| **Source:** | **SA5 (Telecom Management)** |
|---|---|
| **Title:** | **CR 32815 Online Charging System (OCS) architecture study** |
| **Document for:** | **Approval** |
| **Agenda Item:** | **7.5.3** |

| Doc-1st-Level | Spec_# | CR_# | R | Phase | Subject | Cat | Ver-Cur | Doc-2nd-Level | Workitem |
|---|---|---|---|---|---|---|---|---|---|
| SP-050273 | 32.815 | 0001 | - | Rel-6 | Correction on the use of "reference point" and "interface" – Align with TR 21.905 | F | 6.0.0 | S5-054277 | CH |

CR-Form-v7.1

# CHANGE REQUEST

| ⌘ | **32.815** | CR | **0001** | ⌘**rev** | **-** | ⌘ | Current version: | **6.0.0** | ⌘ |

*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:*** ⌘ | Correction on the use of "reference point" and "interface" – Align with TR 21.905 | |
| ***Source:*** ⌘ | SA5 (zhang.qiang118220@zte.com.cn) | |
| ***Work item code:*** ⌘ | CH | ***Date:*** ⌘ 18/03/2005 |

| | |
|---|---|
| ***Category:*** ⌘ **F** | ***Release:*** ⌘ Rel-6 |

| | |
|---|---|
| *Use one of the following categories:*<br>**F** *(correction)*<br>**A** *(corresponds to a correction in an earlier release)*<br>**B** *(addition of feature),*<br>**C** *(functional modification of feature)*<br>**D** *(editorial modification)*<br>Detailed explanations of the above categories can<br>be found in 3GPP TR 21.900. | *Use one of the following releases:*<br>Ph2 *(GSM Phase 2)*<br>R96 *(Release 1996)*<br>R97 *(Release 1997)*<br>R98 *(Release 1998)*<br>R99 *(Release 1999)*<br>Rel-4 *(Release 4)*<br>Rel-5 *(Release 5)*<br>Rel-6 *(Release 6)*<br>Rel-7 *(Release 7)* |

| | |
|---|---|
| ***Reason for change:*** ⌘ | As defined in TR 21.905, the concept of "receference point" is quite different from the concept of "interface". Interface is an architectural concept that provides interconnection between physical blocks at reference points. The confused using of the two concepts in Charging specifications will cause misunderstanding. |
| ***Summary of change:*** ⌘ | Distinguishing and rightly using "reference point" and "interface" |
| ***Consequences if not approved:*** ⌘ | The confused using of the two concepts in Charging specifications will cause misunderstanding. |

| | |
|---|---|
| ***Clauses affected:*** ⌘ | Introduction, 1, 3.2, 4, 5 |

| | Y | N | | |
|---|---|---|---|---|
| ***Other specs*** ⌘<br>***affected:*** | | X | Other core specifications ⌘ | |
| | | X | Test specifications | |
| | X | | O&M Specifications | |

| | |
|---|---|
| ***Other comments:*** ⌘ | |

**Change in Introduction**

# Introduction

3GPP TR 23.815 [1] identified three ~~interface~~reference points related to the Online Charging System (OCS), namely Rb, Rc, and Re. The OCS is considered to be a framework that comprises, but may not be limited to, the functions employed for prepaid rating and real-time account manipulation. According to 3GPP TR 23.815 [1], the above ~~interface~~reference points were scheduled for standardisation in Release 6, but an exact definition of their functionalities does not exist yet. Note that, in contrast to 3GPP TR 23.815 [1], the present document is not limited to IMS but intends to cover all charging domains.

The Rc and Re ~~interface~~reference points are necessary for operators in order to seamlessly integrate online charging for the bearer, service and IMS levels in the same OCS.

**End of Change in Introduction**

**Change in Clause 1**

# 1 Scope

The present document analyses the architectures and functions of the OCS and thereby derives the functionality of the OCS ~~interface~~reference points. It is expected that the content of the present document will serve as a basis for detailed 3GPP specifications of ~~interface~~reference points between the logical OCS functionalities. The functionality of the OCS, as described in the present document, applies to all charging domains (bearer, session and service).

**End of Change in Clause 1**

**Change in Clause 3.2**

## 3.2 Symbols

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

| | |
|---|---|
| Bo | Off-line Charging Reference Point towards the operator's post-processing system |
| Rc | On-line Charging Reference Point towards the Account Balance Management Function |
| Re | On-line Charging Reference Point towards the Rating Function |
| Ro | IMS On-line Charging Reference Point towards the online charging functions (ECF, SCF) |
| Ro' | On-line charging reference point for non-IMS services (e.g. MMS) towards the online charging functions (ECF, SCF, BCF). |

Note that the distinction between Ro and Ro' is made in the present document for descriptive purposes only. The definition of extensions of the Ro ~~interface~~reference point and the question whether Ro and Ro' are identical in terms of protocol specification or not, is beyond the scope of the present document. These ~~interface~~reference points are to be defined in other 3GPP specifications.

**End of Change in Clause 3.2**

**Change in Clause 4**

# 4 Required functionality of OCS

The Online Charging System (OCS) shall support mechanisms for:

- online bearer charging towards access network entities (e.g. SGSN, GGSN, IP Flow Handler, WLAN). Online charging ~~interface~~reference points to be supported are Ro, Ro' and CAP;

- online charging of applications/services that are provided to subscribers via service nodes (outside the core network) e.g. MMS and LCS. The online charging ~~interface~~reference point to be supported is Ro';

- IMS online charging. Online charging ~~interface~~reference point to be supported is Ro;

- correlation of bearer, service and IMS charging;

- account balance management towards e.g. recharge server, hot billing server;

- generation of Charging Data Records (CDRs) and their transfer to the operator's post-processing system.

To support these requirements, the functions listed below are necessary in the OCS:

1. rating (before and/or after service consumption)

   - unit determination: calculation and reservation of a number of session-related non-monetary units (service units, data volume, time and events);

   - price determination: calculation of monetary units (price) for a given number of non-monetary units;

   - tariff determination: determination of tariff information based on the subscribers contractual terms and service being requested (e.g. e-parameters for AoC) ;

   - get/set counters applicable for rating (alternatively these counters can be here or in the subscriber account balance management; for further details refer to subclause 5.1.2)

2. subscriber account balance management

   - check account balance;

   - account balance update (credit/debit);

   - account balance reservation;

   - get/set counters;

   - get/set expiry date of the (prepaid) account (optional)

3. charging transaction control

   - perform charging control on request basis for bearer and events/services;

   - immediate charging and charging with reservation;

   - generation of charging information/CDR per charging transaction.

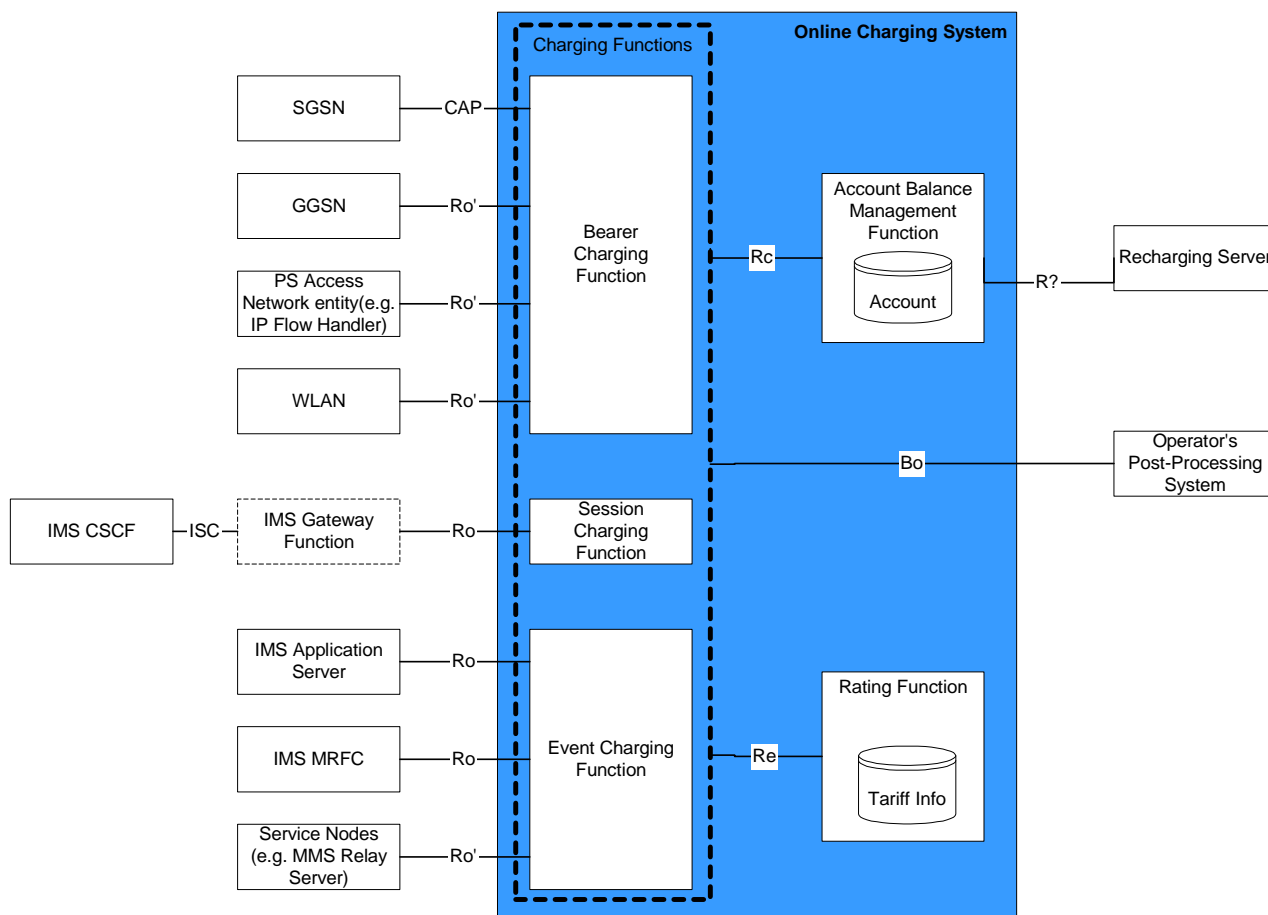4. correlation function: for further study in later releases

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**End of Change in Clause 4**

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**Change in Clause 5**

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# 5 Architectural concept

## 5.1 Architecture reference model for online charging

In 3GPP TR 23.815 [1] a reference architecture for IMS online charging is defined which structures the Online Charging System into different logical functions and reference points between them. Based on this architecture and the requirements given before, a general reference architecture for online charging is defined (see Figure 5-1) that is designed to support online charging mechanisms for bearer charging, service charging and IMS charging.

Online Charging System

Charging Functions

SGSN — CAP —

GGSN — Ro' —

PS Access Network entity(e.g. IP Flow Handler) — Ro' —

WLAN — Ro' —

Bearer Charging Function

Account Balance Management Function — Account — Rc

R? — Recharging Server

IMS CSCF — ISC — IMS Gateway Function — Ro — Session Charging Function

Bo — Operator's Post-Processing System

IMS Application Server — Ro —

IMS MRFC — Ro —

Service Nodes (e.g. MMS Relay Server) — Ro' —

Event Charging Function — Re — Rating Function — Tariff Info

NOTE: The lines representing the Rc, Re and Bo reference points connecting the Bearer, Session and Event Charging Functions with Account Balance Management Function, Rating Function and the operator's post-processing system respectively are performed only once for figure layout purposes only.

NOTE: The support of ISC as charging interface towards IMS S-CSCF requires additional functionality to be provided by the OCS. The support of Ro as charging interface towards OCS requires additional functionality to be provided by the IMS CSCF. This issue is analysed in more detail in sub-clause 5.4.

**Figure 5-1: Online Charging System**

Concerning the distinction between Ro and Ro' refer to clause 3.2.

Note that towards the SGSN, the OCS or a separate function could provide a translation between CAP and Ro. This is beyond the scope of the present document.

The Bearer Charging Function (BCF) performs bearer charging using the CAP interface towards the SGSN and Ro reference point or variants thereof towards other network entities in the access domain.

The Session Charging Function (SCF) performs IMS session charging using the Ro reference point towards the IMS CSCF. Whether the CSCF is directly connected to the OCS or via a gateway (IMS Gateway Function) is beyond the scope of the present document.

The Event Charging Function (ECF) performs event-based charging using the Ro reference point or variants thereof.

The Rating Function and the Account Balance Management Function are described in clause 4. The Re reference point allows the interaction between Charging Functions (BCF, SCF, ECF) and Rating Function.

The Rc reference point allows the interaction between Charging Functions (BCF, SCF, ECF) and Account Balance Management Function to access the account of the subscriber and correlation information. Further analysis is needed whether this reference point can be used as well for interactions with external servers such as recharge server or hot billing server within the operator domain.

The Bo reference points allows the collection and transfer of charging information from the Charging Functions (BCF, SCF, ECF) to the operator's post-processing system.

Compared with the IMS OCS the following extensions and modifications have been made:

- Use of the Event Charging Function (ECF) to support online charging mechanisms also towards service nodes such as MMS Relay Server. The ECF performs event-based charging towards IMS Application Server and MRFC using the Ro reference point. As it is expected that variants of Ro will be used as online charging interface towards service nodes, the ECF is well suited to perform online charging towards service nodes.

- Extension of the Bearer Charging Function to support not only CAP, but also Ro or variants thereof as online charging interface. This extension is motivated by the ongoing standardisation activities. It is expected that Ro or variants thereof will be used as online charging interface towards different access network entities.

- Use of Ro instead of ISC as online charging interface towards IMS Gateway Function, which may or may not be integrated with the IMS S-CSCF. The main motivation behind is that ISC is a service interface. It defines the reference point between a CSCF and an Application Server and as such provides no support for online charging. An extension of ISC would mean to mix service and charging interface. Since there exists already a suitable online charging interface, namely Ro, that provides appropriate mechanisms for online charging of IMS sessions, it is proposed to use Ro as online charging interface instead of extending ISC. A more detailed analysis is given in subclause 5.4.

- Renaming of Correlation Function into Account Balance Management Function. As before the function provides access to account and correlation information.

- For Bearer and Session Charging Functions a similar interface structure is proposed as for the ECF. Considering the functionality of a (bearer, session or event) charging function, in all cases access to the Account Balance Management Function and the Rating Function is needed. It is therefore proposed to use Re as rating ~~interface~~reference point towards the Rating Function and Rc as ~~interface~~reference point to access account and correlation information also for the Bearer and Session Charging Functions.

- As a consequence of the above two points, reference point Rc is used between Session Charging Function and Account Balance Management Function instead of reference point Rb.

- An additional reference point for charging data collection interfaces from Bearer, Session and Event Charging Functions towards the operator's post-processing system is proposed (Bo).

- An additional reference point between Account Balance Management Function and external systems within the operators domain is foreseen to support access to account and related data e.g. for recharging or hot billing purposes. It has to be analysed whether the functionality provided via the Rc reference point is sufficient or whether it needs extensions so that a different reference point should be defined.

## 5.1.1 Functional split between Charging Function and Rating Function

Void.

## 5.1.2 Functional split between Charging Function and Rating Function

### 5.1.2.1 Option 1: Repository style

Account Balance Management Function and Rating Function serve as data repositories, the charging functions (BCF, SCF, ECF) perform charging control and the required computations. Figure 5-2 illustrates this model.
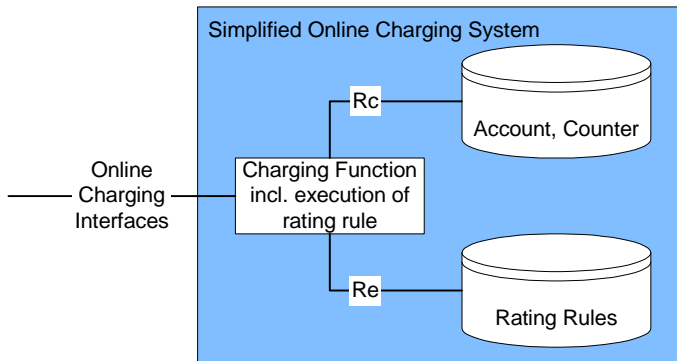
**Figure 5-2: Repository style model**

Upon receipt of a charging request, the charging function fetches data from Account Balance Management Function (e.g. account, counters) and from the Rating Function (tariff rule). It applies the tariff rule using data from the charging request and from the Account Balance Management Function, i.e. the charging function performs the unit calculation/rating. It will update account and counters accordingly.

This model follows the architectural pattern called repository style. It has the following characteristics:

- Clear separation of execution and data.

- Data can be fetched simultaneously.

- No transfer of data between Account Balance Management Function and Rating Function needed.

To be analysed: protocol implications of transferring tariff rules.

## 5.1.2.2 Option 2: Rating Engine

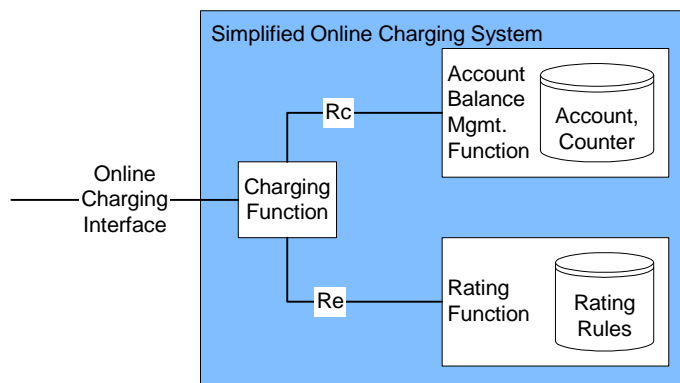This model assumes that rating is performed by the Rating Function. Figure 5-3 illustrates the model.



**Figure 5-3: Rating Engine model**

Upon receipt of a charging request, the charging function fetches data from the Account Balance Management Function (e.g. account, counters). In its rating request towards the Rating Function rating relevant information such as subscriber service usage counters or loyalty accounts are transferred. In the case of a price request for an event the Rating Function identifies the tariff rule to be applied and performs the price determination using the input parameters from the rating request. As response, it will return the calculated price and information on whether/how counters are to be updated. The update is done by the Charging Function. In the case of a tariff request for session or bearer charging, the Rating function determines and directly returns the applicable tariffs (both monetary and for counters, e.g. e-parameters). The determination of the price and the counter changes is done in the Charging Function, which also updates the account and counters.

This design supports the use of a logically common Rating Function for online and offline charging, i.e. it enables a common rating infrastructure for online and offline charging.

The concept for data distribution between Rating and Account Balance Management in this design is motivated by a clear separation of account related data, which may need to be updated during the online charging request, from rating execution and tariff information (e.g. rating rules).

In this option, transfer of data from the Account Balance Management Function to the Rating Function via the Charging Function is necessary.

### 5.1.2.3 Option 3: Extended Rating Engine

The extended rating engine model has a similar architecture as the rating engine (figure 5-3). However, in an extended Rating Engine, the rating function is also responsible for storing and managing at least some of the counters needed for the rate calculation (e.g. bonus counters, free minutes per time period). Figure 5-4 illustrates the model:
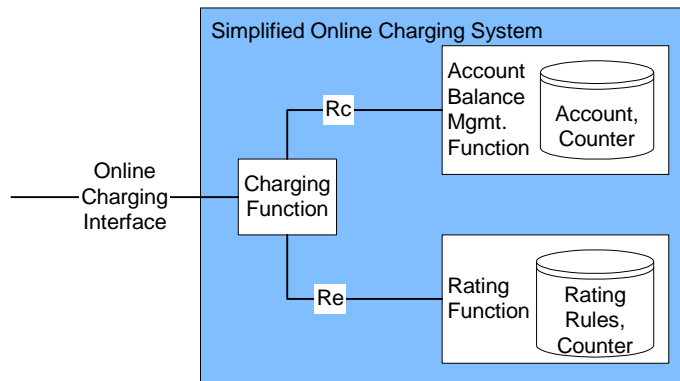


**Figure 5-4: Extended Rating Engine model**

A rating request can be either for a price for a given service usage (price request) or tariff for AoC (e.g. e-parameters). In the rating request, the charging function provides the request type, information regarding subscriber identity and service identifier. As response, the rating engine will return the calculated price or tariff, respectively.

This design supports common rating infrastructure for online and offline charging as well.

The concept for data distribution between Rating and Account Balance Management in this option is motivated by the encapsulation principle of object oriented design, i.e. all the data that is needed for an object (here: rating engine) should reside within that object.

In this option, an additional scenario - as compared to option 2 - needs to be supported on the Re-~~interface~~reference point, i.e. the charging function has to inform the rating function about the success of service delivery before counters can be updated and the rating function has to acknowledge the successful counter update.

### 5.1.2.4 Recommendation

The comparison between the above Re ~~interface~~reference point options is depicted in table 5.2:

**Table 5.2: Functional split options comparison**

| Aspect | Option 1: Repository Style | Option 2: Rating Engine | Option 3: Extended Rating Engine |
|---|---|---|---|
| Complexity | Very Complex – Need to export a full rating schema | Moderate | Moderate |
| Durability / Flexibility | Inflexible – Need to change I/F for every schema enhancement | Fully flexible – Bounded only by the counter manipulation methodology | Fully flexible – Bounded only by interface functionality |
| Rating Functionality | Spread between Charging & Rating | Focused in the Rating Engine | Only in the Rating Engine |
| Coupling | Tight | Moderate | Moderate |
| Counters fetch | N/A | Charging function must fetch all associated counters (note 1) | Counters are fetched on a need to use basis |
| Counters locking | N/A | Must lock all counters for each request (note 1) | Counters are locked on a need to use basis |
| Counters update | Update of counters similar to account update via Rc-~~Interface~~Reference point | Update of counters similar to account update via Rc-~~Interface~~Reference point | Additional messages on Re-~~Interface~~Reference point and transaction control / session handling necessary (note 2) |
| Performance | High | Potentially less than Option 1 due to counters locking. | Potentially less than Option 1 due to additional messages on the Re ~~interface~~reference point. |

NOTE 1: Load could be reduced, depending on the functionality of the Rc ~~interface~~reference point and logic within the charging function.

NOTE 2: Overhead caused by the additional messages could be relieved, if account balance management and rating function reside in the same physical entity.

Option 1 is not recommended, due to it's tight coupling, inflexibility and complexity.

Option 2 has the advantages, that there is a clear architectural split: dynamic subscriber data (account balance, counters) are maintained only in the Account Balance Management Function. Furthermore, the Rating engine can be stateless.

Option 3 has the advantage, that the load on the Re ~~interface~~reference point can be lowered, however the Re-~~interface~~reference point needs to be extended for synchronisation purposes. Tariff requests for charging are not required for this option.

To allow for a common rating infrastructure for online and offline charging, options 2 and/or 3 are recommended.

## 5.1.2 Bearer Charging Function (BCF)

The BCF performs the bearer level charging based on bearer usage requests received from the network. It controls the bearer usage in the network, e.g. in terms of time or volume granted. It communicates with the Rating Function in order to determine the value of the requested bearer resources. It communicates with the Account Balance Management Function to query and update the subscribers' account and counters status (counters not applicable in the "Extended Rating Engine" option, ref. subclause 5.1.2.3).

Concerning the correlation of charging information, refer to the discussion in subclause 5.3.

## 5.1.3 Event Charging Function (ECF)

The ECF performs event based charging (e.g. content charging) based on service usage requests received from the network. It can grant or deny the service usage in the network. It communicates with the Rating Function in order to determine the value of the requested service usage. It communicates with the Account Balance Management Function to query and update the subscribers' account and counters status (counters not applicable in the "Extended Rating Engine" option, ref. subclause 5.1.2.3).

Concerning the correlation of charging information, refer to the discussion in subclause 5.3.

## 5.1.4 Session Charging Function (SCF)

The SCF performs charging of sessions based on session resource usage requests received from the network (e.g. the IMS CSCF). It controls sessions in the network, e.g. it has the ability to grant or deny a session set-up request and to terminate an existing session. It communicates with the Rating Function in order to determine the value of the requested session. It communicates with the Account Balance Management Function to query and update the subscribers' account and counters status (counters not applicable in the "Extended Rating Engine" option, ref. subclause 5.1.2.3).

Concerning the correlation of charging information, refer to the discussion in subclause 5.3.

Concerning the interface between the SCF and the IMS CSCF, refer also to the discussion in subclause 5.4.

## 5.1.5 Rating Function

The Rating Function performs both monetary and non-monetary unit determination (rating). It provides following features:

- Rating for network- and external services and applications (session, service, event) before and after service delivery;

- Cross-product and cross-channel discounts, benefits and allowances.

The Rating Function must be able to handle a wide variety of rateable instances, such as:

- Rating of volume (in terms of granted units or money, e.g. based on charging initiated by an access network entity);

- Rating of time (in terms of granted units or money, e.g. based on charging initiated by a SIP application);

- Rating of events (e.g. based on charging of web content or MMS).

The Rating Function includes the determination of the tariff or the price of a chargeable event; examples include the price of a call minute, data volume, multimedia session, Web content, etc.

Upon receipt of a rate request from the Charging Function, the Rating Function:

- Evaluates the request. Rate requests include various rating parameters such as service identifier, subscriber reference, network identification, user location, service usage time, transferred data volume etc. Note that necessary rating information includes counters of subscriber service and subscriber session usage maintained by the Account Balance Management Function and (optionally) the Rating Function, respectively;

- Determines the applicable price or tariff model and returns it to the Charging Function.

## 5.1.6 Account Balance Management Function

To be defined in a later release.

# 5.2 Charging architecture reference points

## 5.2.1 Re Reference Point (BCF, SCF, ECF – Rating Function)

### 5.2.1.1 Functionality for the "Rating Engine" Option

The following applies with respect to the Rating Interface:

- The Rating Function will potentially cover all rating scenarios for all charging levels (bearer, session and service) and all payment channels (prepaid, postpaid and wallet).

- The Rating Function will cover the following scenarios/use cases **PriceRequest** and **TariffRequest**.

- An additional scenario **ServiceUsageRequest,** where the number of service units for a given price is determined, may be needed. This detail will be studied in the specification of the Re ~~interface~~reference point and is beyond the scope of the present document.

- The Rating Function will operate in a stateless way on a per request basis. No context or state is stored internally.

- The Rating Function will not modify accounts or bonus counters directly. Instead it passes the corresponding information as part of the response (e.g. "debit 1 € from subscriber X", "credit 0.9 € to merchant Y", "add 100 loyalty points of partner Z to subscriber X", "increase counter SMScounter for subscriber X and merchant Y by 1").

- The Rating Interface is an interface in a trusted environment. No session handling, transaction control or authentication will be supported.

- No tickets are written by the rating function. Thus billing relevant information is part of the response (e.g. "tariff Z for gold customers was applied").

- Functional compatibility with existing external Rating is required, thus the functionality of these tariff requests must be covered by Re as well.

Resulting from these requirements following functionality of Re is proposed:

- Basic Functions:

  - Price Request (to calculate a price for given service usage);

  - Service Usage Request (to calculate service units for a given amount of money/loyalty);

  - Tariff Request (to request a tariff that is applicable, e.g. GSM 'e-parameters')

- Extended Functions:

  - Discounts by use of consumer specific counters;

  - Loyalty programs;

  - Taxes.

- Supplement:

  - Detailed Information for use during invoice generation.

To follow the spirit of IETF DIAMETER a lean interface is proposed with just two methods, namely:

- rateRequest (common method for price request and service usage request);

- tariffRequest.

Depending on the service or product offered and on the customer's contract, the Rating Function supports the following scenarios:

- **PriceRequest**: Determination of a price for the execution of a service or the delivery of a good. From the rating perspective this is the same scenario if run before delivery (e.g. for balance check or AoC), after delivery (post-rating for charging) or even later in a re-rating process. The same scenario applies for one-time or recurrent charges.

- **TariffRequest**: Determination of a tariff for a given service. This scenario is used, e.g., for voice calls, where e-parameters are returned by the rating function. Based on the tariff (e-parameters) the charging function calculates either the amount of units for a given price or the price for given number of units. The scenario can also be used for various other services.

Scenarios involving granted units may be covered via a TariffRequest or by the Rating Function directly. The handling of the first case is part of the charging function. For the latter case the Re ~~interface~~reference point will offer a special request type:

- **ServiceUsageRequest**: This type of request, also called backward rating, determines the amount of units of a given service given the price. There is no principle difference to a regular price request from the rating perspective.

Potentially the Rating Function would also be able to determine granted units for a given service type.

Input for Rating:

- Rating Request Type: Price Request, Service Usage Request, Tariff Request.

- Service-specific data: Service-ID, Time/Date of Service usage, QoS, ...

- Subscriber-specific static data: Subscriber-ID, Partner-ID {MVNO, merchant, ...}, additional tariff information ("Friends & Family" list, …), other static data.

- Subscriber specific dynamic data: Account Balances incl. units/currency {money, loyalty}, Subscriber Counters (Service-Type {SMS/MMS/Volume/Time} used per time-unit {day/week/month/year}), other dynamic data)

Output of Rating:

- Rating Request Type Response: Price or Service units or Tariff incl. tariff switch information (e-Parameters,  Tariff Switch Time (absolute time/duration), ....);

- Charge and Recharge Information: Value for accounts and Subscriber Counters (e.g. charge money, recharge loyalty accounts);

- Tax information;

- Detailed information to be used for invoice generation.

Depending on the technological basis of the interface, results may be passed as return values (as described below) or in equivalent response-"methods" (rateResponse, tariffResponse).

The parameters needed for rating depend on the service type (VoiceCall, VoIP, VoD, SMS, Content, ...). Even if this is a small set, an introduction of methods like rateRequestSMS, ... does not seem to be feasible if the interface should be sufficiently general, extensible and stable. Thus the service type will be passed as an argument instead.

There are basically several options for the protocol to be used:

- XML (via socket, SOAP, HTTP, ...);

- Diameter/Radius;

- CORBA.

There are some arguments in favour of Diameter, however which option to choose will be defined in the specification of the Re ~~interface~~reference point and is beyond the scope of the present document.

## 5.2.1.2    Functionality for the "Extended Rating Engine" Option

If the Extended Rating Engine option (subclause 5.1.2.3) is chosen, i.e. counters are maintained in the Rating Function, then the Re Reference Point is modified with respect to the previous clause in the following way:

- an additional scenario/use case **ServiceDeliveryConfirmed** has to be covered;

- the Rating Function has to become statefull;

- the Rating Function has to modify counters directly;

- the Rating Function has to handle sessions / has to support transaction control;

- the TariffRequest is required only for AoC.

### 5.2.2 Rc Reference Point (BCF, SCF, ECF – Account Balance Management Function)

To be defined in a later release.

### 5.2.3 Reference Point (Account Balance Management Function – ext. server)

Analysis on requirements needed in order to evaluate whether Rc can be used or separate reference point needed. For further study in a later release.

### 5.2.4 Bo Reference Points (BCF, SCF, ECF – post-processing system)

The Bo reference point represents the intra-billing-domain interface for the CDR file transfer from the OCS to the operator's post-processing system. The functional requirements for this reference point are similar to those of the generic Bx ~~interface~~reference point. Re-use of the Bx reference point specification for Bo will be analysed in a later release.

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**End of Change in Clause 5**
**End of Document**

</div>

# Annex A:
# Change history

<table>
<tr><td colspan="9" align="center"><b>Change history</b></td></tr>
<tr><td>Date</td><td>TSG #</td><td>TSG Doc.</td><td>CR</td><td>Rev</td><td>Subject/Comment</td><td>Old</td><td>New</td></tr>
<tr><td>Jun 2003</td><td>S_20</td><td>SP-030274</td><td>--</td><td>--</td><td>Submitted to TSG SA#20 for Information</td><td>1.0.0</td><td></td></tr>
<tr><td>Sep 2003</td><td>S_21</td><td>SP-030409</td><td>--</td><td>--</td><td>Submitted to TSG SA#21 for Approval</td><td>2.0.0</td><td>6.0.0</td></tr>
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