may not be possible.
Summary of change:	⌘	Clarify that the CK may not be sufficient for service flow identification. An editorial change of the format in 5.2.
Consequences if not approved:	⌘	The TS is not distinct which could lead to implementation problems.

Clauses affected:	⌘	5.2, 5.4				
		Y	**N**			
Other specs affected:	⌘		X	Other core specifications	⌘	
			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘					

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****** FIRST 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 charging rules for bearer charging are defined by the operator.
- These charging rules are made available to the TPF for both offline and online charging.
- Multiple charging rules are supported simultaneously per user.
- Filtering information within a charging rule is applied through filtering functionality at the TPF to identify the packets belonging to a particular service data flow.
- Charging rules with dynamically provisioned filtering information (i.e. made available to the TPF) are supported in order to cover IP service scenarios where the filtering information is dynamically negotiated (e.g. negotiated on the application level (e.g. 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 filters that are part of the predefined charging rules may support extended capabilities, including enhanced capabilities to identify packets associated with application protocols.
- 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: It’s operators’ responsibility to ensure that overlap between the predefined charging rules can be resolved based on precedence of each predefined charging rule in the TPF. It’s CRF’s responsibility to 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;
    - In case of offline charging whether to record volume- or time-based charging information or both;
    - 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 associated with all the charging rules of an IP network connection.
- A CCF 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.
- The Application Function Record information (e.g. ICID and flow ID(s)) is included in the charging rule, and in subsequently generated charging information generated as a result of the rule, if it is provided by an AF and the rule filters are based on the AF provided information. 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 determined it is applied to the service data flow at the TPF and packets are counted and 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 established for a bearer can be modified by the CRF later on, 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 trigger the same TPF behaviour as the simultaneous removal of the old and instalment of the new (modified) charging rule.
- Different charging rules can be applied for different users.
- The same charging rule can be applied for multiple users.
- Different charging rules can be applied based on the location of the user (e.g. based on identity of the roamed to network).

~~- Charging rule assignment can occur at bearer service establishment, modification and termination. For GPRS, charging rule assignment 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 7.3 for the interaction with the TPF.~~

~~- For GPRS, the charging rules can be dependent on the APN used.~~- Charging rule assignment can occur at bearer service establishment, modification and termination. For GPRS, charging rule assignment 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 7.3 for the interaction with the TPF.
- For GPRS, the charging rules can be dependent on the APN used.

****** NEXT MODIFIED SECTION ********

5.4 Reporting

~~This~~ Reporting refers to the differentiated charging information being reported to the online or offline charging functions. Note that reporting usage to the online charging function is distinct from requesting quotas for online credit control. ~~Basic example: those 20 packets were in rating category A, include this in your global charging information.~~Hence multiple charging rules may share the same charging key for which one quota is assigned whereas reporting may be at higher granularity if serviced identifier level reporting is used.

- The TPF shall report bearer charging information for online charging;

- The TPF shall report bearer charging information for offline charging;
- Charging information is reported based on the application of the bearer charging rules in the TPF (service data flow related charging information), and in the case of GPRS, as specified in [3] (per PDP context);
- The TPF shall report triggered Events of an existing charging rule for both offline and on-line charging;
- The TPF shall report triggered re-authorisation of existing charging keys for on-line charging;
- The TPF shall report charging information for each bearer and charging key value;
- Depending on the configuration of a charging rule the TPF may report charging information for each charging key/service identifier;
  - For reporting purposes a) the charging key value identifies a service data flow if the charging key value is unique for that particular service data flow and b) if the service identifier level reporting is present then the service identifier value of the charging rule together with the charging key identify the service data flow.
- A report may contain multiple containers, each container associated with a charging key/service identifier;
- It shall be possible to associate per PDP context charging information with the corresponding service data flow based charging information.

****** END OF CHANGE *******

3GPP TSG-SA WG2 Meeting #44 **Tdoc ⌘S2-050474**
Budapest, Hungary, 26th January – 2nd February 2005.

CR-Form-v7.1

CHANGE REQUEST

⌘	**23.125**	**CR**	**117**	⌘**rev**	**2**	⌘	Current version:	**6.3.0** ⌘

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:	⌘	FBC and MBMS and collection of statistics		
Source:	⌘	3GPP TSG_SA WG2		
Work item code:	⌘	CH-FBC	***Date:*** ⌘	01/02/2005
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 MBMS services as a special case is currently not consideredin the FBC TS. It could however be useful for an operator to collect statistics how much resources a particular MBMS service has concumed in the GGSN. FBC can be used for this purpose. The data produced by FBC for MBMS can e.g. be used for charging a 3rd party supplier.
Summary of change:	⌘	Clarifies that FBC may be used for collecting statistics by using pre-defined charging rules that are specifically related to MBMS bearer contexts.
Consequences if not approved:	⌘	The TS does not consider that FBC may be used for charging a 3rd party supplier

Clauses affected:	⌘	2, 5.2				
		Y	**N**			
Other specs affected:	⌘	X		Other core specifications	⌘	TS 23.246
			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘					

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

****** FIRST MODIFIED SECTION ********

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 41.001: "GSM Release specifications".

[2] 3GPP TS 21.905: "Vocabulary for 3GPP Specifications".

[3] 3GPP TS 32.200: "Charging Principles".

[4] 3GPP TS 23.228: "IP Multimedia (IM) Subsystem - Stage 2".

[5] 3GPP TS 23.002: "Network architecture".

[6] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service description; Stage 2".

[7] 3GPP TS 32.225: "Telecommunication management; Charging management; Charging data description for the IP Multimedia Subsystem (IMS)".

[8] 3GPP TS 23.078: "Customised Applications for Mobile network Enhanced Logic (CAMEL); Stage 2".

[9] Diameter Credit-Control Application, draft-ietf-aaa-diameter-cc-06.txt, work in progress

Editor's note: The above document cannot be formally referenced until it is published as an RFC.

[10] 3GPP TS 23.234: "3GPP system to Wireless Local Area Network (WLAN) Interworking"

[11] 3GPP TR 33.919: "Generic Authentication Architecture (GAA)"

[12] 3GPP TS 23.207: "End-to-end Quality of Service (QoS) concept and architecture"

[xx] 3GPP TS 23.246: "Multimedia Broadcast/Multicast Service (MBMS)"

****** NEXT 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 charging rules for bearer charging are defined by the operator.
- These charging rules are made available to the TPF for both offline and online charging.
- Multiple charging rules are supported simultaneously per user.
- Filtering information within a charging rule is applied through filtering functionality at the TPF to identify the packets belonging to a particular service data flow.

- Charging rules with dynamically provisioned filtering information (i.e. made available to the TPF) are supported in order to cover IP service scenarios where the filtering information is dynamically negotiated (e.g. negotiated on the application level (e.g. 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 filters that are part of the predefined charging rules may 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, cf. TS 23.246 [xx]. 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: It's operators' responsibility to ensure that overlap between the predefined charging rules can be resolved based on precedence of each predefined charging rule in the TPF. It's CRF's responsibility to 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;

  - In case of offline charging whether to record volume- or time-based charging information or both;

  - 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 associated with all the charging rules of an IP network connection.

- A CCF 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.

- The Application Function Record information (e.g. ICID and flow ID(s)) is included in the charging rule, and in subsequently generated charging information generated as a result of the rule, if it is provided by an AF and the rule filters are based on the AF provided information. 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 determined it is applied to the service data flow at the TPF and packets are counted and 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 established for a bearer can be modified by the CRF later on, 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 trigger the same TPF behaviour as the simultaneous removal of the old and instalment of the new (modified) charging rule.
- Different charging rules can be applied for different users.
- The same charging rule can be applied for multiple users.
- Different charging rules can be applied based on the location of the user (e.g. based on identity of the roamed to network).
- - Charging rule assignment can occur at bearer service establishment, modification and termination. For GPRS, charging rule assignment 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 7.3 for the interaction with the TPF.
- For GPRS, the charging rules can be dependent on the APN used.

****** END OF CHANGE *******

3GPP TSG-SA WG2 Meeting #44 **Tdoc ⌘S2-050477**
Budapest, Hungary. 26th Jan. - 2nd Feb. 2005.

CR-Form-v7.1

CHANGE REQUEST

⌘	23.125	CR	118	⌘ rev	2	⌘	Current version:	6.3.0	⌘

*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:	⌘	Removal of the Ry reference point	
Source:	⌘	3GPP TSG_SA WG2	
Work item code:	⌘	CH-FBC	***Date:*** ⌘ 01/02/2005
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 23.125 does not pose any specific requirements for the Ry reference point, but expects that it is identical to the Rx.
Summary of change:	⌘	All references to the Ry reference point are removed. It is added that the OCS may act as an AF with a CRF.
Consequences if not approved:	⌘	The Ry reference point is an alias for the Rx reference point, serving no other purpose.

Clauses affected:	⌘	6.1.1, 6.2.2, 6.3.5, 7.1, 7.1a				
		Y	**N**			
Other specs Affected:	⌘		**X**	Other core specifications	⌘	
			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘					

How to create CRs using this form:

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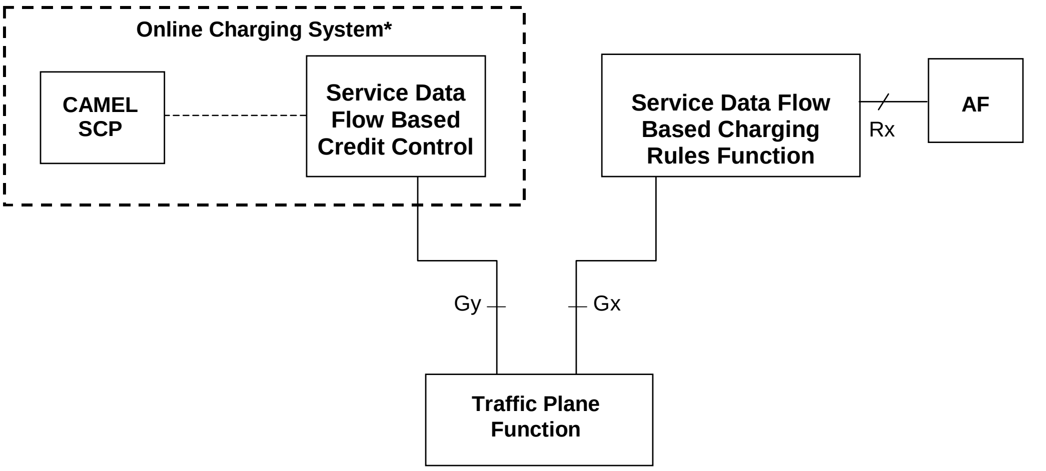
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

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

6.1.1 Online service data flow based bearer charging architecture

Figure 6.1 below presents the overall architecture for service data flow based online bearer charging.



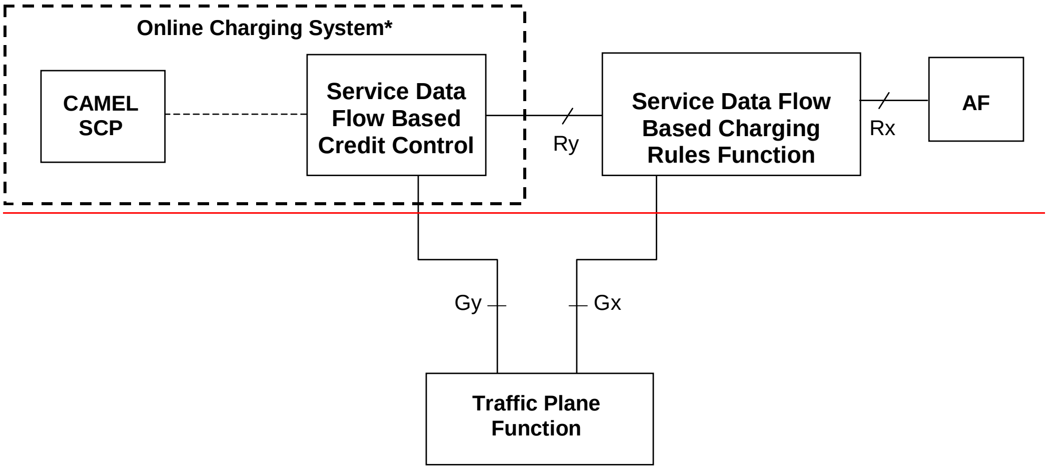


Figure 6.1: Overall architecture for service data flow based online bearer charging

Note(*): The detailed functional entities of the Online Charging System are not shown in this figure. The details of the OCS are specified in [3].
The CAMEL-SCP depicted on the figure above performs the functions as defined in [8].

Note: The OCS may interact as an AF with a CRF

****** 2nd 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 3GPP TS 32.200 [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 can interact with the CRF, by using the Ry interface. This allows the OCS to provide input to the CRF for charging rules selection.~~

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.

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

~~6.3.5 Ry reference point~~

~~The Ry reference point enables transport of information (e.g. charging rules selection information) from the OCS to the CRF. The functionality supported over the Ry reference point should be the same as for the Rx reference point and a common interface specification is expected.~~

7 Message Flows

7.1 AF input to provision of charging rules

The AF may provide the CRF with application/service data flow charging information as described in 6.2.5. This information is used by the CRF to determine and complete the appropriate charging rules to send to the TPF. It is an AF decision when to send this information and the CRF takes the AF input into account from the point that it receives the AF information. The AF input may trigger an unsolicited provision of charging rules by the CRF as described in 7.3.

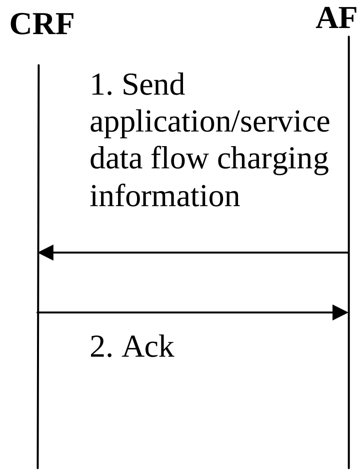
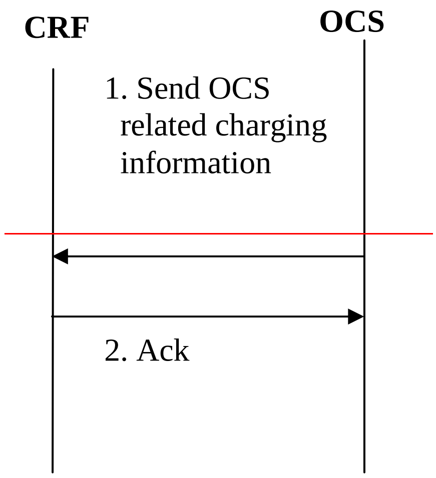


Figure 7.0a: AF input to provision of charging rules

1. The AF sends application/service data flow charging information. The AF may include IMSI/MSISDN in addition to the IP Address of the UE

2. If the AF only provides the IP Address of the UE the CRF acknowledges the AF input. If the AF in addition to the IP Address of the UE also provides the IMSI/MSISDN the CRF performs, based on the operator configuration, a check of the UE identities provided by the AF against the UE identities provided by the TPF. After the identity matching procedures the CRF informs the AF about the result. For GPRS the CRF receives the IMSI and MSISDN from the TPF at bearer establishment.

~~7.1a OCS input to provision of charging rulesThe OCS may provide the CRF with OCS related charging information. It is an OCS decision when to send this information and the CRF takes the OCS input into account from the point that it receives the OCS information. The OCS input may trigger an unsolicited provision of charging rules by the CRF as described in 7.3.~~



~~**Figure 7.0b: OCS input to provision of charging rules**~~

~~1. The OCS sends OCS related charging information~~

~~2. The CRF acknowledges the OCS input.~~

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

3GPP TSG-SA WG2 Meeting #44 **Tdoc ⌘S2-050480**
Budapest, Hungary. 26th Jan. - 2nd Feb. 2005.

CR-Form-v7.1

CHANGE REQUEST

⌘	23.125	CR	119	⌘ rev	2	⌘	Current version:	6.3.0	⌘

*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:	⌘	Editorial and readability amendments
Source:	⌘	3GPP TSG_SA WG2
Work item code:	⌘	CH-FBC — ***Date:*** ⌘ 01/02/2005
Category:	⌘	**D** — ***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 23.125 has been elaborated prior to the charging specifications have been available. 23.125 therefore refers to Rel-5 charging specifications, which do not exist in Rel-6 because they have been assigned new TS numbers. The 23.125 has a few missing words, malformed phrasings etc.
Summary of change:	⌘	• The [1] TS 41.001 is withdrawn and no descendant extists. • For Rel-6, the [3] TS 32.200 descendant is TS 32.240. • The [4] TS 23.228 is not used in the spec. • The [7] TS 32.225 has a descendant in Rel-6, however not relevant for FBC. Replaced by TS 32.251. • The CCF was defined in the TS 32.200. The proper counterpart in TS 32.240 is the CGF or the GDF. This is clarified. • Unifying the spelling of online and offline with TS 32.240 (hyphen removed). • Editorial amendments without any intent to change the factual content.
Consequences if not approved:	⌘	Invalid references to Rel-5 specifications, for which a Rel-6 descendant exists. FBC and charging architecture not aligned. Misleading and/or less legible text.

Clauses affected:	⌘	2, 3, 4.1, 4.3.1, 5.1, 5.2, 5.3, 5.4, 5.5, 5.8.2, 6.1.2, 6.2.1, 6.2.2, 6.2.3, 6.2.4, 6.3.2, 6.3.3, 7.2.1, A.2.7, D.2.1

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

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

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

2 References

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[1] ~~3GPP TR 41.001: "GSM Release specifications"~~Void.

[2] 3GPP TS 21.905: "Vocabulary for 3GPP Specifications".

[3] 3GPP TS 32.~~200~~240: "Telecommunication management; Charging management; Charging architecture and principles~~Principles~~".

[4] ~~3GPP TS 23.228: "IP Multimedia (IM) Subsystem - Stage 2"~~Void.

[5] 3GPP TS 23.002: "Network architecture".

[6] 3GPP TS 23.060: "General Packet Radio Service (GPRS); Service description; Stage 2".

[7] 3GPP TS 32.~~225~~251: "Telecommunication management; Charging management; Packet Switched (PS) domain charging~~Charging data description for the IP Multimedia Subsystem (IMS)~~".

[8] 3GPP TS 23.078: "Customised Applications for Mobile network Enhanced Logic (CAMEL); Stage 2".

[9] Diameter Credit-Control Application, draft-ietf-aaa-diameter-cc-06.txt, work in progress

Editor's note: The above document cannot be formally referenced until it is published as an RFC.

[10] 3GPP TS 23.234: "3GPP system to Wireless Local Area Network (WLAN) Interworking"

[11] 3GPP TR 33.919: "Generic Authentication Architecture (GAA)"

[12] 3GPP TS 23.207: "End-to-end Quality of Service (QoS) concept and architecture"

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.~~225~~ 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
~~CCF~~CDF	Charging ~~Collection~~ 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
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

4 General Requirements

4.1 General

The current level of traffic differentiation and traffic-type awareness of the GPRS architecture shall be extended beyond APN and PDP Context level. It shall be possible to apply differentiated charging for the traffic flows belonging to different services (a.k.a. different service data flows) even if they use the same PDP Context.

In addition, it shall be possible to apply differentiated charging for the traffic flows belonging to different services carried by other IP Connectivity Access Networks (IP-CANs).

Charging and tariffing models described in this Technical Specification shall be possible to be applied to both prepaid and postpaid subscribers, i.e. to both online and offline charging.

Online and offline are not the same as prepaid and postpaid (see TS 32.~~225~~ 240 [~~7~~3]). For example it is worth highlighting that the operator can have postpaid subscribers on credit control by using on~~-line~~line charging mechanisms.

The GPRS online charging solutions up to release 5 are built around CAMEL mechanisms that provide online access- and charging-control for GPRS - pertaining to PDP Contexts of an APN.

The flow based charging architecture developed in this Technical Specification shall use generic native IP charging mechanisms to the extent possible in order to enable the reuse of the same charging solution and infrastructure for different type of IP-Connectivity Networks.

Note: Providing differentiated service data flow based charging is a different function from providing differentiated traffic treatment on the IP-flow level. The operation of service data flow based charging shall not mandate the operation of service based local policy.

In addition charging based on specific application services or protocols shall be supported.

4.2 Backwards compatibility

The capabilities of the enhanced architecture introduced with flow based charging shall be backwards compatible with the release 5 charging capabilities. These new functions shall be compatible and coherent with the authentication, authorization, PDP context management, roaming and other functions provided by the release 5 architecture.

It shall be possible to collect data volumes per PDP context for use in billing and operational management systems.

Flow based charging is assumed to provide complete coverage of all traffic, but it shall be possible to collect statistics on data volumes, which were not subject to service data flow based charging.

In case of GPRS the data volumes may be charged according to the GPRS offline charging mechanisms.

In case of GPRS, when service data flow based online charging is applied in the GGSN, other GPRS online charging procedures need not be applied to packets counted by FBC.

4.3 Charging models

4.3.1 General

When developing the charging solutions, the following charging models should be considered, even though the full solution to support the models may not be within the scope of this TS.

Shared revenue services shall be supported. In this case settlement for all parties shall be supported, including the third parties that may have been involved providing the services.

The charging solution shall allow various charging models such as:

- Volume based charging;
- Time based charging;
- Volume and time based charging;
- No charging.

It shall be possible to apply different rates and charging models when a user is identified to be roaming from when the user is in the home network.

It shall be possible to restrict special rates to a specific service, e.g. allow the user to download a certain volume of data from one service for free, but this allowed volume is not transferable to other services. It shall be possible also to apply special rates based on the time of day.

It shall be possible to enforce per-service usage limits for a service data flow using online charging on a per user basis (may apply to pre~~-paid~~paid and postpaid users).

It shall be possible for online charging systems to check the amount of data used over some time period. The online charging systems can provide both volume credit and time indication. In case the TPF detects the counted volume reaches the volume credit or the counted time reaches the indicated period of time, the TPF shall send a request for credit to the OCS with the remaining time value and/or remaining credit volume.

In the case of online charging, it shall be possible to perform rating and allocate credit depending on the characteristics of the bearer resources allocated initially (in the GPRS case, the QoS of the PDP context).

The flow based bearer level charging can support dynamic selection of charging to apply. A number of different inputs can be used in the decision to identify the specific charging to apply. For example, a service data flow may be charged with different rates depending on what QoS is applicable. The charging rate may thus be modified when a bearer is created or removed, to change the QoS provided for a service data flow.

The charging rate or charging model applicable to a service data flow may also be changed as a result of events in the service (e.g. insertion of a paid advertisement within a user requested media stream). The charging model applicable to a service data flow may also change as a result of events identified by the OCS (e.g. after having spent a certain amount, the user gets to use some services for free). The charging rate or charging model applicable to a service data flow may also be changed as a result of having used the service data flow for a certain amount of time and/or volume.

In the case of online charging, it shall be possible to apply an online charging action upon TPF events (e.g. re-authorization upon QoS change).

It shall be possible to indicate to the TPF that interactions with the charging systems are not required for a charging rule, i.e. to perform neither accounting nor credit control for this service data flow.

4.3.2 Examples of Service Data Flow Charging

There are many different services that may be used within a network, including both user-user and user-network services. Service data flows from these services may be identified and charged in many different ways. A number of examples of configuring charging rules for different service data flows are described below.

A network server provides an FTP service. The FTP server supports both the active (separate ports for control and data) and passive modes of operation. A charging rule is configured for the service data flows associated with the FTP server for the user. The charging rule uses a filter specification for the uplink that identifies packets sent to port 20 or 21 of the IP address of the server, and the origination information is wildcarded. In the downlink direction, the filter specification identifies packets sent from port 20 or 21 of the IP address of the server.

A network server provides a “web” service. A charging rule is configured for the service data flows associated with the HTTP server for the user. The charging rule uses a filter specification for the uplink that identifies packets sent to port 80 of the IP address of the server, and the origination information is wildcarded. In the downlink direction, the filter specification identifies packets sent from port 80 of the IP address of the server.

The same server also provides a WAP service. The server has multiple IP addresses, and the IP address of the WAP server is different from the IP address of the web server. The charging rule uses the same filter specification as for the web server, except the IP address is different.

An operator offers a zero rating for network provided DNS service. A charging rule is established setting all DNS traffic to/from the operators DNS servers as offline charged. The data flow filter identifies the DNS port number, and the source/destination address within the subnet range allocated to the operators network nodes.

An operator has a specific charging rate for user-user VoIP traffic over the IMS. A charging rule is established for this service data flow. The filter information to identify the specific service data flow for the user-user traffic is provided by the P-CSCF.

An operator is implementing UICC based authentication mechanisms for HTTP based services utilizing the GAA Framework as defined in TR 33.919 [11] by e.g. using the Authentication Proxy. The Authentication Proxy may appear as an AF and provide information to the CRF for the purpose of selecting an appropriate Charging Rule.

5 Flow Based Charging Concepts

5.1 Overview

The following functions are provided by the network for service data flow based charging. This applies to both online and offline charging unless otherwise specified:

- Identification of the service data flows that need to be charged individually (e.g. at different rates), and those that can be handled as an aggregate;
- Provision and control of charging rules on service data flow level;
- In the GPRS case: Provision and control of charging rules on a per PDP context basis;
- Reporting of service data flow level byte counts (for volume based charging) and service data flow durations (for time based charging);
- Event indication according to on~~-line~~line charging procedures (e.g. sending AAA Accounting Stop) and, optionally, following this particular event, taking appropriate actions on service data flow(s) according to the termination action.
- Event indication and event monitoring by the TPF and following this particular event, taking the appropriate on~~-line~~line charging actions.
- In addition FBC Policy Functions may be achieved by activating/deactivating charging rules according to the policies of the operator.

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 ~~charging rules for bearer charging are defined by the operator~~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.
- ~~These~~ Charging rules are installed at ~~charging rules are made available to~~ 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 ~~Charging rules with~~ dynamically ~~provisioned~~ generate and install charging rules ~~filtering information (i.e. made available to the TPF) are supported~~ in order to cover IP service scenarios where the filtering information is dynamically negotiated (e.g. negotiated on the application level ~~(e.g.~~ 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 ~~that are part of the predefined charging rules may~~ support extended capabilities, including enhanced capabilities to identify packets associated with application protocols.
- 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: ~~It's~~ The operator shall~~s' responsibility to~~ ensure that overlap between the predefined charging rules can be resolved based on precedence of each predefined charging rule in the TPF. ~~It's~~ The ~~CRF's~~ CRF shall ~~responsibility to~~ 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;
  - In case of offline charging whether to record volume- or time-based charging information or both;
  - 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 ~~CCF~~OCF 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.

- The Application Function Record information (e.g. ICID and flow ID(s)) is included in the charging rule, and in subsequently generated charging information generated as a result of the rule, if it is provided by an AF and the rule filters are based on the AF provided information. 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 ~~determined~~ installed at the TPF, the TPF ~~it is~~ ~~applied~~ applies ~~to~~ the rule to detect the service data flow and counts ~~at~~ the ~~TPF and~~ packets, ~~are counted and~~ 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 ~~established~~ installed for a bearer can be modified by the CRF~~-later on~~, 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 trigger ~~the same~~equivalent TPF behaviour as the CRF ~~simultaneous~~simultaneously ~~removal~~ removing ~~of~~ the old and ~~instalment of~~installing the new (modified) charging rule.

- Different charging rules can be ~~applied~~ installed for different users.

- The same charging rule can be ~~applied~~ installed for multiple users.

- Different charging rules can be ~~applied~~ installed based on the location of the user (e.g. based on identity of the roamed to network).

- Installation of the ~~Charging~~ charging ~~rule~~rules ~~assignment~~ can occur at bearer service establishment, modification and termination. For GPRS, charging rule ~~assignment~~ 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 7.3 for the interaction with the TPF.

- For GPRS, the charging rules can be dependent on the APN used.

5.3 Service data flow ~~filters~~ detection and counting

This section refers to the ~~filtering~~ detection process that identifies and counts the packets of each ~~the~~ service data ~~flows~~ flow that requires different FBC treatment, ~~need~~ e.g. they are to be charged individually (e.g. at different rates~~)~~. Separate treatment is possible when the resulting charging key values are different. ~~Basic example: look for packets of one service, e.g. to and from a server A.~~

- Service data flow filters are unidirectional, so that ~~Separate~~ independent ~~filtering~~ detection and counting can be applied for downlink and uplink. ~~The service data flow filters are specified separately for the uplink and downlink direction.~~

Note: A charging rule may ~~provide~~include ~~information for a~~ service data flow filters for one direction, or for both directions.

- ~~Different granularity for service~~ Service data flow filters identifying the service data flow may be more or less detailed~~is possible e.g~~:~~.~~

  - Filters based on the IP 5 tuple (source IP address, destination IP address, source port number, destination port number, protocol ID of the protocol above IP). Port numbers and protocol ID may be wildcarded. IP addresses may be wildcarded or masked by a prefix mask.

- ~~Special~~ Predefined filters ~~which~~ may extend the packet inspection beyond the IP 5 tuple and look further into the packet, or ~~require~~ define other ~~complex~~ operations (e.g. maintaining state). Such filters may be predefined in the TPF and activated by the CRF using standardised means. Such filters may be used to support filtering with respect to a service data flow based on the transport and application protocols used above IP. This shall be possible for HTTP and WAP. This includes the ability to differentiate between TCP, Wireless-TCP according to WAP 2.0, WDP, etc, in addition to differentiation at the application level. Filtering for further application protocols and services may also be supported.

- In the case of GPRS, the TPF supports simultaneous and independent ~~filtering on~~ service data flow~~s~~ ~~associated with~~detection on each individual active PDP context.

- The TPF shall discard a packet ~~In~~ in case ~~of~~ there is no ~~applicable~~ installed and matching ~~filters for a~~ service data flow filter for that particular bearer (PDP context in the case of GPRS)~~, the TPF shall discard the packets for this service data flow~~. To avoid the TPF ~~automatically~~ discarding packets due to no matching ~~applicable~~ service data flow filter~~charging rules~~, the operator may define generic charging rules (with wild-carded ~~packet~~ service data flow filters) to allow for default charging for the packets that don't match any service data flow filter of the other charging rules.

- The service data flow ~~filters~~ detection and counting ~~are applied by~~are functions in the TPF (the GGSN in the case of GPRS).

- The TPF shall maintain a counter per bearer (for GPRS, PDP context) and Charging Key and per Service identifier if Service identifier level reporting is required.

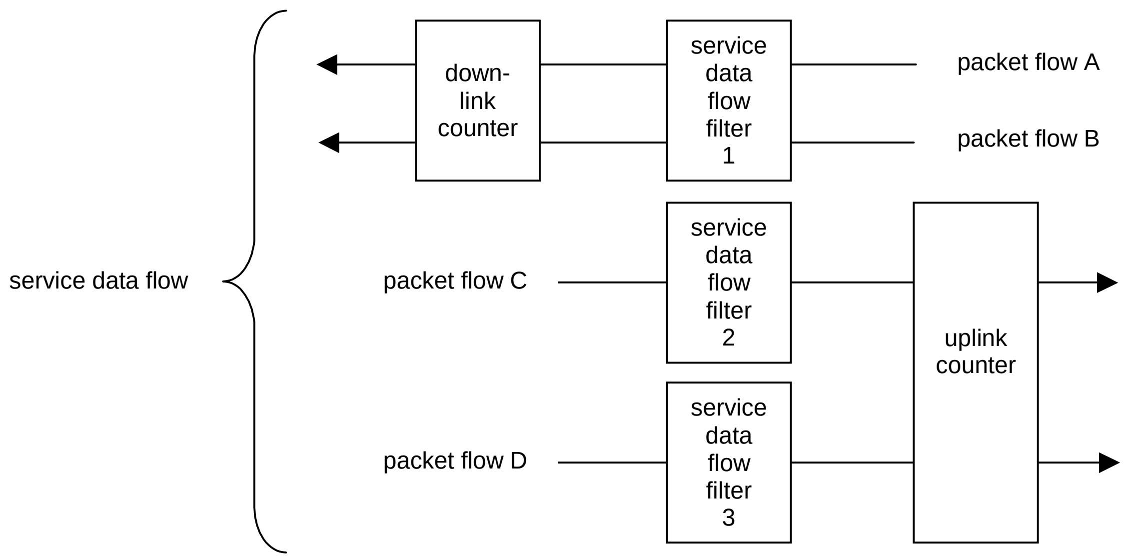

Figure 5.1 – Relationship of service data flow, packet flow and service data flow filter

5.4 Reporting

This refers to the differentiated charging information being reported to the online or offline charging functions. Note that reporting usage to the online charging function is distinct from requesting quotas for online credit control. Basic example: those 20 packets were in rating category A, include this in your global charging information.

- The TPF shall report bearer charging information for online charging;

- The TPF shall report bearer charging information for offline charging;

- Charging information is reported based on the result from the service data flow detection and counting process ~~application of the bearer charging rules in the TPF (service data flow related charging information),~~ and in the case of GPRS~~,~~ reporting occurs as specified in TS 32.251 [~~3~~7] (per PDP context);
- The TPF shall report triggered Events of an existing charging rule for both offline and on~~-line~~line charging;
- The TPF shall report triggered re-authorisation of existing charging keys for on~~-line~~line charging;
- The TPF shall report charging information for each bearer and charging key value;
- ~~Depending on the configuration of a charging rule the~~The TPF ~~may~~ shall report charging information for each charging key/service identifier;
- A report may contain multiple containers, each container associated with a charging key/service identifier;
- It shall be possible to associate per PDP context charging information with the corresponding service data flow based charging information.

5.5 Credit management

Online charging credits shall operate on a per charging key basis~~.~~.

Note: ~~This implies that where independent~~ Independent credit control ~~is required~~ for an individual service data flow may be achieved by assigning~~, then the charging rule applying to that flow must have~~ a unique charging key value for the charging rule.

The TPF shall support credit management on a per bearer basis.

~~In case of online charging, i~~It shall be possible for the OCS to apply re-authorisation of credit in case of particular events as described in section 5.7.

~~In case of online charging,~~It shall be possible for the OCS to form a credit ~~can be~~ pool~~ed~~ for multiple (one or more) charging keys, applied at the Traffic Plane Function, e.g. with the objective of avoiding credit fragmentation. ~~A pool of credit applying to a single charging key is equivalent to an individual credit limit for that charging key.~~ Multiple pools of credit shall be allowed per bearer.

Note: A pool of credit applying to a single charging key is equivalent to an individual credit limit for that charging key.

The OCS shall strictly control the rating decisions. The OCS shall also control the credit pooling decisions. The OCS shall, when credit ~~provision~~ authorization is sought, either ~~provide~~ grant a new pool of credit, together with a new credit limit, or a reference to a pool of credit that is already ~~exists at the TPF~~granted.

The grouping of charging keys into pools ~~in this way~~ shall not restrict the ability of the OCS to do credit authorisation and provide termination action individually for each charging key of the pool.

Note: ‘credit’ as used here does not imply actual monetary credit, but an abstract measure of resources available to the user. The relationship between this abstract measure, actual money, and actual network resources or data transfer, is controlled by the OCS.

It shall be possible for the OCS to group service data flows charged at different rates or in different units (e.g. time/volume) into the same pool.

****** 2nd 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/~~CCF~~OCF, 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.

****** 3rd 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.

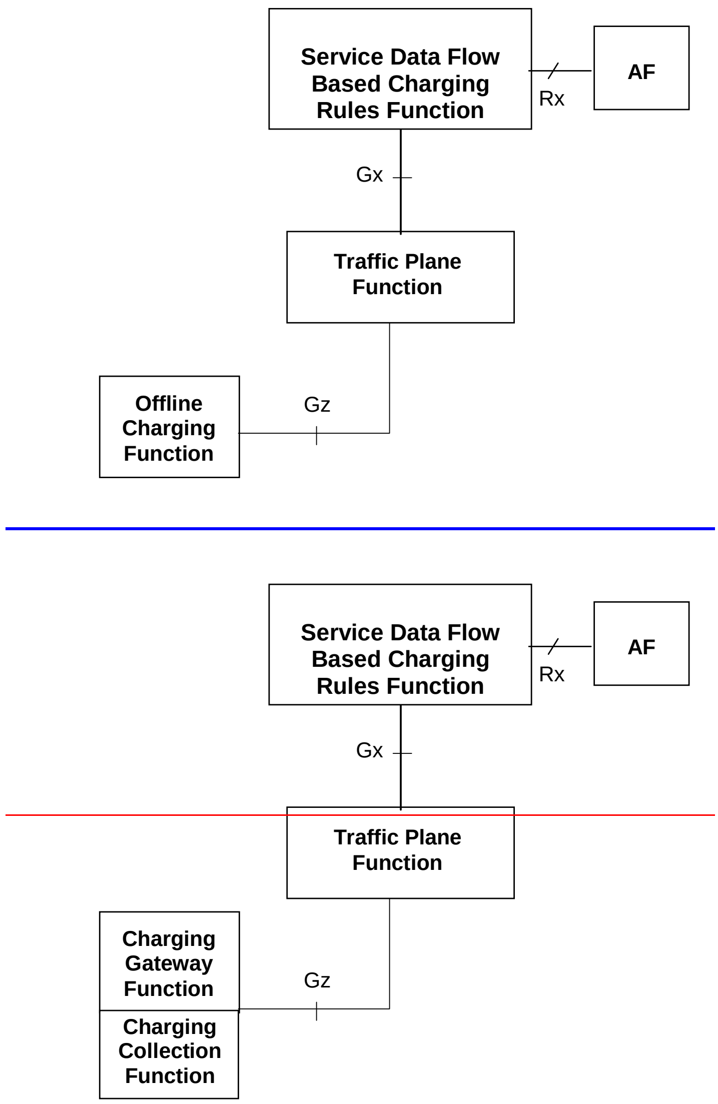

Figure 6.2: Overall architecture for service data flow based offline bearer charging

Note: ~~The CCF depicted on the figure above performs the functions as defined in [3].~~The Offline Charging Function (OCF) for Flow Based Charging may be either a CGF or a CDF as defined in TS 32.240 [3].

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

6.2.1 Based Charging Rules Function

The CRF provides service data flow level charging rules. This functionality is required for both offline and online charging. The CRF accesses information stored in the service data flow based charging rules data repository. An external interface to the charging rules data repository may be used for management of the charging rules within the data repository. Specification of interfaces to the data repository is out of scope of this TS.

The CRF supports both dynamic activation of predefined charging rules in the TPF and dynamic charging rules that are downloaded to the TPF.

The CRF determines what charging rules (including precedence) to apply for a user. The applicable charging rules are determined based on information available to the CRF including that received from the TPF, i.e. information about the user, the bearer characteristics, and the network related information. When a further request for charging rules from the TPF or information from an AF arrives the CRF shall be able to identify whether new charging rules need to be transferred to the TPF and respond accordingly.

The CRF will receive information from the AF that allows a service data flow to be identified, and this information may be used within the charging rule (i.e. protocol, IP addresses and port numbers). Other information that is received by the CRF (~~i.~~e.g. application identifier, type of stream) may be used in order to select the charging rule to be applied.

For a specific AF, the CRF shall apply the AF input to the charging rule completion and selection to all charging rules of the user.

A CRF node may serve multiple TPFs.

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 3GPP TS 32.~~200~~ 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 can interact with the CRF, by using the Ry interface. This allows the OCS to provide input to the CRF for charging rules selection.

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.

6.2.3 Offline Charging ~~Collection~~ Function

The Offline Charging ~~Collection~~ Function is specified in 3GPP TS 32.~~200~~ 240 [3].

There may be several ~~CCF~~OCFs in a PLMN. To allow for this case, ~~CCF~~OCF 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: 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 operators 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 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/~~CCF~~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.

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

6.3.2 Gy reference point

The Gy reference point allows online credit control for service data flow based ~~online~~ charging. The functionalities required across the Gy reference point use existing functionalities and mechanisms for example based on [9].

6.3.3 Gz reference point

The Gz reference point enables transport of service data flow based offline charging information.

For GPRS the relationship of the Gz reference point and the existing Ga interface is subject to investigation in SA5.

The Ga interface is specified by TS 32.~~200~~ 240 [3].

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

7.2.1 Bearer Service Establishment

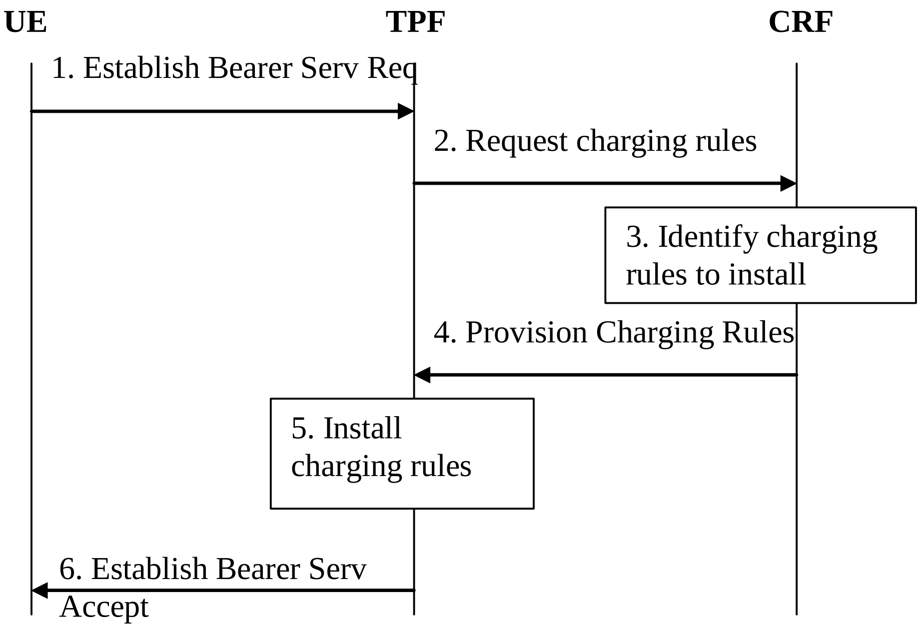

Figure 7.1: Bearer Service Establishment in case of offline charging

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 ~~and associated~~ event triggers, ~~CCF~~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 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.

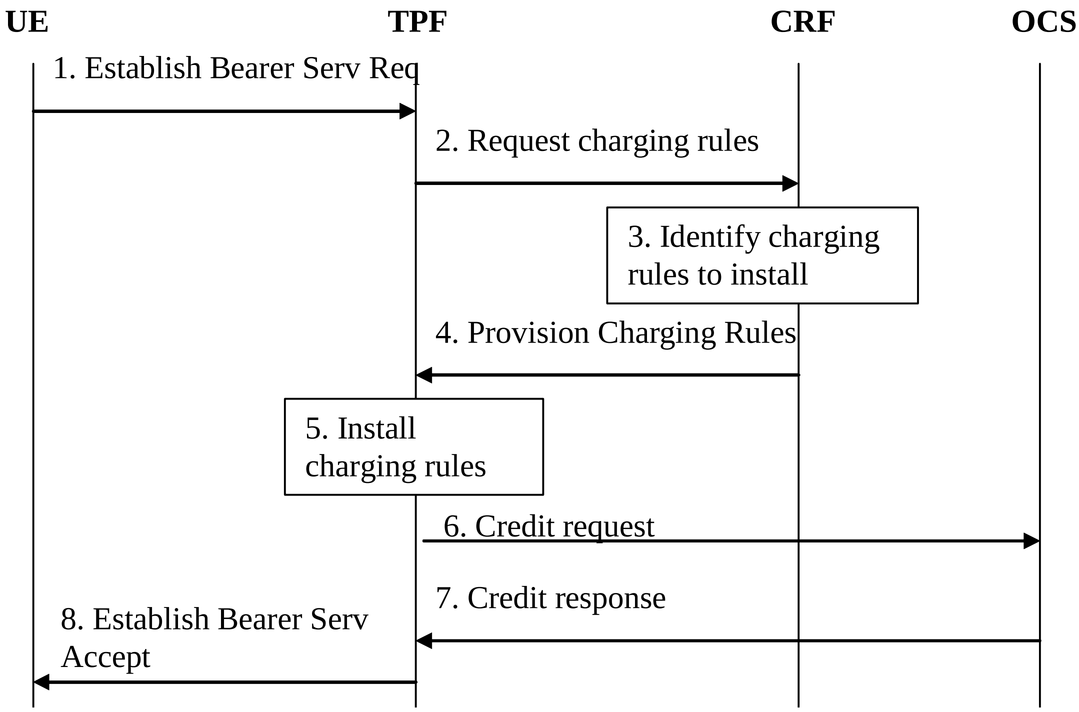

Figure 7.2: Bearer Service Establishment in case of online charging

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, ~~CCF~~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. 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 ******

A.2.7 CAMEL information

Some CAMEL functionality relates to SGSN based on~~-line~~line charging. When using SGSN based on~~-line~~line charging, GGSN based on~~-line~~line charging is unlikely to also be used. However, other CAMEL functionality relates to APN ID manipulation; SGSN resource utilisation, and the provision for the gsmSCF to write a "free format field" to the main CDR. This information appears to be useful to transfer to the GGSN.

Overall it appears simplest to transfer all the S-CDR CAMEL Information as one parameter from the SGSN to the GGSN. The format and encoding of this information element should be constructed in an extensible manner, hopefully by just referencing the encoding already used within 3GPP TS 32.215.

This information element should be included in the Create PDP Context Request and Update PDP Context Request messages.

****** 8th modified section ******

D.2.1 Charging correlation

The FBC architecture provides an alternative bearer charging mechanism. The charging key passed to the OCS/~~CCF~~OCF 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-WG2 Meeting #44
Budapest, Hungary, January 26- February 2, 2005

Tdoc ⌘ S2-050475

CR-Form-v7.1

CHANGE REQUEST

⌘	**23.125**	**CR**	**122**	⌘ **rev**	**1**	⌘	Current version:	**6.3.0**	⌘

*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:	⌘	Allowing charging without FBC functionality		
Source:	⌘	3GPP TSG_SA WG2		
Work item code:	⌘	CH-FBC	***Date:*** ⌘	01/02/2005
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:	⌘	According to the current 23.125, once a bearer is established, the TPF shall request the charging rule from CRF, then basing on the obtained charging rule, the TPF could be able to identify the corresponding service data flow. However, in the actual network, for some particular bearers, it shall be possible to perform charging without involving FBC functionality (i.e. without invoking the TPF). E.g. in case of GPRS, an operator may configure that for some specified APNs, the common GPRS charging mechanism shall be performed (i.e. counting and reporting on a per PDP context basis), for other APNs the TPF shall perform flow based charging. Therefore, there is a need for the operator to be able to configure whether FBC applies or not. This also presents a convenient mechanism to the operators to reduce the impact when they upgrade their network to support FBC functionality. The operator may use different APNs to split FBC needed services and common GPRS charging mechanism needed services. In this way, it's easier to keep good compatibility to the current running services.
Summary of change:	⌘	When a bearer is established, it shall be checked whether FBC functionality is to be launched for this bearer.
Consequences if not approved:	⌘	It remains unclear how the application of FBC for a particular bearer is decided in the network

Clauses affected:	⌘	6.2.4

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

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

<< First changed clause >>

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: 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~~s~~ 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: 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/CCF 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 changed clause >>

3GPP TSG-SA WG2 Meeting #44 **S2-050518**
Budapest, Hungary. 26th Jan. - 2nd Feb. 2005.

CR-Form-v7.1

CHANGE REQUEST

⌘	**23.125**	**CR**	**123**	⌘ **rev**	**2**	⌘	Current version:	**6.3.0**	⌘

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:	⌘	Clarification on the handling of the CRF to the input from the AF			
Source:	⌘	3GPP TSG_SA WG2			
Work item code:	⌘	CH-FBC	***Date:***	⌘	30/01/2005
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:	⌘	In the current specificatin, it is not clear on the handling of the CRF to the input application/service data flow charging information from the AF. If an AF which is not allowed to pass the application/service information decides on its own to send informaiton to the CRF, and the CRF does not do any check to this AF, the consequence will be dangerous and the process burden of the CRF will be huge. In some cases, it will do harm to the normal processing of the CRF, for example, the AF located in the third party network continues to send irrelated information that can not be used by the CRF to select a charging rule. Therefore, on receiving the application/service data flow charging information from the AF, based on the operator's configuration, the CRF should check whether the AF is allowed to pass the application/service information to the CRF.
Summary of change:	⌘	Based on the operator's configuration, the CRF will check whether the AF is allowed to pass the information to the CRF.
Consequences if not approved:	⌘	The AF located in the third party network may send unrelated information to the CRF, which will affect the process efficiency of the CRF.

Clauses affected:	⌘	6.3.4.1				
		Y	**N**			
Other specs affected:	⌘		**X**	Other core specifications	⌘	
			X	Test specifications		

	X O&M Specifications	
Other comments:	⌘	

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2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

6.3.4.1 General

The Rx reference point enables transport of information (e.g. dynamic media stream information) from the AF to the CRF. An example of such information would be filter information to identify the service data flow. The AF and the CRF, which may reside in the same or different security domain, shall have a trust relationship. Hence the information exchanged between an AF and a CRF shall be protected with adequate security.

Further the CRF may check whether the AF is allowed to pass application/service information to the CRF.

3GPP TSG-WG2 Meeting #44 **Tdoc ⌘ S2-050410**
Budapest, Hungary, January 26- February 2, 2005

CR-Form-v7.1

CHANGE REQUEST

⌘	**23.125**	**CR**	**124**	⌘ **rev**	**-**	⌘	Current version:	**6.3.0** ⌘

*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:	⌘	Indication of charging unit		
Source:	⌘	3GPP TSG_SA WG2		
Work item code:	⌘	CH-FBC	***Date:*** ⌘	01/02/2005
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:	⌘	In the current charging rule, in case of offline charging, it's CRF's responsibility to indicate the TPF whether to record volume- or time-based charging information or both. However, the online charging case also supports to record volume- or time-based charging information or both. There is no corresponding description about how to indicate the TPF which charging model shall be applied.
Summary of change:	⌘	In case of offline charging, the Indication of charging unit is used to indicate the TPF whether to record volume- or time-based charging information or both; In case of online charging, the indication of charging unit is passed as a part of credit control.
Consequences if not approved:	⌘	Inconsistency and ambiquity are remained in the speicification.

Clauses affected:	⌘	5.2				
		Y	**N**			
Other specs affected:	⌘		**X**	Other core specifications	⌘	
			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘					

How to create CRs using this form:
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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

<< First changed clause >>

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 charging rules for bearer charging are defined by the operator.
- These charging rules are made available to the TPF for both offline and online charging.
- Multiple charging rules are supported simultaneously per user.
- Filtering information within a charging rule is applied through filtering functionality at the TPF to identify the packets belonging to a particular service data flow.
- Charging rules with dynamically provisioned filtering information (i.e. made available to the TPF) are supported in order to cover IP service scenarios where the filtering information is dynamically negotiated (e.g. negotiated on the application level (e.g. 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 filters that are part of the predefined charging rules may support extended capabilities, including enhanced capabilities to identify packets associated with application protocols.
- 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: It's operators' responsibility to ensure that overlap between the predefined charging rules can be resolved based on precedence of each predefined charging rule in the TPF. It's CRF's responsibility to 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, ~~I~~in case of offline charging whether to record volume- or time-based charging information or both;

Notes: 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 associated with all the charging rules of an IP network connection.
- A CCF 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.
- The Application Function Record information (e.g. ICID and flow ID(s)) is included in the charging rule, and in subsequently generated charging information generated as a result of the rule, if it is provided by an AF and the rule filters are based on the AF provided information. 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 determined it is applied to the service data flow at the TPF and packets are counted and 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 established for a bearer can be modified by the CRF later on, 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 trigger the same TPF behaviour as the simultaneous removal of the old and instalment of the new (modified) charging rule.
- Different charging rules can be applied for different users.
- The same charging rule can be applied for multiple users.
- Different charging rules can be applied based on the location of the user (e.g. based on identity of the roamed to network).
- - Charging rule assignment can occur at bearer service establishment, modification and termination. For GPRS, charging rule assignment 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 7.3 for the interaction with the TPF.
- For GPRS, the charging rules can be dependent on the APN used.

<< End of changed clause >>

3GPP TSG-SA WG2 Meeting #44 **Tdoc ⌘S2-050524**
Budapest, Hungary, 26th January – 2nd February 2005.

CR-Form-v7.1

CHANGE REQUEST

⌘	23.125	CR	125	⌘rev	-	⌘	Current version:	6.3.0	⌘

*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:	⌘	FBC and MBMS and changes to requirements on contacting CRF		
Source:	⌘	3GPP TSG_SA WG2		
Work item code:	⌘	CH-FBC	***Date:*** ⌘	01/03/2005
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:	⌘	In the GPRS case FBC only operates on a per pdp context basis. TS 23.246 assumes that FBC can be used for MBMS charging such that the BM-SC acts as an AF towards the CRF. However TS 23.125 has not been developed to support MBMS Bearer Contexts and/or relation to a particular subscriber cf. e.g. the Gx interface. This need to be clarified in the TS 23.125. It is however suitable to apply application level charging for MBMS and that charging applies in the BM-SC as described in TS 23.246. The current text describing the requirements for an AF to contact a CRF are more restrictive than necessary and require an AF to wait for interaction with a UE in order to provide information for a charging rule. This restriction is not necessary for some configurations and should be changed.
Summary of change:	⌘	Clarifies that FBC has not been defined to support MBMS Bearer Contexts over the Gx interface. The restriction that the AF must always know the IP address of the UE is removed.
Consequences if not approved:	⌘	The TS may lead to implementation problems since FBC do not support that charging rules are installed, modified or removed on a per MBMS bearer context basis.

	Some applications will not be able to utilize FBC

Clauses affected:	⌘	5.1, 6.2.5				
		Y	**N**			
Other specs affected:	⌘	**X**		Other core specifications	⌘	TS 23.246
			X	Test specifications		
			X	O&M Specifications		
Other comments:	⌘	This CR combines the CR 111r2 (S2-050418) and 116r2 (S2-050472).				

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

****** FIRST MODIFIED SECTION ********

5.1 Overview

The following functions are provided by the network for service data flow based charging. This applies to both online and offline charging unless otherwise specified:

- Identification of the service data flows that need to be charged individually (e.g. at different rates), and those that can be handled as an aggregate;
- Provision and control of charging rules on service data flow level;
- In the GPRS case: Provision and control of charging rules on a per PDP context basis;
- Reporting of service data flow level byte counts (for volume based charging) and service data flow durations (for time based charging);
- Event indication according to on-line charging procedures (e.g. sending AAA Accounting Stop) and, optionally, following this particular event, taking appropriate actions on service data flow(s) according to the termination action.
- Event indication and event monitoring by the TPF and following this particular event, taking the appropriate on-line charging actions.
- In addition FBC Policy Functions may be achieved by activating/deactivating charging rules according to the policies of the operator.

Note: The CRF does not operate on a per MBMS bearer context basis i.e. it is not possible for a CRF to install, remove or modify charging rules in the TPF on a per MBMS bearer context basis.

****** NEXT MODIFIED SECTION ********

6.2.5 Application Function

The AF provides information to the service data flow based CRF, which can then be used for selecting the appropriate charging rule, and also used for configuring some of the parameters for the charging rule. The operator configures the charging rules in the service data flow based CRF, and decides what data from the AF shall be used in the charging rule selection algorithm.

An AF may communicate with multiple CRFs. The AF shall contact the appropriate CRF based on either:-

- the end user IP Address and/or,~~;~~

- other UE identity information the AF is aware of.

Note: By using the end user IP address, an AF is not required to acquire any UE identity in order to provide information, for a specific user, to the CRF.

~~- the end user IP address and any other UE identity information the AF is aware of.~~

When contact is not based on the end user IP address, the AF shall assure that it communicates with any CRF that might be used for this service (APN).

Note: Since MBMS is using MBMS Bearer Contexts a BM-SC cannot act as an AF since Gx in the case of GPRS only operates on flows within a PDP context in this release.

The AF shall provide information to allow the service data flow to be identified. The AF shall also provide some other information that may be used in the charging rule selection process.

The information provided by the AF is as follows:

Information to identify the service data flow: refer to subclause 5.3.
The AF may use wildcards to identify an aggregate set of IP flows.

- Optional Application Function Record information that would be included in charging data generated by the AF and by the TPF and could be used to associate the records for post processing.
- Information to support charging rule selection:
  - Application identifier;
  - Application event identifier;
  - Type of Stream (e.g. audio, video) (optional);
  - Data rate of stream (optional);
  - User information (such as user identity).

The “Application Identifier” is an identifier associated with each service that an AF provides for an operator (e.g. a packet streaming service AF would have one application identifier for the service).

The “Application event identifier” is an identifier within an Application identifier. It is used to notify the Service Data Flow Based CRF of such a change within a service session that affects the charging rules, e.g. triggers the generation of a new charging rule.

****** END OF CHANGE *******