3GPP TSG-SA Meeting #26 **TSGS#26(04)0753**
13th – 16th December 2004. Athens, Greece.

Source: **TSG SA WG2**
Title: **CRs on 23.125 (IP Flow Based Bearer Level Charging)**
Agenda item: **7.2.3**
Document for: **APPROVAL**

The following CRs have been agreed by TSG SA WG2 and are requested to be approved by TSG SA plenary #26.

Note: *the source of all these CRs is now SA2, even if the name of the originating company(ies) is still reflected on the cover page of all the attached CRs.*

S2 doc #	Title	Spec	CR #	Rev	Cat	C_Ver	Rel	WI
S2-043762	CCF/OCS address clarifications	23.125	78	3	F	6.2.0	Rel-6	CH-FBC
S2-043108	Connection maintenance	23.125	79	1	F	6.2.0	Rel-6	CH-FBC
S2-043106	Modification of charging rules	23.125	80	1	F	6.2.0	Rel-6	CH-FBC
S2-043378	Clarify that SGSN event is MCC/MNC related	23.125	83	2	F	6.2.0	Rel-6	CH-FBC
S2-043379	Clarify the handling of PDP contexts	23.125	85	2	F	6.2.0	Rel-6	CH-FBC
S2-043375	Clarify that Charging Rules apply on a per PDP context basis	23.125	86	2	F	6.2.0	Rel-6	CH-FBC
S2-043109	CRF addressing	23.125	88	1	F	6.2.0	Rel-6	CH-FBC
S2-043325	Removal of FFS notes	23.125	89	1	D	6.2.0	Rel-6	CH-FBC
S2-043376	Clarify the terminology related to instances	23.125	91	2	F	6.2.0	Rel-6	CH-FBC
S2-043280	Clarification of Credit Pooling	23.125	92	1	F	6.2.0	Rel-6	CH-FBC
S2-043323	Clarify that CRF is responsible for policy control functions in FBC	23.125	93		F	6.2.0	Rel-6	CH-FBC
S2-043906	selecting the charging rule	23.125	94	3	F	6.2.0	Rel-6	CH-FBC
S2-043758	Security considerations between CRF and AF	23.125	95	1	B	6.2.0	Rel-6	CH-FBC
S2-043759	Selection of the appropriate CRF by a TPF for a user in GPRS.	23.125	96	1	B	6.2.0	Rel-6	CH-FBC
S2-043760	Clarification of volume and time based charging	23.125	98	1	F	6.2.0	Rel-6	CH-FBC
S2-043904	clarification of online charging procedure	23.125	99	2	F	6.2.0	Rel-6	CH-FBC
S2-043618	Update of bearer termination message flow	23.125	101		F	6.2.0	Rel-6	CH-FBC
S2-043905	Updates to Rx handling	23.125	103	2	C	6.2.0	Rel-6	CH-FBC

3GPP TSG-SA2 Meeting #42
Sophia Antipolis, France, 11th – 15th October, 2004

Tdoc ⌘ S2-043106

CR-Form-v7

CHANGE REQUEST

⌘ **23.125** **CR** **080** ⌘ **rev** **1** ⌘ Current version: **6.2.0** ⌘

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

Title:	⌘	Modification of charging rules
Source:	⌘	Siemens
Work item code:	⌘	CH-FBC
Date:	⌘	12/10/2004
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:

2	*(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)*

Reason for change:	⌘	The current specification describes the possibility to modify a charging rule that was previously provided by the CRF and established in the TPF. However, it is not described which parts of a charging rule may be modified.
Summary of change:	⌘	It is clarified that apart from the charging rule identifier and the charging method (online, offline, neither) all parts of a charging rule may be modified. Furthermore, it is stated that the 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. The information flows for unsolicited charging rule provision is updated to include the possibility of modification.
Consequences if not approved:	⌘	It is not clear which parts of a charging rule may be affected by modifications.

Clauses affected:	⌘	5.2, 7.3			
Other specs affected:	⌘	**Y**	**N**		
			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.

Start of 1st 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 Traffic Plane function 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 Traffic Plane Function to identify the packets belonging to a particular service data flow.
- Charging rules with dynamically provisioned filtering information (i.e. made available to the Traffic Plane Function) 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)).
- Pre-defined charging rules stored in the TPF are supported. The charging rule identifiers of the pre-defined charging rules shall be different from the charging rule identifiers allocated by the CRF.
- Elements of charging rules may be statically configured at the Traffic Plane Function, or dynamically provisioned.

Note-i: The mechanism to support use of elements statically pre-defined in the TPF (e.g. filter information) is for stage 3 development.

Note-ii: The stage 3 development may also evaluate providing an optimisation to support dynamic provisioning of an entire charging rule pre-defined in the TPF.

- Pre-defined filters that are part of the pre-defined 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 pre-defined charging rules in the TPF;
    - multiple charging rules from the CRF;
    - charging rules pre-defined in the TPF and rules from the Service Data Flow Based Charging Rules Function, which can overlay the pre-defined 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 pre-defined 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' responsibity to ensure that overlap between the pre-defined charging rules can be resolved based on precedence of each pre-defined charging rule in the TPF. It's CRF's responsibity 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);

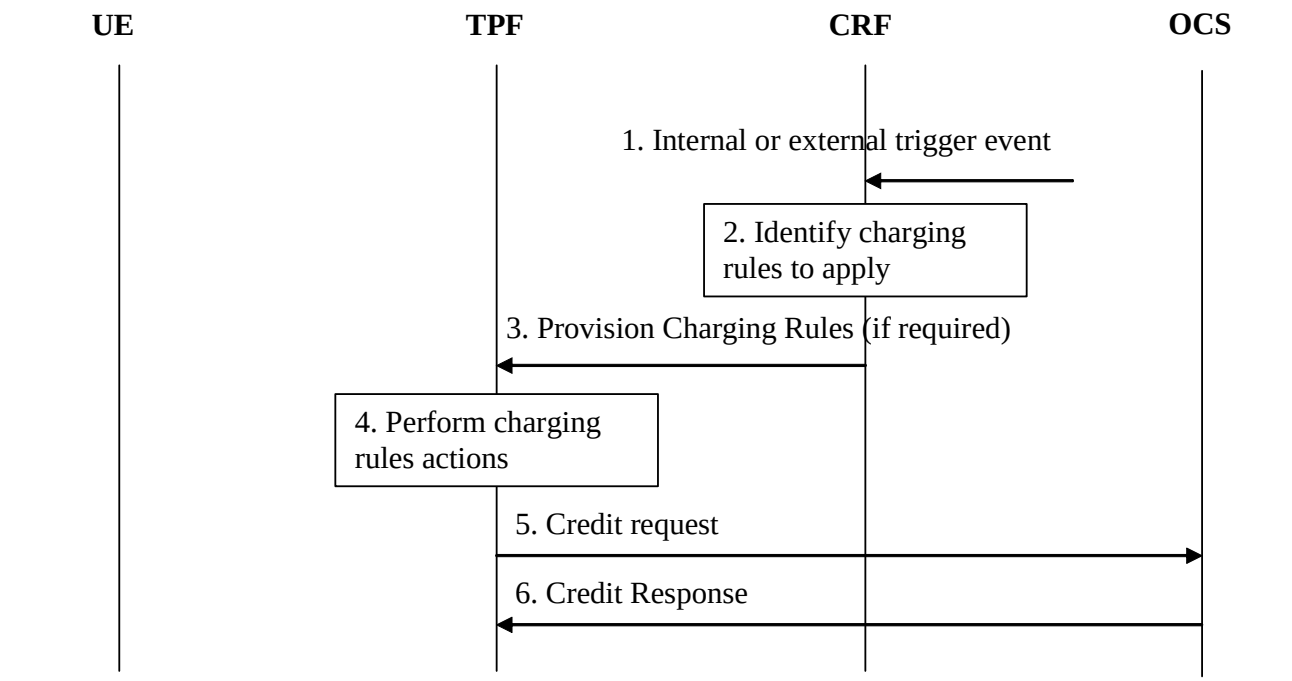
  - Precedence (used at the TPF to determine the order in which charging rules shall be applied to a service data flow);
  - Charging rule identifier (used between CRF and TPF for referencing charging rules);
  - Application Function Record Information.

- Event triggers and/or CCF/OCS addresses are associated with all charging rules for a user and IP network connection.
- The charging rule identifiers allocated by the CRF shall be unique for a CRF/TPF instance.
- 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 Application Function and the rule filters are based on the Application Function 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 Traffic Plane Function 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.
- Charging rules that were provided by the CRF and established for a bearer can ~~change and~~ be ~~overridden~~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, the charging rules can be dependent on the APN used.

End of 1st modified section

Start of 2nd modified section

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



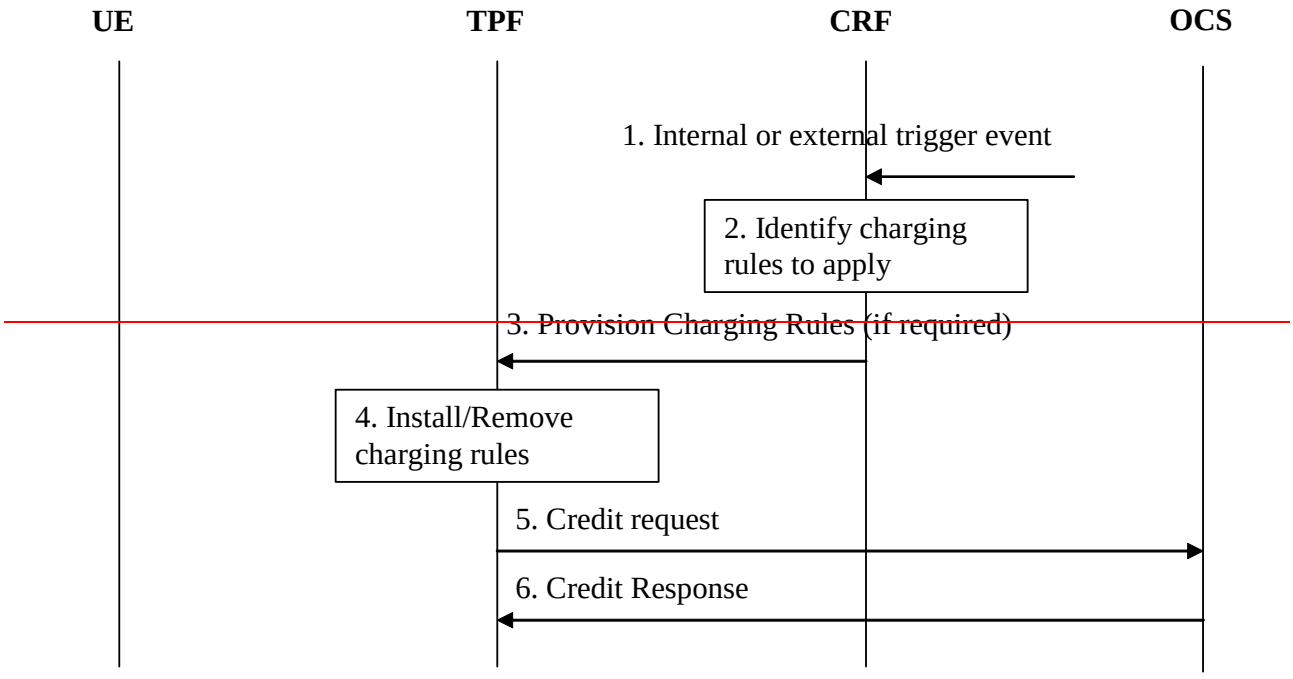


Figure 7.4: Provision of Charging Rules due to external or internal Trigger Event

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

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

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

4 The TPF performs charging rule actions as indicated, i.e. installing, modifying or removing charging rules.

5 In case of online charging, the TPF requests credit for any newly installed charging rule from the OCS, and provides relevant input information for the OCS decision. The TPF returns the remaining credit of any removed charging rule.

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

End of 2nd modified section

3GPP TSG-SA2 Meeting #42
Sophia Antipolis, France, 11th – 15th October, 2004

Tdoc ⌘ S2-043108

CR-Form-v7

CHANGE REQUEST

⌘ **23.125** **CR** **079** ⌘ **rev** **1** ⌘ Current version: **6.2.0** ⌘

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

Title:	⌘	Connection maintenance
Source:	⌘	Siemens
Work item code:	⌘	CH-FBC
Date:	⌘	12/10/2004
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:
2 (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)

Reason for change:	⌘	The current specification of the maintenance mechanisms for Gx and Rx allow for the selection of an alternate CRF. However, if multiple alternate CRFs are available there is no further requirement stated that the same CRF has to be selected. Therefore, it should be clarified that the maintenance mechansism of Rx shall guarantee that the same alternate CRF is selected as the one that was chosen by the Gx maintenance mechanism.
Summary of change:	⌘	The requirement for the Rx maintenance mechanism is added. It is furthermore clarified that commands are forwarded at failover.
Consequences if not approved:	⌘	The maintenance mechanisms for Gx and Rx may select different alternate CRFs.

Clauses affected:	⌘	6.3.1.1, 6.3.4.2

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

⌘

Other comments: ⌘

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Start of 1st modified section

6.3.1.1 Initialisation and Maintenance of Connection

A single connection shall be established between each interworking CRF and TPF pair. The connection can be direct, or established via a relay/proxy node. A connection may be redirected to an alternate CRF.

At a failover, commands which have not been successfully received shall be ~~queued~~ forwarded to an alternate CRF.

Only CRFs responsible for the same UE identity information may be selected as alternate CRF.

The detail specification of the connection establishment and maintenance is for specification in stage 3.

End of 1st modified section

Start of 2nd modified section

6.3.4.2 Initialisation and Maintenance of Connection

A single connection shall be established between each interworking CRF and AF pair. The connection can be direct, or established via a relay/proxy node. A connection may be redirected to an alternate CRF.

At a failover, commands which have not been successfully received shall be ~~queued~~ forwarded to an alternate CRF.

Only CRFs responsible for the same UE identity information may be selected as alternate CRF. Furthermore, the maintenance mechanism for Rx shall ensure that the same alternate CRF is selected as the one selected by the Gx maintenance mechanism.

The detail specification of the connection establishment and maintenance is for specification in stage 3.

End of 2nd modified section

3GPP TSG- SA WG2 Meeting #42 ***Tdoc ⌘ S2-043109***
Sophia Antipolis, France, 11th – 15th October 2004

CR-Form-v7

CHANGE REQUEST

⌘ **23.125** **CR** **088** ⌘ **rev** **1** ⌘ Current version: **6.2.0** ⌘

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

Title:	⌘	CRF addressing
Source:	⌘	Ericsson
Work item code:	⌘	CH-FBC
Date:	⌘	14/10/2004
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:
2 (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)

Reason for change: ⌘

This CR is an elaborated version of previous contribution S2-042552.

TPF

The 23.125 specifies that the TPF contacts the appropriate CRF based on the UE identity. Which specific identity to use is left FFS.

For GPRS a TPF may offer several APN. A CRF may serve several APN, but an operator may wish to separate the nodes serving the APNs physically.

The situation is similar for other IP-CANs that offer more than one access point.

Therefore the APN need to be a parameter for CRF selection in the TPF.

Introducing APN for CRF selection does however not exclude a UE identity to be a parameter as well. The candidate UE identities include (refer to 29.060 v6.5.0, section 7.3.1)
1) IMSI (identifies the HPLMN operator)
2) MSISDN
The use of the Diameter protocol for Gx opens for using, at the CRF end, any of the Diameter agent options as described in RFC 3588.

AF

The 23.125 specifies that the AF contacts the appropriate CRF based on the UE identity. Which specific identity to use is left FFS.

A UE, using GPRS, connects to the PDN by establishing a PDP context to an IP

	network identified by an APN. The UE is given an IP address within that IP network. The AF is not guaranteed to have access to any other information element than the End User PDP address (IP address). Any other identity need to be conveyed to the AF in a protocol on top of IP, or by separate means. Thus, without further measures, the only information relating to the UE identity, which is guaranteed to be available at the AF, is the End User PDP Address. However, an AF providing a service requiring service-specific authentication may maintain an association for finding the appropriate CRF, based on the service-specific user identity and optionally the PDP Address. The use of any user identity that is specific for a certain kind of IP-CAN shall be avoided in the CRF addressing at an AF, thus enabling the same mechanism being used when finding the appropriate CRF, regardless the kind of IP-CAN. The use of the Diameter protocol for Rx opens for using, at the CRF end, any of the Diameter agent options as described in RFC 3588.
Summary of change: ⌘	The TPF is specified to find the appropriate CRF based on the APN (Access Point Name) and optionally the IMSI or MSISDN. The AF is specified to find the appropriate CRF based on the End User PDP Address and/or a UE identity.
Consequences if not approved: ⌘	The finds the TPF based on a UE identity. Thus there must be a single CRF for all the PDP subscriptions for a certain user. Physically separated CRFs for different APNs cannot be deployed. The AF has no guaranteed access to any UE identity, thus left without any means to find the CRF address unless the UE identity is presented to the AF.

Clauses affected:	⌘	6.2.4, 6.2.5, 6.3.1.1, 6.3.4.2			
		Y	**N**		
Other specs Affected:	⌘		**X**	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

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

6.2.4 Traffic Plane Function

The Traffic Plane Function 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 Traffic Plane Function shall support pre-defined charging rules, and pre-defined filters. See subclause 5.3 for further filtering and counting requirements.

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

For online charging, the Traffic Plane Function shall be capable of managing a pool of credit used for some or all of the service data flows of a user. The Traffic Plane Function 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~~ the TPF shall contact the appropriate CRF ~~is contacted~~ based on the access point connected to and, optionally, a UE identity information that is applicable in that kind of IP-CAN.

~~Editor's note: The specific identity information used to identify the appropriate CRF is FFS.~~

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 traffic Plane Function is a logical function allocated to the GGSN.

Editor's Note: The effects of this co-location to the interfaces still needs to be studied e.g. Gy, Gz, Gi. Gi radius extensions for charging purposes are not precluded.

For GPRS, the TPF/GGSN shall be able to do separate counts per PDP context for a single service data flow if it is transferred on more than one PDP context.

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

At initial bearer establishment the Traffic Plane Function shall request charging rules applicable for this bearer from the charging rules function. As part of the request, the Traffic Plane Function provides the relevant information to the charging rules function. The Traffic Plane Function shall use the charging rules received in the response from the charging rules function. In addition, the Traffic Plane Function shall use any applicable pre-defined static charging rules. Pre-defined charging rules may apply for all users or may be dynamically activated by the CRF for a specific bearer of a single user.

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 charging rules function. 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 Traffic Plane Function receives an unsolicited update of the charging rules from the charging rules function, the new charging rules shall be used.

If another bearer is established by the same user (e.g. for GPRS a secondary PDP context), the same procedures shall be applied by the Traffic Plane Function as described for the initial bearer. For a bearer (e.g. in GPRS, a secondary PDP context), 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 Traffic Plane Function 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 the packet shall be discarded.

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

6.2.5 Application Function

The Application Function provides information to the service data flow based charging rules function, 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 charging rules function, and decides what data from the application function shall be used in the charging rule selection algorithm.

An AF may communicate with multiple CRFs. The AF shall contact~~s~~ the appropriate CRF ~~for a user at any time~~ based on either

- the end user IP Address;

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~~.~~

~~Editor's note: The specific identity information used to identify the appropriate CRF is FFS.~~

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

The information provided by the application function is as follows:

Information to identify the service data flow: refer to subclause 5.3.
The application function 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 application function 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 Charging Rules Function of such a change within a service session that affects the charging rules, e.g. triggers the generation of a new charging rule.

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

6.3.1.1 Initialisation and Maintenance of Connection

A single connection shall be established between each interworking CRF and TPF pair. The connection can be direct, or established via a relay/proxy node. A connection may be redirected to an alternate CRF.

At a failover, commands which have not been successfully received shall be queued to an alternate CRF.

Only CRFs responsible for the same IP network (for GRPS, APN) and UE identity information may be selected as alternate CRF.

The detail specification of the connection establishment and maintenance is for specification in stage 3.

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

6.3.4.2 Initialisation and Maintenance of Connection

A single connection shall be established between each interworking CRF and AF pair. The connection can be direct, or established via a relay/proxy node. A connection may be redirected to an alternate CRF.

At a failover, commands which have not been successfully received shall be queued to an alternate CRF.

Only CRFs responsible for the same IP network (for GPRS, APN) and UE identity information may be selected as alternate CRF.

The detail specification of the connection establishment and maintenance is for specification in stage 3.

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

3GPP TSG-SA2 Meeting #42
Sophia Antipolis, France, 11-15 October 2004

Tdoc ⌘S2-043094

CR-Form-v7

CHANGE REQUEST

⌘ **23.125** **CR** **092** ⌘ **rev** **1** ⌘ Current version: **6.2.0** ⌘

*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 of credit pooling
Source:	⌘	Nortel Networks
Work item code:	⌘	CH-FBC
Date:	⌘	06/10/2004
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:
2 (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)

Reason for change: ⌘ The specification includes a requirement for credit pooling at the TPF, to allow reduction in credit fragmentation when multiple online quotas are issued for different services.

However, the specification is unclear as to the objective of credit pooling, particularly with respect of the scope of credit pools – is it required to be able to pool credit from multiple PDP Contexts, or across APNs ?

IETF Diameter Credit Control is the chosen protocol for the Gy reference point in SA5. This protocol already includes a credit pooling capability which it would be desirable to re-use.

Given this, it is desirable to leave questions such as credit pool granularity to Stage 3, where the already defined IETF mechanism can be applied in a straightforward manner which best meets the high level requirement.

Summary of change: ⌘ Clarification of the scope of the Stage 2 requirement.

Consequences if not approved: ⌘ Lack of clarity in Stage 2 specifications causes problems determining how Stage 3 should apply the IETF defined mechanism.

Clauses affected: ⌘ 5.5

Other specs affected:	Y	N		
⌘	X		Other core specifications	⌘ 32.299, 32.251, 32.252
		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.

********** Start of Changes **********

5.5 Credit management

In case of online charging, it shall be possible for the OCS to apply re-authorisation of credit in case of particular events e.g. credit authorisation lifetime expiry, idle timeout, charging rule is changed, GPRS events such as SGSN change, QoS changes, RAT type change.

In case of online charging, credit can be pooled for multiple (one or more) charging rules applied at the Traffic Plane Function with the objective of avoiding credit fragmentation. A pool of credit applying to a single charging rule is equivalent to an individual credit limit for that charging rule. Multiple pools of credit shall be allowed per user.

Rating decisions shall be strictly controlled by the OCS for each service. The OCS shall also control the credit pooling decision for charging rules. The OCS shall either provide a new pool of credit, together with a new credit limit, or a reference to a pool of credit that already exists at the TPF.

The grouping of charging rules 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 rule 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 flows charged at different rates or in different units (e.g. time/volume).

~~Editor’s note: Any impact of this requirement in relation to operation of the Gy needs to be investigated.~~

********** End of Changes **********

3GPP TSG-SA2 Meeting #42
Sophia-Antipolis, France, 11-15 October 2004

Tdoc ⌘S2-043323

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.125** **CR** **093** ⌘ **rev** **-** ⌘ Current version: **6.2.0** ⌘

*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:	⌘	Clarify that CRF is responsible for policy control functions in FBC
Source:	⌘	Ericsson
Work item code:	⌘	CH-FBC
Date:	⌘	14/10/2004
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:	⌘	SA2 has agreed that the CRF provides with policy control functions. This CR updates the CR accordingly. The use of the term static charging rule can be made clearer by using the term predifined charging rule. Further some editorial modifications are made.
Summary of change:	⌘	Clarify text to make it clearer that the CRF is responsible for policy control in FBC. Further also a clarification that Charging Rules are either pre-defined in the TPF or provisioned by the CRF. Some Editorial changes are also made.
Consequences if not approved:	⌘	The TS may be interpreted incorrectly and lead to faulty implementations.

Clauses affected:	⌘	3.1, 5.2, 5.3, 5.8, 6.2.1, 6.2.4, 6.2.5, 6.3.1.3, 6.3.4.1, 6.3.5

Other specs affected:	⌘	Y	N	
			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.

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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 MODIFIED SECTION ********

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 [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.

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

Predefined charging rule: ~~Static~~A charging rule which is predefined in the Traffic Plane Function. A predefined charging rule is either applicable for ~~all users or any~~all bearers of all users or dynamically activated for an individual bearer~~per user.~~

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).

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.

~~**Static charging rule**: Charging rule where all of the data within the charging rule describing the service data flow is permanently configured throughout the duration of a user's data session. A static charging rule that is predefined may be activated dynamically.~~

TPF/CRF instance: A dialogue between TPF and CRF, with a unique instance identifier per user and IP network connection to identify each established dialogue.

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

****** 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 Traffic Plane function 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 Traffic Plane Function to identify the packets belonging to a particular service data flow.
- Charging rules with dynamically provisioned filtering information (i.e. made available to the Traffic Plane Function) 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)).

- Pre-defined charging rules stored in the TPF are supported. The charging rule identifiers of the pre-defined charging rules shall be different from the charging rule identifiers allocated by the CRF.

- ~~Elements of charging rules may be statically configured at the Traffic Plane Function, or dynamically provisioned.~~

~~Note i: The mechanism to support use of elements statically pre-defined in the TPF (e.g. filter information) is for stage 3 development.~~

~~Note ii: The stage 3 development may also evaluate providing an optimisation to support dynamic provisioning of an entire charging rule pre-defined in the TPF.~~

- Pre-defined filters that are part of the pre-defined 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 pre-defined charging rules in the TPF;

  - multiple charging rules from the CRF;

  - charging rules pre-defined in the TPF and rules from the ~~Service Data Flow Based Charging Rules Function~~CRF, which can overlay the pre-defined 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 pre-defined 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' responsibity to ensure that overlap between the pre-defined charging rules can be resolved based on precedence of each pre-defined charging rule in the TPF. It's CRF's responsibity 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);

  - 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.

- Event triggers and/or CCF/OCS addresses are associated with all charging rules for a user and IP network connection.

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

- 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 Application Function and the rule filters are based on the Application Function 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 Traffic Plane Function 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.
- Charging rules can change and be overridden, 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).
- 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, the charging rules can be dependent on the APN used.

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

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

5.3 Service data flow filters and counting

This section refers to the filtering that identifies the service data flows that need to be charged individually (e.g. at different rates). Basic example: look for packets of one service, e.g. to and from a server A.

- Separate filtering 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 information for a service data flow for one direction, or for both directions.

- Different granularity for service data flow filters identifying the service data flow 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 filters which look further into the packet, or require other complex operation (e.g. maintaining state) may be pre-defined in the TPF and ~~invoked~~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 traffic plane function supports simultaneous independent filtering on service data flows associated with each individual active PDP context; that is, primary and secondary PDP contexts, of one APN.
- In case of no applicable filters for a service data flow, the TPF shall discard the packets for this service data flow. To avoid the TPF automatically discarding packets due to no applicable charging rules, the operator may define generic charging rules (with wild-carded packet filters) to allow for default charging for the packets that don't match any other charging rule.
- The service data flow filters and counting are applied by the TPF (the GGSN in the case of GPRS).

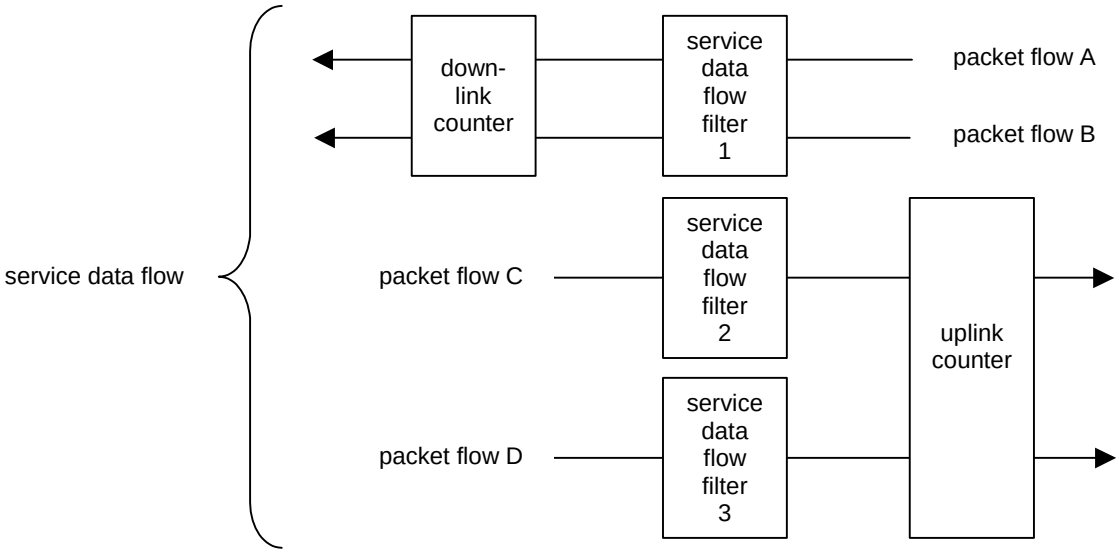

Figure 5.1 – Relationship of service data flow, packet flow and service data flow filter

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

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

5.8 Policy functions provided by FBC architecture

5.8.1 General

Service Based Local Policy (SBLP) specified in 3GPP TS 23.207[12] provides policy control functions for PS traffic. Some of these policy control functions are also provided by the FBC architecture to a certain extent, as described in the following sub-clauses. Note that there is no intention to duplicate the same SBLP functionalities with FBC, instead an overall description of the FBC Policy Functions is given ~~how FBC may provide policy like functions~~.

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 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.

5.8.3 Gating

The Gating functionali~~l~~ty of SBLP provides the ability to control blocking or allowing packets of a service flow to pass through. FBC achieves this functionality by discarding the packets for the service data flow in case of there is no other applicable filter available in the TPF for this service data flow.

For peer-to-peer traffic, special rates may apply. The gate could therefore be either closed for this traffic before the applicable filters are available, or the gate could be opened with a more generic charging rule, which does not allow for this special rate to apply yet.

The AF controls the point of time where Rx input is given to the CRF, which then sends this information down to the TPF, allowing for the filters for this peer-to-peer traffic to form a new charging rule. This allows the AF and CRF to control whether flows can pass through a particular bearer (PDP Context in case of GPRS):

- If the bearer has a charging rule installed that matches the flow, the flow is allowed to pass through on the bearer;
- If the bearer does not have a charging rule installed that matches the flow, the flow is not allowed to pass through on the bearer. If none of the bearers have a charging rule installed matching the flow, the flow is not allowed to pass through on any of the bearers.

5.8.4 QoS control

The QoS control functionality of SBLP provides control and authorization of the QoS parameters of the bearer that carries the service flow.

FBC provides means to control what bearer a service flow is allowed to be carried on. This implicitly allows the CRF to control what type of bearer (to the extent of QoS parameters) a service flow is allowed to use. A charging rule may apply to one or more particular bearer(s) (to a particular PDP Context in case of GPRS). Hence, the QoS the service flow is allowed to use is restricted to the QoS of a particular bearer(s).

5.8.5 Bearer events

SBLP provides means for the Policy Enforcement Function to indicate certain bearer events (e.g. sudden 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.

5.8.6 Session events

SBLP provides means to enforce bearer release upon certain AF session events (e.g. session hold or release).

The FBC architecture provides means to disable the service flows of the AF session upon AF session events (e.g. session hold or release). This is achieved by the AF providing new Rx input to the CRF, which then removes the charging rules of the service flows of the AF session from the TPF. Hence, traffic of the service flow will be blocked in case there is no other applicable filter available in the TPF for this service data flow i.e. the CRF has not allowed this traffic to pass through the network.

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

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

6.2.1 ~~Service Data Flow Based~~ Charging Rules Function

The ~~Service Data Flow Based Charging Rules Function~~CRF provides service data flow level charging rules. This functionality is required for both offline and online charging. The ~~Service Data Flow Based Charging Rules Function~~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 ~~service data flow based charging rules function~~CRF supports both ~~static~~dynamiac activation of predefined charging rules in the TPF and dynamic charging rules that are downloaded to the TPF.

The ~~service data flow based charging rules function~~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 Traffic Plane Function, i.e. information about the user, the bearer characteristics and whether it is an initial request or not. When a further request for charging rules from the Traffic Plane Function or information from an AF arrives the ~~service data flow based charging rules function~~CRF shall be able to identify whether new charging rules need to be transferred to the Traffic Plane Function and respond accordingly.

The ~~service data flow based charging rules function~~CRF will receive information from the application function 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 ~~service data flow based charging rules function~~CRF (i.e. 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.

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

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

6.2.4 Traffic Plane Function

The Traffic Plane Function 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 Traffic Plane Function shall support pre-defined charging rules, and pre-defined filters. See subclause 5.3 for further filtering and counting requirements.

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

For online charging, the Traffic Plane Function shall be capable of managing a pool of credit used for some or all of the service data flows of a user. The Traffic Plane Function 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. The appropriate CRF is contacted based on UE identity information.

Editor's note: The specific identity information used to identify the appropriate CRF is FFS.

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 traffic Plane Function is a logical function allocated to the GGSN.

Editor's Note: The effects of this co-location to the interfaces still needs to be studied e.g. Gy, Gz, Gi. Gi radius extensions for charging purposes are not precluded.

For GPRS, the TPF/GGSN shall be able to do separate counts per PDP context for a single service data flow if it is transferred on more than one PDP context.

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 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 Traffic Plane Function shall identify packets that are charged according to service data flow based charging. The Traffic Plane Function shall report the data volume(s) charged according to service data flow based charging. In case of

GPRS, the Traffic Plane Function shall report the service data flow based charging data for each charging rule on a per PDP context basis.

At initial bearer establishment the Traffic Plane Function shall request charging rules applicable for this bearer from the ~~charging rules function.~~CRF. As part of the request, the Traffic Plane Function provides the relevant information to the ~~charging rules function.~~CRF. The Traffic Plane Function shall use the charging rules received in the response from the ~~charging rules function.~~CRF. In addition, the Traffic Plane Function shall use any applicable pre-defined ~~static~~ charging rules. Pre-defined charging rules may apply for all bearers of all users or may be dynamically activated (or deactivated) by the CRF for a specific bearer ~~of a single user~~.

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 ~~charging rules function.~~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 Traffic Plane Function receives an unsolicited update of the charging rules from the ~~charging rules function,~~CRF, the new charging rules shall be used.

If another bearer is established by the same user (e.g. for GPRS a secondary PDP context), the same procedures shall be applied by the Traffic Plane Function as described for the initial bearer. For a bearer (e.g. in GPRS, a secondary PDP context), 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 Traffic Plane Function 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 the packet shall be discarded.

6.2.5 Application Function

The Application Function provides information to the service data flow based ~~charging rules function,~~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 ~~charging rules function,~~CRF, and decides what data from the application function shall be used in the charging rule selection algorithm.

An AF may communicate with multiple CRFs. The AF contacts the appropriate CRF for a user at any time based on UE identity information.

Editor's note: The specific identity information used to identify the appropriate CRF is FFS.

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

The information provided by the application function is as follows:

Information to identify the service data flow: refer to subclause 5.3.
The application function 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 application function 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 ~~Charging Rules Function~~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 *******

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

6.3.1.3 Provision of Charging Rules (from CRF to TPF)

The CRF identifies the charging rules that are applicable to the TPF. The CRF then sends the charging rule information to the TPF.

The charging rule information represents the set of charging rules to be installed (or activated) by the TPF, which can be one or a combination of the following:

- charging rules,
- identifiers for pre-defined charging rules,
- a single identifier for a set of pre-defined charging rules.

The provisioning may be a response to a Request for Charging Rules, or it may be unsolicited.

Provision of Charging Rule shall support cases where charging rules are to be installed, removed or modified in the TPF as well as cases where charging rules are neither installed nor removed nor modified in the TPF (only relevant in the response to a request for charging rules).

Note: Predefined charging rules cannot be modified.

The Provision of Charging Rules shall include information about the instance it relates to (i.e. identifier for the relevant TPF/CRF instance), in addition, the Provision of Charging Rules may include charging rules and the associated action indications (install, modify, remove).

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

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

6.3.4.1 General

The Rx reference point enables transport of information (e.g. dynamic media stream information) from the application function to the ~~charging rules function.~~CRF. An example of such information would be filter information to identify the service data flow.

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

****** NEXT 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 ~~charging rules function.~~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.

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

3GPP TSG- SA WG2 Meeting #42 **Tdoc ⌘ S2-043325**
Sophia Antipolis, France, 11th – 15th October 2004

CR-Form-v7

CHANGE REQUEST

⌘ **23.125** **CR** **089** ⌘ **rev** **1** ⌘ Current version: **6.2.0** ⌘

*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 ☒

Title:	⌘	Removal of FFS notes		
Source:	⌘	Ericsson		
Work item code:	⌘	CH-FBC	***Date:*** ⌘	14/10/2004
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:
2 *(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)*

Reason for change:	⌘	The TS 23.125 v6.2.0 contains a number of Editor's notes, which can be removed. The IETF work on the Diameter Credit-Control Application has made progress. The reference [9] should be upgraded to reflect the IETF progress. The Editor's note for reference [9] has wrong paragraph type. The set of charging models listed in 4.3.1 may be considered stable by now. Should the need for additional charging models arise, these may be introduced using normal change procedures. The consequences of allocating the TPF to the GGSN for GPRS is taken care of in stage 3 work in SA5 by now. Communicating charging rules from an home network to a TPF in a visited network is not applicable in the 3GPP Rel-6 architecture. Appendix D contains a number of Editor's notes with incorrect paragraph type.
Summary of change:	⌘	Reference [9] upgraded to reflect IETF progress. Document title aligned with IETF draft. Remove FFS note on charging models. Remove FFS note on the effects of allocating the TPF to the GGSN. Remove FFS note on how to provide charging rules from a home network to a visited network. Add that TPF and CRF exist in the same operator's network

		Use the appropriate paragraph type for Editor's notes in Appenix D. Additional editorial corrections.
Consequences if not approved:	⌘	FFS notes on already resolved matters remain.

Clauses affected:	⌘	2, 3, 5, 4.3.1, 6.2.1, 6.2.4, 6.2.5, 6.2.6, 6.3.4.1, Appendix D.2			
Other specs affected:	⌘	**Y** / **N** **N**	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.

****** 1st 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 ~~DIAMETER Credit~~ Credit-Control Application, draft-ietf-aaa-diameter-cc-~~03~~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 [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.

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

Predefined charging rule: Static charging rule which is defined in the ~~Traffic Plane Function~~TPF. A predefined charging rule is either applicable for all users or dynamically activated per user.

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.

Static charging rule: Charging rule where all of the data within the charging rule describing the service data flow is permanently configured throughout the duration of a user's data session. A static charging rule that is predefined may be activated dynamically.

TPF/CRF instance: A dialogue between TPF and CRF, with a unique instance identifier per user and IP network connection to identify each established dialogue.

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

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.

~~Editor's note: Additional charging models that are event and service based require further investigation.~~

It shall be possible to apply different rates 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 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 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.

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

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);
- Provision and control of charging rules on service data flow level;
- 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.

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 ~~Traffic Plane function~~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 ~~Traffic Plane Function~~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 ~~Traffic Plane Function~~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)).
- Pre-defined charging rules stored in the TPF are supported. The charging rule identifiers of the pre-defined charging rules shall be different from the charging rule identifiers allocated by the CRF.
- Elements of charging rules may be statically configured at the ~~Traffic Plane Function~~TPF, or dynamically provisioned.

Note-i: The mechanism to support use of elements statically pre-defined in the TPF (e.g. filter information) is for stage 3 development.

Note-ii: The stage 3 development may also evaluate providing an optimisation to support dynamic provisioning of an entire charging rule pre-defined in the TPF.

- Pre-defined filters that are part of the pre-defined 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 pre-defined charging rules in the TPF;
    - multiple charging rules from the CRF;
    - charging rules pre-defined in the TPF and rules from the Service Data Flow Based Charging Rules Function, which can overlay the pre-defined 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 pre-defined 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' responsibity to ensure that overlap between the pre-defined charging rules can be resolved based on precedence of each pre-defined charging rule in the TPF. It's CRF's responsibity 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);
    - 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.
- Event triggers and/or CCF/OCS addresses are associated with all charging rules for a user and IP network connection.
- The charging rule identifiers allocated by the CRF shall be unique for a CRF/TPF instance.
- 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 ~~Application Function~~AF and the rule filters are based on the ~~Application Function~~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 ~~Traffic Plane Function~~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.
- Charging rules can change and be overridden, 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).
- 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, the charging rules can be dependent on the APN used.

5.3 Service data flow filters and counting

This section refers to the filtering that identifies the service data flows that need to be charged individually (e.g. at different rates). Basic example: look for packets of one service, e.g. to and from a server A.

- Separate filtering 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 information for a service data flow for one direction, or for both directions.

- Different granularity for service data flow filters identifying the service data flow 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 filters which look further into the packet, or require other complex operation (e.g. maintaining state) may be pre-defined in the TPF and invoked 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 ~~traffic plane function~~TPF supports simultaneous independent filtering on service data flows associated with each individual active PDP context; that is, primary and secondary PDP contexts, of one APN.

- In case of no applicable filters for a service data flow, the TPF shall discard the packets for this service data flow. To avoid the TPF automatically discarding packets due to no applicable charging rules, the operator may define generic charging rules (with wild-carded packet filters) to allow for default charging for the packets that don't match any other charging rule.

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

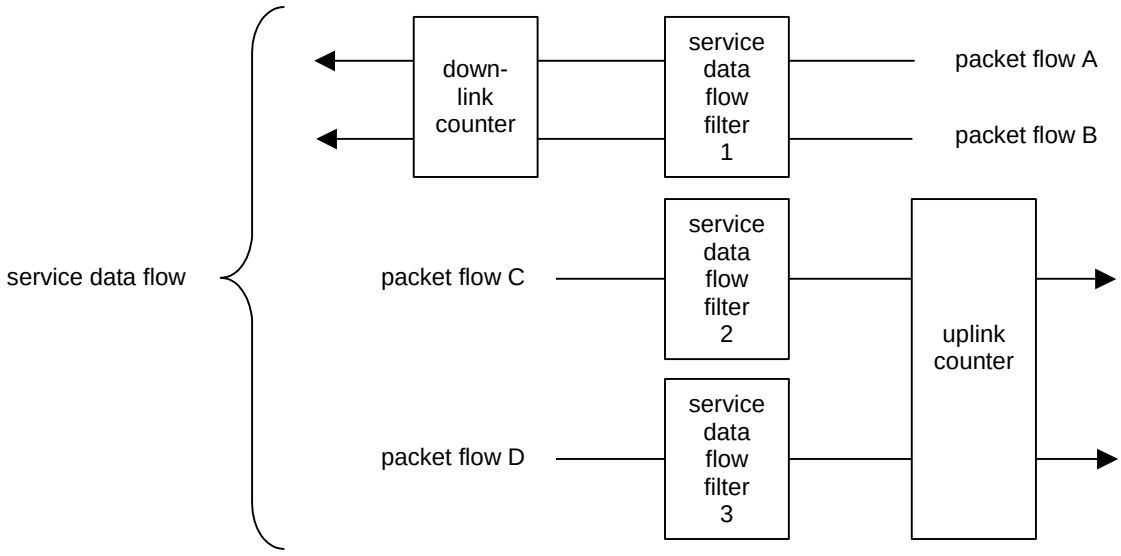

Figure 5.1 – Relationship of service data flow, packet flow and service data flow filter

5.4 Reporting

This refers to the differentiated charging information being reported to the charging functions. Basic example: those 20 packets were in rating category A, include this in your global charging information.

- The ~~Traffic Plane function~~TPF shall report bearer charging information for online charging;
- The ~~Traffic Plane function~~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 ~~Traffic Plane function~~TPF shall report triggered Events of an existing charging rule for both offline and on-line charging;
- The ~~Traffic Plane function~~TPF shall report triggered re-authorisation of existing charging rules for on-line charging;
- It shall be possible to report charging information showing usage for each user for each charging rule, e.g. a report may contain multiple containers, each container associated with a charging key;
- It shall be possible to associate per PDP context charging information with the corresponding service data flow based charging information. It shall be possible to derive or account the data volumes per PDP context for traffic not accounted via any applicable charging rule.
  For example, in the case of GPRS, output of FBC data per charging rule on a per PDP context basis would allow non-FBC charged data volumes to be determined, and existing per PDP context charging mechanisms in the GGSN to be applied.

5.5 Credit management

In case of online charging, 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, credit can be pooled for multiple (one or more) charging rules applied at the ~~Traffic Plane Function~~TPF. A pool of credit applying to a single charging rule is equivalent to an individual credit limit for that charging rule. Multiple pools of credit shall be allowed per user.

Rating decisions shall be strictly controlled by the OCS for each service. The OCS shall also control the credit pooling decision for charging rules. The OCS shall either provide a new pool of credit, together with a new credit limit, or a reference to a pool of credit that already exists at the TPF.

The grouping of charging rules 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 rule 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.

5.6 Termination Action

The ~~Termination Action~~termination action applies only in case of online charging. The termination action indicates the action, which the ~~Traffic Plane Function~~TPF should perform when the credit for the service data flow has expired.

The defined termination actions include:

- Allowing the packets corresponding to a terminated service data flow to pass through;

- Dropping the packets corresponding to a terminated service data flow as they pass through the ~~Traffic Plane Function~~TPF;
- Indicating to the TPF that the default termination behaviour shall be used;
- The re-directing of packets corresponding to a terminated service data flow to an application server (e.g., defined in the termination action).

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

The default termination behaviour for all terminated service data flows without a specific ~~Termination Action~~termination action shall be pre-configured in the TPF according to operator's policy. For instance, the default behaviour may consist of allowing packets of any terminated service data flow to pass through the TPF.

The OCS may provide a ~~Termination Action~~termination action over the Gy interface. Any previously provided ~~Termination Action~~termination action may be overwritten by the OCS.

Note: A ~~Termination Action~~termination action remains valid and shall be applied by the TPF until the corresponding charging rule is removed or the user and IP network connection is removed (for GPRS when the last PDP context is removed).

In case the OCS intends to provide ~~Termination Action~~termination action, it shall send it to the TPF before the credit for the service data flow is exhausted; otherwise pre-configured default termination behaviour will be performed.

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

5.7 Re-authorisation and Event Triggers

Re-authorisation applies to online charging. For each charging rule, the TPF receives re-authorisation trigger information from the OCS which determines when the TPF should perform a re-authorisation. The re-authorisation trigger detection will cause the TPF to request re-authorisation of the credit in the OCS. It shall be possible for the OCS to apply re-authorisation of credit in case of particular events, e.g. credit authorisation lifetime expiry, idle timeout, charging rule is changed, GPRS events such as SGSN change, QoS changes, RAT type change.

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

Event triggers include GPRS events such as SGSN change, QoS change, RAT type change, TFT change.

Event triggers apply after initial bearer establishment.

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

5.8 Policy functions provided by FBC architecture

5.8.1 General

Service Based Local Policy (SBLP) specified in 3GPP TS 23.207[12] provides policy control functions for PS traffic. Some of these policy control functions are also provided by the FBC architecture to a certain extent, as described in the following sub-clauses. Note that there is no intention to duplicate the same SBLP functionalities with FBC, instead an overall description is given how FBC may provide policy like functions.

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 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.

5.8.3 Gating

The Gating functionalilty of SBLP provides the ability to control blocking or allowing packets of a service flow to pass through. FBC achieves this functionality by discarding the packets for the service data flow in case of there is no other applicable filter available in the TPF for this service data flow.

For peer-to-peer traffic, special rates may apply. The gate could therefore be either closed for this traffic before the applicable filters are available, or the gate could be opened with a more generic charging rule which does not allow for this special rate to apply yet.

The AF controls the point of time where Rx input is given to the CRF which then sends this information down to the TPF, allowing for the filters for this peer-to-peer traffic to form a new charging rule. This allows the AF and CRF to control whether flows can pass through a particular bearer (PDP Context in case of GPRS):

- If the bearer has a charging rule installed that matches the flow, the flow is allowed to pass through on the bearer;

- If the bearer does not have a charging rule installed that matches the flow, the flow is not allowed to pass through on the bearer. If none of the bearers have a charging rule installed matching the flow, the flow is not allowed to pass through on any of the bearers.

5.8.4 QoS control

The QoS control functionality of SBLP provides control and authorization of the QoS parameters of the bearer that carries the service flow.

FBC provides means to control what bearer a service flow is allowed to be carried on. This implicitly allows the CRF to control what type of bearer (to the extent of QoS parameters) a service flow is allowed to use. A charging rule may apply to one or more particular bearer(s) (to a particular PDP Context in case of GPRS). Hence, the QoS the service flow is allowed to use is restricted to the QoS of a particular bearer(s).

5.8.5 Bearer events

SBLP provides means for the Policy Enforcement Function to indicate certain bearer events (e.g. sudden loss of bearer connection) to the ~~Application Function~~AF 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.

5.8.6 Session events

SBLP provides means to enforce bearer release upon certain AF session events (e.g. session hold or release).

The FBC architecture provides means to disable the service flows of the AF session upon AF session events (e.g. session hold or release). This is achieved by the AF providing new Rx input to the CRF which then removes the charging rules of the service flows of the AF session from the TPF. Hence, traffic of the service flow will be blocked in case there is no other applicable filter available in the TPF for this service data flow i.e. the CRF has not allowed this traffic to pass through the network.

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

6.2.1 Service Data Flow Based Charging Rules Function

The Service Data Flow Based Charging Rules Function provides service data flow level charging rules. This functionality is required for both offline and online charging. The Service Data Flow Based Charging Rules Function 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 service data flow based charging rules function supports both static and dynamic charging rules.

The service data flow based charging rules function 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 ~~Traffic Plane Function~~TPF, i.e. information about the user, the bearer characteristics and whether it is an initial request or not. When a further request for charging rules from the ~~Traffic Plane Function~~TPF or information from an AF arrives the service data flow based charging rules function shall be able to identify whether new charging rules need to be transferred to the ~~Traffic Plane Function~~TPF and respond accordingly.

The service data flow based charging rules function will receive information from the ~~application function~~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 service data flow based charging rules function (i.e. 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.

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

6.2.4 Traffic Plane Function

The ~~Traffic Plane Function~~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 ~~Traffic Plane Function~~TPF shall support pre-defined charging rules, and pre-defined filters. See subclause 5.3 for further filtering and counting requirements.

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

For online charging, the ~~Traffic Plane Function~~TPF shall be capable of managing a pool of credit used for some or all of the service data flows of a user. The ~~Traffic Plane Function~~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. The appropriate CRF is contacted based on UE identity information.

Editor's note: The specific identity information used to identify the appropriate CRF is FFS.

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 ~~traffic Plane Function~~TPF is a logical function allocated to the GGSN.

~~Editor's Note: The effects of this co-location to the interfaces still needs to be studied e.g. Gy, Gz, Gi. Gi radius extensions for charging purposes are not precluded.~~

For GPRS, the TPF/GGSN shall be able to do separate counts per PDP context for a single service data flow if it is transferred on more than one PDP context.

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 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 ~~Traffic Plane Function~~TPF shall identify packets that are charged according to service data flow based charging. The ~~Traffic Plane Function~~TPF shall report the data volume(s) charged according to service data flow based charging. In case of GPRS, the ~~Traffic Plane Function~~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 ~~Traffic Plane Function~~TPF shall request charging rules applicable for this bearer from the charging rules function. As part of the request, the ~~Traffic Plane Function~~TPF provides the relevant information to the charging rules function. The ~~Traffic Plane Function~~TPF shall use the charging rules received in the response from the charging rules function. In addition, the ~~Traffic Plane Function~~TPF shall use any applicable pre-defined static charging rules. Pre-defined charging rules may apply for all users or may be dynamically activated by the CRF for a specific bearer of a single user.

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 charging rules function. 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 ~~Traffic Plane Function~~TPF receives an unsolicited update of the charging rules from the charging rules function, the new charging rules shall be used.

If another bearer is established by the same user (e.g. for GPRS ~~a secondary PDP context~~the Secondary PDP Context Activation procedure), the same procedures shall be applied by the ~~Traffic Plane Function~~TPF as described for the initial bearer. For a bearer ~~(e.g. in GPRS, a secondary PDP context)~~, 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 ~~Traffic Plane Function~~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 the packet shall be discarded.

6.2.5 Application Function

The ~~Application Function~~AF provides information to the service data flow based charging rules function, 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 charging rules function, and decides what data from the ~~application function~~AF shall be used in the charging rule selection algorithm.

An AF may communicate with multiple CRFs. The AF contacts the appropriate CRF for a user at any time based on UE identity information.

Editor's note: The specific identity information used to identify the appropriate CRF is FFS.

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

The information provided by the ~~application function~~AF is as follows:

Information to identify the service data flow: refer to subclause 5.3.
The ~~application function~~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 ~~application function~~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 Charging Rules Function of such a change within a service session that affects the charging rules, e.g. triggers the generation of a new charging rule.

6.2.6 Relationship between functional entities

The AF and the CRF need not exist within the same operator's network. The Rx interface may be intra- or inter-domain and shall support the relevant protection mechanisms for an inter-operator or third party interface. The TPF and the CRF exist within the same operator's network.

~~Editor's note: It is for further study how charging rules from a home network can be supported when the TPF is in the visited network (e.g. CRF in home network communicating via CRF in visited network, CRF in home network communicating to TPF in visited network).~~

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

6.3.4.1 General

The Rx reference point enables transport of information (e.g. dynamic media stream information) from the ~~application function~~AF to the charging rules function. An example of such information would be filter information to identify the service data flow.

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

D.2 General architectural considerations

Considering the FBC development described in this specification, as well as the definition of new services e.g. IMS based services, which were not available in Release 5, it has been recognized that there is a need to introduce flexibility in the handling of the different services. It will be studied whether a CRF responsible for Charging Rules and Policy control may be considered. This could facilitate the possibility to minimize the number of nodes to maintain as well as for Stage 3 defined interfaces i.e. from a Stage 3 point of view interfaces may be re-used.

Media flows for an AF (e.g. IMS) can be divided into two categories:

- Peer-to-peer where the AF (e.g. P-CSCF) may provide information to the CRF for Charging Rule selection;
- Client/Server media flows where the AF (e.g. AS) sends input to the CRF for Charging Rule selection. The handling of the Charging Rule procedures as defined in Annex B is to be performed dynamically.

The handling of Charging Rules and the procedures related to selecting charging rules is specified in this technical specification. Below, the procedures for possible handling of policy control within the FBC framework are described.

It shall be possible to have multiple flows over the same PDP context.

It shall be possible to support generic IP flow policies.

The CRF shall take the responsibility for all applications, which means that conflicts between policies are alleviated facilitating easier and faster provisioning of services. The CRF shall be responsible for the precedences of the policies. An AS may provide information to the CRF whether the subscriber is allowed to access the service or not as an input to the decision function for filter definition.

The evolved FBC architecture including not only charging rules but also policy control shall implement policies for both IMS and non-IMS services, as SBLP has also been generalized in Rel6 to support both IMS and non-IMS services.

The CRF not only provides dynamic filters but also references to pre-configured filters.

The following subclauses provide a list and corresponding analysis of policy functions considered to be provided by the FBC architecture.

D.2.1 Charging correlation

The FBC architecture provides an alternative bearer charging mechanism. The charging key passed to the OCS/CCF 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.

D.2.2 Gating

This refers to the ability to block or allow traffic to flow. This can be achieved by the TPF in the FBC architecture which discards the packets for the service data flow in case of no applicable filters for this service data flow. However, it is only possible to implicitely block a specific service data flow, i.e. in case there are no other charging rules matching the service data flow for any bearer.

For peer-to-peer traffic, special rates may apply. The gate could therefore be either closed for this traffic before the applicable filters are available, or the gate could be opened with a more generic charging rule which doesn't allow for this special rate to apply yet.

The AF (e.g. P-CSCF) could wait until answer to give Rx input to the CRF which then sends this information down to the TPF, allowing for the filters for this peer-to-peer traffic to form a new charging rule. This allows waiting until the final SDP and the actual answer to allow the special rate to apply (and possibly the traffic to flow if no other filters were applicable before). As soon as the rules are sent down to the TPF then they are active at the TPF.

Compared to Gq/Go gating functionality the FBC ability of blocking traffic provides for further flexibility in combining the charging and policy models, because Go/Gq do not provide for a model where different rates can be applied in combination with different gating rules. However, FBC is able to prevent the usage of a specific PDP context as Gq/Go gating functionality does as long as there is no other matching charging rule established for this PDP context.

The functionality for allowing and implicite blocking of service data flows is part of this release.

Editor's note: It is FFS if and how the explicite blocking (i.e. blocking of a specific service data flow that also matches a generic charging rule) can be provided by FBC.

~~Editor's note: It is FFS if and how the explicite blocking (i.e. blocking of a specific service data flow that also matches a generic charging rule) can be provided by FBC.~~

D.2.3 QoS control

This refers to the ability to authorize different QoS for different applications (even peer-to-peer session) and to the ability to control the bandwidth usage once the traffic has been allowed to flow.

Requirements need to be identified for QoS control in the context of FBC, which could be different needs than those of SBLP and Go. FBC provides means to control what bearer a service flow is allowed to be carried on. This implicitly allows the CRF to control the QoS parameters of the bearer a service flow is allowed to use. A charging rule may only apply to one or more particular bearer(s) (to a particular PDP Context in case of GPRS). Hence, the QoS the service flow is allowed to use is restricted to the QoS of a particular bearer(s).

To evolve the FBC architecture towards complete QoS control for the service data flow as well as the bearer enhancements and extensions are probably required. The binding concept could be replaced by TFT interpretation to some extent but for the uplink similar information would be required. The control of the bitrate of a PDP context is only possible in case the charging rules apply only to a particular bearer. Otherwise one does not know on which bearer and at which time the service data flows occur.

The functionality for limiting the maximum QoS class of a service data flow is part of this release.

Editor's note: It is FFS how complete QoS control can be provided by FBC

~~Editor's note: It is FFS how complete QoS control can be provided by FBC~~

D.2.4 Bearer events

Indication of bearer events could allow for communication between the GGSN and the AF (P-CSCF in IMS).

In case a charging rule for an AF service flow applies only to a particular bearer, it is possible for the CRF to inform the AF about events related to that bearer. However, this bearer event indication functionality of FBC only works if there is no matching charging rule installed for any other bearer.

In case a charging rule for an AF service flow applies to more than one bearer of a UE IP address or more than one matching charging rule is applied, it is only possible for the CRF to inform the AF in case of the removal of all these bearers of a UE IP address (i.e. the AF is not aware of the removal of individual bearers). Because due to the missing binding concept it is difficult to predict if a service data flow would use another PDP context instead once the previously used PDP context was deleted. Therefore, it may not be necessary or even wrong to inform the AF. Furthermore, the knowledge which service data flows are currently active may need to be extended to the CRF because an AF is only interested in such information if the corresponding service data flow is currently active.

The functionality for informing the CRF about the removal the last bearer for a specific IP address and APN is part of this release. Based on the applied charging rules, the CRF may also be able to inform the AF about events related to a particular bearer.

Editor's note: There is a need to confirm whether this functionality is required in the case that the service data flow used for the AF session can be found on multiple bearers.

~~Editor's note: There is a need to confirm whether this functionality is required in the case that the service data flow used for the AF session can be found on multiple bearers.~~

D.2.5 Session events

Thisrefers to the ability to react on AF session modification or AF session release, e.g. upon IMS session release. This can be provided by the Rx input which allows the AF to tell the CRF that e.g. no charging rule exists for a traffic flow any more, meaning the traffic will no longer be allowed at the TPF.The same applies if, over the Gy reference point, the OCS indicates to abort the session (Abort Session Request in Diameter Credit Control).

While the FBC architecture supports an update of charging rules in the TPF due to a session modification, it is only to some extent possible to enforce a bearer modification or removal. It is possible to disable the service data flow belonging to the AF session as long as there are no other matching charging rules. However the actual bearer release or modification cannot be enforced in general.

The functionality for updating the charging rules in the TPF due to a session modification is part of this release.

Editor's note: It is FFS if and when the TPF could release the entire bearer (e.g. GGSN PDP context deletion).

~~Editor's note: It is FFS if and when the TPF could release the entire bearer (e.g. GGSN PDP context deletion).~~

D.3 Summary and comparison

Go/Gq procedure	**Provides for**	**FBC equivalent in this release**	**FBC equivalent not in this release**
Authorize QoS Resources, AF session establishment	QoS control, charging correlation	Transfer of charging correlation information Or relies on charging key for rating instead of charging correlation QoS control is limited to maximum QoS class for a service data flow (in case no other matching charging rule is in place)	Complete QoS control for service data flow and the bearer is FFS
Authorize QoS Resources, bearer establishment	QoS control, charging correlation	Transfer of charging correlation information Or relies on charging key for rating instead of charging correlation QoS control is limited to maximum QoS class for a service data flow (in case no other matching charging rule is in place)	Complete QoS control for service data flow and the bearer is FFS
Enable Media procedure	Gating (open)	Provide charging rules over Gx for the traffic flow Provide credit over Gy for the traffic flow Service data flow can be enabled	Control of bearer usage in case of existing other matching charging rules is FFS

		and usage of bearer controlled (in case no other matching charging rule is in place)	
Disable Media procedure	Gating (close)	Provide no charging rule over Gx for the traffic flow Provide no credit over Gy for the traffic flow Service data flow can be disabled and usage of bearer controlled (in case no other matching charging rule is in place)	Control of bearer usage and explicite disabling in case of existing other matching charging rules is FFS
Revoke Authorization for GPRS and IP Resources	Session events	AF input to provision of charging rules over Rx followed by Provision of Charging Rules triggered by other event to the CRF, Or OCS Abort Session Request	Complete QoS control for service data flow and the bearer is FFS
Indication of PDP Context Release	Bearer events	Bearer service termination over Gx and Gy Rx in case a charging rule applies only to this bearer and no other matching charging rules are used on any other bearer	Rx in the general case is FFS
Authorization of PDP Context Modification	QoS control	Bearer service modification over Gx Rx in case a charging rule applies only to this bearer and no other matching charging rules are used on any other bearer	Complete QoS control for service data flow and the bearer is FFS Rx in the general case is FFS
Indication of PDP Context Modification	Bearer events	Bearer service modification over Gx Rx in case a charging rule applies only to this bearer and no other matching charging rules are used on any other bearer	Rx in the general case is FFS
Update Authorization procedure	QoS control	AF input to provision of charging rules over Rx followed by Provision of Charging Rules triggered by other event to the TPF, Or OCS initiated re-authorisation	Complete QoS control for service data flow and the bearer is FFS

3GPP TSG-SA2 Meeting #42
Sophia-Antipolis, France, 11-15 October 2004

Tdoc ⌘S2-043375

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.125** **CR** **086** ⌘**rev** **2** ⌘ Current version: **6.2.0** ⌘

*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 ☒

Title:	⌘	Clarify that Charging Rules apply on a per PDP context basis
Source:	⌘	Ericsson
Work item code:	⌘	CH-FBC
Date:	⌘	14/10/2004
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:	⌘	SA2 has agreed that charging rules apply on a per PDP context basis. This CR updates the TS accordingly.
Summary of change:	⌘	Clarify text to make it clearer that charging rules apply on a per PDP context basis
Consequences if not approved:	⌘	The TS may be interpreted incorrectly and lead to faulty implementations

Clauses affected:	⌘	5.1, 5.2, 5.3, 5.4, 6.2.4

Other specs affected: ⌘	Y	N		⌘
		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 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);
- 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.

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 Traffic Plane function 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 Traffic Plane Function to identify the packets belonging to a particular service data flow.
- Charging rules with dynamically provisioned filtering information (i.e. made available to the Traffic Plane Function) 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)).
- Pre-defined charging rules stored in the TPF are supported. The charging rule identifiers of the pre-defined charging rules shall be different from the charging rule identifiers allocated by the CRF.
- Elements of charging rules may be statically configured at the Traffic Plane Function, or dynamically provisioned.

Note-i: The mechanism to support use of elements statically pre-defined in the TPF (e.g. filter information) is for stage 3 development.

Note-ii: The stage 3 development may also evaluate providing an optimisation to support dynamic provisioning of an entire charging rule pre-defined in the TPF.

- Pre-defined filters that are part of the pre-defined 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 pre-defined charging rules in the TPF;
- multiple charging rules from the CRF;
- charging rules pre-defined in the TPF and rules from the Service Data Flow Based Charging Rules Function, which can overlay the pre-defined 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 pre-defined 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' responsibity to ensure that overlap between the pre-defined charging rules can be resolved based on precedence of each pre-defined charging rule in the TPF. It's CRF's responsibity 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);
  - 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.
- Event triggers and/or CCF/OCS addresses are associated with all charging rules for a user and IP network connection.
- The charging rule identifiers allocated by the CRF shall be unique for a CRF/TPF instance.
- 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 Application Function and the rule filters are based on the Application Function 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 Traffic Plane Function 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.
- Charging rules can change and be overridden, 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).
- 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 *******

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

5.3 Service data flow filters and counting

This section refers to the filtering that identifies the service data flows that need to be charged individually (e.g. at different rates). Basic example: look for packets of one service, e.g. to and from a server A.

- Separate filtering 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 information for a service data flow for one direction, or for both directions.

- Different granularity for service data flow filters identifying the service data flow 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 filters which look further into the packet, or require other complex operation (e.g. maintaining state) may be pre-defined in the TPF and invoked 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 traffic plane function supports simultaneous independent filtering on service data flows associated with each individual active PDP context; that is, primary and secondary PDP contexts, of one APN.

- In case of no applicable filters for a service data flow 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 applicable charging rules, the operator may define generic charging rules (with wild-carded packet filters) to allow for default charging for the packets that don't match any other charging rule.

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

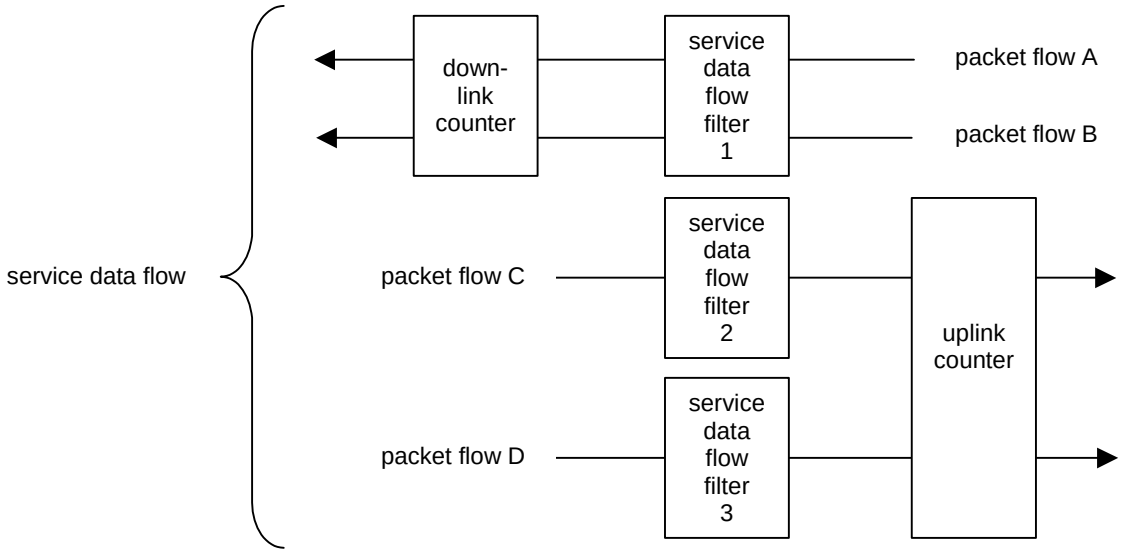

Figure 5.1 – Relationship of service data flow, packet flow and service data flow filter

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

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

5.4 Reporting

This refers to the differentiated charging information being reported to the charging functions. Basic example: those 20 packets were in rating category A, include this in your global charging information.

- The Traffic Plane function shall report bearer charging information for online charging;
- The Traffic Plane function 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 Traffic Plane function shall report triggered Events of an existing charging rule for both offline and on-line charging;
- The Traffic Plane function shall report triggered re-authorisation of existing charging rules for on-line charging;
- It shall be possible to report charging information showing usage for each user for each charging rule, e.g. a report may contain multiple containers, each container associated with a charging key;
- It shall be possible to associate per PDP context charging information with the corresponding service data flow based charging information. ~~It shall be possible to derive or account the data volumes per PDP context for traffic not accounted via any applicable charging rule.~~

~~For example, in the case of GPRS, output of FBC data per charging rule on a per PDP context basis would allow non-FBC charged data volumes to be determined, and existing per PDP context charging mechanisms in the GGSN to be applied.~~

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

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

6.2.4 Traffic Plane Function

The Traffic Plane Function 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 Traffic Plane Function shall support pre-defined charging rules, and pre-defined filters. See subclause 5.3 for further filtering and counting requirements.

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

For online charging, the Traffic Plane Function shall be capable of managing a pool of credit used for some or all of the service data flows of a user. The Traffic Plane Function 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. The appropriate CRF is contacted based on UE identity information.

Editor's note: The specific identity information used to identify the appropriate CRF is FFS.

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 traffic Plane Function is a logical function allocated to the GGSN.

Editor's Note: The effects of this co-location to the interfaces still needs to be studied e.g. Gy, Gz, Gi. Gi radius extensions for charging purposes are not precluded.

For GPRS, the TPF/GGSN applies charging rules on a per PDP context basis.~~shall be able to do separate counts per PDP context for a single service data flow if it is transferred on more than one PDP context.~~

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

At initial bearer establishment the Traffic Plane Function shall request charging rules applicable for this bearer from the charging rules function. As part of the request, the Traffic Plane Function provides the relevant information to the charging rules function. The Traffic Plane Function shall use the charging rules received in the response from the charging rules function. In addition, the Traffic Plane Function shall use any applicable pre-defined static charging rules. Pre-defined charging rules may apply for all users or may be dynamically activated by the CRF for a specific bearer of a single user.

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 charging rules function. 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 Traffic Plane Function receives an unsolicited update of the charging rules from the charging rules function, the new charging rules shall be used.

If another bearer is established by the same user (e.g. for GPRS a secondary PDP context), the same procedures shall be applied by the Traffic Plane Function as described for the initial bearer. For a bearer (e.g. in GPRS, a secondary PDP context), 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 Traffic Plane Function 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 CHANGE *******

3GPP TSG- SA WG2 Meeting #42 ***Tdoc ⌘ S2-043376***
Sophia Antipolis, France, 11th – 15th October 2004

CR-Form-v7

CHANGE REQUEST

⌘ **23.125** **CR** **091** ⌘ **rev** **2** ⌘ Current version: **6.2.0** ⌘

*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 ☒

Title:	⌘	Clarify the terminology related to instances
Source:	⌘	Ericsson
Work item code:	⌘	CH-FBC
Date:	⌘	14/10/2004
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:
2 (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)

Reason for change: ⌘

In the present TS, the “TPF/CRF instance” is explained to be a dialogue. There may various flavours of configurations, where e.g.
- one node includes several logical CRFs
- several nodes, each with its own logical CRF, form a “cluster”

which may confuse terminology.
The term refers to an association between the TPF and CRF for the purpose of providing charging rules from the TPF to the CRF.
As the definition readily states that a TPF/CRF instance is a dialogue, TPF/CRF dialogue is a more appropriete term.

In the present TS, the term “IP network connection” is frequently used, whereas the term “bearer connection” appears as well. In order to remove possible ambiguities the “IP network connection” is defined as “the UE association with an APN and the allocated IP address at the TPF”. The definition corresponds to the “PDP session” as defined in TS 29.210.

In the “Termination Action” section includes different words for expressing that credit is/will be granted/denied.
The charging rule filters are tools to detect service data flows, which do not exist per se. A packet is subject to a termination action when the OCS has denied credit for the charging key for the charging ruel that matches the packet.
The phrasing “dropping packets… as they pass through the TPF” is ambiguous.

The “Initilisation and maintenace of connection” sections for Gx and Rx describes a connection, so that it stretches all the way to any endpoint of a dialogue. The intention is to permit a minimal set of connections to be established initially. Therefore a connection is to a neighbour node. That node may act as a relay/proxy/redirect agent. The only agent that require support from the node at

		the other end of a connection is the redirect agent.
Summary of change:	⌘	1. Change “TPF/CRF instance” to “TPF/CRF dialogue”. 2. Define the “IP network connection”. 3. Clarify the scope of and conditions for the Termination Action. 4. Align sections “Initialisation and maintenance of connection” to (a) require a minimal set of connections and (b) clarify that a dialogue uses a connection for the communication.
Consequences if not approved:	⌘	

Clauses affected:	⌘	3.1, 5, 6.2.4, 6.3.1, 6.3.1.1, 6.3.4.2, 7.2.1.				
Other specs affected:	⌘	**Y**	**N**	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.

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

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 [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.

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 Traffic Plane Function. A packet flow can be an IP flow.

Predefined charging rule: Static charging rule which is defined in the Traffic Plane Function. A predefined charging rule is either applicable for all users or dynamically activated per user.

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.

Static charging rule: Charging rule where all of the data within the charging rule describing the service data flow is permanently configured throughout the duration of a user's data session. A static charging rule that is predefined may be activated dynamically.

~~**TPF/CRF instance**~~**TPF/CRF dialogue**: A dialogue, between a TPF and a CRF, with a unique ~~instance~~ identi~~fier~~ty, There is one TPF/CRF dialogue per user and IP network connection ~~to identify each established dialogue~~.

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

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);
- Provision and control of charging rules on service data flow level;
- 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.

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 Traffic Plane function 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 Traffic Plane Function to identify the packets belonging to a particular service data flow.
- Charging rules with dynamically provisioned filtering information (i.e. made available to the Traffic Plane Function) 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)).
- ~~Pre-defined~~Predefined charging rules stored in the TPF are supported. The charging rule identifiers of the ~~pre-defined~~predefined charging rules shall be different from the charging rule identifiers allocated by the CRF.
- Elements of charging rules may be statically configured at the Traffic Plane Function, or dynamically provisioned.

Note-i: The mechanism to support use of elements statically ~~pre-defined~~predefined in the TPF (e.g. filter information) is for stage 3 development.

Note-ii: The stage 3 development may also evaluate providing an optimisation to support dynamic provisioning of an entire charging rule ~~pre-defined~~predefined in the TPF.

- ~~Pre-defined~~Predefined filters that are part of the ~~pre-defined~~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 ~~pre-defined~~predefined charging rules in the TPF;
  - multiple charging rules from the CRF;
  - charging rules ~~pre-defined~~predefined in the TPF and rules from the Service Data Flow Based Charging Rules Function, which can overlay the ~~pre-defined~~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 ~~pre-defined~~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' ~~responsibity~~ responsibility to ensure that overlap between the ~~pre-defined~~predefined charging rules can be resolved based on precedence of each ~~pre-defined~~predefined charging rule in the TPF. It's CRF's ~~responsibity~~ 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);
  - 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.
- Event triggers ~~and/or CCF/OCS addresses are~~ associated with all the charging rules of an IP network connection.
- A CCF and/or OCS address may be associated with an ~~for a user and~~ IP network connection.
- The charging rule identifiers allocated by the CRF shall be unique ~~for~~ within a ~~CRF/~~TPF/CRF ~~instance~~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 Application Function and the rule filters are based on the Application Function 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 Traffic Plane Function 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.
- Charging rules can change and be overridden, 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).
- 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, the charging rules can be dependent on the APN used.

5.3 Service data flow filters and counting

This section refers to the filtering that identifies the service data flows that need to be charged individually (e.g. at different rates). Basic example: look for packets of one service, e.g. to and from a server A.

- Separate filtering 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 information for a service data flow for one direction, or for both directions.

- Different granularity for service data flow filters identifying the service data flow 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 filters which look further into the packet, or require other complex operation (e.g. maintaining state) may be ~~pre-defined~~predefined in the TPF and invoked 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 traffic plane function supports simultaneous independent filtering on service data flows associated with each individual active PDP context; that is, primary and secondary PDP contexts, of one APN.

- In case of no applicable filters for a service data flow, the TPF shall discard the packets for this service data flow. To avoid the TPF automatically discarding packets due to no applicable charging rules, the operator may define generic charging rules (with wild-carded packet filters) to allow for default charging for the packets that don't match any other charging rule.

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

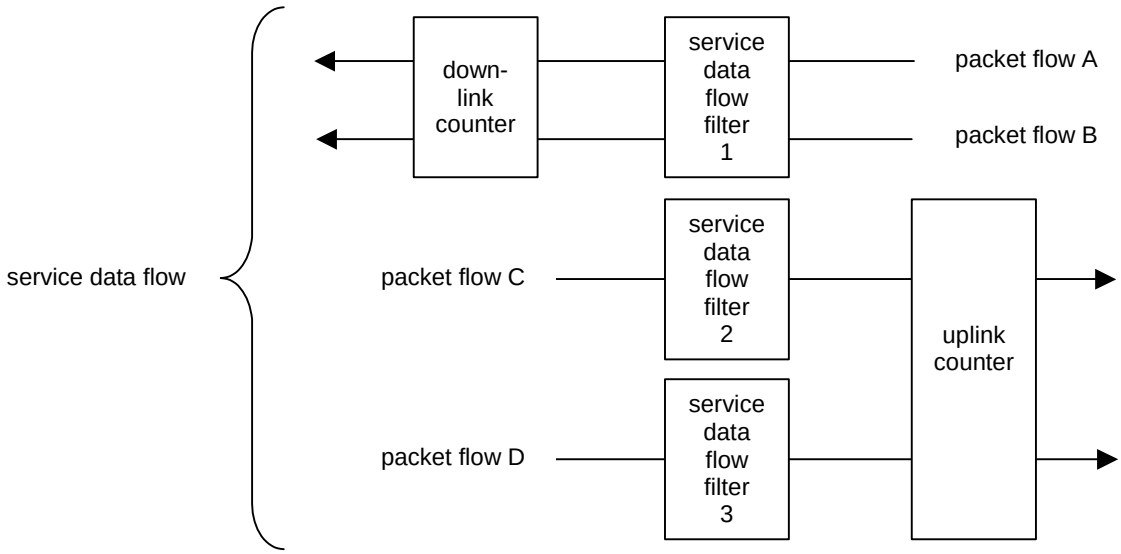

Figure 5.1 – Relationship of service data flow, packet flow and service data flow filter

5.4 Reporting

This refers to the differentiated charging information being reported to the charging functions. Basic example: those 20 packets were in rating category A, include this in your global charging information.

- The Traffic Plane function shall report bearer charging information for online charging;
- The Traffic Plane function 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 Traffic Plane function shall report triggered Events of an existing charging rule for both offline and on-line charging;
- The Traffic Plane function shall report triggered re-authorisation of existing charging rules for on-line charging;
- It shall be possible to report charging information showing usage for each user for each charging rule, e.g. a report may contain multiple containers, each container associated with a charging key;
- It shall be possible to associate per PDP context charging information with the corresponding service data flow based charging information. It shall be possible to derive or account the data volumes per PDP context for traffic not accounted via any applicable charging rule.
  For example, in the case of GPRS, output of FBC data per charging rule on a per PDP context basis would allow non-FBC charged data volumes to be determined, and existing per PDP context charging mechanisms in the GGSN to be applied.

5.5 Credit management

In case of online charging, 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, credit can be pooled for multiple (one or more) charging rules applied at the Traffic Plane Function. A pool of credit applying to a single charging rule is equivalent to an individual credit limit for that charging rule. Multiple pools of credit shall be allowed per user.

Rating decisions shall be strictly controlled by the OCS for each service. The OCS shall also control the credit pooling decision for charging rules. The OCS shall either provide a new pool of credit, together with a new credit limit, or a reference to a pool of credit that already exists at the TPF.

The grouping of charging rules 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 rule 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.

5.6 Termination Action

The Termination Action applies only in case of online charging. The termination action indicates the action, which the Traffic Plane Function should perform when ~~the~~ no more credit ~~for the service data flow has expired~~is granted. A packet that matches a charging rule, indicating a charging key for which no credit has been granted, is subject to a Termination Action.

The defined termination actions include:

- Allowing the packets, subject to the termination action, ~~corresponding to a terminated service data flow~~ to pass through;

- Dropping the packets, subject to the termination action ~~corresponding to a terminated service data flow as they pass through the Traffic Plane Function~~;

- ~~Indicating to the~~ The TPF ~~that the d~~Default ~~t~~Termination ~~behaviour shall be used~~Action;~~-~~

- The re-~~directing~~ direction of packets, subject to the termination action, ~~corresponding to a terminated service data flow~~ to an application server (e.g., defined in the termination action).

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

The ~~default~~ Default ~~t~~Termination ~~behaviour~~ Action for all charging keys, for which no more credit is granted and there is no ~~terminated service data flows without a~~ specific Termination Action shall be pre-configured in the TPF according to operator's policy. For instance, the default behaviour may consist of allowing packets of any terminated service data flow to pass through the TPF.

The OCS may provide a Termination Action over the Gy interface. Any previously provided Termination Action may be overwritten by the OCS.

Note: A Termination Action remains valid and shall be applied by the TPF until the corresponding charging rule is removed or the corresponding bearer is removed ~~the user and IP network connection is removed~~ (for GPRS ~~when the last~~ the PDP context ~~is removed~~).

~~In case the~~ The OCS ~~intends to~~shall provide the Termination Action~~, it shall send it~~ to the TPF before ~~the~~ denying credit ~~for the service data flow is exhausted~~; otherwise the TPF ~~pre-configured~~ default termination ~~behaviour~~ action will be performed.

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

5.7 Re-authorisation and Event Triggers

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

- credit authorisation lifetime expiry~~,~~;
- idle timeout~~,~~;
- charging rule is changed~~,~~;
- ~~GPRS events such as~~ SGSN change~~,~~;
- QoS change~~s,~~;
- RAT type change.

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

Event triggers include ~~GPRS~~ the following events ~~such as~~:

- SGSN change~~,~~;
- QoS change~~,~~;
- RAT type change~~,~~;
- TFT change.

Event triggers apply after ~~initial~~ bearer establishment.

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

5.8 Policy functions provided by FBC architecture

5.8.1 General

Service Based Local Policy (SBLP) specified in 3GPP TS 23.207[12] provides policy control functions for PS traffic. Some of these policy control functions are also provided by the FBC architecture to a certain extent, as described in the following sub-clauses. Note that there is no intention to duplicate the same SBLP functionalities with FBC, instead an overall description is given how FBC may provide policy like functions.

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 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.

5.8.3 Gating

The Gating functionalilty of SBLP provides the ability to control blocking or allowing packets of a service flow to pass through. FBC achieves this functionality by discarding the packets for the service data flow in case of there is no other applicable filter available in the TPF for this service data flow.

For peer-to-peer traffic, special rates may apply. The gate could therefore be either closed for this traffic before the applicable filters are available, or the gate could be opened with a more generic charging rule which does not allow for this special rate to apply yet.

The AF controls the point of time where Rx input is given to the CRF which then sends this information down to the TPF, allowing for the filters for this peer-to-peer traffic to form a new charging rule. This allows the AF and CRF to control whether flows can pass through a particular bearer (PDP Context in case of GPRS):

- If the bearer has a charging rule installed that matches the flow, the flow is allowed to pass through on the bearer;
- If the bearer does not have a charging rule installed that matches the flow, the flow is not allowed to pass through on the bearer. If none of the bearers have a charging rule installed matching the flow, the flow is not allowed to pass through on any of the bearers.

5.8.4 QoS control

The QoS control functionality of SBLP provides control and authorization of the QoS parameters of the bearer that carries the service flow.

FBC provides means to control what bearer a service flow is allowed to be carried on. This implicitly allows the CRF to control what type of bearer (to the extent of QoS parameters) a service flow is allowed to use. A charging rule may apply to one or more particular bearer(s) (to a particular PDP Context in case of GPRS). Hence, the QoS the service flow is allowed to use is restricted to the QoS of a particular bearer(s).

5.8.5 Bearer events

SBLP provides means for the Policy Enforcement Function to indicate certain bearer events (e.g. ~~sudden~~ 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.

5.8.6 Session events

SBLP provides means to enforce bearer release upon certain AF session events (e.g. session hold or release).

The FBC architecture provides means to disable the service flows of the AF session upon AF session events (e.g. session hold or release). This is achieved by the AF providing new Rx input to the CRF which then removes the charging rules of the service flows of the AF session from the TPF. Hence, traffic of the service flow will be blocked in case there is no other applicable filter available in the TPF for this service data flow i.e. the CRF has not allowed this traffic to pass through the network.

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

6.2.4 Traffic Plane Function

The Traffic Plane Function 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 Traffic Plane Function shall support ~~pre-defined~~predefined charging rules, and ~~pre-defined~~predefined filters. See subclause 5.3 for further filtering and counting requirements.

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

For online charging, the Traffic Plane Function shall be capable of managing a pool of credit used for some or all of the service data flows of a user. The Traffic Plane Function 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. The appropriate CRF is contacted based on UE identity information.

Editor's note: The specific identity information used to identify the appropriate CRF is FFS.

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 traffic Plane Function is a logical function allocated to the GGSN.

Editor's Note: The effects of this co-location to the interfaces still needs to be studied e.g. Gy, Gz, Gi. Gi radius extensions for charging purposes are not precluded.

For GPRS, the TPF/GGSN shall be able to do separate counts per PDP context for a single service data flow if it is transferred on more than one PDP context.

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

At initial bearer establishment the Traffic Plane Function shall request charging rules applicable for this bearer from the charging rules function. As part of the request, the Traffic Plane Function provides the relevant information to the charging rules function. The Traffic Plane Function shall use the charging rules received in the response from the charging rules function. In addition, the Traffic Plane Function shall use any applicable ~~pre-defined~~predefined static charging rules. ~~Pre-defined~~Predefined charging rules may apply for all users or may be dynamically activated by the CRF for a specific bearer of a single user.

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 charging rules function. 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 Traffic Plane Function receives an unsolicited update of the charging rules from the charging rules function, the new charging rules shall be used.

If another bearer is established by the same user (e.g. for GPRS a secondary PDP context), the same procedures shall be applied by the Traffic Plane Function as described for the initial bearer. For a bearer (e.g. in GPRS, a secondary PDP context), 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 Traffic Plane Function 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 the packet shall be discarded.

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

6.3.1 Gx reference point

The Gx reference point enables the use of service data flow based charging rules such as counting number of packets belonging to a rate category in the IP-Connectivity Network. This functionality is required for both offline and online charging.

Note: The reuse of existing protocols over the Gi reference point for Gx shall be evaluated in stage 3.

The Gx reference point supports the following functions:

1. Initialisation and maintenance of Gx connection
2. Request for Charging Rules (from TPF to CRF)
3. Provision of Charging Rules (from CRF to TPF)
4. Indication of Bearer Service Termination (from TPF to CRF)

6.3.1.1 Initialisation and Maintenance of Gx Connection

~~A~ The TPF shall ensure the establishment of a single Gx connection ~~shall be established between~~to each ~~interworking~~ CRF~~ and TPF pair~~. The connection can be direct, or established via a relay/proxy node. A connection may be redirected to an alternate CRF.

Note: The set of CRFs, to which the TPF must establish a Gx connection, depends on the configuration.

At a failover, commands which have not been successfully received shall be queued to an alternate CRF.

Only CRFs responsible for the same UE identity information may be selected as alternate CRF.

The detailed specification of the connection establishment and maintenance is for specification in stage 3.

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

6.3.4.2 Initialisation and Maintenance of Rx Connection

~~A~~The AF node shall ensure the establishment of a single Rx connection ~~shall be established between~~ to each ~~interworking~~ CRF ~~and AF pair~~. The connection can be direct, or established via a relay/proxy node. A connection may be redirected to an alternate CRF.

Note: The set of CRFs, to which the AF must establish a Rx connection, depends on the configuration.

At a failover, commands which have not been successfully received shall be queued to an alternate CRF.

Only CRFs responsible for the same UE identity information may be selected as alternate CRF.

The detailed specification of the connection establishment and maintenance is for specification in stage 3.

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

7.2.1 Bearer Service Establishment

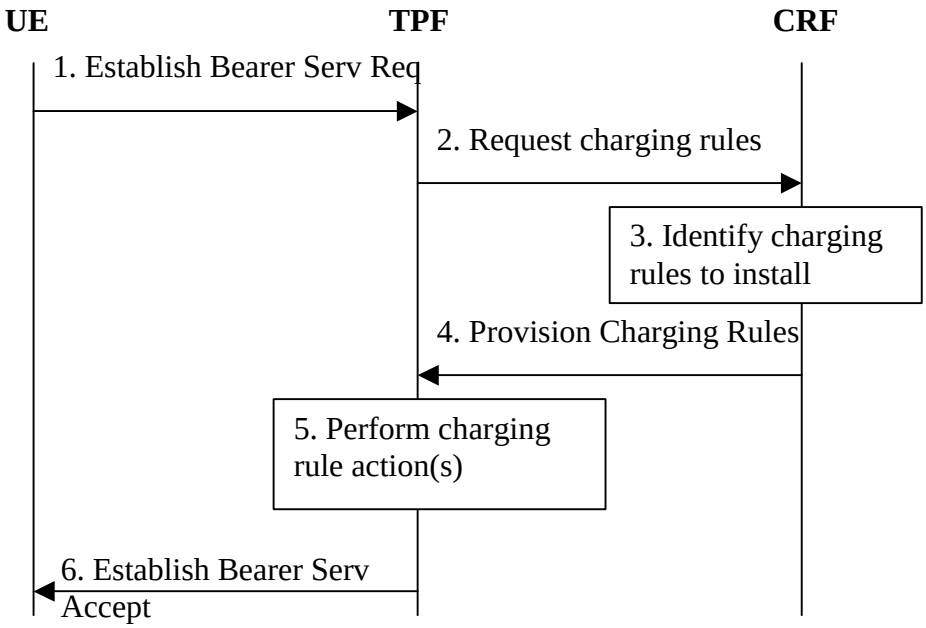

Figure 7.1: Bearer Service Establishment in case of offline charging

1 The TPF receives a request to establish a bearer service. For GPRS, this is the GGSN that receives a Create PDP context request for a primary or secondary PDP context.

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 and associated event triggers (if available) 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 initial bearer service the TPF also installs any ~~pre-defined~~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.

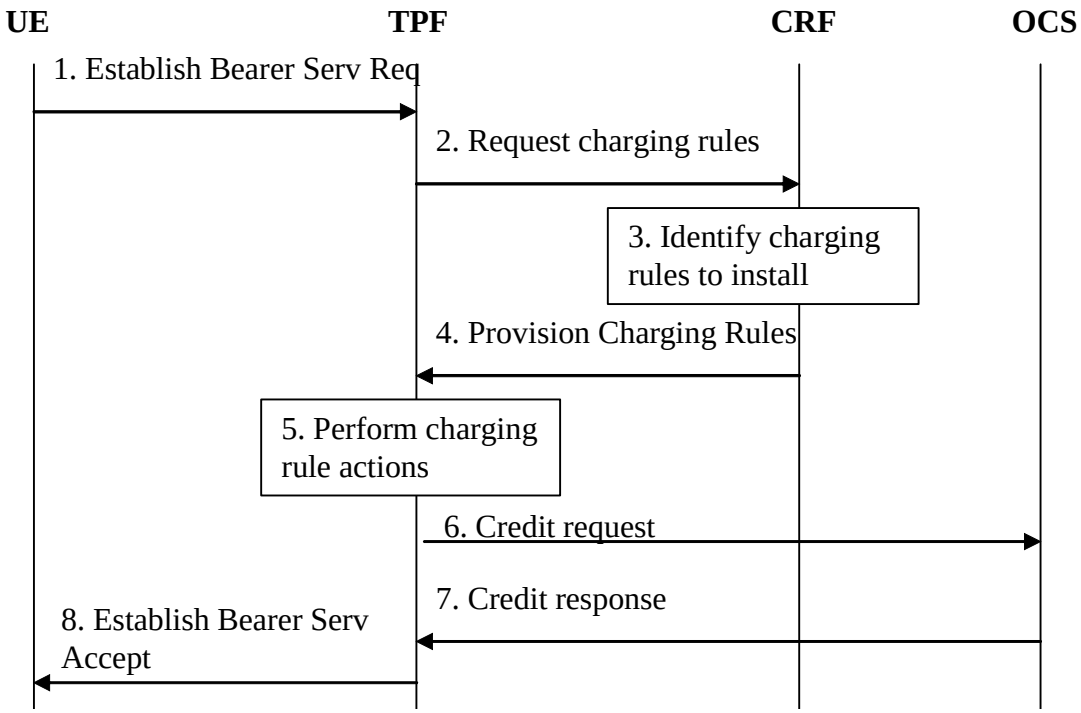

Figure 7.2: Bearer Service Establishment in case of online charging

1. The TPF receives a request to establish a bearer service. For GPRS, this is the GGSN that receives a Create PDP context request for a primary or secondary PDP context.
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 and associated event triggers (if available) 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 initial bearer service the TPF also installs any ~~pre-defined~~predefined charging rules.
6. The TPF requests credit for any established charging rule (either already established or newly installed) from the OCS, and provides relevant input information for the OCS decision. The TPF returns the remaining credit of any removed charging rule.
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 rule, 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.

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

3GPP TSG-SA2 Meeting #42
Sophia-Antipolis, France, 11-15 October 2004

Tdoc ⌘S2-043378

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.125** **CR** **083** ⌘**rev** **2** ⌘ Current version: **6.2.0** ⌘

*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 ☒

Title:	⌘	Clarify that SGSN event is MCC/MNC related
Source:	⌘	Ericsson
Work item code:	⌘	CH-FBC
Date:	⌘	14/10/2004
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:	⌘	Currently the TS requires that an SGSN change should be considered as an event trigger. However it is not clear at what granularity the CRF need to know. This CR clarifes that it is at PLMN level.
Summary of change:	⌘	Adds that SGSN change event is at PLMN level.
Consequences if not approved:	⌘	The TS may be interpreted incorrectly and lead to faulty implementations

Clauses affected:	⌘	5.7

Other specs affected: ⌘	Y	N		⌘
		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 MODIFIED SECTION ********

5.7 Re-authorisation and Event Triggers

Re-authorisation applies to online charging. For each charging rule, the TPF receives re-authorisation trigger information from the OCS which determines when the TPF should perform a re-authorisation. The re-authorisation trigger detection will cause the TPF to request re-authorisation of the credit in the OCS. It shall be possible for the OCS to apply re-authorisation of credit in case of particular events, e.g. credit authorisation lifetime expiry, idle timeout, charging rule is changed, GPRS events such as SGSN change, PLMN change, QoS changes~~,~~ and RAT type change.

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

Event triggers include GPRS events such as SGSN change, PLMN change, QoS change, RAT type change and~~,~~ TFT change.

Event triggers apply after initial bearer establishment.

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

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

3GPP TSG-SA2 Meeting #42
Sophia-Antipolis, France, 11-15 October 2004

Tdoc ⌘S2-043379

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.125** **CR** **085** ⌘ **rev** **2** ⌘ Current version: **6.2.0** ⌘

*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 ☒

Title:	⌘	Clarify the handling of PDP contexts
Source:	⌘	Ericsson
Work item code:	⌘	CH-FBC
Date:	⌘	14/10/2004
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 TS currently distinguishes between primary and secondary PDP context however there is no definition in GPRS that implies that certain PDP contexts are more important than others.
Summary of change:	⌘	The use of primary and secondary PDP context is removed.
Consequences if not approved:	⌘	The TS may be interpreted incorrectly and lead to faulty implementations

Clauses affected:	⌘	5.3, 6.2.4, 6.3.1.2, 7.2.1

Other specs affected: ⌘	Y	N		⌘
		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 MODIFIED SECTION ********

5.3 Service data flow filters and counting

This section refers to the filtering that identifies the service data flows that need to be charged individually (e.g. at different rates). Basic example: look for packets of one service, e.g. to and from a server A.

- Separate filtering 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 information for a service data flow for one direction, or for both directions.

- Different granularity for service data flow filters identifying the service data flow 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 filters which look further into the packet, or require other complex operation (e.g. maintaining state) may be pre-defined in the TPF and invoked 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 traffic plane function supports simultaneous independent filtering on service data flows associated with each individual active PDP context~~; that is, primary and secondary PDP contexts, of one APN~~.
- In case of no applicable filters for a service data flow, the TPF shall discard the packets for this service data flow. To avoid the TPF automatically discarding packets due to no applicable charging rules, the operator may define generic charging rules (with wild-carded packet filters) to allow for default charging for the packets that don't match any other charging rule.
- The service data flow filters and counting are applied by the TPF (the GGSN in the case of GPRS).

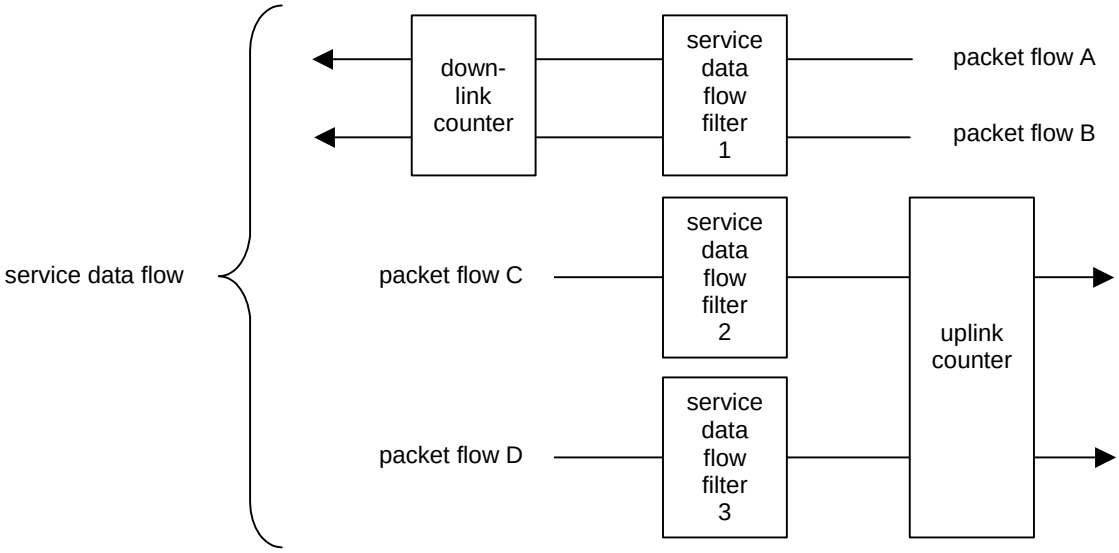

Figure 5.1 – Relationship of service data flow, packet flow and service data flow filter

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

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

6.2.4 Traffic Plane Function

The Traffic Plane Function 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 Traffic Plane Function shall support pre-defined charging rules, and pre-defined filters. See subclause 5.3 for further filtering and counting requirements.

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

For online charging, the Traffic Plane Function shall be capable of managing a pool of credit used for some or all of the service data flows of a user. The Traffic Plane Function 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. The appropriate CRF is contacted based on UE identity information.

Editor's note: The specific identity information used to identify the appropriate CRF is FFS.

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 traffic Plane Function is a logical function allocated to the GGSN.

Editor's Note: The effects of this co-location to the interfaces still needs to be studied e.g. Gy, Gz, Gi. Gi radius extensions for charging purposes are not precluded.

For GPRS, the TPF/GGSN shall be able to do separate counts per PDP context for a single service data flow if it is transferred on more than one PDP context.

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

At initial bearer establishment the Traffic Plane Function shall request charging rules applicable for this bearer from the charging rules function. As part of the request, the Traffic Plane Function provides the relevant information to the charging rules function. The Traffic Plane Function shall use the charging rules received in the response from the charging rules function. In addition, the Traffic Plane Function shall use any applicable pre-defined static charging rules. Pre-defined charging rules may apply for all users or may be dynamically activated by the CRF for a specific bearer of a single user.

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 charging rules function. 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 Traffic Plane Function receives an unsolicited update of the charging rules from the charging rules function, the new charging rules shall be used.

If another bearer is established by the same user (e.g. for GPRS ~~a secondary PDP context~~the Secondary PDP Context Activation procedure), the same procedures shall be applied by the Traffic Plane Function as described for the initial bearer. For a bearer ~~(e.g. in GPRS, a secondary PDP context)~~, 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 Traffic Plane Function 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 the packet shall be discarded.

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

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

6.3.1.2 Request for Charging Rules (from TPF to CRF)

The TPF requests the charging rules to be applied:

- At bearer service establishment (PDP context establishment for GPRS) or,
- At bearer service modification (PDP context modification for GPRS) if the Event trigger is met, or
- At bearer service termination (PDP context deactivation for GPRS).

The request from the TPF to the CRF must identify whether it is an initial request ~~(primary context establishment for GPRS),~~from the UE (for GPRS the PDP Context Activation procedure [6]), or a subsequent request (i.e. for GPRS, a ~~secondary PDP context establishment,~~new PDP context is activated with the Secondary PDP Context Activation procedure [6], or a PDP context ~~modification).~~is modified with any of the PDP Context Modification procedures [6]). For an initial request for GPRS, the request from the TPF to the CRF shall include at a minimum APN, PDP address information, QoS values and at least one of IMSI or MSISDN.

An identifier is required to allow the specific instance in the TPF/CRF to be identified for subsequent data exchange. The identifier for the communication must be provided.

The request must provide further information used for the charging rule selection. The request shall include an identifier for the bearer, the QoS information, and flow identifier information allocated to the bearer. For GPRS, this information would include the traffic class, IM CN Subsystem Signalling Flag (if present in the downlink), and the TFT.

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

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

7.2.1 Bearer Service Establishment

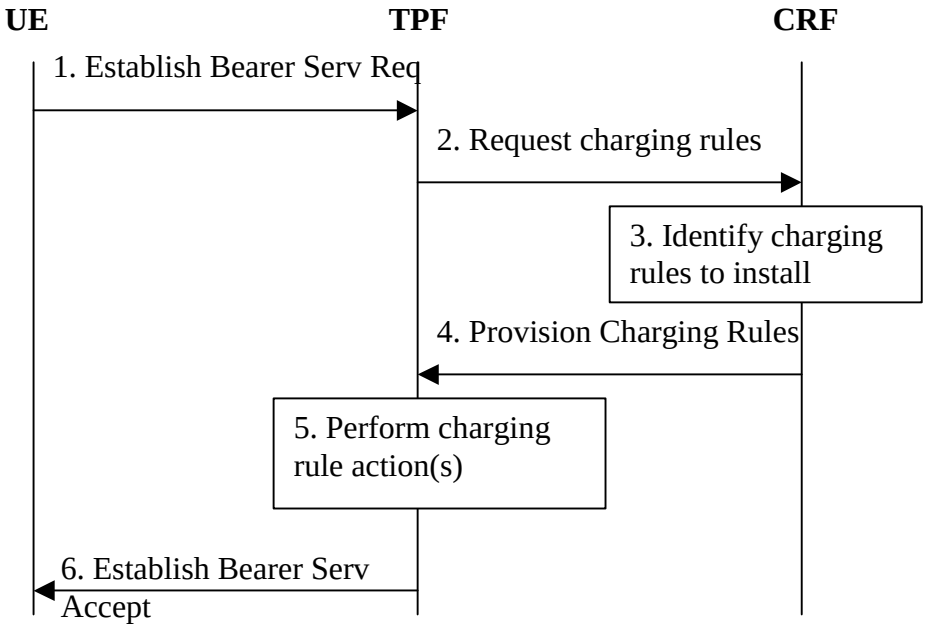

Figure 7.1: Bearer Service Establishment in case of offline charging

1 The TPF receives a request to establish a bearer service. For GPRS, ~~this~~it is the GGSN that receives a Create PDP context request ~~for a primary or secondary PDP context.~~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 and associated event triggers (if available) 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 initial bearer service the TPF also installs any pre-defined 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.

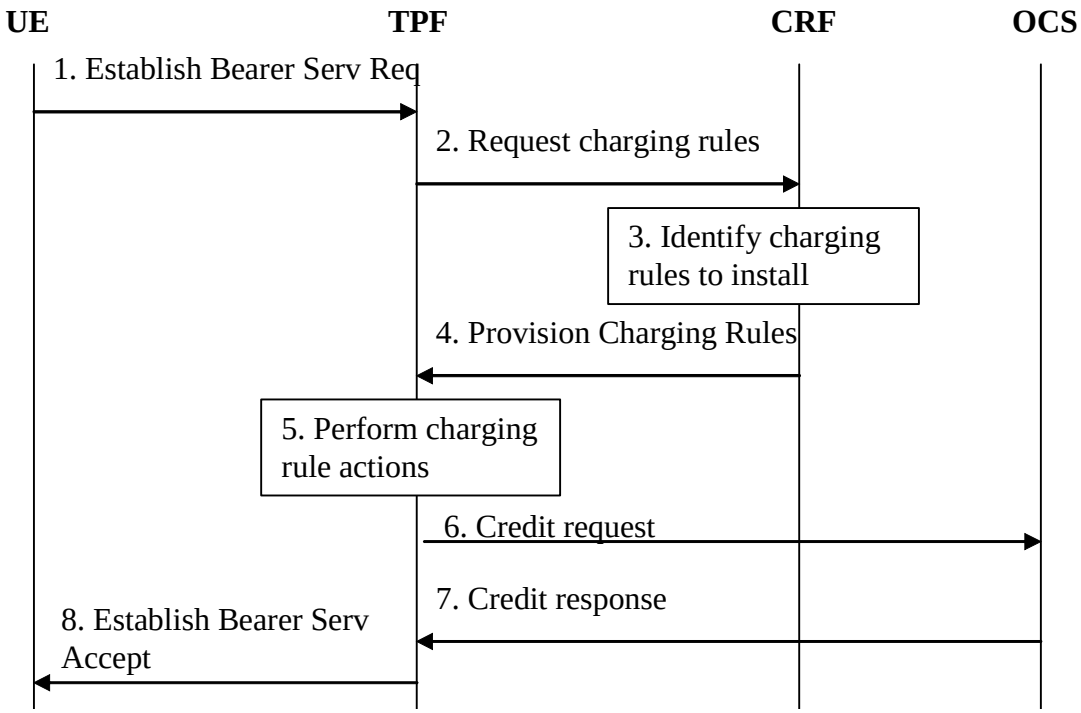

Figure 7.2: Bearer Service Establishment in case of online charging

1. The TPF receives a request to establish a bearer service. For GPRS, ~~this~~it is the GGSN that receives a Create PDP context request ~~for a primary or secondary PDP context.~~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 and associated event triggers (if available) 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 initial bearer service the TPF also installs any pre-defined charging rules.

6. The TPF requests credit for any established charging rule (either already established or newly installed) from the OCS, and provides relevant input information for the OCS decision. The TPF returns the remaining credit of any removed charging rule.

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 rule, 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.

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

3GPP TSG-SA2 Meeting #43
Seoul, Korea, 15th – 19th November, 2004

Tdoc ⌘ S2-043618

CR-Form-v7

CHANGE REQUEST

⌘ **23.125** **CR** **101** ⌘ **rev** **-** ⌘ Current version: **6.2.0** ⌘

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

Title:	⌘	Update of bearer termination message flow
Source:	⌘	Siemens
Work item code:	⌘	CH-FBC
Date:	⌘	10/11/2004
Category:	⌘	**F**
Release:	⌘	Rel-6

Use one of the following categories:
F *(correction)*
A *(corresponds to a correction in an earlier release)*
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Use one of the following releases:

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R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
Rel-4	*(Release 4)*
Rel-5	*(Release 5)*
Rel-6	*(Release 6)*

Reason for change:	⌘	The current message flows are not clear regarding the provision of charging rules for other bearers during a bearer service termination.
Summary of change:	⌘	The message flows are updated by clarifying that the bearer service termination could only lead to a removal of charging rules. A provision of charging rules for other bearer services of the same IP network connection is still possible and can be triggered. The message flow for unsolicited provision of charging rules shall be used in this case.
Consequences if not approved:	⌘	The requirements for the Gx interface are not clear, especially with regard to the provisioning of charging rules for other bearers in case of a bearer service termination.

Clauses affected:	⌘	7.2.3

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

Other comments:	⌘	The notes are also updated with regard to the wording and the format.

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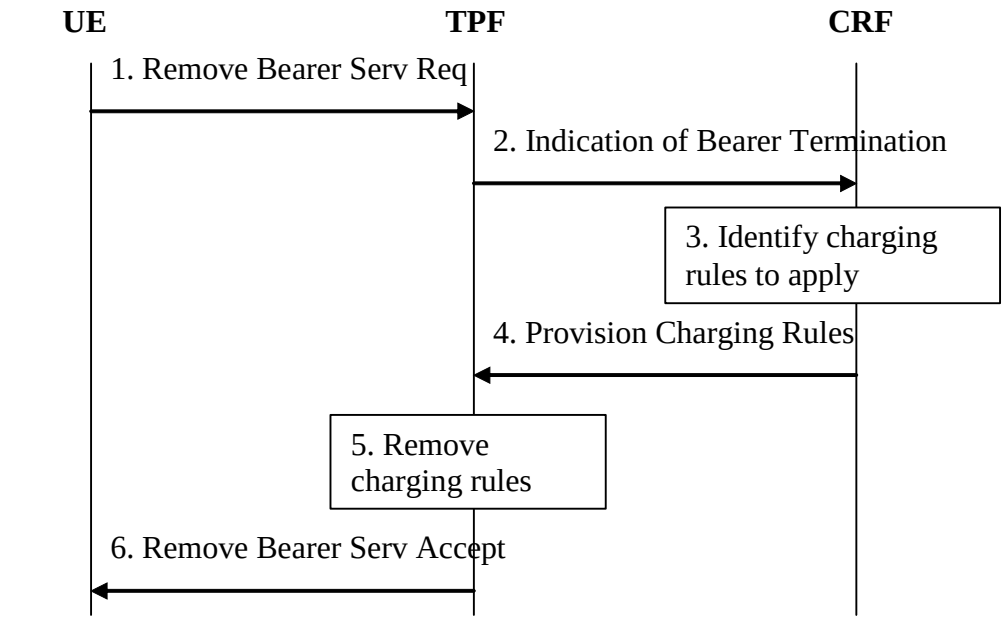
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

Start of modified section

7.2.3 Bearer Service Termination



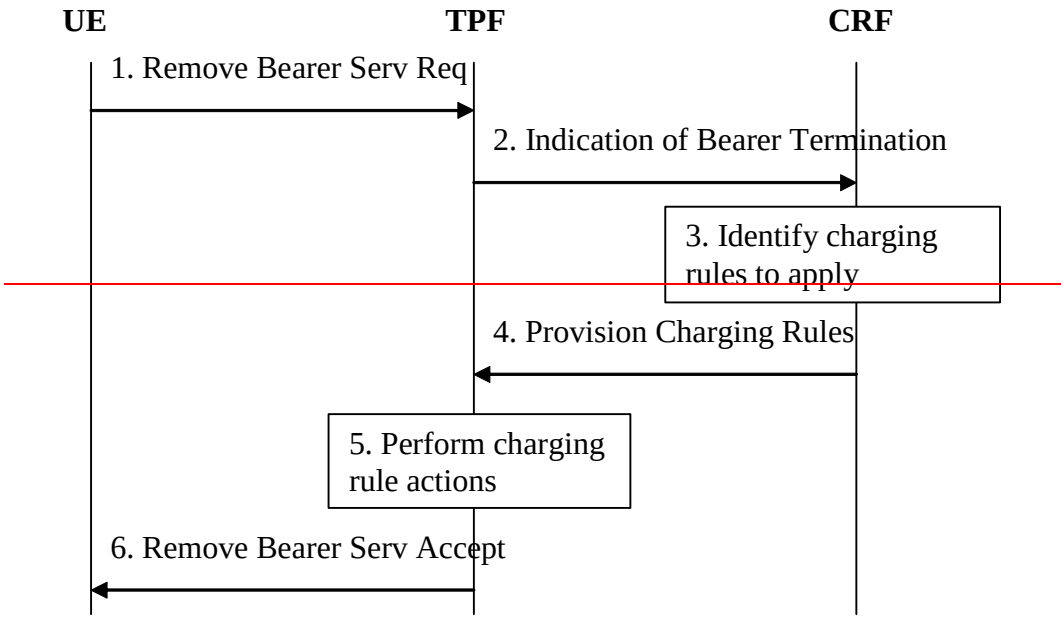


Figure 7.3: Bearer Service Termination in case of offline charging

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 ~~input~~ information for the ~~charging rule selection~~CRF.

3 The CRF applies the indication of the bearer service termination to determines ~~the~~ 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)~~, 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 removed for the terminated bearer service. However, there is no need for the CRF to remove charging rules explicitely.

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

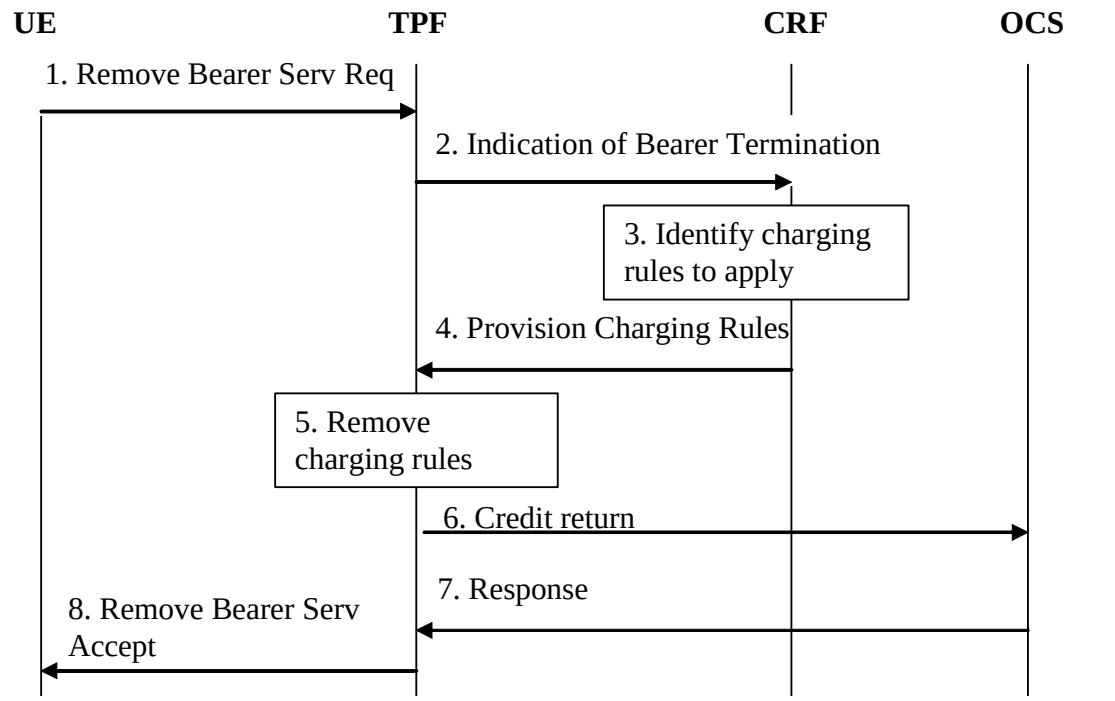
5 The TPF performs charging rule actions as indicated, i.e. removing charging rules.

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.

~~The bearer service termination procedure can proceed in parallel with the indication of bearer termination.~~

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



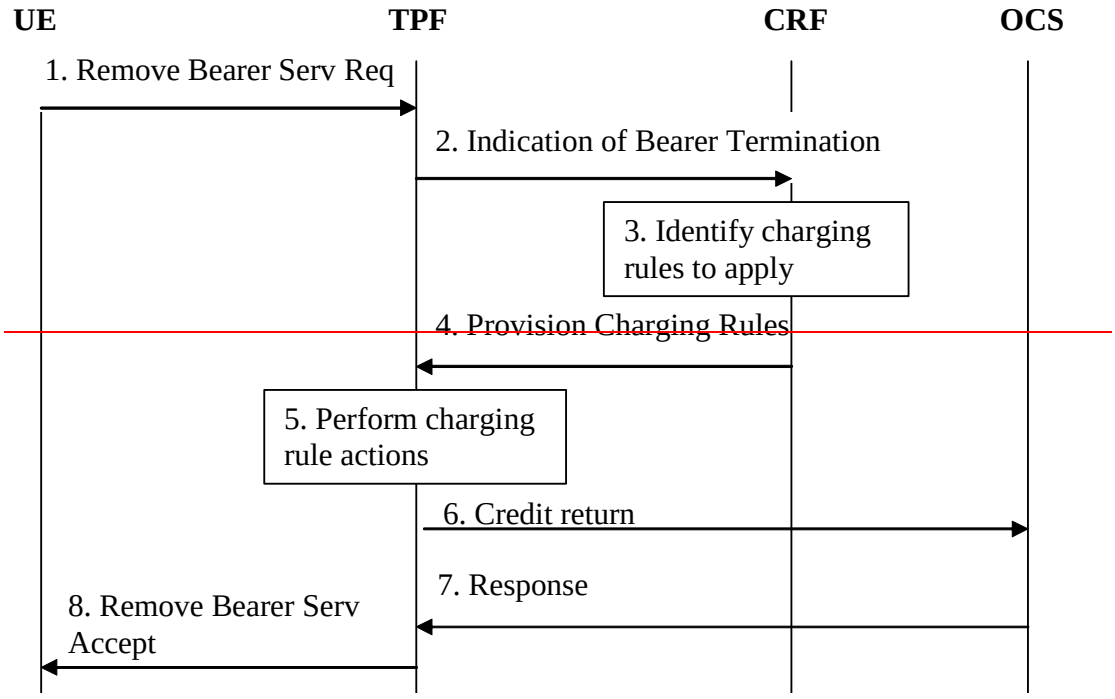


Figure 7.3a: Bearer Service Termination in case of online charging

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 ~~input~~ information for the ~~charging rule decision~~CRF.

3. The CRF applies the indication of the bearer service termination to determine~~s the~~ 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)~~, based on information available to the CRF (e.g. information may be available from the AF as described in 7.1 and the new information received from the TPF)~~. Charging rules may need to be ~~installed, and/or~~ removed~~, and/or modified~~ for the terminated bearer service. However, there is no need for the CRF to remove charging rules explicitely.

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 to the OCS for each charging rule that is removed.
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 ~~procedure~~ 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.

End of modified section

3GPP TSG-WG2 Meeting #43
Seoul, Korea, 15th-19th Nov 2004

Tdoc ⌘ S2-043758

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.125** **CR** **095** ⌘ **rev** **1** ⌘ Current version: **6.2.0** ⌘

*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 ☒

Title:	⌘	Security considerations between CRF and AF
Source:	⌘	ZTE Corporation
Work item code:	⌘	CH-FBC
Date:	⌘	20/10/2004
Category:	⌘	**B**
Release:	⌘	Rel-6

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

Use one of the following releases:

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

Reason for change:	⌘	The current specification dos not state the connection between the CRF and the AF should be able to trust. AF may belong to the third party, then, it is possible not in the operator's network, so it should protect the information exchanged between the AF and CRF.
Summary of change:	⌘	Add the function that the connection between the CRF and the AF should be able to trust, and It's operators' responsibity to ensure confidentiality and integrity of information come from AFs.
Consequences if not approved:	⌘	If the connection between the CRF and the AF exposes itself to kinds of attack from the internet, the charging rules and rates may be deemed unconfident. Therefore, this may affect use of FBC.

Clauses affected:	⌘	6.3.4.1

Other specs affected: ⌘	Y	N		⌘
		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 >>

6.3.4 Rx reference point

6.3.4.1 General

The Rx reference point enables transport of information (e.g. dynamic media stream information) from the application function to the charging rules function. 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.

<< End of changed clause >>

3GPP TSG-WG2 Meeting #43
Seoul, Korea, 15th-19th Nov 2004

Tdoc ⌘ S2-043759

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.125** **CR** **096** ⌘ **rev** **1** ⌘ Current version: **6.2.0** ⌘

*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 ☒

Title:	⌘	Selection of the appropriate CRF by a TPF for a user in GPRS.
Source:	⌘	ZTE
Work item code:	⌘	CH-FBC
Date:	⌘	20/10/2004
Category:	⌘	**B**
Release:	⌘	Rel-6

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

Use one of the following releases:

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

Reason for change:	⌘	The current specification states that the appropriate CRF is contacted based on UE identity information by a TPF as described of the section 6.2.4. However, it does not specify how the TPF selects the appropriate CRF for a GPRS user.
Summary of change:	⌘	To indicate the CRF address(es) are configed in the TPF per APN. This is for the purpose of selection of CRF for a GPRS user.
Consequences if not approved:	⌘	It is not clear for the CRF selection for a GPRS user.

Clauses affected:	⌘	6.2.4

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

Other comments: ⌘

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

6.2.4 Traffic Plane Function

The Traffic Plane Function 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 Traffic Plane Function shall support pre-defined charging rules, and pre-defined filters. See subclause 5.3 for further filtering and counting requirements.

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

For online charging, the Traffic Plane Function shall be capable of managing a pool of credit used for some or all of the service data flows of a user. The Traffic Plane Function 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. The appropriate CRF is contacted based on UE identity information.

Editor's note: The specific identity information used to identify the appropriate CRF is FFS.

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 traffic Plane Function is a logical function allocated to the GGSN.

Editor's Note: The effects of this co-location to the interfaces still needs to be studied e.g. Gy, Gz, Gi. Gi radius extensions for charging purposes are not precluded.

<< End of changed clause >>

3GPP TSG-WG2 Meeting #43
Seoul, Korea, November 15-19, 2004

Tdoc ⌘ S2-043760

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.125** **CR** **098** ⌘ **rev** **1** ⌘ Current version: **6.2.0** ⌘

*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 ☒

Title:	⌘	Clarification of volume and time based charging
Source:	⌘	Huawei
Work item code:	⌘	CH-FBC
Date:	⌘	19/11/2004
Category:	⌘	**F**
Release:	⌘	Rel-6

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

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

Reason for change:	⌘	The current speicification provides a kind of charging model:" Volume and time based charging", with this charging model, the OCS could be able to check the amount of data used over some time period. However, currently the specification only describes in case of "volume and time based charging" model, the OCS can provide both volume credit and time indication to the TPF, there is no further description about the TPF shall how to handle these two parameters, the incomplete description may cause confusion in stage 3.
Summary of change:	⌘	Add a sentence to describe that TPF how to handle the volume credit and time indication.
Consequences if not approved:	⌘	Incomplete description remained, this may affect the functionality of " Volume and time based charging".

Clauses affected:	⌘	4.3.1			
Other specs affected:	⌘	**Y**	**N**		
			X	Other core specifications	⌘
			X	Test specifications	
			X	O&M Specifications	
Other comments:	⌘				

How to create CRs using this form:

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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.

<< First changed clause >>

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.

Editor's note: Additional charging models that are event and service based require further investigation.

It shall be possible to apply different rates 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 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.

<< End of changed clause >>

3GPP TSG-SA2 Meeting #43
Seoul, Korea, 15th – 19th November, 2004

Tdoc ⌘ S2-043762

CR-Form-v7

CHANGE REQUEST

⌘ **23.125** **CR** **078** ⌘ **rev** **3** ⌘ Current version: **6.2.0** ⌘

*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 ☒

Title:	⌘	CCF/OCS address clarifications
Source:	⌘	Siemens
Work item code:	⌘	CH-FBC
Date:	⌘	16/11/2004
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:

2	*(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)*

Reason for change:	⌘	The current description of CCF/OCS addresses that are pre-configured in the TPF are not clear regarding the user relationship. It is also not shown when the CCF/OCS addresses are provided to the TPF.
Summary of change:	⌘	It is clarified that the pre-configured CCF/OCS addresses are relevant for all users, i.e. there are no user specific CCF/OCS addresses pre-configured. The relevant text is also separated into an OCS and CCF part. The information flows for the bearer service establishment are extended by the CCF/OCS provision. It is also clarified that event triggers and CCF/OCS addresses may be only provided during the initial bearer service establishment of an IP network connection.
Consequences if not approved:	⌘	Unclear TPF and Gx interface requirements.

Clauses affected:	⌘	6.2.2, 6.2.3, 7.2.1

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

Other comments:	⌘	

How to create CRs using this form:
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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.

Start of 1st 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 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 ~~CCFs and/or~~ OCSs in a PLMN. To allow for this case, ~~CCF and/or~~ OCS addresses (i.e. the primary address and secondary address) may be passed once per ~~user and~~ IP network connection from the CRF to the TPF. ~~Alternatively t~~This information ~~may~~ shall be locally pre-configured within the TPF for all users. The addresses provided by the CRF have higher priority than the pre-configured ones.

End of 1st modified section

Start of 2nd modified section

6.2.3 Charging Collection Function

The Charging Collection Function is specified in 3GPP TS 32.200 [3].

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

End of 2nd modified section

Start of 3rd modified section

7.2.1 Bearer Service Establishment

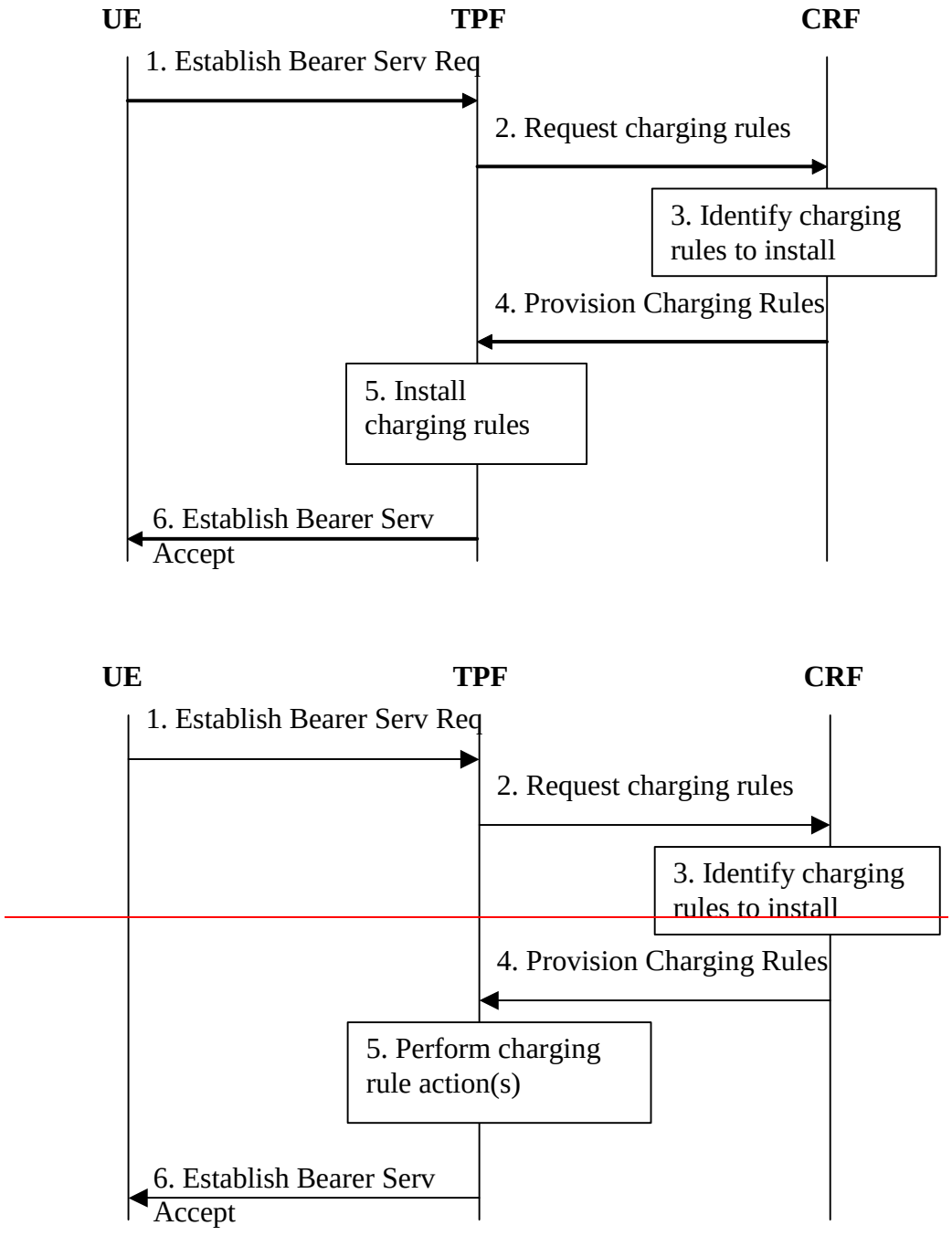

Figure 7.1: Bearer Service Establishment in case of offline charging

1 The TPF receives a request to establish a bearer service. For GPRS, this is the GGSN that receives a Create PDP context request for a primary or secondary PDP context.

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 ~~(if available),~~ CCF 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 ~~initial~~ bearer service the TPF also installs any pre-defined 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.

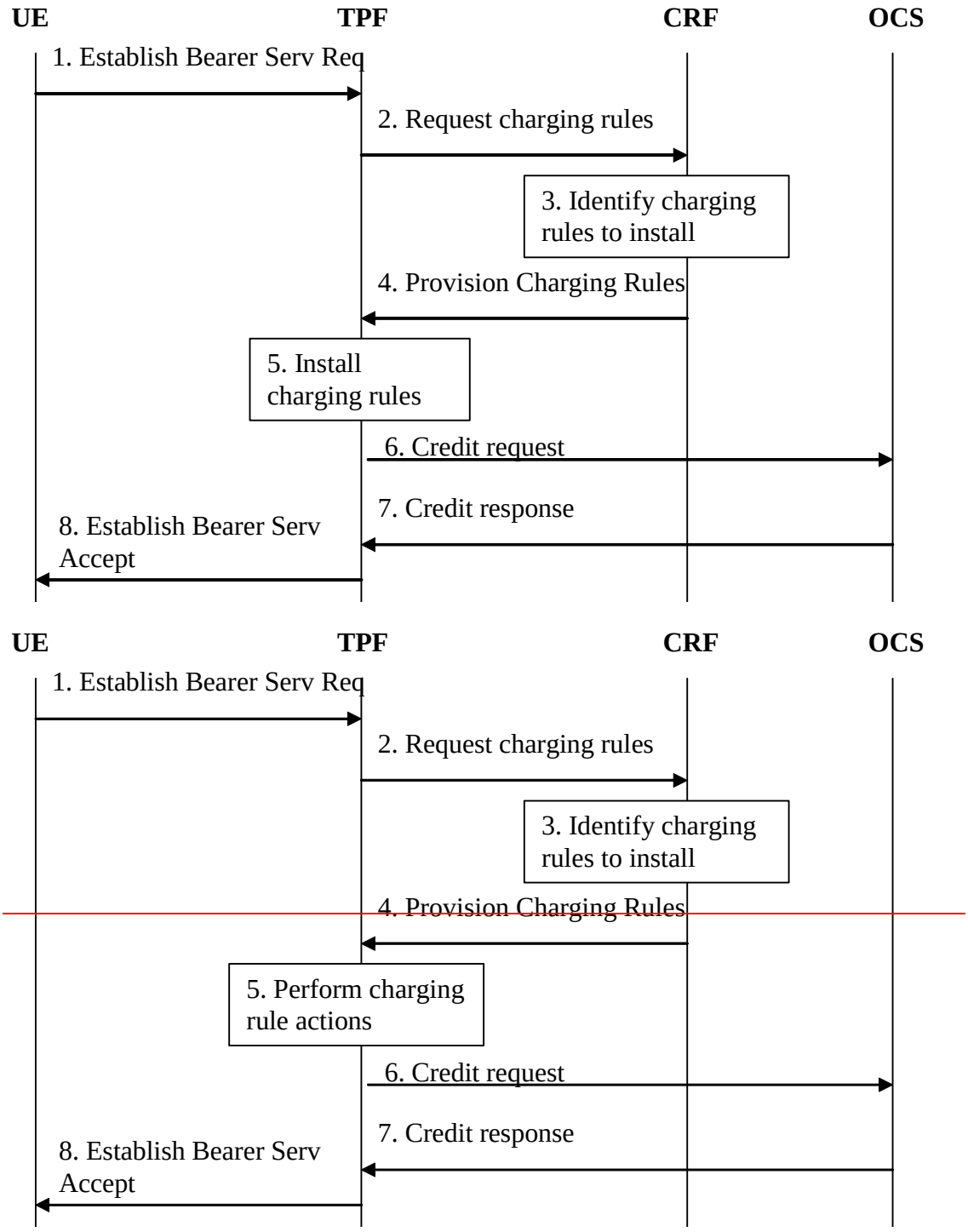

Figure 7.2: Bearer Service Establishment in case of online charging

1. The TPF receives a request to establish a bearer service. For GPRS, this is the GGSN that receives a Create PDP context request for a primary or secondary PDP context.

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 ~~and associated~~ event triggers ~~(if available),~~ CCF 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 ~~initial~~ bearer service the TPF also installs any pre-defined charging rules.

6. The TPF requests credit for any established charging rule (either ~~already established~~ predefined or newly installed) from the OCS, and provides relevant input information for the OCS decision. The TPF returns the remaining credit of any removed charging rule.

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 rule, 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.

End of 3rd modified section

3GPP TSG-WG2 Meeting #43
Seoul, Korea, November 15-19, 2004

Tdoc ⌘ S2-043904

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.125** **CR** **099** ⌘ **rev** **2** ⌘ Current version: **6.2.0** ⌘

*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 ☒

Title:	⌘	Clarification of online charging procedure
Source:	⌘	Huawei
Work item code:	⌘	CH-FBC
Date:	⌘	19/11/2004
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 approved CR#82, the credit request is based on per charging key. however, in the online charging procedures, the corresponding descripition is not updated to meet the new feature.
Summary of change:	⌘	When a charging rule is installed or modified, the TPF shall request credit only for a newly charging key. When a charging rule is removed, the TPF shall return the remaining credit only in case there is no other charging rule sharing it. The re-authorisation trigger provided by OCS should be applied to per charging key basis.
Consequences if not approved:	⌘	The speicification remains inconsistency and may cause confusion.

Clauses affected:	⌘	5.6, 5.7, 7.2.1, 7.2.2.4, 7.2.3, 7.3

	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 changed clause >>

5.6 Termination Action

The Termination Action applies only in case of online charging. The termination action indicates the action, which the Traffic Plane Function should perform when the credit for the ~~service data flow~~ charging key has expired.

The defined termination actions include:

- Allowing the packets corresponding to a terminated service data flow to pass through;
- Dropping the packets corresponding to a terminated service data flow as they pass through the Traffic Plane Function;
- Indicating to the TPF that the default termination behaviour shall be used;
- The re-directing of packets corresponding to a terminated service data flow to an application server (e.g., defined in the termination action).

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

The default termination behaviour for all terminated service data flows without a specific Termination Action shall be pre-configured in the TPF according to operator's policy. For instance, the default behaviour may consist of allowing packets of any terminated service data flow to pass through the TPF.

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

Note: A Termination Action remains valid and shall be applied by the TPF until all the corresponding charging rule of that charging key is removed or the user and IP network connection is removed (for GPRS when the last PDP context is removed).

In case the OCS intends to provide Termination Action, it shall send it to the TPF before the credit for the ~~service data flow~~charging key is exhausted; otherwise pre-configured default termination behaviour will be performed.

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

<< Next changed clause >>

5.7 Re-authorisation and Event Triggers

Re-authorisation applies to online charging. For each charging ~~rule~~ key, the TPF receives re-authorisation trigger information from the OCS which determines when the TPF should perform a re-authorisation. The re-authorisation trigger detection will cause the TPF to request re-authorisation of the credit in the OCS. It shall be possible for the OCS to apply re-authorisation of credit in case of particular events, e.g. credit authorisation lifetime expiry, idle timeout, charging ~~rule~~ key is changed, GPRS events such as SGSN change, QoS changes, RAT type change.

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

Event triggers include GPRS events such as SGSN change, QoS change, RAT type change, TFT change.

Event triggers apply after initial bearer establishment.

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

<< Next changed clause >>

7.2.1 Bearer Service Establishment

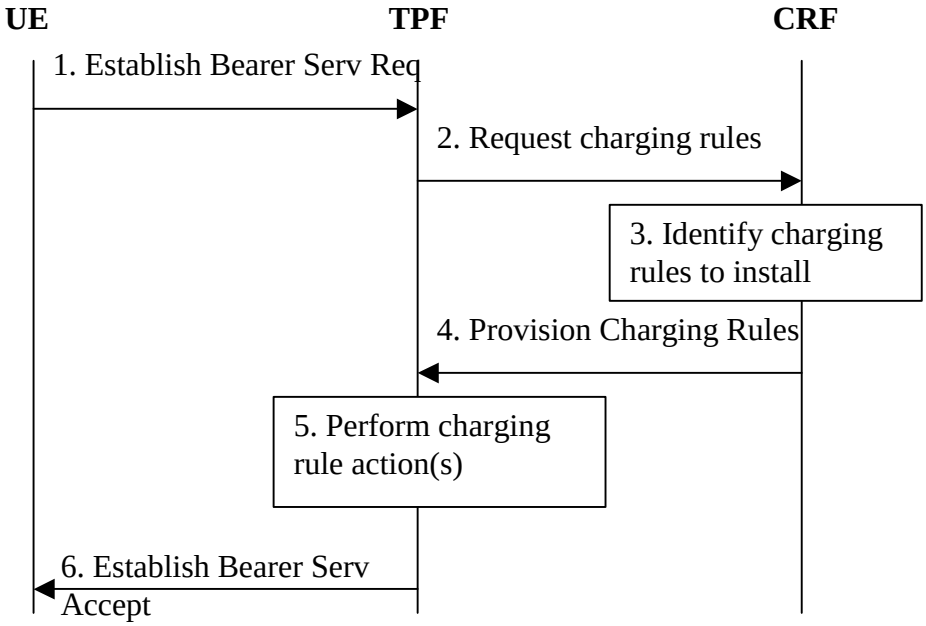

Figure 7.1: Bearer Service Establishment in case of offline charging

1 The TPF receives a request to establish a bearer service. For GPRS, this is the GGSN that receives a Create PDP context request for a primary or secondary PDP context.

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 and associated event triggers (if available) 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 initial bearer service the TPF also installs any pre-defined 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.

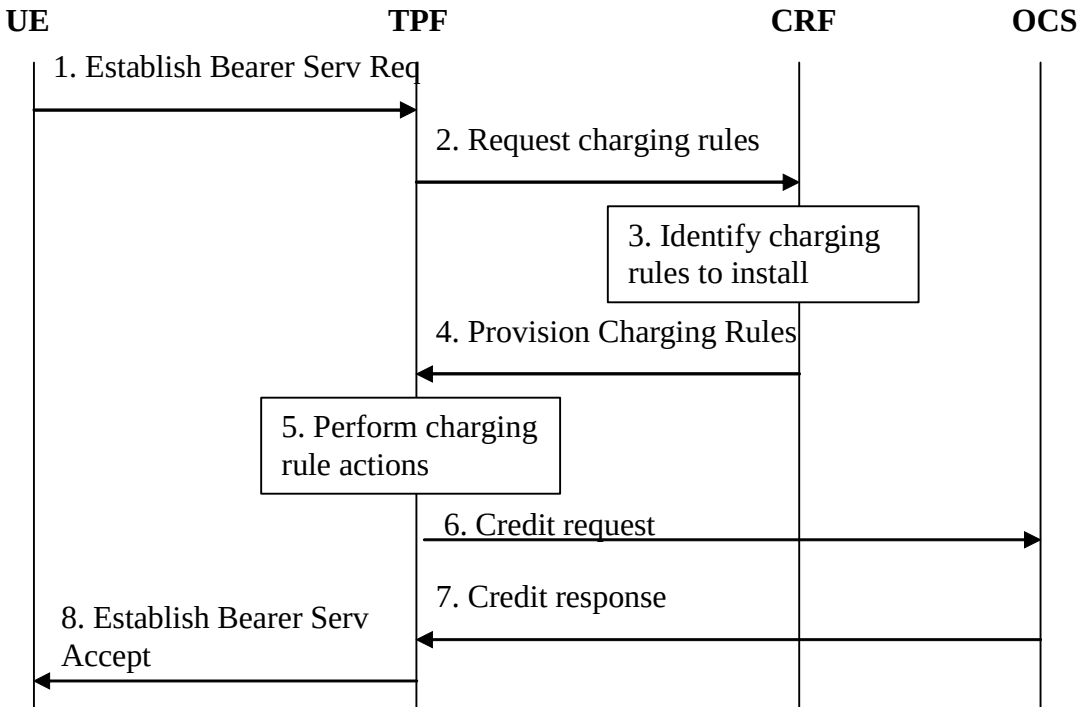

Figure 7.2: Bearer Service Establishment in case of online charging

1. The TPF receives a request to establish a bearer service. For GPRS, this is the GGSN that receives a Create PDP context request for a primary or secondary PDP context.

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 and associated event triggers (if available) 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 initial bearer service the TPF also installs any pre-defined charging rules.

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

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 ~~rule~~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.

<< Next changed clause >>

7.2.2.4 Bearer Service Modification in case of online charging

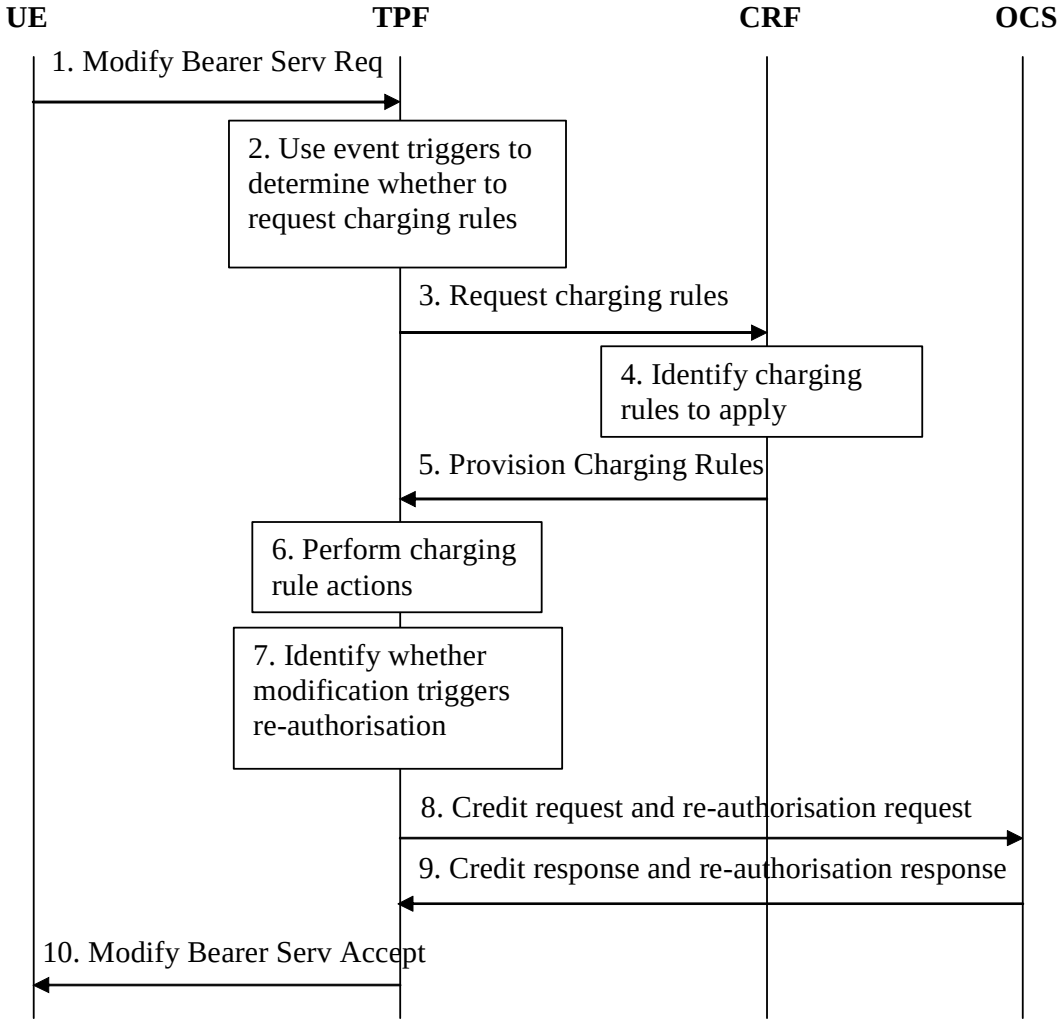

Figure 7.2c: Bearer Service Modification in case of online charging

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

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

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

9. The OCS answers to the TPF providing credits.

10. If credit is available at least for one charging rule, the TPF accepts the bearer modification.

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

<< Next changed clause >>

7.2.3 Bearer Service Termination

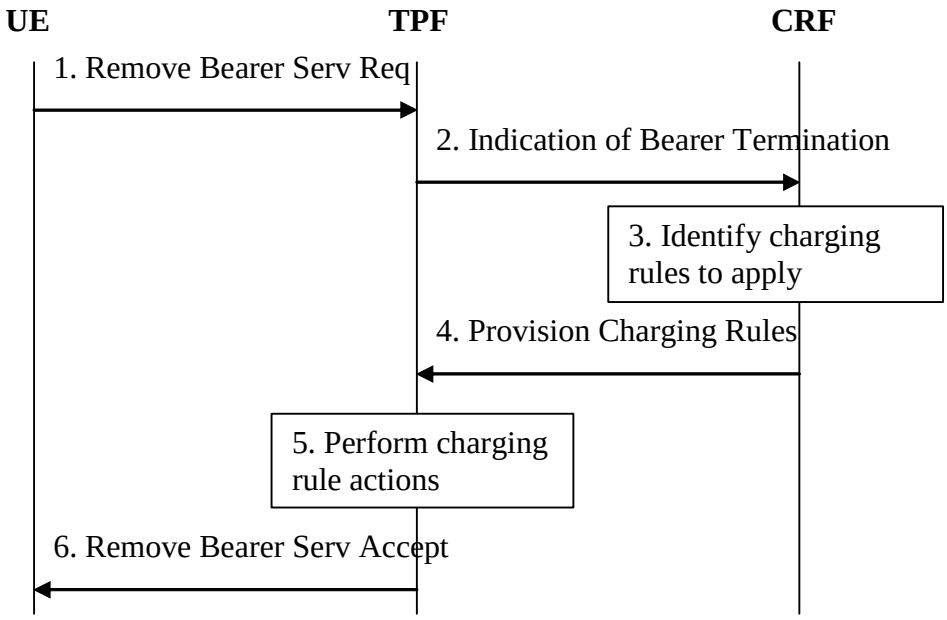

Figure 7.3: Bearer Service Termination in case of offline charging

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 (for GPRS, a PDP context) is being removed 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 removed.

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.

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

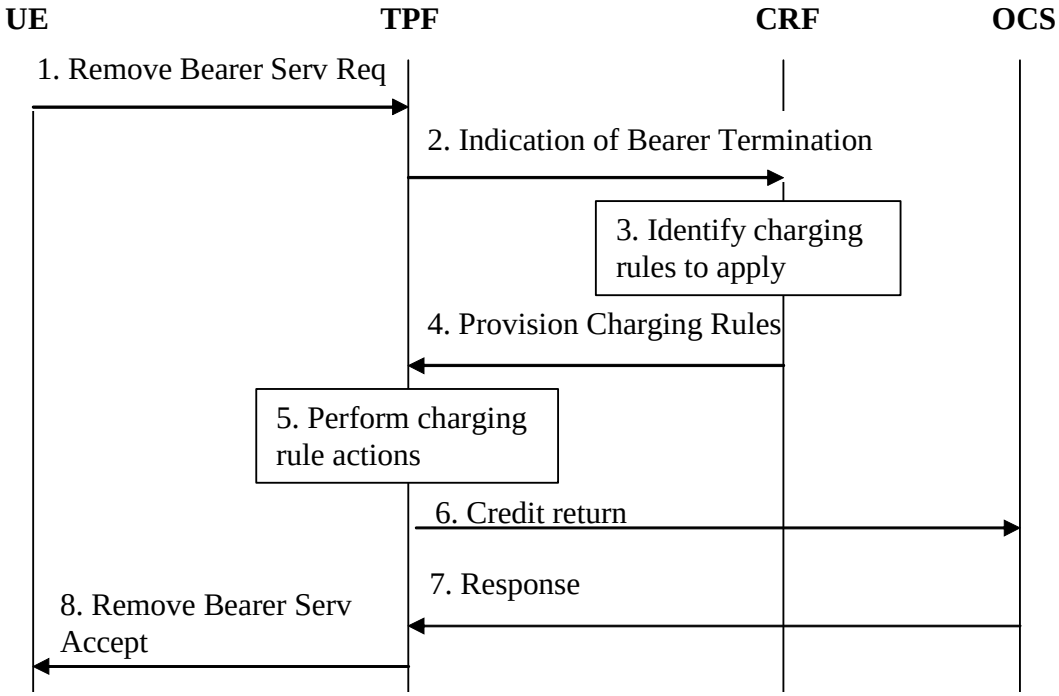

Figure 7.3a: Bearer Service Termination in case of online charging

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 (for GPRS, a PDP context) is being removed 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, and/or removed, and/or modified.
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 ~~for each charging rule that is removed~~.
7. The OCS acknowledges the report to the TPF.
8. The TPF continues with the bearer service removal procedure.

The bearer service termination procedure can proceed in parallel with the final usage reporting.

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

<< Next changed clause >>

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

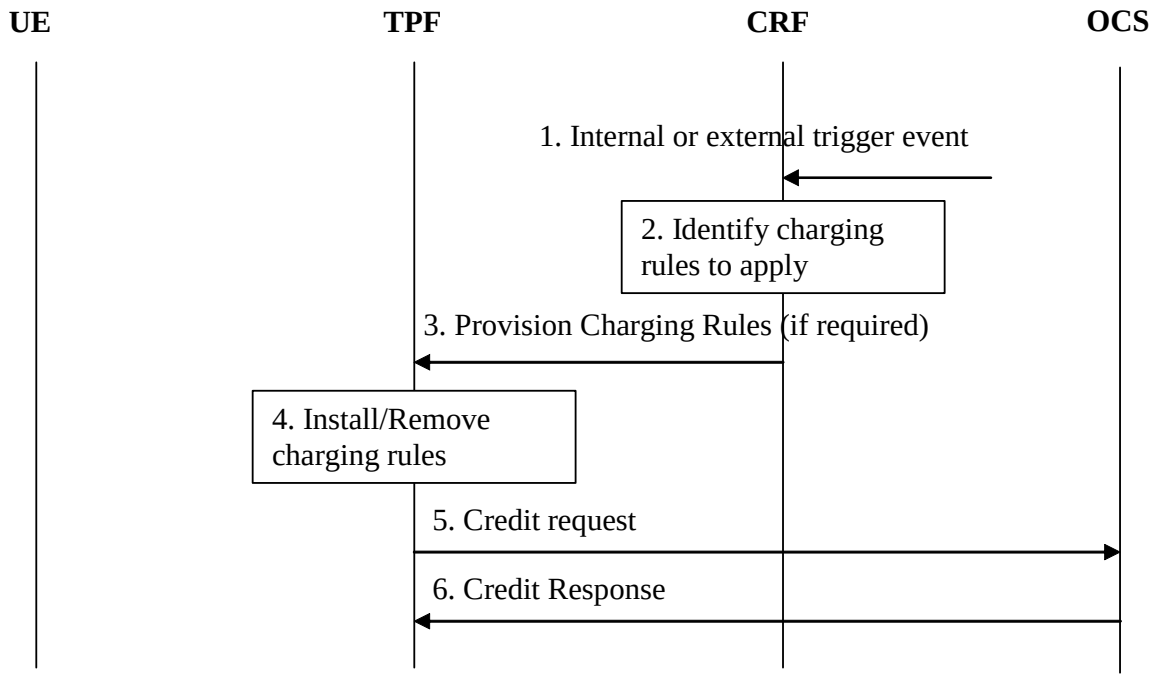

Figure 7.4: Provision of Charging Rules due to external or internal Trigger Event

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

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

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

4 The TPF performs charging rule actions as indicated, i.e. installing, modifying or removing charging rules.

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

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

<< End of changed clause >>

3GPP TSG-SA WG2 Meeting #43 ***Tdoc ⌘S2-043905***

Seoul, Korea.15th - 19th November 2004.

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.125** **CR** **103** ⌘ **rev** **2** ⌘ Current version: **6.2.0** ⌘

*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 ☒

Title:	⌘	Updates to Rx handling
Source:	⌘	Ericsson
Work item code:	⌘	CH-FBC
Date:	⌘	18/11/2004
Category:	⌘	**C**
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:	⌘	An AF provides with user identities over Rx interface e.g. IMSI or MSISDN as well as the IP Address of the UE. Further the GGSN provides with similar identities. However in certain situations an operator want to verify that e.g. the IMSI/IP Address information from AF is the same as the IMSI/IP Address from GGSN. If they are different an error has occurred and the CRF should not implement a charging rule.
Summary of change:	⌘	Add that the CRF checks the user identities, IMSI/MSISDN, from AF (if available) can be matched to the same IP Address as provided from GGSN.
Consequences if not approved:	⌘	There is no mechanism to guide the CRF how to treat the error case that e.g. IMSI and IP Address do not match with the IMSI and IP Address from the GGSN.

Clauses affected:	⌘	7.1

		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.

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

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.

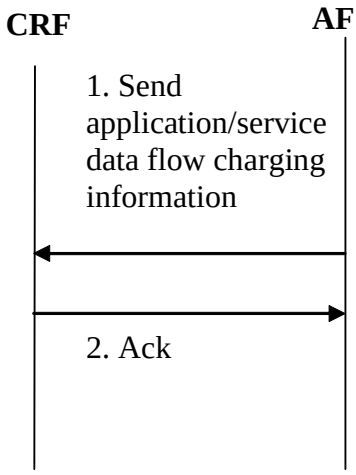

Figure 7.0a: AF input to provision of charging rules

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~~ 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.

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

3GPP TSG- SA WG2 Meeting #43
Seoul, Korea, 15th-19th Nov 2004

Tdoc ⌘ S2-043906

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.125** **CR** **094** ⌘ **rev** **3** ⌘ Current version: **6.2.0** ⌘

*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 ☒

Title:	⌘	Selecting the charging rule
Source:	⌘	ZTE Corporation
Work item code:	⌘	CH-FBC
Date:	⌘	29/11/2004
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 specifies that It shall be possible to apply different rates when a user is identified to be roaming from when the user is in the home network as described in section 4.3.1. It should be also possible to apply different charging rules when a user is identified to be roaming. Considering the operators may apply different charging rules and rates when the UE belongs to different PLMN, MCC and MNC may be used by the CRF in order to select the charging rule to be applied. The 23.125 specifies that The applicable charging rules are determined based on information available to the CRF including that received from the Traffic Plane Function, i.e. information about the user, the bearer characteristics and whether it is an initial request or not as described in section 6.2.1 . It is essential to indicate distinctly that MCC and MNC as one of information about the user may be used by the CRF to select the approprait charging rules.
Summary of change:	⌘	MCC and MNC can be used by the CRF in the decision to identify the specific charging to apply.
Consequences if not approved:	⌘	The 23.125 does not specify whether the operator may apply different rates and charging rules for users which are from different PLMN,according to MCC and MNC.

Clauses affected:	⌘	4.3.1, 6.2.1, 6.2.4, 6.3.1.2,

		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 modified section ******

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.

Editor's note: Additional charging models that are event and service based require further investigation.

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.

<< Next changed clause >>

6.2 Functional Entities

6.2.1 Service Data Flow Based Charging Rules Function

The Service Data Flow Based Charging Rules Function provides service data flow level charging rules. This functionality is required for both offline and online charging. The Service Data Flow Based Charging Rules Function 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 service data flow based charging rules function supports both static and dynamic charging rules.

The service data flow based charging rules function 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 Traffic Plane Function, i.e. information about the user, the bearer characteristics, and the network related information ~~and whether it is an initial request or not~~. When a further request for charging rules from the Traffic Plane Function or information from an AF arrives the service data flow based charging rules function shall be able to identify whether new charging rules need to be transferred to the Traffic Plane Function and respond accordingly.

The service data flow based charging rules function will receive information from the application function 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 service data flow based charging rules function (i.e. 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.

<< Next changed clause >>

6.2.4 Traffic Plane Function

The Traffic Plane Function 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 Traffic Plane Function shall support pre-defined charging rules, and pre-defined filters. See subclause 5.3 for further filtering and counting requirements.

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

For online charging, the Traffic Plane Function shall be capable of managing a pool of credit used for some or all of the service data flows of a user. The Traffic Plane Function 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. The appropriate CRF is contacted based on UE identity information.

Editor's note: The specific identity information used to identify the appropriate CRF is FFS.

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 traffic Plane Function is a logical function allocated to the GGSN.

Editor's Note: The effects of this co-location to the interfaces still needs to be studied e.g. Gy, Gz, Gi. Gi radius extensions for charging purposes are not precluded.

For GPRS, the TPF/GGSN shall be able to do separate counts per PDP context for a single service data flow if it is transferred on more than one PDP context.

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 reporting, so this allows the OCS and offline charging system to apply different rating depending on the PDP context.

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

<< Next changed clause >>

6.3.1.2 Request for Charging Rules (from TPF to CRF)

The TPF requests the charging rules to be applied:

- At bearer service establishment (PDP context establishment for GPRS) or,
- At bearer service modification (PDP context modification for GPRS) if the Event trigger is met, or
- At bearer service termination (PDP context deactivation for GPRS).

The request must identify whether it is an initial request (primary context establishment for GPRS), or a subsequent request (i.e. for GPRS, a secondary PDP context establishment, or a PDP context modification). For an initial request for GPRS, the request shall include APN, PDP address information, MCC and MNC of the serving network (i.e. SGSN), and at least one of IMSI or MSISDN.

An identifier is required to allow the specific instance in the TPF/CRF to be identified for subsequent data exchange. The identifier for the communication must be provided.

The request must provide further information used for the charging rule selection. The request shall include an identifier for the bearer, the QoS information, and flow identifier information allocated to the bearer. For GPRS, this information would include the traffic class, IM CN Subsystem Signalling Flag (if present in the downlink), and the TFT.

<< End of changed clause >>