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ETSI

650 Route des Lucioles
F-06921 Sophia Antipolis Cedex - FRANCE

Tel.: +33 4 92 94 42 00   Fax: +33 4 93 65 47 16

Siret N° 348 623 562 00017 - NAF 742 C
Association à but non lucratif enregistrée à la
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Foreword

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Contents

Foreword

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

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1   Scope

The objective of this study item is to study requirements and potential new capabilities in 3GPP that need to be standardized for the CAT service, especially additional features for roaming and interoperability support.

The present document specifies the requirements and technical implements for Customized Alerting Tone (CAT) service in CS domain and the developments in PS domain.

Basically this TR is considering voice services, though interaction with MITe [2] services will be studied. Also Multimedia CAT will be taken into consideration, so the CAT user may experience favourable songs, multi-media clips or other customized alerting tones.

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 22.173: "IP Multimedia Core Network Subsystem (IMS) Multimedia Telephony Service and supplementary services; Stage 1".

[3]   3GPP TS 22.240: "Service requirements for 3GPP Generic User Profile (GUP); Stage 1".

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.

Alerting Tone: An indication that is played to the calling subscriber during establishment of a call or during an established call session indicating one of the following:

- that the called subscriber is being alerted.

- the progress of communication request   (Call Forward, Call Wait etc.)

- any alerting event during a call session

Customized Alerting Tone: An Alerting Tone that is customized by the called subscriber or the calling subscriber. A Customized Alerting Tone (CAT) may e.g. be a piece of recorded or composed music, greeting words , voice, advertisement or video.

Customized Alerting Tone Service: A Customized Alerting Tone Service (CAT service) is an operator specific service by which an operator enables the subscriber to customize his alerting tone.

CAT Inter-action: is the interaction of the CAT service with other services, e.g. Multiple Services Inter-actioninteraction with Call Forwarding.

CAT Inter-working : Multiple Domains Inter-workingis the interworking of a CAT service over different domains or subsystems (CS or IMS) as well as between PLMNs.

CAT content provider: A service provider that provides a set of Alerting Tones for use as CAT for subscribers of the CAT service. A 3GPP operator may be a CAT content provider.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 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 TR 21.905 [1].

CAT Customized Alerting Tone

4 Suggested CAT service requirements

4.1 Basic functionality of the CAT service

The Customized Alerting Tone Service (CAT service) is an operator specific service by which an operator enables the subscriber to customize the alerting tone which is played to the calling party. CAT service should not negatively affect the conversation between calling and called parties.

The CAT service should at least be able to fulfil the following requirements:

- The service user can easily subscribe the CAT service, activate the CAT service, and update the settings, e.g. to change his active CAT.

- The calling party can experience the CAT set by the called party.

- The calling party can experience the CAT set by the calling party.

- The calling party"s operator should be able to configure which CAT should have priority, the one set by the called or calling party. The calling party"s operator shall be able to take into account the calling party"s preferences.

- The CAT shall override the default alerting tone towards the calling subscriber.

- Each CAT subscriber has a personal CAT library to store all his CATs. The CAT can be chosen from the CAT library according to rules such as time, calling party"s location, called party"s location, the identity of the calling and called party.

- It shall be possible to inform the user about changes in his CAT service, e.g. close expiry date for the CAT service or a particular CAT content.

- The user whose CAT service is active will be charged according to a specified charging mode.

- When the called party answers the call, the call channel is set up and the CAT stops. Alternatively, as an operator option the content of the CAT may continue to play during the conversation.

- When the called party is notified about an incoming call, the called party can send an indication to the CAT service which CAT to play to the calling party.

- When the CAT is playing, the calling party can stop it for instance by pressing a specific button, then he shall experience the default alerting tone.

- When the CAT is playing, the called party can stop it for instance by pressing a specific button, the calling party shall experience another CAT.

- It shall be possible for a CAT subscriber to select a CAT, which content is provided by a CAT content provider, which does not have to be the service provider.

Note: the CAT implementation for PLMN based Networks may have a number of issues (CAT unidirectional channel, charging for Early Media, negotiation of early H.324M during the alerting phase, etc.) that should be a subject for Stage 2 standardization

4.2 Normal procedures with successful outcome

4.2.1 Provisioning and Withdrawal

The CAT Service can be provisioned and withdrawn by the operator per subscriber. Procedures for provisioning and withdrawal are out of scope of standardisation

4.2.2 Activation and Deactivation and Update

4.2.2.1 General

The service subscriber can activate, de-activate his CAT service. For activation and de-activation, the service subscriber may e.g. employ operator specific USSD commands, SMS, IVR or other means (e.g. customer self-administration via a web-site).

4.2.2.2 Activation

When a subscriber activates his CAT Service he needs to specify, which CAT a calling user should experience.

After a subscriber has activated his CAT Service a calling user should experience the CAT, that was chosen by the subscriber.

4.2.2.3 Deactivation

After a subscriber has deactivated his CAT Service a calling user should experience the default alerting tone.

4.2.3 Basic scenarios

In the following scenarios, contained in table 1, it is assumed that the called party (B) has activated his CAT Service. Calling party (A) is calling B. The calling party has not subscribed and/or activated the CAT service.

The Customized Alerting Tone of B is CAT-B.

Table 1: Normal Operation Scenarios

	Called party B (condition)	Forwarded-to-party	Expected behaviour
4	B, ringing		A experiences CAT-B
5	B, busy		A experiences busy indication.
6	B, no answer		First A experiences CAT-B and then the "no answer" indication after B"s "no answer" timer has expired
7	B, not reachable		A experiences "not reachable" indication

In the following scenarios, contained in table 2, it is assumed that only the calling party (A) has activated his CAT Service. Calling party (A) is calling B. The called party has not subscribed and/or activated the CAT service.

The Customized Alerting Tone of A is CAT-A,

Table 2: Normal Operation Scenarios

	Called party B (condition)	Forwarded-to-party	Expected behaviour
4	B, ringing		Depending on A settings, subscriber A will experience either CAT-A or the default alerting tone.
5	B, busy		Depending on A settings, subscriber A will experience either CAT-A or the default busy tone.
6	B, no answer		Depending on A settings, subscriber A will experience either CAT-A or the default alerting tone and then the "no answer" indication after B"s "no answer" timer has expired
7	B, not reachable		A experiences "not reachable" indication

In the following scenarios, contained in table 3, it is assumed that both the calling party (A) and called party (B) have activated the CAT Service. Calling party (A) is calling B.

The Customized Alerting Tone of B is CAT-B, the Customized Alerting Tone for A is CAT-A.

Table 3: Normal Operation Scenarios

	Called party B (condition)	Forwarded-to-party	Expected behaviour
4	B, ringing		Depending on A settings, A experiences CAT-A, CAT-B or the default alerting tone.
5	B, busy		Depending on A settings, subscriber A will experience either CAT-A or the default busy tone.
6	B, no answer		Depending on A settings, subscriber A will experience either CAT-A, CAT-B or the default alerting tone and then the "no answer" indication after B"s "no answer" timer has expired
7	B, not reachable		A experiences "not reachable" indication

4.2.4 Interaction with Supplementary Services

Additionally, for call-forwarding scenarios, it is assumed that Forwarded-to-party (C) has activated his CAT Service. The Customized Alerting Tone of C is called CAT-C. The Customized Alerting Tone of D is called CAT-D. The calling party has not subscribed and/or activated the CAT service. If applicable, the CAT experienced by the calling user should be the one customized for the user by the connected-to-party

In the following table, all the CATs that A experiences in the column "Expected behaviour" may be replaced by CAT-B, if the operator wants to deploy so.

Table 1: Supplementary Service Interaction Scenarios

	Called party B (condition)	Forwarded-to-party (condition)	Expected behaviour
8	B has activated call waiting and B is engaged in an active or held call.		Depending on A settings, subscriber A will experience either CAT-B or the default call waiting tone.
9	B has activated Call Forwarding Unconditional (CFU) to C and A"s call is forwarded to C	C, ringing	A experiences CAT-C
10	B has activated Call Forwarding on Busy (CFB) to C, B is busy and A"s call is forwarded to C	C, ringing	A experiences CAT-C
11	B has activated Call Forwarding on No Reply (CFNRy) to C and A"s call is forwarded to C	C, ringing	A experiences CAT-B until B"s CFNRy timer has expired. Then experiences CAT-C.
12	B has activated Call Forwarding on Not Reachable (CFNRc) to C and A"s call is forwarded to C	C, ringing	A experiences CAT-C
13	B has activated a Call Forwarding to C and C has activated a Call Forwarding to D so A"s call is forwarded to D	Tandem Forwarding: C has activated a Call Forwarding to D and A"s call is forwarded to D	A experiences CAT-D

- As a configurable option it shall be possible to distinguish between different call states (from call status) and provide the caller with different CAT

- It should be possible to configure each specific action (CAT) as a result of a sequence of specific rolls (Date, Time, Call status etc.) for instance as an XML table

4.3 CAT service configuration

- A service subscriber, that has activated his CAT service, shall be able to select and update his CAT settings - i.e. select a different CAT than the current one. It should be possible to charge the subscriber for selection / update of the CAT settings.

- The calling user should be able to "copy" the last CAT that was experienced in the ongoing call, as his own CAT.

Note 1: DRM issues should be covered in order to make sure that copyrights are not infringed.

Note 2: One solution could for instance be to use DTMF signalling.

4.4 Personal CAT Library

Each CAT subscriber has a personal CAT library to store his purchased CAT contents and/or his CAT settings. After a CAT subscriber purchases a CAT content from else places, such as the system CAT library or other PLMN, the system stores it in his personal CAT library automatically. Then the subscriber can set a CAT with the CAT contents in his personal CAT library. The personal CAT library contains all the contents that the subscriber can use. The subscriber can change the CAT contents in his personal CAT library. The system administrator may configure and query the maximum number of CAT contents in a personal CAT library.

4.5 CAT Expiry Notify

Every CAT has its absolute expiry date (a specific date such as December 31, 2008), or relative expiry date (such as 30 days).

Considering that generally CAT content providers have strict requirements for the location and timeliness of CAT and the copyright legality of CAT must be guaranteed, the copyright expiry date of an CAT must be provided in the CAT management process. Upon expiry of this expiry date, the CAT will be invalid and the subscriber will be unable to continue to use it. The CAT system (for example, the system-timing task) will periodically check the expiry dates of all CAT. If an CAT is soon to reach its expiry date, the system will send a short message (or other ways) to the subscriber, telling him that the CAT he is using will soon expire. When the expiry date is up, the system will change the status of this CAT to the deleted or hidden status (depending on the system configuration).

4.6 The content of CAT

The content of CAT can be music, voice, text, or video.

The CAT may be composed of music, voice, text, video, which can be provided by the CAT content provider, operator or by the user himself.

The content of the CAT service may be dynamically created, possibly taking into account information available in the network, e.g. calling and/or called user"s location and/or presence information.

Charging information may be provided within a CAT in order to inform the caller about long distance call charging.

4.7 Inter-working CAT

It is important for a good user experience that CAT works as predicted independently if the called or the calling user is roaming. A standardized CAT solution should therefore fulfil the following end user requirements:

- When calling a service subscriber of another network, the calling party can still experience the CAT set by the called party.

- When the calling party is roaming to another network, the calling party can still experience the CAT set by the called party.

- When the calling party is roaming to another network, the calling party should still be able to experience the CAT set by the calling party.

- The calling party should experience the CAT set by the called party if the called party is roaming to another network.

- When calling a service subscriber of another network, the calling party should be able to "copy" the last CAT that was experienced in the ongoing call, as his own CAT.

4.8 CAT Charging

4.8.1 General

Each CAT subscriber can be charged according to the different charging mode.

Index	Charging mode	Description
1	Service monthly fee	Fixed (for example monthly) expense for the CAT service. In the first month the expense may be calculated according to the number of days. This revenue is obtained by network operators.
2	Fee of purchasing CAT	A subscriber is charged by the system when he purchases CAT in any mode, including copying some CAT of other subscribers. The rates vary with different CAT content.. DRM is necessary.
3	Fee of setting CAT	A subscriber may be charged by the system when he set his CAT or updates his CAT setting. The rates vary with different CAT set ways. System administrator determines the price
4	Fee of multimedia CAT	Allocated bandwidth based charging may be applied

.

The following means supporting above specified charging modes should be provided:

- Prepaid charged sub-scriber (single step / two steps approach, reserve commit)

- Post-paid charged sub-scriber

- Event based real-time billing

- CDR generation

- Switching (triggering) between different modes/means

4.8.2   Advertising CATs

If a CAT contains an advert, then this may not only be free of charge, bit whenever this is selected by for example, subscriber B and played to subscriber A, subscriber B may receive a credit.   This could be in the form of units (voice minutes, SMS, etc.) or actual monetary amount.

It is possible that the network can play advert to the calling user only if the calling user subscribes to the advertising CAT.

4.9   CAT Security

The CAT service never affects the common call.

If the CAT can"t be played for some reason (for example, the CAT system fails, or the CAT content expiry is up, or other reasons), the calling party will experience the traditional prompt tone instead of the CAT, but it will not affect the coming call.

When the media CAT fails to be played in some condition (such as the caller roams from 3G network to 2G network), the voice CAT may be played instead if possible.

4.10   Interaction with User Profile

4.10.1   CAT User Profile Provisioning

- User Profile can be stored in the home network environment and/or CAT equipment (storage).

- CAT User Profile will be accessed/managed by user, subscriber, CAT content provider and network operator

- The administration and management of the data associated with CAT functionality is under the control of the home network or CAT content provider.

- All activities related to user profile are provisioning and administration of user data by the network operator. These activities for CAT are characterised by needs for high throughput and allow longer response time. In order to allow simple and centralized administration it should be transparent to the administrator where the different parts of the user data are stored. As a result, this role needs a single system image on user profile, or, on functional terms, a common data access function. (see Synchronization model [3GPP TS22.240])

  - No limit on number of users

  - No limit on users data

  - Open API based on   a set of Web Service protocols □such as SOAP, WSDL.

- Access rights management

  - User Profile components

  - Media content

- Open API for Content Provider Interface should be provided

- 3rd party content providers" support

- Open API for Subscriber Provisioning should be supported

  - API should be stateless

  - Customer application may initiate the communication

  - XML over HTTP (XCAP) with HTTP post method may be used for instance

  - Synchronous mode

  - API may consist of the following parts

    - Authentication API – used to start, stop a provisioning session

    - Subscriber profile API – including profile management, requests

    - Content offering API – including content related requests

    - Customer care API – externalize customer-care features

    - Special Services API – SMS notifications etc.

- Other Open API"s:

  - Open API for Network Operator and other Service Providers should be supported

4.10.2   Contents of User Profile relevant to CAT

1. Authorised and subscribed services information (GUP defined) [3]:

> This kind of data is generally owned by the home operator and allows management and interrogation of subscription information and would typically consist of:

- General user information

  - Data, owned by the CAT user, which are not specific to individual services, but may be useful for any service. These would be data like

  - settings (e.g. name, postal address), preferences (e.g. language)

- Registered Service Profiles of the user, indicating the currently active Service Profile of the user.

- Service specific information of the user:

  - Data, owned by the CAT user or CAT provider

  - Service customisation data of the user (time, data ring back tone, group etc.)

    - Time of the day, day of the week, group ID, content ID

    - Group Management

  - Terminal related data

    - Terminal capabilities of the terminal currently in use (e.g. User Interface capabilities, communication capabilities, available services, service capabilities,…).

- Charging and billing related data

  - This data consists of information necessary for the user related charging and billing. This data could e.g. consist of:

  - The billing policy

  - Online/offline

2. Other CAT data that currently is not part of GUP [3]:

- Run Time Data.
  Data that are created during the initiation of the session, call or application execution and if they are only available during the lifetime of such session, call or application execution then they are considered as Run Time data.

- Historic/Statistic Data.
  User/system behaviour information (e.g. statistics on the usage preferred web pages; duration, number of calls, error rate).

- Media Content related data

  - Type of music (classical music etc.)

  - Type of video-clip (MTV, Hollywood etc.)

5 Architectural considerations on the CAT service

5.1 CS Video telephony CAT

When the service subscriber (MS-a) dials other service subscriber (MS-b) and the called party is ringing,   the calling party maybe experience the multimedia CAT, such as video, text , or music.

When MS-a calls the Ms-b and MS-b is ringing, the MSC-a will connect the CAT Server according to the response from MS-b.

MSC-a will setup the media channel between the MS-a, MSC-a and the CAT server.

The CAT server plays the multimedia CAT to MS-a.

If the conversation is downgraded from a videotelephony call to speech the CAT should be adopted to the new service.

5.2 IMS Multimedia CAT

In IMS-based environment the CAT server may be implemented as CAT AS and MRF. In this case a multimedia CAT would be played in MRF

5.3 Interaction with IMS services and -entities

5.3.1 Interaction with Multimedia Telephony Service

There will be a possibility for dynamic services interaction/invocation between CAT services and MITe Supplementary Services, as specified in 22.173.

- A User Profile (GUP) will include necessary information in order to support services orchestration

When Using CAT with MITe

- There will be a possibility to configure different CAT"s for User Equipment with different media capabilities

5.3.2 Interaction with Multimedia Resource Function

- CAT Interaction with IMS MRF will be according to the Media Server Control Protocol that is being currently developed by 3GPP CT1 (or other protocol).

- There will be possible to send an Advice of Charge, Subscriber Location or other informational notifications via MRF protocol (or other protocol).

- There will be possible that: MRF will play the multimedia CAT to the calling user according to the negotiation result of the media capability between the calling MSC Server and the calling user, after the calling MSC Server receives the notice of the called MSC Server calling the called user. - There will be possible that MGCF(Media Gateway Control Function) indicates Media Gateway to start media when MGCF receiving ACM or CPG, and the calling user"s MRF will possible start media according to the negotiation result of Offer/Answer mode,when the calling user and the called user separately locate in IMS network and PSTN,

5.4 Considerations on applicability of CAT in IMS

5.4.1 Consideration on QoS

- It will be possible to set-up a separate early media SIP connection with necessary QoS parameters in order to provide a high quality multi-media CAT (as specified in IETF RFC 3960 "Early Media and Ringing Tone Generation in the Session Initiation Protocol (SIP)".

  - In order to ensure the relevant QoS level all the way towards the subscriber a Communication Service ID may be used as currently being specified in 3GPP SA2

5.4.2 Consideration on VAD

- It will be possible during setting up the CAT channel or playing the CAT, to disable the VAD (Voice Activity Detection, a technology used in narrowband encoding/decoding). VAD is beneficial for the voice communication, but may create undesirable effects on the music.

- As an option a separate SIP connection may be used for CAT transmission as described above.

5.5 Considerations on requirement of Inter-working

5.5.1 CS-CS Inter-working scenario

Among several PLMNs, operators provide the users Inter-working CAT services, including the functions as following:

- When calling a user of another PLMN, the caller can still experience the CAT set by the called party.

- When roaming to another PLMN, the caller can still experience the CAT set by the called party.

- The caller can experience the CAT set by the called party who is roaming to another PLMN.

- When a user called the user of another PLMN and experienced the CAT of called user, before called answered he can press a key to "copy" the CAT as his own CAT.

In order to let the calling party"s MSC or the G-MSC know whether the called party subscribes the CAT service, the called party"s HLR , MSC, or other network entity may store the CAT mark-code and/or its CAT Server"s address information (the CAT address information maybe vary when the called party roaming from one PLMN to another PLMN). Then the calling party"s MSC or G-MSC will play CAT from the related CAT server for the calling party.

The reference network model for the CAT of inter-working is showed as the figure 2.
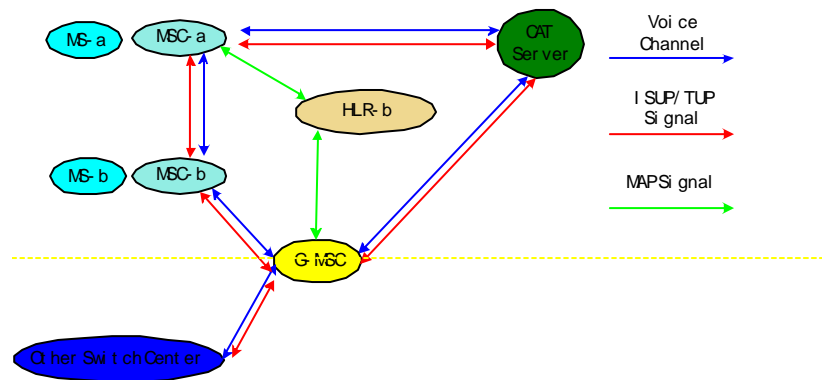
Figure 1 CAT of interworking

Otherwise, if the called party"s MSC can directly play the CAT for the calling party, the called party"s MSC will setup the CAT channel directly with its CAT Server when the called party is ringing, regardless that the calling party and the called party locate in the same PLMN or different PLMNs.

5.5.2 CS-IMS interworking scenario

5.5.2.1 General

Two scenarios with a high-level diagram of a SIP based call flow are shown below. The first scenario describes the case when both Callee and Caller are IMS-based.

The second scenario involves a caller that is legacy PSTN (or PLMN) Circuit Switched phone.

The difference between these two scenarios is that in case of legacy phone the SIP dialog is established with MGCF instead of direct connection with SIP client.

The CAT AS after checking the caller "A" Profile (as part of User "B" profile) decides what kind of CAT is applicable. As one option each subscriber"s capabilities may be stored in the User Profile in HSS. As an other option the capabilities may be learned dynamically during SDP negotiation.

CAT AS (acting as B2BUA) performs third party call control with the MRF, where the S-CSCF is in the signaling path.

5.5.2.2 Scenario with IMS-based subscribers

1) "A" generates a call to subscriber "B"

2) The S-CSCF checks the status of subscriber "B" using the Filter Criteria (FC)

3) "B" is a CAT subscriber, therefore S-CSCF generates a message to the CAT AS with "A" and "B" phone numbers

4) CAT AS checks "B" User profiles for "A" (caller)

5) CAT AS establishes the "Early Media" resources reservation between MRF and SIP client on "A"

6) CAT AS calls "B"

7) "B" phone starts ringing and sends indication back to CAT AS that it is ringing

8) CAT AS initiates a session with the MRF requesting the MRF to generate the CAT for "A" based on its provisioning info in "B" "s Profile

9) MRF generates the media

10) "B" answers the phone

11) CAT AS stops playing media

12) CAT AS informs "A" that "B" answered the call. At this point, the call is established between "A" and "B"

   Note 1: CAT may be started before "B" answers with Ringing and even before "B" is called

   Note 2: CAT generation may be stopped after the time-out time. The time-out value is set by CAT AS together with CAT type via AS-MRF protocol.

   Note 3: It is assumed that A and B subscriber is in the same PLMN.

5.5.2.3 Scenario with Inter-working between CS and IMS subscribers

1) "A" (CS phone) generates a call to "B" (MITe Phone). The MGCF transfers the call towards the SIP-based IMS network (see the previous diagram)

2) The S-CSCF checks the status of subscriber "B" using the Filter Criteria (FC)

3) "B" is a CAT subscriber, therefore S-CSCF generates a message to CAT AS with "A" and "B" phone numbers

4) CAT AS checks "B" User profiles for "A" (caller)

5) CAT AS establishes the "Early Media" resources reservation between MRF and SIP client on MGCF

6) CAT AS calls "B"

7) "B" phone starts ringing and sends indication back to CAT AS that it is ringing

8) CAT AS initiates a session with the MRF requesting the MRF to generate the CAT for "A" based on its provisioning info in "B" "s Profile

9) MRF generates the media which then is being forwarded to "A" by MGW and further over TDM

10) "B" answers the phone

11) CAT AS stops playing media

12) CAT AS informs "A" that "B" answered the call. At this point, the call is established between "A" and "B"
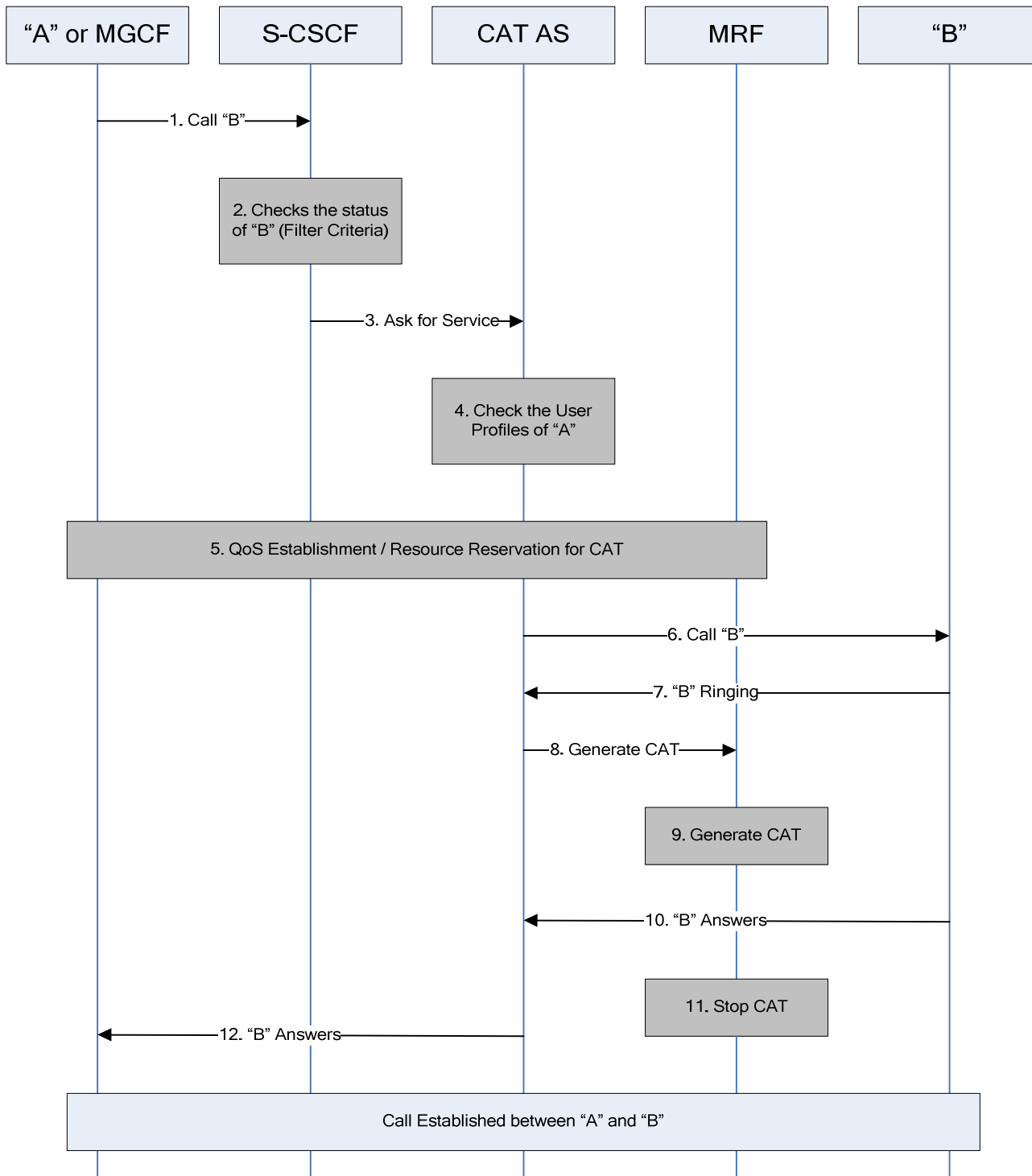
Annex A (informative):
Change history

Change history								
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**	**WI**
2005-07	SA1-29	S1-050792			First draft		0.0.0	
2005-10	SA1-30	S1-051156			Second draft	0.0.0	0.1.0	CAT
2006-04	SA1-31	S1-060295			Third draft	0.1.0	0.2.0	CAT
2006-04	SA1-32	S1-060582			Merging of S1-060380, S1-060381, S1-060462, S1-060489 and S1-060490	0.2.0	0.3.0	
2006-04	SA1-32	S1-060583			Raised to version 1.0.0 for presentation to SA #32 for information	0.3.0	1.0.0	
2006-06	SA1-33	S1-060871			Merging of S1-060690, S1-060691, S1-060692 and S1-060788	1.0.0	1.1.0	CAT
2006-10	SA1-34	S1-061280			Merging of S1-061272, S1-061273, S1-061274, S1-061275 and S1-061276	1.1.0	1.2.0	CAT
2006-10	SA1-34	S1-061428			Raised to version 2.0.0 for presentation to SA for approval	1.2.0	2.0.0	CAT
					Approved at SA#34	2.0.0	8.0.0	
2009-12	SP-46				Updated to Rel-9	8.0.0	9.0.0	

History

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