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Technical Report

3rd Generation Partnership Project;

Technical Specification Group Core Network and Terminals;

Study on Policy and Charging for Volume Based Charging;

(Release 16)

** 

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# Foreword

This Technical Report has been produced by the 3rd Generation Partnership Project (3GPP).

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

x the first digit:

1 presented to TSG for information;

2 presented to TSG for approval;

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y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.

z the third digit is incremented when editorial only changes have been incorporated in the document.

# Introduction

This clause is optional. If it exists, it is always the second unnumbered clause.

# 1 Scope

The present document provides the study on Policy and Charging for Volume Based Charging, which is used to investigate and evaluate possible functional enhancements.

The study shall investigate how to separate the volume usage between different IMS based services (e.g. CAT and voice calls, 3PTY conference, Call waiting, Call Hold).

# 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 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 29.212: "Policy and Charging Control (PCC); Reference points".

[3] 3GPP TS 29.213: "Policy and Charging Control signalling flows and Quality of Service (QoS) parameter mapping".

[4] 3GPP TS 29.214: "Policy and Charging Control over Rx reference point".

[5] 3GPP TS 24.182: "IP Multimedia Subsystem (IMS) Customized Alerting Tones (CAT); Protocol specification".

[6] 3GPP TS 24.605: "Conference (CONF) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification".

[7] 3GPP TS 24.147: "Conferencing using the IP Multimedia (IM) Core Network (CN) subsystem; Stage 3".

[8] 3GPP TS 32.251: "Telecommunication management; Charging management; Packet Switched (PS) domain charging".

[9] 3GPP TS 24.610: "Communication HOLD (HOLD) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification".

[10] 3GPP TS 24.615: "Communication Waiting (CW) using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification".

# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in 3GPP TR 21.905 [1].

## 3.2 Symbols

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

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply.   
An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in 3GPP TR 21.905 [1].

3PTY Three Party

ARP Allocation and Retention Priority

AS Application Server

AVP Attribute Value Pair

CAT Customized Alerting Tones

CONF Conference calling

CW Communication Waiting

HOLD Communication HOLD

MMTEL Multimedia Telephony

NDUB Network Determined User Busy

PCC Policy and Charging Control

PCEF Policy and Charging Enforcement Function

PCRF Policy and Charging Rule Function

P-CSCF Proxy-Call Session Control Function

# 4 Volume based charging scenarios

## 4.1 Scenario 1 Customized Alerting Tones (CAT) scenario

3GPP TS 24.182 [5] defines the usage of SIP and SDP signalling to provide Customized Alerting Tones. The CAT service is an operator specific service by which an operator enables the subscriber to customize the media which is played to the calling party during alerting of the called party. The media are inserted by an application server (AS).

3GPP TS 24.182 [5] defines the following models to provide CAT:

- **Forking Model**: The caller´s UE will for the same SDP offer receive an SDP answer for the CAT early media and an SDP answer from the callee´s UE in different SIP dialogues. (see Figure 4.1-1)

- **Early Session Model**: The caller´s UE will send a SIP INVITE containing an SDP offer and receive the corresponding answer from the callee´s UE for the normal media and an SIP provisional response from the AS that contains an SDP offer of the "early session" disposition type for the CAT early media. The caller´s UE responds with a SIP PRACK message containing the SDP answer of the "early session" disposition type. Only one SIP dialogue is used. (see Figure 4.1-2)

- **Gateway model**: The caller´s UE will send a SIP INVITE and receive an SDP answer from the AS for the CAT early media. After the callee has answered, the caller´s UE will receive a new SDP offer containing an SDP offer for the media towards the callee and will reply with an SDP answer. Only one SIP dialogue is used. (see Figure 4.1-3)



Figure 4.1-1. Example callflows for CAT forking model (Figure A.3.2-1 of 3GPP TS 24.182 [5])



Figure 4.1-2. Example callflows for CAT early session (Figure A.4.2-1 of 3GPP TS 24.182 [5])



Figure 4.1-3. Example callflows for CAT gateway model (Figure A.5.1-1 of 3GPP TS 24.182 [5])

For all models, the IMS Communication Service Identifier value for MMTEL will be used in the SIP signalling and CAT early media and established media cannot be distinguished based on this information. However, the CAT early media are marked with the media-level "a=content:g.3gpp.cat" SDP attribute.

The SIP/SDP signalling for CAT will be translated by the P-CSCF into Rx signalling towards the PCRF according to the Annex A of 3GPP TS 29.214 [4] and Clause 6.2 of 3GPP TS 29.213 [3]. In particular:

- The IMS Communication Service Identifier value for MMTEL will be provided as AF-Application-Identifier.

- The media-level "a=content:g.3gpp.cat" SDP attribute can be encapsulated within the "Codec-Data" AVP for corresponding media components.

- The forking model will be handled according to Annex A.3 of 3GPP TS 29.214 [4].

- The early session model will be handled according to Annex A.7 of 3GPP TS 29.214 [4].

- The gateway model will be handled according to Annex A.1 of 3GPP TS 29.214 [4].

- For all three models a single Rx session will be used.

The PCRF can thus recognise whether media described in the Rx service information are CAT early media or established media.

It is desirable that the PCRF configures the PCEF over the Gx interface (see 3GPP TS 29.212 [2]) in such a manner that separate charging records are generated for the CAT early media and for the established media.

## 4.2 Scenario 2 3PTY conference scenario

SIP signalling for a 3PTY conference is described in 3GPP TS 24.605 [6] and 3GPP TS 24.147 [7]

A UE invoking a 3PTY conference will establish separate SIP dialogues to the two peers and will put the media for both calls on hold using the SDP direction attribute "sendonly" or "inactive" in an SDP offer sent towards each of the peers. The UE will then establish a third SIP dialogue towards the MRF to establish a conference. After that, the UE will invite the peers to join the conference, either by sending SIP refer requests to the peers within the corresponding SIP dialogues (see Figure 4.2-1), or by tasking the MRF to send INVITE requests to the peers (see Figure 4.2-2).

The P-CSCF serving the UE can recognise the SIP dialogue toward the MRF via the Conference-factory URI used as request URI, or via the "isfocus" parameter in the SIP contact header within the SIP response.

The SIP/SDP signalling will be translated by the P-CSCF into Rx signalling towards the PCRF according to the Annex A of 3GPP TS 29.214 [4] and Clause 6.2 of 3GPP TS 29.213 [3]. In particular:

- The different Rx sessions will be used

- The IMS Communication Service Identifier value for MMTEL will be provided as AF-Application-Identifier.

- The Rx session and media towards the conference server/MRF are not explicitly marked.

- Resource sharing among the media related to the different SIP dialogues can be requested as specified in subclause A.12 of 3GPP TS 29.214 [4]

There is only a single IP CAN session and only one Gx session. As described for the bearer binding mechanism (see 3GPP TS 29.214 [4]), the Bearer Binding Function (BBF) located at the PCEF will evaluate whether it is possible to use one of the existing IP-CAN bearers that has the same QoS class identifier and ARP.

It is desirable to enable the PCEF to request the network to generate separate CDR the usage between the UE and different parties and to recognise the media components exchanged between the served UE and the MRF.

The PCEF provides the capability to categorise the service data flows within IP-CAN bearer data traffic by rating group or combination of the rating group and service id according to subclauses 5.2.1.3 and 5.3.1.2 of 3GPP TS 32.251 [8]. However, the PCRF could not supply different rating group or service id for the different PCC rules in this scenario.



Figure 4.2-1: The Call flow for 3PTY conference by sending REFER request described in 3GPP TS 24.605 [6]



Figure 4.2-2: The Call flow for 3PTY conference sending INVITE request with URI list described in 3GPP TS 24.605 [6]

If charging correlation is used, it is very hard for the charging system to correlate the PS CDR and IMS CDR. There may be one PS CDR with multiple AF-Correlation-Information.

## 4.3 Scenario 3 Communication HOLD (HOLD) scenario

3GPP TS 24.610 [9] defines the usage of SIP and SDP signalling to provide Communication HOLD (HOLD) service. The HOLD service enables a user to suspend the reception of media stream(s) of an established IP multimedia session, and resume the media stream(s) at a later time. The media are inserted by the communication origin or the AS.

3GPP TS 24.610 [9] defines HOLD communication and RESUME communication to provide HOLD.



Figure 4.3-1. Example callflows for HOLD communication without announcement to the held user (Figure A.1.1.1 of 3GPP TS 24.610 [9])



Figure 4.3-2. Example callflows for HOLD communication with announcement to the held user (Figure A.1.2.1 of 3GPP TS 24.610 [9])



Figure 4.3-3. Example callflows for HOLD communication with modification of the SDP answer (Figure A.1.3.1 of 3GPP TS 24.610 [9])



Figure 4.3-4. Example callflows for RESUME communication without announcement to the held user (Figure A.2.1.1 of 3GPP TS 24.610 [9])



Figure 4.3-5. Example callflows for RESUME communication with announcement to the held user (Figure A.2.2.1 of 3GPP TS 24.610 [9])

For all cases, The P-CSCF serving the UE can recognise the SIP dialogue toward different SIP Call-IDs.

The SIP/SDP signalling will be translated by the P-CSCF into Rx signalling towards the PCRF according to the Annex A of 3GPP TS 29.214 [4] and clause 6.2 of 3GPP TS 29.213 [3]. In particular:

- The different Rx sessions will be used

- The IMS Communication Service Identifier value for MMTEL will be provided as AF-Application-Identifier.

- The Rx session and media towards different communication dialogues are not explicitly marked.

- Resource sharing among the media related to the different SIP dialogues can be requested as specified in subclause A.12 of 3GPP TS 29.214 [4]

There is only a single IP CAN session and only one Gx session. As described for the bearer binding mechanism (see 3GPP TS 29.213 [3]), the Bearer Binding Function (BBF) located at the PCEF will evaluate whether it is possible to use one of the existing IP-CAN bearers that has the same QoS class identifier and ARP.

It is desirable to enable the PCEF to request the network to generate separate CDR the usage between different communication dialogues and to recognise the media components exchanged between different communication dialogues.

The PCEF provides the capability to categorise the service data flows within IP-CAN bearer data traffic by rating group or combination of the rating group and service id according to subclauses 5.2.1.3 and 5.3.1.2 of 3GPP TS 32.251 [8]. However, the PCRF could not supply different rating group or service id for the different PCC rules in this scenario. If charging correlation is used, it is very hard for the charging system to correlate the PS CDR and IMS CDR. There may be one PS CDR with multiple AF-Correlation-Information.

## 4.4 Scenario 4 Communication Waiting (CW) scenario

3GPP TS 24.615 [10] defines the usage of SIP and SDP signalling to provide Communication Waiting (CW) service. The CW service enables a UE to be informed that no resources are available for an incoming communication. The user then has the choice of accepting, rejecting or ignoring the incoming communication (as per basic communication procedures). The media are inserted by a different communication origin.

3GPP TS 24.615 [10] defines the following cases to provide CW:

- network based CW, i.e. sufficient information on the user is available at the time a communication is to be delivered to the user, the network validates the status of this user. If the status of the user is "approaching NDUB", the network presents the waiting communication to the destination user; or

- terminal based CW, the network may be informed of the communication waiting situation upon receipt from the destination user of a communication waiting indication.



Figure 4.4-1. Example callflows for Network based CW using an AS (Figure A.1.1 of 3GPP TS 24.615 [10])



Figure 4.4-2. Example callflows for Terminal based CW at the terminating side, successful communication establishment (Figure A.2.1 of 3GPP TS 24.615 [10])

For all cases, The P-CSCF serving the UE can recognise the SIP dialogue toward different SIP Call-IDs.

The SIP/SDP signalling will be translated by the P-CSCF into Rx signalling towards the PCRF according to the Annex A of 3GPP TS 29.214 [4] and clause 6.2 of 3GPP TS 29.213 [3]. In particular:

- The different Rx sessions will be used

- The IMS Communication Service Identifier value for MMTEL will be provided as AF-Application-Identifier.

- The Rx session and media towards different communication dialogues are not explicitly marked.

- Resource sharing among the media related to the different SIP dialogues can be requested as specified in subclause A.12 of 3GPP TS 29.214 [4]

There is only a single IP CAN session and only one Gx session. As described for the bearer binding mechanism (see 3GPP TS 29.213 [3]), the Bearer Binding Function (BBF) located at the PCEF will evaluate whether it is possible to use one of the existing IP-CAN bearers that has the same QoS class identifier and ARP.

It is desirable to enable the PCEF to request the network to generate separate CDR the usage between different communication dialogues and to recognise the media components exchanged between different communication origins.

The PCEF provides the capability to categorise the service data flows within IP-CAN bearer data traffic by rating group or combination of the rating group and service id according to subclauses 5.2.1.3 and 5.3.1.2 of 3GPP TS 32.251 [8]. However, the PCRF could not supply different rating group or service id for the different PCC rules in this scenario.If charging correlation is used, it is very hard for the charging system to correlate the PS CDR and IMS CDR. There may be one PS CDR with multiple AF-Correlation-Information.

# 5 Requirements analysis and assumptions

5.1 Requirements analysis and assumptions for CT3

In order to support the volume based charging for IMS, all the IMS scenarios as described in clause 4 should be supported. The requirements for CT3 have been identified:

1) The PCRF shall be able to identify CAT media and normal media;

2) The PCRF shall be able to identify media related to different called parties;

3) The PCEF shall be able to separate charging records generated for CAT media and normal media;

4) The PCEF shall be able to separate charging records generated between the UE and different parties.

5.2 Requirements analysis and assumptions for CT1

In order to support the volume based charging for IMS, all the IMS scenarios as described in clause 4 should be supported. The requirements for CT1 have been identified:

1) The P-CSCF shall be able to identify from the SIP signalling that the CAT service is to be used so that the P-CSCF can provide a CAT service indication to PCRF;

2) The P-CSCF shall be able to identify from the SIP signalling that the 3PTY conference service is to be used so that the P-CSCF can provide a 3PTY conference service indication to PCRF.

# 6 Alternative solutions for CT3

## 6.1 Solution 1: PCRF configuration solution addressing on requirement 2 and 4 for CT3

### 6.1.1 Introduction

This solution addresses requirement 2 and 4 for CT3 and specifically considers how the PCRF identify media related to different called parties and how the PCEF separate charging records generated between the UE and different parties.

### 6.1.2 Procedure and Function Description

Addressing requirement 2 for CT3:

The P-CSCF use Content-Type AVP within the Media-Component-Description AVP to mark the IMS content type for the PCRF to identify the conference service information.

The Content-Type AVP determines the IMS content type of a session component. The following values are defined:

CONFERENCE (x)

This value is used to indicate that the content corresponding to the affected media component is the conference.

NOTE 1: The Content-Type AVP is a new AVP and the name, the definition and the encoding can be further analysed in the normative work.

The PCRF will be configured with a group of rating group(RG) or service ID(SID) for one service (e.g. IMS Communication Service) based on the IMS Communication Service Identifier within the AF-Application-Identifier AVP and the IMS content type within the Content-Type AVP.

When the PCRF receives a new Rx session with the same IMS Communication Service within the "AF-Application-Identifier" AVP as a previous one and this previous Rx session still exists, the PCRF will select a different RG or SID from the PCC rule related the previous Rx session to separate the volume charging between the two Rx sessions. The PCEF will install the PCC rules with the different RG and SID.

NOTE 2: When the new AVP is used and the indicator to identify conference service is SDP a=content media-level attribute line, the a=content media-level attribute line do not need to be included in the "Codec-Data" AVP to avoid duplication of information. Otherwise, the "Codec-Data" AVP within the Media-Component-Description AVP shall be used to mark the IMS content type for the PCRF to identify the CAT service information This could be further analysed in the normative work.

NOTE 3: If duplicated Rx session are used, the DUPLICATED\_AF\_SESSION Permanent Failure can occur.

NOTE 4: The number configured for a group of rating groups or service IDs for one service will limit the number that PCRF support Rx sessions when the previous Rx session with same "AF-Application-Identifier" still exists.

Addressing requirement 4 for CT3:

The PCEF will separate charging records generated for the UE and different parties based on the rating group(RG) or service ID(SID).

NOTE 5: When the PCRF update the RG or service ID(SID) for the existing PCC rule, there can be some impact on the online and/or offline charging mechanism. This could be updated in the normative work.

### 6.1.3 Analysis

This solution can address the requirement 2 and 4 for CT3 and specifically considers how the PCRF identify media related to different called parties and how the PCEF separate charging records generated between the UE and different parties.

There are additional requirements on the P-CSCF:

The P-CSCF shall be able to indicate the PCRF to mark related media as the conference service.

NOTE 1: Whether introducing a new AVP or reusing the Codec-Data AVP to indicate the conference service will be studied in the normative work.

There are additional requirements on the PCRF:

The PCRF shall be able to be configured with a group of rating group(RG) or service ID(SID) for one service (e.g. IMS Communication Service).

The PCRF shall be able to update the RG or service ID(SID) for the existing PCC rule.

There is additional requirement on the PCEF:

The PCEF shall be able to separate charging records generated for the UE and different parties based on the rating group(RG) or service ID(SID).

NOTE 2: When the PCRF update the RG or service ID(SID) for the existing PCC rule, there can be some impact on the online and/or offline charging mechanism. This could be further analysed in the normative work.

## 6.2 Solution 2: PCRF configuration solution addressing on requirement 1 and 3 for CT3

### 6.2.1 Introduction

This solution addresses requirement 1 and 3 for CT3 and specifically considers how the PCRF identify CAT media and normal media and how the PCEF separate charging records generated for CAT media and normal media.

### 6.2.2 Procedure and Function Description

Addressing requirement 1 for CT3:

The P-CSCF use Content-Type AVP within the Media-Component-Description AVP to mark the IMS content type for the PCRF to identify the CAT service information.The Content-Type AVP determines the IMS content type of a session component. The following values are defined:

NO\_CONTENT\_DETAIL (0)

This value is used to indicate that no information about the IMS content type is being provided. This is the default value applicable if the AVP is omitted.

CAT (1)

This value is used to indicate that the content corresponding to the affected media component is CAT early media.

NOTE 1: The Content-Type AVP is a new AVP and the name, the definition and the encoding can be updated in the normative work.

The PCRF will be configured with a group of rating group(RG) or service ID(SID) for one service (e.g. IMS Communication Service) based on the IMS Communication Service Identifier within the AF-Application-Identifier AVP, and the IMS content type within the Content-Type AVP.

NOTE 2: When the new AVP is used and the indicator to identify CAT early media is SDP a=content media-level attribute line, the a=content media-level attribute line do not need to be included in the "Codec-Data" AVP to avoid duplication of information. Otherwise, the "Codec-Data" AVP within the Media-Component-Description AVP shall be used to mark the IMS content type for the PCRF to identify the CAT service information This could be futher analysed in the normative work.

Addressing requirement 3 for CT3:

The PCEF will separate charging records generated for CAT media and normal media based on the rating group(RG) or service ID(SID).

NOTE 3: When the PCRF update the RG or service ID(SID) for the existing PCC rule, there can be some impact on the online and/or offline charging mechanism. This could be futher analysed in the normative work.

### 6.2.3 Analysis

This solution can address the requirement 1 and 3 for CT3 and specifically considers how the PCRF identify CAT media and normal media and how the PCEF separate charging records generated for CAT media and normal media.

When the feature is supported, the additional requirements are as follows.

There is additional requirement on the P-CSCF:

The P-CSCF shall be able to indicate the PCRF to mark the related media as the CAT service.

NOTE 1: Whether introducing a new AVP or reusing the Codec-Data AVP to indicate the CAT service will be studied in the normative work.

There are additional requirements on the PCRF:

The PCRF shall be able to be configured with a group of rating group(RG) or service ID(SID) for one service (e.g. IMS Communication Service).

The PCRF shall be able to update the RG or service ID(SID) for the existing PCC rule.

There is additional requirement on the PCEF:

The PCEF shall be able to separate charging records generated for CAT media and normal media based on the rating group(RG) or service ID(SID).

NOTE 2: When the PCRF update the RG or service ID(SID) for the existing PCC rule, there can be some impact on the online and/or offline charging mechanism. This could be futher analysed in the normative work.

7 Alternative solutions for CT1

7.1 Solution 1: Convey CAT service indication in SDP

7.1.1 Introduction

This solution addresses the requirement on P-CSCF being able to identify that the CAT service is to be used so that the P-CSCF can provide a CAT service indication to PCRF.

The PCRF needs the CAT service indication to distinguish the media flow used for CAT service from that used for other media during the session, thus the CAT service indication should be bound to a particular media component over the Rx interface. 3GPP TS 24.182 [5] specifies the use of a=content media-level attribute with the value of "g.3gpp.cat" in the SDP which identifies the corresponding media component is used for CAT service, this media-level attribute can be used to convey CAT service indication.

7.1.2 Procedure and Function Description

7.1.2.1 General

When sending a SIP message with SDP related to the CAT media, the CAT AS includes the a=content media-level attribute line with the value of "g.3gpp.cat" under the corresponding media line. If the received SDP contains such an a=content media-level attribute line, the P-CSCF includes a CAT service indicatior in the Diameter message used for initial provisioning or modification of session indication as described in subclause 6.2.

7.1.2.2 Procedure for CAT AS acting in forking model

If the CAT AS is acting in forking model as specified in 3GPP TS 24.182 [5], the procedure of convey CAT service indication to PCRF is shown in Figure 7.1.2.2-1.



Figure 7.1.2.2-1: procedure of convey CAT service indication when forking model

NOTE: The network entities and the messages which are not concerned is not shown in the figure.

**1-3 INVITE request (UE(MO) to UE(MT))**

UE(MO) sends a SIP INVITE request to UE(MT).

**4 180 (Ringing) response (UE(MT) to CAT AS)**

UE(MT) sends a SIP 180 response to CAT AS.

**5 18x response (CAT AS to P-CSCF(MO))**

CAT AS sends a SIP 18x response to the P-CSCF(MO). The SIP 18x response contains the SDP of the CAT media. An a=content attribute line with value of "g.3gpp.cat" is included in the SDP.

**6 Diameter AAR (P-CSCF(MO) to PCRF)**

P-CSCF(MO) provides the session information to the PCRF, the CAT service indication is contained in this message.

**7 Diameter AAA (PCRF to P-CSCF(MO))**

PCRF respond to P-CSCF(MO) with AAA.

**8 18x response (P-CSCF(MO) to UE(MO))**.

P-CSCF(MO) forwards the SIP 18x response to the UE(MO).

**9-10 200 (OK) response (UE(MT) to P-CSCF(MO))**.

UE(MT) sends 200 (OK) response to the initial INVITE request, the SDP of media used for the voice communication on the MT UE is included in the 200 (OK) response.

**11 Diameter AAR (P-CSCF(MO) to PCRF)**.

P-CSCF(MO) modifies the session information, the CAT service indication is not included in this message.

**12 Diameter AAA (PCRF to P-CSCF(MO))**.

PCRF respond to P-CSCF(MO) with AAA.

**13 200 (OK) response (P-CSCF(MO) to UE(MO))**.

P-CSCF(MO) forwards the SIP 200 (OK) response to the UE(MO).

7.1.2.3 Procedure for CAT AS acting in early session model

If the CAT AS is acting in early session model as specified in 3GPP TS 24.182 [5], the procedure of convey CAT service indication to PCRF is shown in Figure 7.1.2.3-1.



Figure 7.1.2.3-1: procedure of convey CAT service indication when early session model

NOTE: The network entities and the messages which are not concerned is not shown in the figure.

**1-3 INVITE request (UE(MO) to UE(MT))**

UE(MO) sends a SIP INVITE request to UE(MT).

**4 180 (Ringing) response (UE(MT) to CAT AS)**

UE(MT) sends a SIP 180 response to CAT AS.

**5 18x response (CAT AS to P-CSCF(MO))**

CAT AS sends a SIP 18x response to the P-CSCF(MO). The SIP 18x response contains the SDP of the CAT media. An a=content attribute line with value of "g.3gpp.cat" is included in the SDP.

**6 Diameter AAR (P-CSCF(MO) to PCRF)**

P-CSCF(MO) provides the session information to the PCRF, the CAT service, the CAT service indication is not included in this message.

**12 Diameter AAA (PCRF to P-CSCF(MO))**.

PCRF respond to P-CSCF(MO) with AAA.

**13 200 (OK) response (P-CSCF(MO) to UE(MO))**.

P-CSCF(MO) forwards the SIP 200 (OK) response to the UE(MO).

7.1.2.4 Procedure for CAT AS acting in Gateway model

If the CAT AS is acting in Gateway model as specified in 3GPP TS 24.182 [5], the procedure of convey CAT service indication to PCRF is shown in Figure 7.1.2.4-1.



Figure 7.1.2.4-1: procedure of convey CAT service indication when Gateway model

NOTE: The network entities and the messages which are not concerned is not shown in the figure.

**1-3 INVITE request (UE(MO) to UE(MT))**

UE(MO) sends a SIP INVITE request to UE(MT).

**4 180 (Ringing) response (UE(MT) to CAT AS)**

UE(MT) sends a SIP 180 response to CAT AS.

**5 18x response (CAT AS to P-CSCF(MO))**

CAT AS sends a SIP 18x response to the P-CSCF(MO). The SIP 18x response contains the SDP of the CAT media. An a=content attribute line with value of "g.3gpp.cat" is included in the SDP.

**6 Diameter AAR (P-CSCF(MO) to PCRF)**

P-CSCF(MO) provides the session information to the PCRF, the CAT service indication is contained in this message.

**7 Diameter AAA (PCRF to P-CSCF(MO))**

PCRF respond to P-CSCF(MO) with AAA.

**8 18x response (P-CSCF(MO) to UE(MO))**.

P-CSCF(MO) forwards the SIP 18x response to the UE(MO).

**9 200 (OK) response (UE(MT) to CAT AS)**.

UE(MT) sends 200 (OK) response to the initial INVITE request, the SDP of media used for the voice communication on the MT UE is included in the 200 (OK) response.

**10-11 UPDATE request (CAT AS to UE(MO))**.

CAT AS sends SIP UPDATE request to the UE(MO) to update the SDP used for the voice communication. The a=content attribute line with value of "g.3gpp.cat" is not included in this SDP.

**12 200 (OK) response (UE(MO) to P-CSCF(MO))**.

UE(MO) responds to the UPDATE request.

**13 Diameter AAR (P-CSCF(MO) to PCRF)**.

P-CSCF(MO) modifies the session information, the CAT service indication is not included in this message.

**14 Diameter AAA (PCRF to P-CSCF(MO))**.

PCRF respond to P-CSCF(MO) with AAA.

**15-17 The rest of the call flow**

7.1.3 Analysis

This solution can address the requirement on P-CSCF being able to identify that the CAT service is to be used so that the P-CSCF can provide a CAT service indication to PCRF

There is no additional requirement on IM CN subsystem functionalities which are under remit of CT1.

7.2 Solution 2: Convey a conference service indication in SDP

7.2.1 Introduction

This solution addresses the requirement on P-CSCF being able to identify from the SIP signalling that the conference service is to be used so that the P-CSCF can provide a conference service indication to PCRF.

7.2.2 Procedure and Function Description

During the SDP negotiation procedure, the conference AS includes a=content media-level attribute line with value of "g.3gpp.conf" in the SDP which is related to the media component used for the conference.

If the received SDP contains such an a=content media-level attribute line with value of "g.3gpp.conf", the P-CSCF includes a conference service indicatior in the Diameter message used for initial provisioning or modification of session indication as described in subclause 6.1.

7.2.3 Analysis

This solution can address the requirement on P-CSCF being able to identify from the SIP signalling that the conference service is to be used so that the P-CSCF can provide a conference service indication to PCRF.

There is additional requirement on the conference AS to include an a=content media-level attribute line with value of "g.3gpp.conf" in the SDP related to the media flow used for conference service.

# 8 Conclusions and recommendations

## 8.1 Conclusions and recommendations for CT3

The present document investigates some functional enhancements which can be used by IMS services to separate the volume usage between different IMS based services (e.g. CAT and voice calls, 3PTY conference, Communication waiting, Communication Hold).

When the feature is supported the following is to be standardized during CT3 normative work:

Addressing requirement 1 for CT3:

The P-CSCF shall indicate the PCRF to mark related media as the CAT service.

NOTE 1: Whether introducing a new AVP or reusing the Codec-Data AVP to indicate the CAT service will be studied in the normative work.

NOTE 2: If duplicated Rx session are used, the DUPLICATED\_AF\_SESSION Permanent Failure can occur.

The PCRF could be configured with a group of rating groups or service IDs for one service (e.g. IMS Communication Service). The PCRF will assign a different rating group or service ID for the different identified media. The PCRF shall be able to update the RG or service ID(SID) for the existing PCC rule.

NOTE 3: The number configured for a group of rating groups or service IDs for one service will limit the number that PCRF support Rx sessions when the previous Rx session with same "AF-Application-Identifier" still exists. Whether the PCRF reject the coming new Rx session or not when the number of group of rating groups or service IDs for one service reached the configuration will be studied in the normative work.

Addressing requirement 2 for CT3:

The P-CSCF shall be able to indicate the PCRF to mark related media as conference service.

NOTE 4: Whether introducing a new AVP or reusing the Codec-Data AVP to indicate the conference service will be studied in the normative work.

The PCRF could be configured with a group of rating groups or service IDs for one service (e.g. IMS Communication Service). The PCRF will assign a different rating group or service ID for the identified media for the different parties. The PCRF shall be able to update the RG or service ID(SID) for the existing PCC rule.

NOTE 5: The number configured for a group of rating groups or service IDs for one service will limit the number that PCRF support Rx sessions when the previous Rx session with same "AF-Application-Identifier" still exists. Whether the PCRF reject the coming new Rx session or not when the number of group of rating groups or service IDs for one service reached the configuration will be studied in the normative work.

Addressing requirement 3 for CT3:

The PCEF will separate charging records generated for the UE and different parties based on the rating group(RG) or service ID(SID).

NOTE 6: When the PCRF update the RG or service ID(SID) for the existing PCC rule, there can be some impact on the online and/or offline charging mechanism. This could be futher analysed in the normative work.

Addressing requirement 4 for CT3:

The PCEF will separate charging records generated for CAT media and normal media based on the rating group(RG) or service ID(SID).

NOTE 7: When the PCRF update the RG or service ID(SID) for the existing PCC rule, there can be some impact on the online and/or offline charging mechanism. This could be further analysed in the normative work.

## 8.2 Conclusions for CT1

8.2.1 Conclusion on the solution for convey CAT service indication

It is concluded to standardize the solution described in subclause 7.1.

No further normative work is needed in CT1.

8.2.2 Conclusion on the solution for convey call parties information

It is concluded to standardize the solution described in subclause 7.2.

The following is to be standardized during CT1 normative work:

a) a new a=content media-level attribute line value, e.g. "g.3gpp.conf ";

b) the conference AS shall include a=content media-level attribute line with value of "g.3gpp.conf" in the SDP used for conference media.

Annex A (informative):  
Change history

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Change history** | | | | | | | |
| **Date** | **Meeting** | **TDoc** | **CR** | **Rev** | **Cat** | **Subject/Comment** | **New version** |
| 2016-11 |  |  |  |  |  | TS skeleton of Study on Policy and Charging for Volume Based Charging. | 0.0.0 |
| 2017-02 |  |  |  |  |  | Inclusion of documents agreed in CT3#87 C3-164214, C3-164215.  Inclusion of documents agreed in CT3#88 C3-171239, C3-171283, C3-171309, C3-171310. | 0.1.0 |
| 2017-04 |  |  |  |  |  | Inclusion of documents agreed in CT3#89 C3-172208, C3-172209, C3-172210. | 0.2.0 |
| 2017-05 |  |  |  |  |  | Inclusion of documents agreed in CT3#90 C3-173327, C3-173328. | 0.3.0 |
| 2017-10 |  |  |  |  |  | Inclusion of documents agreed in CT3#92 C3-175339, and document agreed in CT1#106 C1-174477. | 0.4.0 |
| 2017-12 |  |  |  |  |  | Inclusion of documents agreed in CT3#93 C3-176290, C3-176291, C3-176292, C3-176386, C3-176387 and documents agreed in CT1#107 C1-175285, C1-175264, and C1-175265 | 0.5.0 |
| 2017-12 | CT-78 | CP-173108 |  |  |  | TS sent to plenary for information and approval | 1.0.0 |
| 2017-12 | CT-78 | CP-173108 |  |  |  | TS approved at plenary | 15.0.0 |
| 2020-07 | SA#88e | - | - | - | - | Update to Rel-16 version (MCC) | 16.0.0 |