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LTE;  
Telecommunication management;  
Charging management;  
Announcement service  
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# Foreword

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# 1 Scope

During any phase of a voice or video call, the Online Charging System (OCS) or Converged Charging System (CCS) may need to deliver billing/charging in-session notifications to the end user via announcements as part of the rating, balance management and billing process. For example, the CCS/OCS may need to inform the user about usage states, threshold crossings, offer statuses, reason for call rejection, alerts about low balances, etc.

Such notifications can be delivered pre-, mid- or post-call.

The Announcement service in the present document provides announcement capabilities for use in a Diameter based online or converged charging session. The CCS/OCS is able to specify that a given announcement be played to a call party in order to deliver charging/billing related notifications.

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## 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 TS 32.240: "Telecommunication management; Charging management; Charging Architecture and Principles".
- [2] - [19] Void.
- [20] 3GPP TS 32.260: "Telecommunication management; Charging management; IP Multimedia Subsystem (IMS) charging".
- [21] - [29] Void.
- [30] 3GPP TS 32.270: "Telecommunication management; Charging management; Multimedia Messaging Service (MMS) charging".
- [31] - [44] Void.
- [45] 3GPP TS 32.290: "Telecommunication management; Charging management; 5G system; Services, operations and procedures of charging using Service Based Interface (SBI)".
- [46] 3GPP TS 32.291: "Telecommunication management; Charging management; 5G system; Charging service, stage 3".
- [47] - [49] Void.
- [50] 3GPP TS 32.299: "Telecommunication management; Charging management; Diameter charging application".
- [51] - [99] Void.
- [100] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".
- [101] 3GPP TS 22.115: "Service aspects; Charging and billing".
- [102] - [203] Void.
- [204] 3GPP TS 24.229: "IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP); Stage 3".
- [205] - [243] Void.
- [244] 3GPP TS 24.628: "Common Basic Communication procedures using IP Multimedia (IM) Core Network (CN) subsystem; Protocol specification".
- [245] - [299] Void.
- [300] - [402] Void.

## 3 Definitions, symbols and abbreviations

### 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [100] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [100]. **Credit-Control:** mechanism which directly interacts in real-time with an account and controls or monitors the charges, related to the service usage. Credit-Control is a process of: checking if credit is available, credit reservation, deduction of credit from the end user account when service is completed and refunding of reserved credit not used.

**online charging:** charging mechanism where charging information can affect, in real-time, the service rendered and therefore a direct interaction of the charging mechanism with bearer/session/service control is required.

**Online Charging System:** the entity that performs real-time Credit-Control. Its functionality includes transaction handling, rating, online correlation and management of subscriber accounts/balances.

### 3.2 Symbols

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

Symbol format

Cr	Reference Point between an AS and an MRFC for media control.
ISC	Reference Point between a CSCF and an Application Server and between a CSCF and an MRB.
Mp	Reference Point between an MRFC and an MRFP.
Mr	Reference Point between a CSCF and an MRFC.
Mr'	Reference Point between an AS and an MRFC for session control.
Ro	Online Charging Reference Point between an AS, MRFC or the IMS-GWF and the OCS

### 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [100] 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 [100].

AS	Application Server
CCA	Credit-Control-Answer
CCR	Credit-Control-Request
CSCF	Call Session Control Function (I-Interrogating; P-Proxy; and S-Serving)
DCCA	Diameter Credit-Control Application
IMS-GWF	IMS Gateway Function
ISC	IMS Service Control
MMTel	MultiMedia Telephony
MRB	Media Resource Broker
MRFC	Media Resource Function Controller
MRFP	Multimedia Resource Function Processor
OCS	Online Charging System
SIP	Session Initiation Protocol
UE	User Equipment

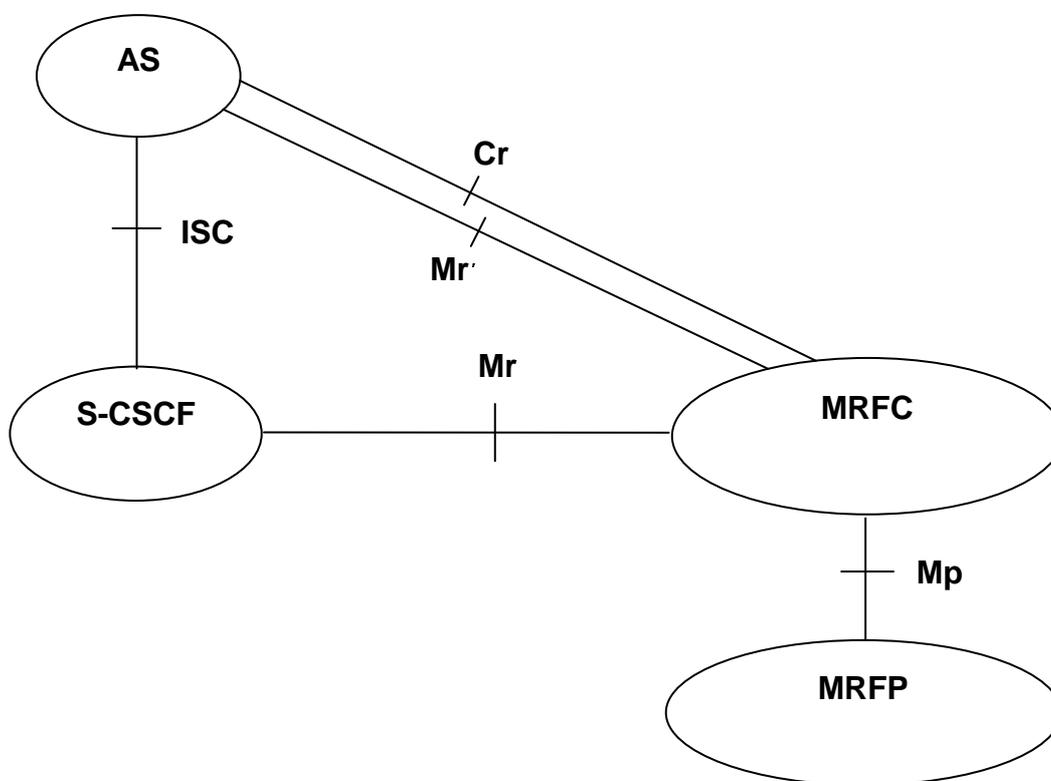
## 4 Architecture considerations

### 4.1 High level Announcement aspects

Each technology to which the Announcement service is applied will utilize a technology-specific special resource function to play announcement media. Each of the architectures described in this clause utilizes the common Announcement service specified in this document.

### 4.2 Announcement in IP Multimedia Subsystem (IMS) architecture

The MRFC/MRFP are resources of the IMS that provide support for bearer related services such as announcements. Collectively, the MRFC/MRFP is known as the Media Resource Function. The architecture of MRF is shown in figure 4.2.1.



**Figure 4.2.1: Architecture of Media Resource Function in IMS**

In the IMS online and converged charging architecture specified in TS 32.260 [20], both the AS and the IMS-GWF interfaces the CHF/OCS. Either the AS or the IMS-GWF may utilize the Announcement service specified in this document.

## 5 Announcement principles and flows

### 5.1 Common announcement principles

The CHF/OCS may provide information in charging messages that describe announcements to be played to a subscriber. When receiving announcement information provided by the CHF/OCS, the receiving node shall use the procedures defined for the specific technology in use. The clauses that follow identify the principles and message flows applicable to each specific technology to which the common Announcement service is applied.

### 5.2 Announcement in IMS

#### 5.2.1 Basic principles and definitions

The CHF/OCS may provide information in charging messages that describe video or audio announcements which can be rendered to a subscriber involved in an IMS session at different stages of interactions with CHF/OCS.

When receiving announcement information provided by CHF/OCS, the AS or the IMS-GWF shall use the procedures defined in clause 10.2.2 of TS 24.229 [204] and TS 24.628 [244] in order to deliver the required announcement in accordance with the provided announcement information.

CHF/OCS can provide announcement information upon interaction with the AS or the IMS-GWF, during different phases of an IMS session:

- At IMS session initiation, before the IMS session is allowed to continue and no quota is granted, or before the IMS session is allowed to continue and use granted quota;
- During an ongoing established IMS session, with media components between the parties of the session, on quota allocation control process;
- At an IMS session termination due to final quota consumption.

Announcements provided by CHF/OCS are driven by quota allocation during the IMS session, and controlled by an indication on when they shall be played:

- Pre-quota announcement shall be played prior to any quota consumption (i.e. immediately);
- Mid-quota announcements shall be played at a specified duration before granted quota is exhausted, which ranges from non-zero value smaller than the granted quota.
- Post-quota announcements shall be played upon granted quota exhaustion

CHF/OCS can provide information for one or more announcements in the same charging message.

A CHF/OCS-provided announcement is delivered to a single party of an IMS session. CHF/OCS indicates to which party the announcement shall be played. This can be the served party or the remote party. When the privacy indicator for the announcement is set to "private", the announcement shall be played only to the requested party. The handling toward the other party during announcement playback is determined by the AS or the IMS-GWF internal logic.

The AS or the IMS-GWF shall control delivery of the announcements based on the announcement content information provided by the CHF/OCS. The AS or the IMS-GWF shall use the procedures in TS 24.628 [244] for announcement delivery. When the AS or the IMS-GWF are separate from the MRFC, the AS or the IMS-GWF shall support one or more of the control methods for announcement referenced in clause 10.2.2 of TS 24.229 [204], regardless of the announcement content information provided by the CHF/OCS. The AS or the IMS-GWF is responsible for determining the MRF handling the announcement.

Announcement information indicates whether any of the granted quota shall be used by the AS or the IMS-GWF during the time the announcement is connected. If not explicitly indicated in the announcement information by the CHF/OCS, it is up to the service logic implemented in the AS or the IMS-GWF to use or not the granted quota.

For announcements delivered by the AS or the IMS-GWF during an IMS established session, the existing media shall be suspended while the announcement media is played.

### 5.2.2 Message flows and types for online charging

The following figures show the Reserve Units transactions that are required between the IMS-GWF/AS and the OCS for session-related IMS procedures when the Announcement service is invoked.

The SIP messages and Charging Data transactions associated with these charging scenarios are shown primarily for general information and to illustrate the charging triggers. They are not intended to be exhaustive and they depend on the Reserve Units Request triggers configured by the operator.

All of the scenarios depict originating sessions only.

#### Scenario 1: Pre-quota announcement with successful session establishment

Figure 5.2.2.1 shows the Reserve Units transactions that are required in the IMS-GWF/AS during a SIP session establishment for which a pre-quota announcement is requested with successful session establishment.

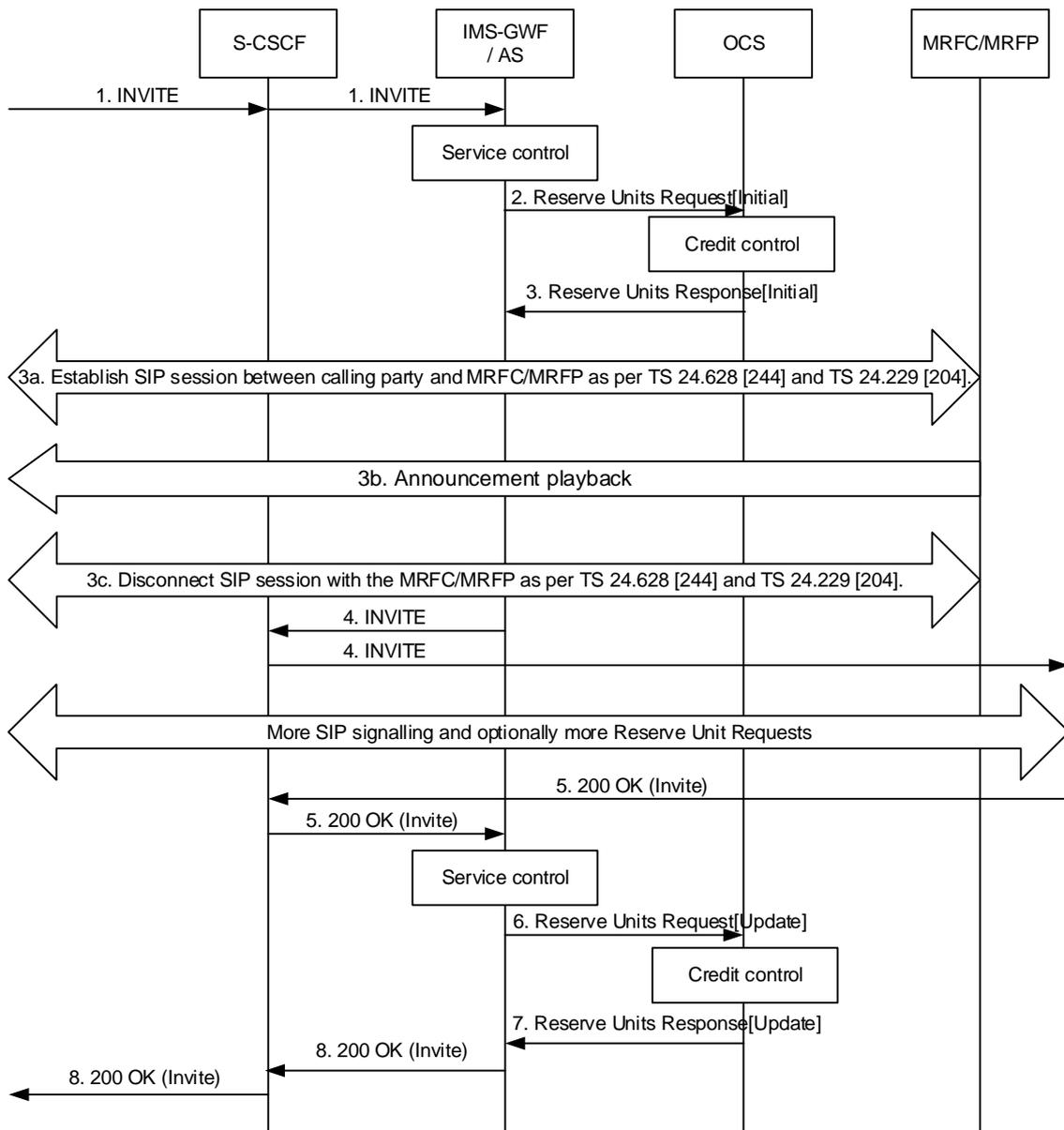
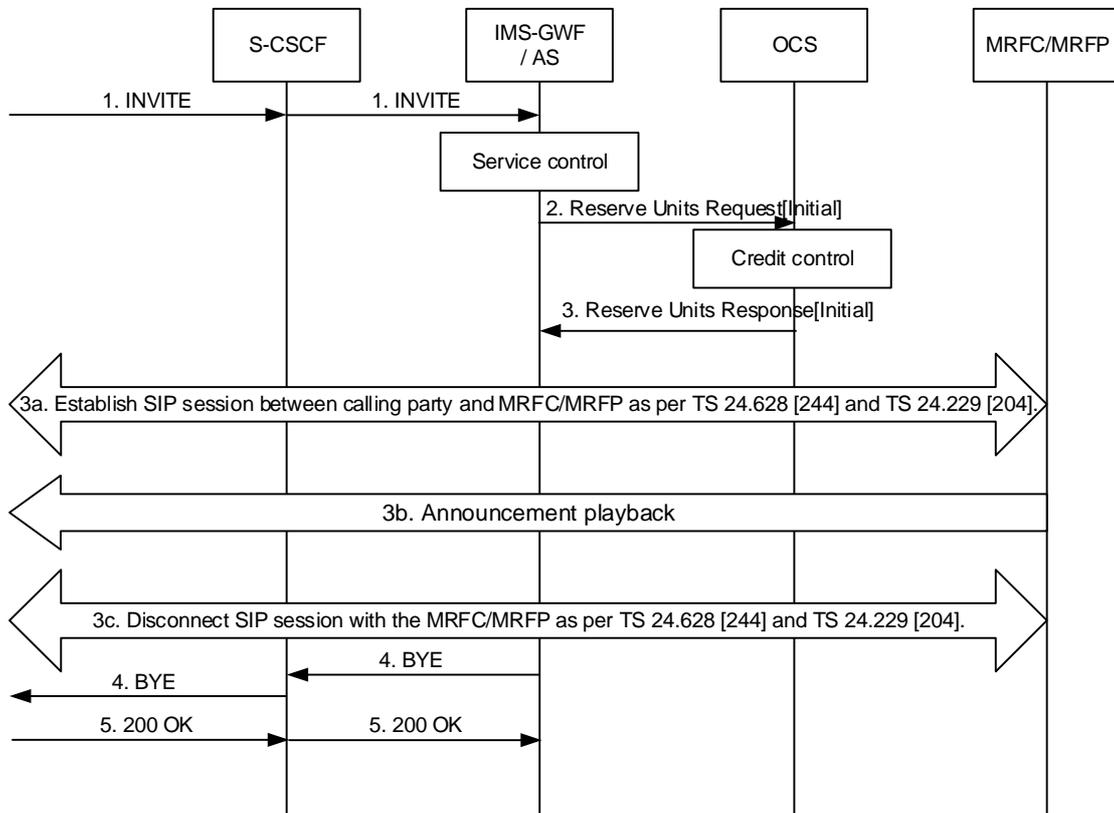


Figure 5.2.2.1: Message sequence chart for pre-quota announcement with successful session establishment

- 1) An initial SIP Invite Request is received in the S-CSCF. This request is forwarded to the IMS-GWF/AS.
- 2) The IMS-GWF/AS sends a Reserve Units Request[Initial] to the OCS requesting service units. The online Credit-Control session is initiated.
- 3) The OCS grants units in a Multiple Unit Operation of the Reserve Units Response with a successful Operation Result and requests an announcement to be played to the calling party immediately. Announcement information may indicate whether or not the granted quota for the IMS session shall be used for playing the announcement.
- 3a) The IMS-GWF/AS establishes a SIP session between the calling party and an MRFC/MRFP for the requested announcement as per TS 24.628 [244] and TS 24.229 [204].
- 3b) The MRFP plays the announcement to the calling party.
- 3c) When the announcement is complete, the IMS-GWF/AS disconnects the SIP session with the MRFC/MRFP as per TS 24.628 [244] and TS 24.229 [204].
- 4) The IMS-GWF/AS and S-CSCF forward the initial SIP INVITE.
- 5) A final response is received in the IMS-GWF/AS.
- 6) If the trigger is active, the SIP 200 OK answer triggers a Reserve Units Request[Update] in the IMS-GWF/AS in order to update the Credit-Control session. New service units are requested in a Multiple Unit Operation. Also the used service units (if any) are reported in the Multiple Unit Operation. If the indication in step 3 is to use the granted quota then the quota usage allocated for playing the announcement shall be reported by the IMS-GWF/AS to the OCS in the used service units.
- 7) The OCS sends the Reserve Units Response to acknowledge the Reserve Units Request. New service units are granted in a Multiple Unit Operation.
- 8) The final answer is forwarded.

## Scenario 2: Pre-quota announcement with session termination

Figure 5.2.2.2 shows the Reserve Units transactions that are required in the IMS-GWF/AS during a SIP session establishment for which a pre-quota announcement is requested with the termination of the session.

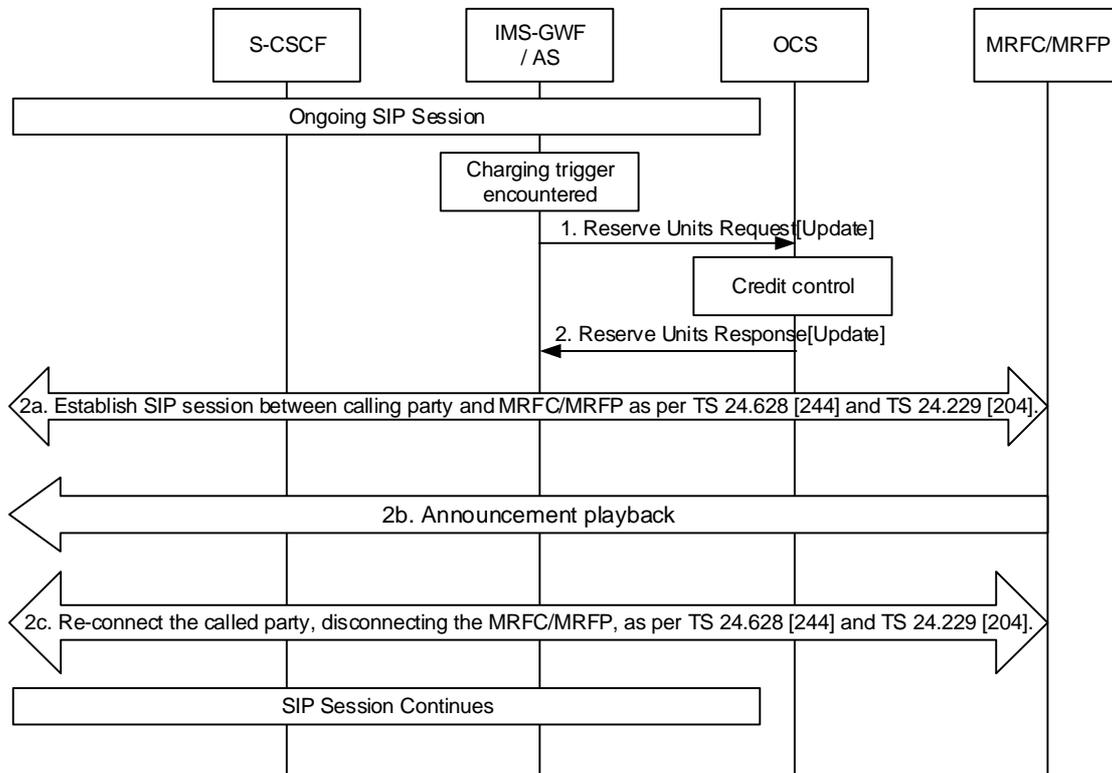


**Figure 5.2.2.2: Message sequence chart for pre-quota announcement with session termination**

- 1) An initial SIP Invite Request is received in the S-CSCF. This request is forwarded to the IMS-GWF/AS.
- 2) The IMS-GWF/AS sends a Reserve Units Request[Initial] to the OCS requesting service units. The online Credit-Control session is initiated.
- 3) The OCS rejects the session in the Reserve Units Response with an unsuccessful Operation Result and requests an announcement to be played to the calling party immediately. No quota is used during the announcement playback when the SIP session is to be terminated.
- 3a) The IMS-GWF/AS establishes a SIP session between the calling party and an MRFC/MRFP for the requested announcement as per TS 24.628 [244] and TS 24.229 [204].
- 3b) The MRFP plays the announcement to the calling party.
- 3c) When the announcement is complete, the IMS-GWF/AS disconnects the SIP session with the MRFC/MRFP as per TS 24.628 [244] and TS 24.229 [204].
- 4) The IMS-GWF/AS and S-CSCF releases the session with a SIP BYE that is forwarded by the S-CSCF towards the calling party. The message sequence shown here assumes that the announcement playback established a SIP dialog with the calling party in Step 3a. For other variations of SIP session termination for use when announcement playback utilized signalling for early media, see Annex B of TS 32.260 [20].
- 5) A final response is forward by the S-CSCF to the IMS-GWF/AS.

**Scenario 3: Mid-quota announcement during IMS session**

Figure 5.2.2.3 shows the Reserve Units transactions that are required in the IMS-GWF/AS for a mid-quota announcement during an established IMS session, followed by session continuation.

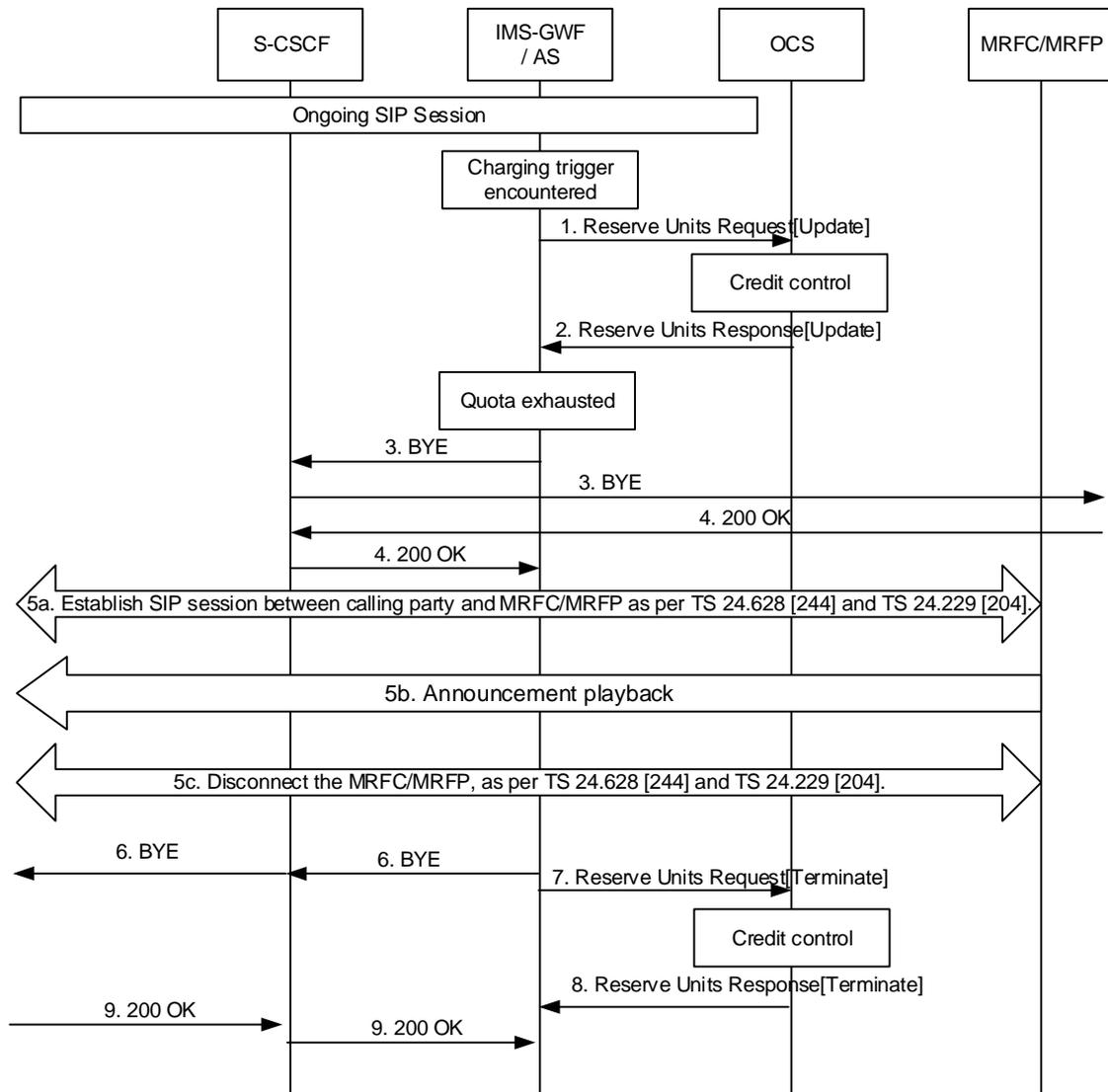


**Figure 5.2.2.3: Message sequence chart for mid-quota announcement during IMS session**

- 1) During an ongoing SIP session, a charging trigger encountered for an update as per table 5.3.1.1 in TS 32.260 [20]. The IMS-GWF/AS sends a Reserve Units Request[Update] to the OCS requesting service units.
- 2) The OCS grants units in a Multiple Unit Operation of the Reserve Units Response with a successful Operation Result and requests an announcement to be played to the calling party prior to quota exhaustion. Announcement information may indicate whether or not the granted quota for the IMS session shall be used for playing the announcement. The announcement is indicated as to be played to a specified duration before the end of the quota is reached.
  - 2a) When the timing conditions are met for the requested announcement, the IMS-GWF/AS establishes a SIP session between the calling party and an MRFC/MRFP for the requested announcement as per TS 24.628 [244] and TS 24.229 [204].
  - 2b) The MRFP plays the announcement to the calling party.
  - 2c) When the announcement is complete, the IMS-GWF/AS re-connects the called party, disconnecting the SIP session with the MRFC/MRFP as per TS 24.628 [244] and TS 24.229 [204].

**Scenario 4: Post-quota announcement with IMS session termination**

Figure 5.2.2.4 shows the Reserve Units transactions that are required in the IMS-GWF/AS for a post-quota announcement which is initiated at final quota exhaust.



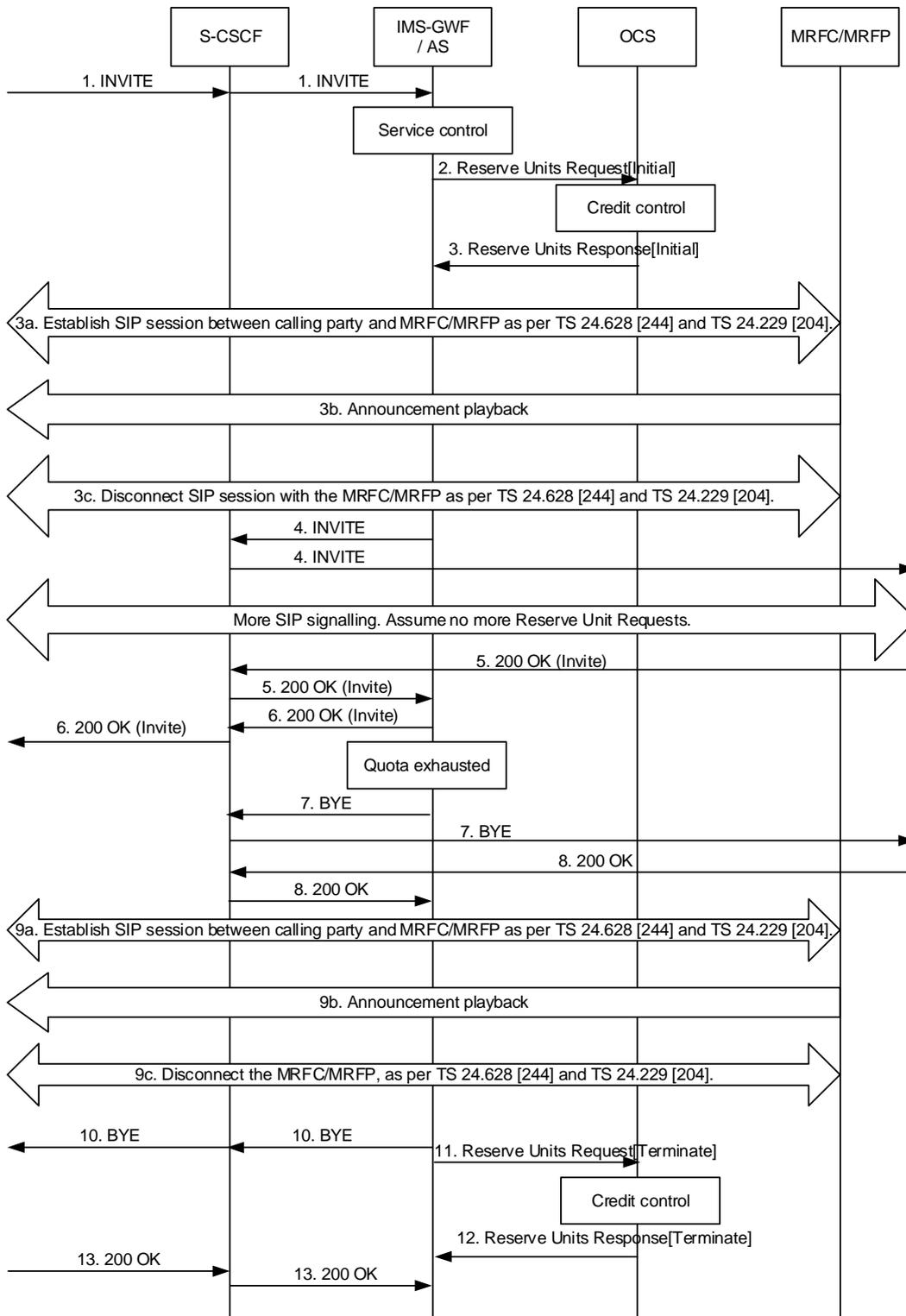
**Figure 5.2.2.4: Message sequence chart for post-quota announcement with IMS session termination**

- 1) During an ongoing SIP session, a charging trigger encountered for an update as per table 5.3.1.1 in TS 32.260 [20]. The IMS-GWF/AS sends a Reserve Units Request[Update] to the OCS requesting service units.
- 2) The OCS grants units in a Multiple Unit Operation of the Reserve Units Response with a successful Operation Result, a final unit indication and a request for an announcement to be played when the quota is exhausted. Granted quota shall not be used for an announcement playback at final quota exhaust.
- 3) When end of quota is reached, the IMS-GWF/AS initiates session termination to the called party by sending a SIP BYE message which is forwarded by the S-CSCF.
- 4) The final answer to the SIP BYE message is forwarded by the S-CSCF to the IMS-GWF/AS ending the SIP dialog with the called party. The IMS-GWF/AS does not wait for this response before continuing the message sequence.
- 5a) The IMS-GWF/AS establishes a SIP session between the calling party and an MRFC/MRFP for the requested announcement as per TS 24.628 [244] and TS 24.229 [204].

- 5b) The MRFP plays the announcement to the calling party.
- 5c) When the announcement is complete, the IMS-GWF/AS disconnects the SIP session with the MRFC/MRFP as per TS 24.628 [244] and TS 24.229 [204].
- 6) The IMS-GWF/AS initiates session termination to the calling party by sending a SIP BYE message which is forwarded by the S-CSCF.
- 7) The IMS-GWF/AS sends a Reserve Units Request[Terminate] reporting the used service units in a Multiple Unit Operation.
- 8) The OCS sends a Reserve Units Response. The online Credit-Control session is terminated.
- 9) The final answer to the SIP BYE message is forwarded by the S-CSCF to the IMS-GWF/AS ending the SIP dialog.

**Scenario 5: Combined pre- and post-quota announcements with IMS session termination**

Figure 5.2.2.5 shows the Reserve Units transactions that are required in the IMS-GWF/AS during a SIP session establishment for which a pre-quota announcement is requested at IMS session initiation along with a post-quota announcement to be played at final quota exhaust.

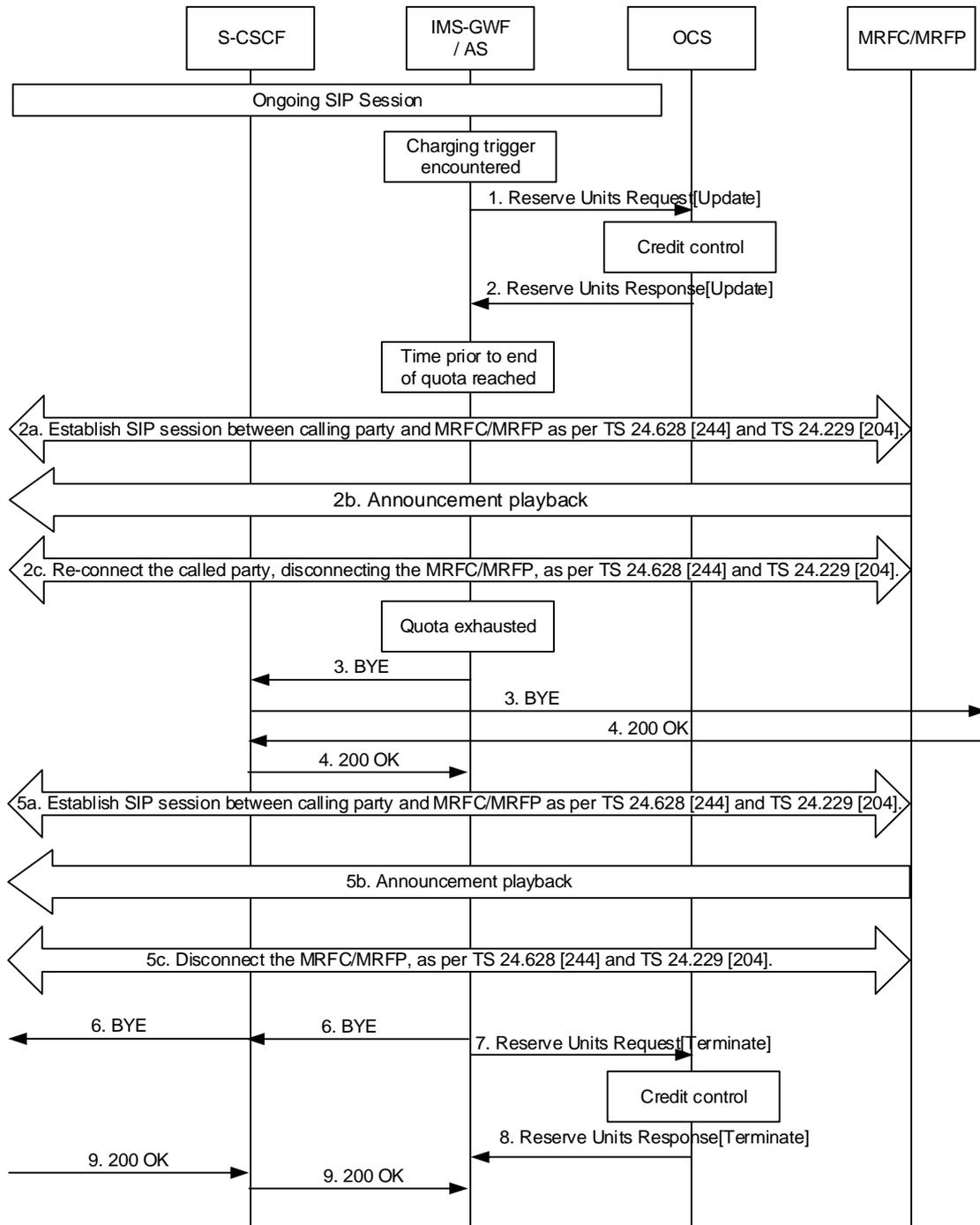


**Figure 5.2.2.5: Message sequence chart for combined pre- and post-quota announcement with IMS session termination**

- 1) An initial SIP Invite Request is received in the S-CSCF. This request is forwarded to the IMS-GWF/AS.
- 2) The IMS-GWF/AS sends a Reserve Units Request[Initial] to the OCS requesting service units. The online Credit-Control session is initiated.
- 3) The OCS grants units in a Multiple Unit Operation of the Reserve Units Response with a successful Operation Result and a final unit indication. The OCS requests an announcement to be played immediately and an announcement to be played at the final end of quota. Only the announcement information for the immediate announcement may indicate to use granted quota for the announcement playback.
- 3a) The IMS-GWF/AS establishes a SIP session between the calling party and an MRFC/MRFP for the requested announcement as per TS 24.628 [244] and TS 24.229 [204].
- 3b) The MRFP plays the announcement to the calling party.
- 3c) When the announcement is complete, the IMS-GWF/AS disconnects the SIP session with the MRFC/MRFP as per TS 24.628 [244] and TS 24.229 [204].
- 4) The IMS-GWF/AS and S-CSCF forward the initial SIP INVITE.
- 5) A final response is received in the IMS-GWF/AS.
- 6) The final answer is forwarded.
- 7) When end of quota is reached, the IMS-GWF/AS initiates session termination to the called party by sending a SIP BYE message which is forwarded by the S-CSCF.
- 8) The final answer to the SIP BYE message is forwarded by the S-CSCF to the IMS-GWF/AS ending the SIP dialog with the called party. The IMS-GWF/AS does not wait for this response before continuing the message sequence.
- 9a) The IMS-GWF/AS establishes a SIP session between the calling party and an MRFC/MRFP for the requested announcement as per TS 24.628 [244] and TS 24.229 [204].
- 9b) The MRFP plays the announcement to the calling party.
- 9c) When the announcement is complete, the IMS-GWF/AS disconnects the SIP session with the MRFC/MRFP as per TS 24.628 [244] and TS 24.229 [204].
- 10) The IMS-GWF/AS initiates session termination to the calling party by sending a SIP BYE message which is forwarded by the S-CSCF.
- 11) The IMS-GWF/AS sends a Reserve Units Request[Terminate] reporting the used service units in a Multiple Unit Operation. If the indication in step 3 is to use the granted quota for the announcement playback then the quota usage for playing the announcement shall be reported by the IMS-GWF/AS to the OCS in the used service units. This is applicable only for an announcement initiated prior to end of granted quota.
- 12) The OCS sends a Reserve Units Response. The online Credit-Control session is terminated.
- 13) The final answer to the SIP BYE message is forwarded by the S-CSCF to the IMS-GWF/AS ending the SIP dialog.

**Scenario 6: Combined mid- and post-quota announcements with IMS session termination**

Figure 5.2.2.6 shows the Reserve Units transactions that are required in the IMS-GWF/AS for a mid-quota announcement prior to final quota exhaust. An example would be to play a low balance warning tone to the calling party before the end of the call and then play a terminating announcement reminding the user to top up the account.

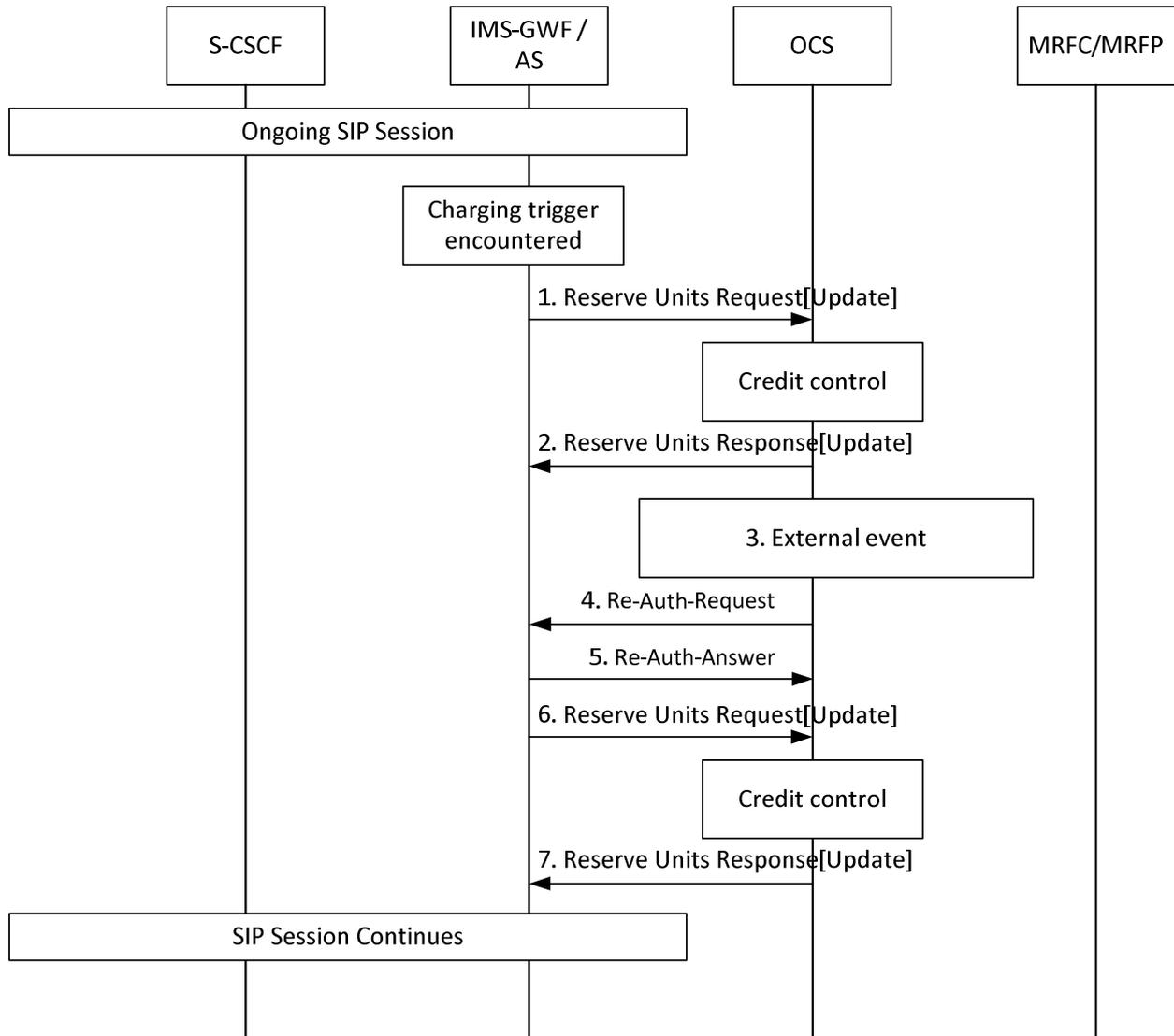


**Figure 5.2.2.6: Message sequence chart for combined mid- and post-quota announcements with IMS session termination**

- 1) During an ongoing SIP session, a charging trigger encountered for an update as per table 5.3.1.1 in TS 32.260 [20]. The IMS-GWF/AS sends a Reserve Units Request[Update] to the OCS requesting service units.

- 2) The OCS grants units in a Multiple Unit Operation of the Reserve Units Response with a successful Operation Result and a final unit indication. The OCS requests an announcement to be played a specified number of seconds prior to end of quota and an announcement to be played at the final end of quota. Only the announcement information for the announcement prior to end of quota may indicate to use granted quota for the announcement playback.
- 2a) When the time prior to end of quota is reached, the IMS-GWF/AS establishes a SIP session between the calling party and an MRFC/MRFP for the requested announcement as per TS 24.628 [244] and TS 24.229 [204].
- 2b) The MRFP plays the announcement to the calling party.
- 2c) When the announcement is complete, the IMS-GWF/AS re-connects the called party, disconnecting the SIP session with the MRFC/MRFP as per TS 24.628 [244] and TS 24.229 [204].
- 3) When end of quota is reached, the IMS-GWF/AS initiates session termination to the called party by sending a SIP BYE message which is forwarded by the S-CSCF.
- 4) The final answer to the SIP BYE message is forwarded by the S-CSCF to the IMS-GWF/AS ending the SIP dialog with the called party. The IMS-GWF/AS does not wait for this response before continuing the message sequence.
- 5a) The IMS-GWF/AS establishes a SIP session between the calling party and an MRFC/MRFP for the requested announcement as per TS 24.628 [244] and TS 24.229 [204].
- 5b) The MRFP plays the announcement to the calling party.
- 5c) When the announcement is complete, the IMS-GWF/AS disconnects the SIP session with the MRFC/MRFP as per TS 24.628 [244] and TS 24.229 [204].
- 6) The IMS-GWF/AS initiates session termination to the calling party by sending a SIP BYE message which is forwarded by the S-CSCF.
- 7) The IMS-GWF/AS sends a Reserve Units Request[Terminate] reporting the used service units in a Multiple Unit Operation. If the indication in step 2 is to use the granted quota then the quota usage for playing the announcement shall be reported by the IMS-GWF/AS to the OCS in the used service units. This is applicable only for an announcement initiated prior to end of granted quota.
- 8) The OCS sends a Reserve Units Response. The online Credit-Control session is terminated.
- 9) The final answer to the SIP BYE message is forwarded by the S-CSCF to the IMS-GWF/AS ending the SIP dialog.

**Scenario 7: Announcement handling subsequent to a Re-Auth-Request**



**Figure 5.2.2.7: Message sequence chart for of announcement handling subsequent to Re-Auth-Request message**

- 1) During an ongoing SIP session, a charging trigger encountered for an update as per table 5.3.1.1 in TS 32.260 [20]. The IMS-GWF/AS sends a Reserve Units Request[Update] to the OCS requesting service units.
- 2) The OCS grants units in a Multiple Unit Operation of the Reserve Units Response with a successful Operation Result and requests an announcement to be played to the calling party. Announcement information may indicate whether or not the granted quota for the IMS session shall be used for playing the announcement. A timing indicator is provided that can indicate the announcement be played immediately or delayed to a specified number of seconds before the end of the quota is reached.
- 3) As a result of an external event (e.g. recharge activity), the OCS decides that announcement needs to be cancelled.
- 4) The OCS sends a Re-Auth-Request to the IMS-GWF/AS requesting to perform new Reserve Units Request.
- 5) The IMS-GWF/AS sends a Re-Auth-Answer response to the OCS.
- 6) The IMS-GWF/AS sends a Reserve Units Request[Update] to the OCS requesting service units.

- 7) The OCS grants units in a Multiple Unit Operation of the Reserve Units Response with a successful Operation Result (with or without request for announcement). This cancels any pending announcement related to the previous granted quota.

### 5.2.3 Message flows and types for converged charging

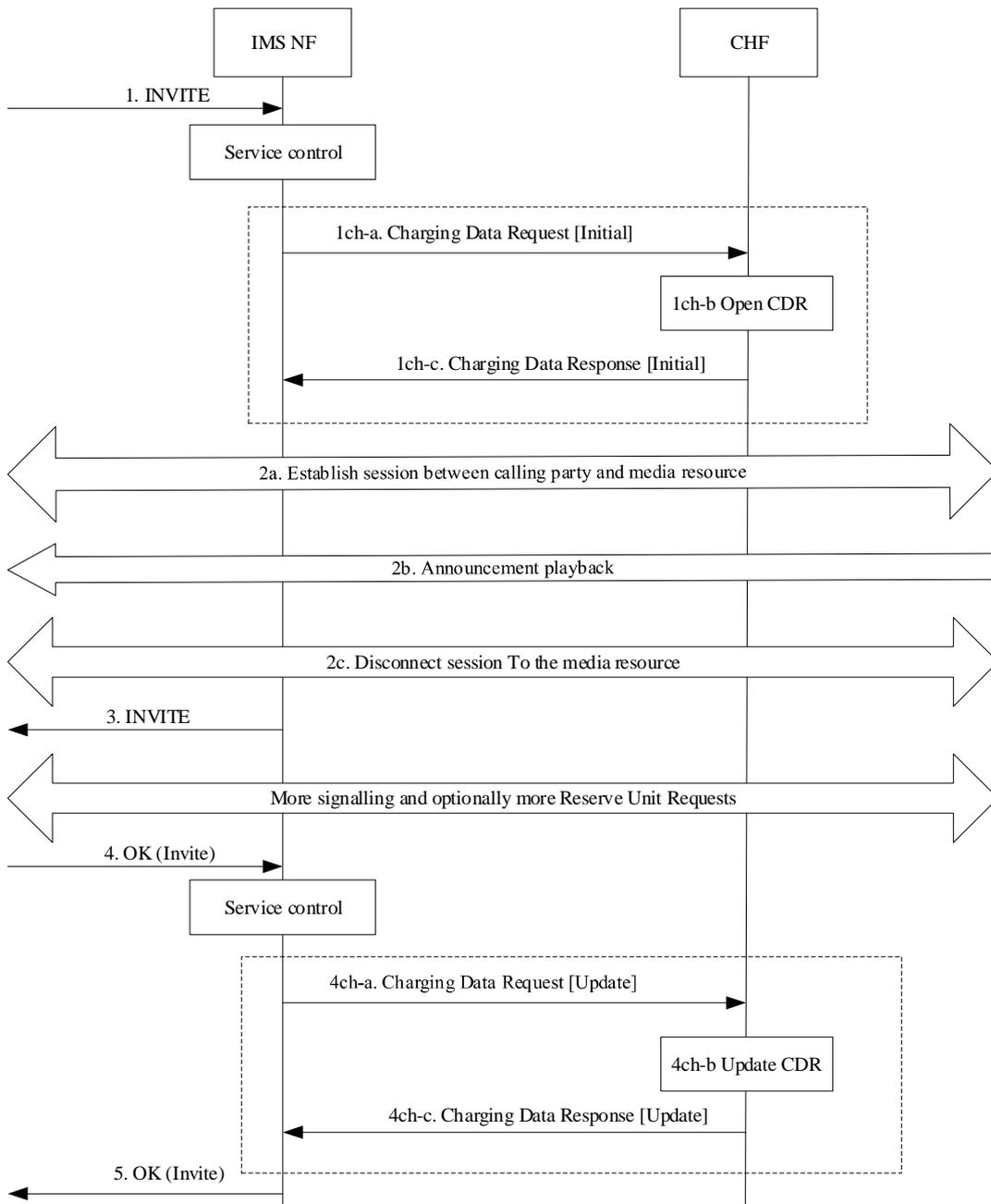
The different scenarios below focus on the different messages from/to the IMS NF (e.g. IMS AS) and corresponding interaction with the CHF.

The IMS related and Charging Data messages associated with these scenarios are shown primarily for general information and to illustrate the charging triggers. They are not intended to be exhaustive and they depend on operator configuration.

**Editor's Note:** The naming and use of IMS NF is FFS. The flows needs further elaboration.

**Scenario 1: Immediate announcement at start of session with establishment**

Figure 5.2.3.1 shows the Charging Data messages that are required for which an immediate announcement is requested with successful session establishment.



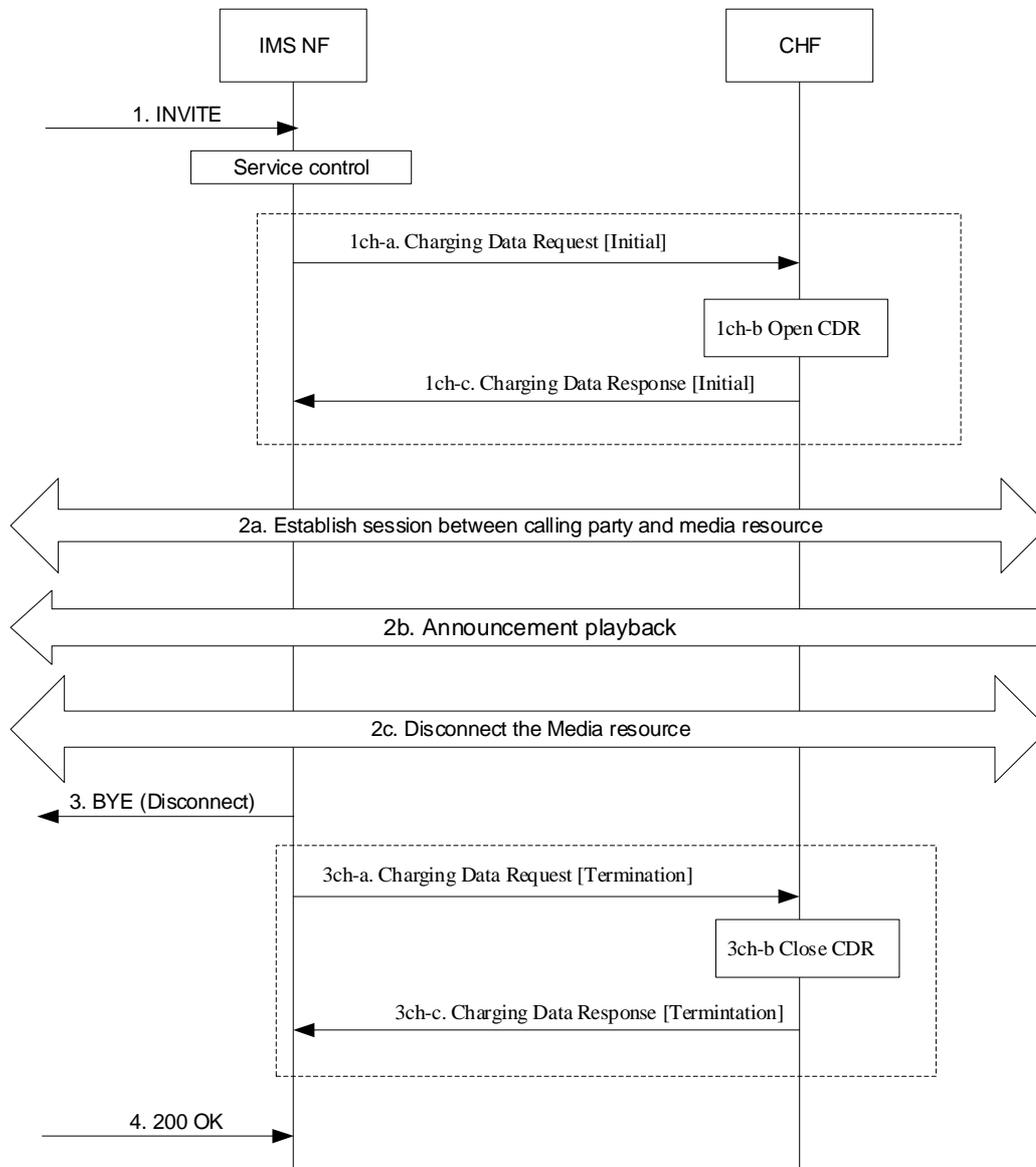
**Figure 5.2.3.1: Message sequence chart for immediate announcement at start of session with establishment**

- 1) An initial Invite Request is received in the IMS NF.
- 1ch-a) The IMS NF sends a Charging Data Request [Initial] to the CHF with quota requested.
- 1ch-b) based on policies, the CHF opens a CDR related to the service and decides the announcement to be played.
- 1ch-c) The CHF grants authorization to IMS NF (CTF) for the service to start, with the reserved number of units and requests an announcement to be played to the calling party immediately. Announcement information may indicate whether the granted quota for the IMS session shall be used for playing the announcement.

- 2a) The IMS NF establishes a session between the calling party and a media resource for the requested announcement as per TS 24.628 [244] and TS 24.229 [204].
- 2b) The media resource plays the announcement to the calling party.
- 2c) When the announcement is complete, the IMS NF disconnects the session with the media resource as per TS 24.628 [244] and TS 24.229 [204].
- 3) The IMS NF forward the initial INVITE.
- 4) A final OK response is received in the IMS NF
- 4ch-a) If the trigger is active, the OK answer triggers a Charging Data Request [Update] in the IMS NF with quota requested. The used units during the announcement are either reported with quota managed indication if the indication in step 1ch-c is to use the quota granted for playing the announcement otherwise they are reported without quota managed indication.
- 4ch-b) based on policies, the CHF updates a CDR related to the service.
- 4ch-c) The CHF grants authorization to IMS NF (CTF) for the service to start, with the number of quotas.
- 5) The final OK answer is forwarded.

**Scenario 2: Immediate announcement at start of session with termination**

Figure 5.2.3.2 shows the Charging Data messages that are required for when an immediate announcement is requested with the termination of the session.



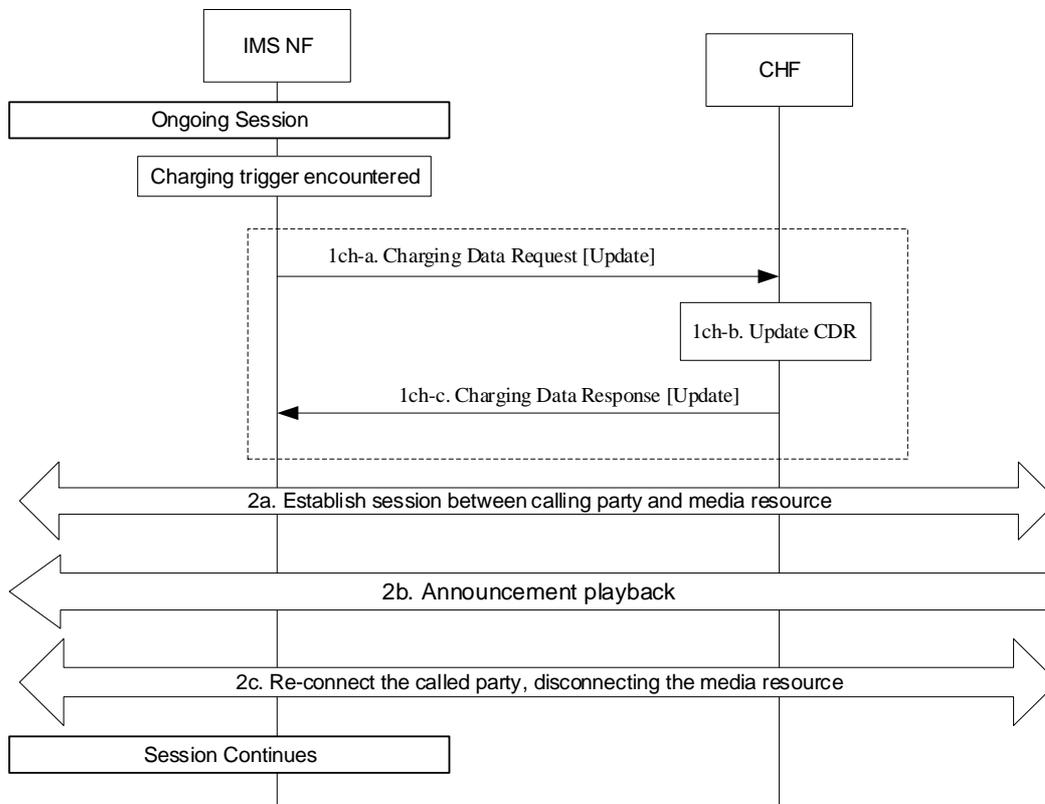
**Figure 5.2.3.2: Message sequence chart for immediate announcement at start of session with termination**

- 1) An initial SIP Invite Request is received in the IMS NF.
- 1ch-a) The IMS NF sends a Charging Data Request [Initial] to the CHF with quota requested.
- 1ch-b) based on policies, the CHF opens a CDR related to the service and decides the announcement to be played.
- 1ch-c) The CHF does not grant authorization to IMS NF (CTF) for the service to start, instead it requests an announcement to be played to the calling party immediately. No quota can be used by the IMS session for playing the announcement.
- 2a) The IMS NF establishes a session between the calling party and a media resource for the requested announcement as per TS 24.628 [244] and TS 24.229 [204].

- 2b) The media resource plays the announcement to the calling party.
- 2c) When the announcement is complete, the IMS NF disconnects the session with the media resource as per TS 24.628 [244] and TS 24.229 [204].
- 3) The IMS NF initiates session termination to the calling party by sending a BYE.
  - 3ch-a) The IMS NF (CTF) sends a Charging Data Request [Termination] to the CHF with units used.
  - 3ch-b) Based on policies, the CHF updates the CDR with charging data related to the service termination and the last reported units.
  - 3ch-c) The CHF informs the IMS NF (CTF) on the result of the request.
- 4) The final answer to the BYE message is forwarded to the IMS NF ending the SIP dialog.

### Scenario 3: Deferred announcement in session with continuation

Figure 5.2.3.3 shows the Charging Data messages that are required in the IMS NF for a deferred announcement during an established session, followed by session continuation.



**Figure 5.2.3.3: Message sequence chart for deferred announcement in session with continuation**

1) During an ongoing SIP session, a charging trigger encountered.

1ch-a) The IMS NF sends a Charging Data Request [Update] to the CHF with quota requested.

1ch-b) Based on policies, the CHF updates the CDR related to the service and decides the announcement to be played.

1ch-c) The CHF grant authorization to IMS NF (CTF) for the service to continue and requests an announcement to be played to the calling party prior to quota exhaustion. Announcement information may indicate whether the granted quota for the IMS session shall be used for playing the announcement.

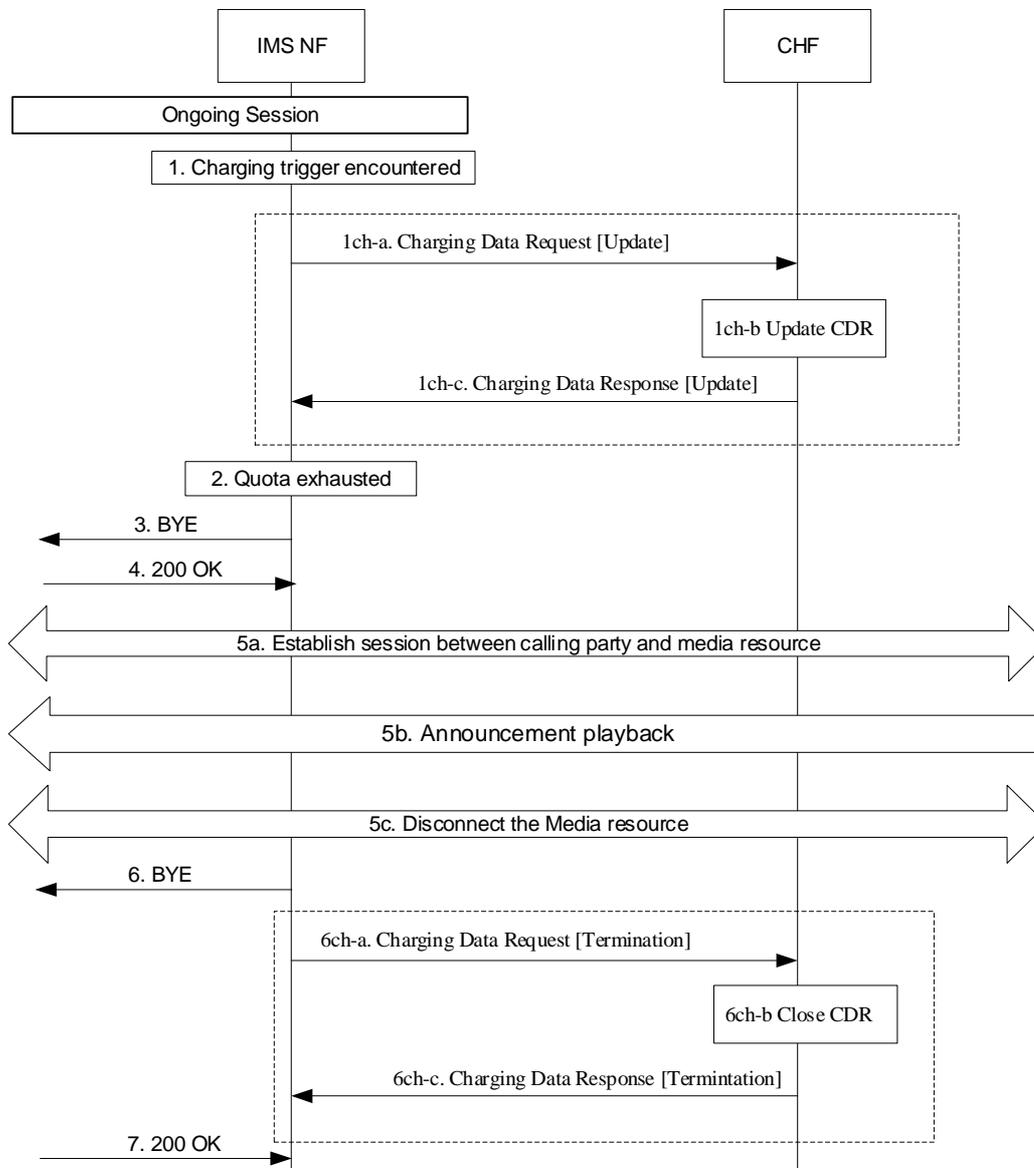
2a) When the conditions are met for the requested announcement, the IMS NF establishes a session between the calling party and a media resource for the requested announcement as per TS 24.628 [244] and TS 24.229 [204].

2b) The media resource plays the announcement to the calling party.

2c) When the announcement is complete, the IMS NF re-connects the called party, disconnecting the session with the media resource as per TS 24.628 [244] and TS 24.229 [204].

**Scenario 4: Deferred an announcement in session with session termination**

Figure 5.2.3.4 shows the Charging Data messages that are required in the IMS NF for a deferred announcement during an established session, followed by session termination.



**Figure 5.2.2.4: Message sequence chart for deferred announcement with session termination**

- 1) During an ongoing session, a charging trigger encountered.
- 1ch-a) The IMS NF sends a Charging Data Request [Update] to the CHF with quota requested.
- 1ch-b) Based on policies, the CHF updates the CDR related to the service and decides the announcement to be played.
- 1ch-c) The CHF grant authorization to IMS NF (CTF) for the service to continue with a final quota indication and requests an announcement to be played to the calling party. No quota can be used by the IMS session for playing the announcement.
- 3) When end of quota is reached, the IMS NF initiates session termination to the called party by sending a BYE message.
- 4) The final answer to the BYE message is forwarded to the IMS NF ending the session with the called party. The IMS NF does not wait for this response before continuing the message sequence.

- 5a) The IMS AF establishes a session between the calling party and a media resource for the requested announcement as per TS 24.628 [244] and TS 24.229 [204].
- 5b) The media resource plays the announcement to the calling party.
- 5c) When the announcement is complete, the IMS NF disconnects the session with the media resource as per TS 24.628 [244] and TS 24.229 [204].
- 6) The IMS NF initiates session termination to the calling party by sending a BYE.
  - 6ch-a) The IMS NF (CTF) sends a Charging Data Request [Termination] to the CHF with units used.
  - 6ch-b) Based on policies, the CHF updates the CDR with charging data related to the service termination and the last reported units.
  - 6ch-c) The CHF informs the IMS NF (CTF) on the result of the request.
- 7) The final answer to the BYE message is forwarded to the IMS NF ending the SIP dialog.

## 6 Definition of Announcement Information

### 6.1 Announcement Information principles

The following principles apply to the Announcement Information used to support the Announcement service:

- A set of Announcement Information elements may be provided within a Multiple Unit Information/Multiple Unit Operation element in a *Charging Data Response/Debit and Reserve Units Response* message.
- When a *Charging Data Response/Debit and Reserve Units Response* message is received, all previously received Announcement Information elements are discarded.
- When a *Charging Data Response/Debit and Reserve Units Response* message is received while an announcement is being played, whether the user is disconnected from the announcement is determined by the logic in the receiving node.
- An Announcement Identifier shall be provided within each Announcement Information element to identify the announcement to be played. When the specified announcement includes variable parts, the Variable Part Sequence information element shall be provided with the order, type, and value of each variable required for the announcement. The following types are supported: Integer, Number, Time, Date, Currency.
- Each Announcement Information element contains a Time Indicator. It indicates the specified time before the granted quota is exhausted at which the announcement is to be played. The specified time ranges from zero to any value smaller than the granted quota. A value of zero means: at the time the quota is exhausted, and absence of the indicator means that the announcement is to be played before the session is allowed to continue.
- When a Final Unit Indication with the granted quota and an Announcement Information element with Time Indicator with a value of zero are received, the announcement is to be played upon quota exhaust prior to processing the Final Unit Action received within the Final Unit Indication.
- When there are multiple Announcement Information elements with the same Time Indicator, an Announcement Order shall be provided that indicates the order in which announcements shall be played.
- Within each Announcement Information element is a Quota Indicator indicating whether the granted quota shall be deducted during announcement setup and playback or if the quota usage is suspended while the announcement is setup and played back and absence of the information element indicates that the logic implemented in the receiving node determines whether to use or not the granted quota.
- When a Final Unit Indication with the granted quota and an Announcement Information element with a non-zero or absent Time Indicator and a Quota Indicator indicating deduction of quota required during announcement are received, the user shall be disconnected from the announcement if the announcement is still being played when final quota exhausts.
- Within each Announcement Information element is a Play Alternative identifying either the "served party" or the "remote party" to which the announcement is to be played and absence of the information element indicates that the announcement is to be played to the "served party".
- Within each Announcement Information element is a Privacy Indicator identifying either that the announcement is private and shall be played only to the party identified by the Play Alternative or that the announcement is not private. Absence of the information element indicates that the announcement is private.
- Within each Announcement Information element, there may be a Language information element indicating the language of the announcement that shall be played and absence of the information element indicates that the default language shall be used as per the receiving node.

## 6.2 Announcement data definition

### 6.2.1 Multiple unit contents for announcement service

The components in the Multiple Unit Operation that are used for Announcement service on Ro can be found in Table 6.2.1.1.

**Table 6.2.1.1: Multiple unit operation contents for announcement service**

Information Element	Category	Description
Multiple Unit Operation	O <sub>M</sub>	Described in TS 32.299 [50].
Announcement Information	O <sub>C</sub>	This is a structured field and holds the Announcement service parameters. It is a grouped information element and may appear multiple times, once per announcement to be played.  The details are defined in clause 6.2.2.

The components in the Multiple Unit Information that are used for Announcement service on Nchf can be found in Table 6.2.1.2.

**Table 6.2.1.2: Multiple unit information contents for announcement service**

Information Element	Category	Description
Multiple Unit Information	O <sub>M</sub>	Described in TS 32.290 [45].
Announcement Information	O <sub>C</sub>	This is a structured field and holds the Announcement service parameters. It is a grouped information element and may appear multiple times, once per announcement to be played.  The details are defined in clause 6.2.2.

### 6.2.2 Definition of Announcement Information

Announcement Information is provided within the Multiple Unit Operation/Information.

The detailed structure of the Announcement Information can be found in table 6.2.2.1 for Multiple Unit Operation and in table 6.2.2.2 for Multiple Unit Information.

**Table 6.2.2.1: Structure of the announcement Information for Multiple Unit Operation**

Information Element	Category	Description
Announcement Identifier	O <sub>M</sub>	A code identifying the announcement to be played.
Variable Part Sequence	O <sub>C</sub>	Sequence of elements specifying each variable part (order, type, and value) to be played back during the announcement. The following types are supported: Integer, Number, Time, Date, Currency.
Time Indicator	O <sub>C</sub>	Instructs the announcement to be connected at the specified time before granted quota is exhausted, which ranges from zero to a value smaller than the granted quota.  A value of zero means at the time quota is exhausted. Absence of this field indicates that the announcement is to be played before the IMS session is allowed to continue.
Quota Indicator	O <sub>C</sub>	Indicates whether the granted quota should be deducted during announcement setup and playback or if the quota usage is suspended while the announcement is setup and played back. If not explicitly indicated, it is up to the logic implemented in the receiving node to use or not the granted quota.
Announcement Order	O <sub>C</sub>	When multiple announcement information blocks are provided in a single message with the same timing indicator, the announcement order indicates the order in which announcements should be connected for playback.
Play Alternative	O <sub>C</sub>	Identifies either the "served party" or the "remote party" to which the announcement is to be played.
Privacy Indicator	O <sub>C</sub>	Identifies if the announcement is "private" or "not private".
Language	O <sub>C</sub>	A language code indicating the language of the announcement that should be played.

**Table 6.2.2.2: Structure of the announcement Information Multiple Unit Information**

Information Element	Converged Charging Category	Description
Announcement Identifier	O <sub>M</sub>	Identifying the announcement to be played.
Announcement Reference	O <sub>M</sub>	The reference to where more information in regard to the announcement can be found, this can be a URI or refence to the standard where it's specified.
Variable Part List	O <sub>C</sub>	List of elements specifying each variable part (order, type, and value) to be played back during the announcement.
Time To Play	O <sub>C</sub>	Instructs the announcement to be played at the specified time before granted time units are exhausted. If the value is set to zero, the announcement is to be played at time when time quota is exhausted. If the field is not present, it indicates that the announcement is to be played immediately.
Quota Consumption Indicator	O <sub>C</sub>	Indicates whether the granted quota should be consumed during announcement setup and played or not. If the field is not present, the quota consumption is receiver dependent.
Announcement Priority	O <sub>C</sub>	When multiple announcement information blocks are provided in a single message with the same timing indicator, the announcement priority indicates the priority order in which announcements is to be played.
Play To Party	O <sub>C</sub>	Identifies the party to which "served party" or the "remote party" to which the announcement is to be played. If the field is not present, it is to be played to "served party".
Announcement Privacy Indicator	O <sub>C</sub>	Indicates if the announcement is "private" or "not private". If the field is not present, it is "private".
Language	O <sub>C</sub>	A language tag indicating the language of the announcement to be played. If the field is not present, the language is receiver dependent.

### 6.2.3 Formal Announcement Information parameter description

The detailed Announcement Information parameter definitions are specified in TS 32.299 [50] for Ro and TS 32.291 [46] for Nchf.

## 6.3 Bindings for Announcement Information

This clause describes the mapping between the information elements and messages described for Announcement service and the Diameter messages and AVPs.

As defined in TS 32.299 [50], the corresponding Diameter Credit-Control Application (DCCA) commands for the *Debit and Reserve Units Request* message is Credit-Control-Request (CCR) and for the *Debit and Reserve Units Response* message is Credit-Control-Answer (CCA).

Table 6.3.1 specifies the bindings for parameters used for Announcement service for the *Debit and Reserve Units* operation.

**Table 6.3.1: Bindings between Information Elements and AVPs**

Information Element	AVP
Announcement Information	Announcement-Information
Announcement Identifier	Announcement-Identifier
Variable Part Sequence	Variable-Part
Time Indicator	Time-Indicator
Quota Indicator	Quota-Indicator
Announcement Order	Announcement-Order
Play Alternative	Play-Alternative
Privacy Indicator	Privacy-Indicator
Language	Language

## Annex A (informative): Change history

Change history							
Date	Meeting	TDoc	CR	Rev	Cat	Subject/Comment	New version
2015-12	SA#70	SP-150815				Presented for information and approval	1.0.0
2015-12	SA#70					Upgrade to Rel-13	13.0.0
2015-12	SA#70	SP-160623	0002	2	F	Correction of reference to Annex B of TS 32.260	14.0.0
2018-06	-	-	-	-	-	Update to Rel-15 version (MCC)	15.0.0
2019-09	SA#85	SP-190760	0003	2	B	Addition of converged charging architecture	16.0.0
2019-09	SA#85	SP-190760	0004	2	B	Addition of converged charging basic principles	16.0.0
2019-09	SA#85	SP-190760	0006	2	B	Addition of converged charging information principles	16.0.0
2019-12	SA#86	SP-191164	0007	2	B	Addition of converged flows	16.1.0
2021-03	SA#91e	SP-210164	0009	1	B	Addition of multiple unit information contents	17.0.0
2021-03	SA#91e	SP-210164	0010	1	B	Adding converged charging to scope	17.0.0
2021-12	SA#94e	SP-211482	0011	1	B	Addition of IMS converged charging announcement	17.1.0

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# History

<b>Document history</b>		
V17.1.0	May 2022	Publication