3GPP TSG-SA Meeting #26 **TSGS#26(04)0875**
13th ñ 16th December 2004. Athens, Greece.

Source: **TSG SA WG2**
Title: **CRs on 23.125 (IP flow based 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.*

Tdoc	Title	Spec	CR	Rev	Cat	C_Ver	Rel	WI
S2-043105	Adding service information to charging rule	23.125	76	1	F	6.2.0	Rel-6	CH-FBC
S2-043377	Granularity of charging data collection	23.125	82	2	F	6.2.0	Rel-6	CH-FBC
S2-043903	Reporting and credit management granularity	23.125	102	2	F	6.2.0	Rel-6	CH-FBC

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

Tdoc ⌘ S2-043105

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.125** **CR** **076** ⌘ **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:	⌘	Adding service information to charging rule
Source:	⌘	Nokia
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:	⌘	Charging rule defines how a service data flow is measured and charged. A service data flow typically maps to an end user service (e.g. http traffic to a web-server) or service component (e.g. voice component for a video conference). However the identity of the service / service component is currently missing from the charging rule. Therefore it is not visible from the charging rule what is the actual end user service or end user service component the charging rule is related to. Service / service component information should be added as a part of a charging rule. This is particularly beneficial for the TPF when offline charging information (e.g. CDRs) are generated for the service data flows. The offline CDRs are finally used in customer bill construction where it should be visible what service customer has used thus is paying for. If this information is missing from a charging rule, it will not be a part of the offline CDR and not available for the customer bill. It should be noted that the TPF is reporting information (e.g CDRs) based on the charging rule information. There are also regulator requirements for this (i.e. it is not enough to state in the customer bill ìx amount of charging key (=rating group) y servicesî but ìx amount of service yî) It should be noted that the same charging key can be used by several charging rules thus is not enough for service identification.
Summary of change:	⌘	The service / service component identity of the service data flow added to the charging rule.

Consequences if not approved:	⌘	The TPF can not report what actual services have been used.

Clauses affected:	⌘	5.2			
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 >>

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: Itís operatorsí 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. Itís CRFís 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);

- Identification of the service or service component;

  - 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 changed clause >>

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

Tdoc ⌘S2-043377

CR-Form-v7

CHANGE REQUEST

⌘ **23.125** **CR** **082** ⌘ **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 **X**

Title:	⌘	Clarification of charging granularity
Source:	⌘	Nortel Networks
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:	⌘	The specification is ambiguous about the granularity for reporting of charging information and application of online credit control. The TPF should, by default, aggregate charging rules with the same Charging Key for reporting and online charging purposes. However, it should also be possible for the CRF to indicate that a specific charging rule requires independent usage reporting.
Summary of change:	⌘	It is clarified that online credit control applies to aggregates of charging rules with the same chargine key. Reporting of information (for both offline and online) may be per charging key or per individual charging rule, as indicated in the charging rule.
Consequences if not approved:	⌘	Unclear specification. Stage 3 work cannot be completed.

Clauses affected:	⌘	5.1, 5.2, 5.4, 5.5

	Y	N			
Other specs affected:	X		Other core specifications	⌘	32.299, 32.251, 32.252
		X	Test specifications		
		X	O&M Specifications		

Other comments:	⌘	

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

5.1 Overview

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

- Identification of the service data flows that need to be charged individually (e.g. at different rates), and those that can be handled as an aggregate;
- Provision and control of charging rules on service data flow level;
- 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.

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

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: Itís operatorsí 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. Itís CRFís 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.
  - Indication of whether separate reporting is required for this charging rule
- 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.

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

5.4 Reporting

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

- The 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, where this is indicated in the charging rule. Otherwise charging information shall be reported for each charging key;~~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.

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

5.5 Credit management

Online charging quotas shall operate on a per charging key basis. This implies that where independent credit control is required for an individual service data flow, then the charging rule applying to that flow must have a unique charging key value. However, as per Section 5.4 above, reporting shall be on a per charging key basis or per charging rule basis as indicated in the charging rule.

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: ëcreditî 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.

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

3GPP TSG-SA WG2 Meeting #43 ***Tdoc ⌘S2-043903***

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

CR-Form-v7.1

CHANGE REQUEST

⌘ **23.125** **CR** **102** ⌘ **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 **X**

Title:	⌘	Reporting and credit management granularity
Source:	⌘	Ericsson
Work item code:	⌘	CH-FBC
Date:	⌘	18/11/2004
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)*
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R98 *(Release 1998)*
R99 *(Release 1999)*
Rel-4 *(Release 4)*
Rel-5 *(Release 5)*
Rel-6 *(Release 6)*
Rel-7 *(Release 7)*

Reason for change: ⌘

In the Overview section, the function ìIdentification of the service data flowsî includes a superfluous distinction on what rates apply for the service data flow. Flow based charging is able to detect service data flows, regardless the purpose.

The specification uses the term service data flow in two ways (a) designating a set of packets rendering a specific service and (b) the packets that, in the service data flow filtering, yield the same charging key value. Service data flows of kind (a) exist per se, whereas service data flows of kind (b) is a result of the service data flow filtering in the TPF. For the two concepts to coincide, the charging rule filters must accurately match the packets that render the service of interest. Even a slightly inaccurate filter may cause a deviation from the expected outcome that there is a 1:1-relation between service data flows of kind (a) and kind (b).
The precise requirements for charging rules accuracy to achieve this is out of scope for the present WI. It is however worth noting that the TS relies on the charging rules being accurate.

The requirements for reporting and credit management granularity and the information elements defined for the charging rule are not consistent. The charging rule includes an indicator that indicates that separate reporting for the charging rule is required. There is however no identifier specified that is guaranteed to be unique for the charging rule. Thus it is not possible to require separate reporting for a single charging rule. However it is feasible to request separate reporting at the finest granularity possible.
The service identifier (in present version identification of the service) may serve

	the purpose of adding one level of granularity to the charging key level. Requesting separate reporting should yield reports on the service identifier level. The Service data flow and counting section lacks from information on by what identity a service data flow may be recognized. It is suggested to use the charging key and the service identifier for providing the service data flow identity. The Reporting section, reporting is indicated to be separtate from online credit control, whereas reporting is required for credit ccontrol in order to properly maintain the userís account. Thus the credit control may use the reporting in credit management, rather than being something different. No other reporting for service data flow based online charging is specified than in the Reporting section. Thus the reporting structure for credit management shall follow the same structure as defined in section Reporting.
Summary of change: ⌘	1) Service data flow based charging includes the ìIdentification of the service data flowsî regardless purpose. 2) Service identifier level reporting is either mandated or not required. 3) Arrange for an identifier that, apart from the charging key, may be used for identifying a service data flow. 4) The occasions for reporting for online charging purposes is clarified. 5) Clarify that quota is granted on a per charging 6)
Consequences if not approved: ⌘	The identification of service data flows remains confined to support certain kinds of charging. There is no hint in the specification on the relation between service data flows, existing per se, and those detected by service data flow based charging. The required structure for reporting will remain impossible to achieve in stage 3. The lack of a unique identifier for the charging rule (except for the CRF ñ TPF communication) makes any processing on a per charging rule basis impossible. Reporting, even for online charging, and credit management have different requirements for reporting structure.

Clauses affected:	⌘	3.1, 5.2, 5.4, 5.5			
Other specs affected:	⌘	**Y** / **N** **X** /	Other core specifications	⌘	29.210, 32.299
		/ **X**	Test specifications		
		/ **X**	O&M Specifications		
Other comments:	⌘	This CR supersedes CR 076 Rev 1 (TDOC S2-043105). This CR supersedes some requirements approved in CR 082Rev2.			

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****** 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.

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

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

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

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 userís 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 ******

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: Itís operatorsí 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. Itís CRFís 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);
- Service identifier
- Precedence (used at the TPF to determine the order in which charging rules shall be applied to a service data flow);
- Charging rule identifier (used between CRF and TPF for referencing charging rules);
- Application Function Record Information.
- Service identifier level reporting: mandated or not required

- Event triggers 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.
- The charging key value and, optionally, the service identifier value of the charging rule identifies the service data flow
- 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.

****** 3rd 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~~ keys for on-line charging;
- The TPF shall report ~~service data flow based~~ charging information for each bearer and charging key value;
- Depending on the configuration of a charging rule the TPF may report ~~service data flow based~~ charging information for each charging key/service identifier
- ~~It shall be possible to report charging information showing usage for each user for each charging rule, e.g. a~~A report may contain multiple containers, each container associated with a charging key/service identifier;

~~The TPF reporting for each charging key/service identifier is governed by the definition of the charging rule..~~

- 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

Online charging ~~quotas~~credits shall operate on a per charging key basis. The TPF shall support credit management on a per bearer basis.

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~~ keys applied at the Traffic Plane Function. A pool of credit applying to a single charging ~~rule~~ key is equivalent to an individual credit limit for that charging ~~rule~~key. Multiple pools of credit shall be allowed per ~~user~~bearer~~credit management session~~.

~~Rating decisions shall be strictly controlled by t~~The OCS shall strictly control the rating decisions ~~for each service~~. The OCS shall also control the credit pooling decisions ~~for charging rules~~. The OCS shall, when credit provision is sought, 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~~ keys into pools in this way shall not restrict the ability of the OCS to do credit authorisation and provide termination action individually for each charging key ~~rule~~ of the pool~~key~~.

Note: ëcreditî 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.

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