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Technical Report

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Contents

Foreword

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Introduction

Multimedia service continuity requirements for Rel-8 have already been included in both TS 22.278 [3] (Service requirements for evolution of the 3GPP system) and TS 22.258 [2] (Service requirements for the AIPN). This document introduces the corresponding stage-2 requirements and studies IMS-level architectures and solutions that can enable multimedia service continuity.

1 Scope

This study intends to investigate the general problem of IMS-level multimedia session continuity, including potential enhancements to IMS specifications that can improve the multimedia session continuity experience. In particular, the following topics will be studied:

- Identification of session continuity scenarios;
- PS-PS session continuity;
- PS-PS session continuity in conjunction with PS-CS continuity;
- Session continuity between 3GPP and non-3GPP systems;
- Network-initiated Multimedia Session Transfer;
- Mobility of media components of a session between different terminals under the control of the same user;
- Coexistence and/or potential interactions with possible underlying mobility solutions defined by 3GPP. The solutions developed within this study should not have any impacts to underlying mobility solutions.

In the end this study will provide conclusions with respects to what further specification work is required in order to fulfil the IMS-level Multimedia Session Continuity requirements and improve the overall service continuity experience.

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 22.258: "Service requirements for the AIPN".

[3] 3GPP TS 22.278: "Service requirements for evolution of the 3GPP system".

[4] 3GPP TS 23.401: "GPRS enhancements for E-UTRAN access".

[5] 3GPP TS 23.402: "Architecture enhancements for non-3GPP accesses".

[6] 3GPP TS 23.206: "Voice Call Continuity between CS and IMS".

[7] 3GPP TS 23.228: "IP Multimedia Subsystem (IMS)".

[8] 3GPP TS 23.002: "Network architecture".

[9] 3GPP TS 23.279: "Combining Circuit Switched (CS) and IP Multimedia Subsystem (IMS) services".

[10] 3GPP TS 23.292: "IP Multimedia System (IMS) centralized services".

[11] 3GPP TS 23.203: "Policy and charging control architecture".

[12] 3GPP TS 29.214: "Policy and charging over Rx reference point".

[13] 3GPP TS 24.216: "Communication Continuity Management Object (MO)".

[14] 3GPP TR 23.892: "IP Multimedia System (IMS) centralized services".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply.

Multimedia Session Transfer: Transfer at the IMS-level of one or more of the session signalling paths and associated media paths of an ongoing multimedia session while maintaining session continuity. The multimedia session transfer incorporates both Access Network Transfer and UE Transfer.

Multi-Media Session Continuity: A service of the IMS which supports the use of Multimedia Session Transfer mechanisms in order to handle Terminal Mobility events and/or mobility between UEs for the case when such events are not hidden from the IMS session layer and thus Session Continuity could not otherwise be maintained.

MMSC UE: The MMSC UE is a User Equipment supporting multimedia session continuity as defined in this document.

Domain Transfer: as defined in TS 23.206 [6].

Access Network Transfer: Transfer at the IMS-level of both the signalling path and media path of an ongoing multimedia session on a UE from PS to CS domain or vice versa or between different IP-CANs.

UE Transfer: Transfer at the IMS-level of all or some of the media components and associated signalling between UEs under the control of the user.

NOTE: The transfer of all media components and the signalling from one device to another is also known as Session Mobility as defined in TS 22.258 [2].

Network-initiated Multimedia Session Transfer: A Multimedia Session Transfer that is initiated by the network.

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply:

EPS	Evolved Packet System
ICS	IMS Centralized Services
MMSC	Multi-Media Session Continuity

4 Architectural Requirements and Assumptions

Editor's note: This clause describes the issues and related architectural requirements which need to be studied in this document.

4.1 Basic Assumptions

- The UE may be capable of transmitting and receiving simultaneously in multiple access networks or may be capable of transmitting and receiving in only one access network at a time.
- It is assumed that underlying mobility mechanisms can not handle PS-PS continuity in conjunction with PS-CS continuity.

- If a UE has an ongoing multimedia session over an IP-CAN and moves to a different IP-CAN but its contact address and its serving P-CSCF remain the same, then there is no need to activate any IMS level mechanisms to transfer its multimedia session.

4.2 Architectural Requirements

- The solution shall be applicable to both EPC and non-EPC Networks.
- The solution shall be able to provide IMS level multimedia session continuity when the user is moving between 3GPP access systems.
- The solution shall be able to provide IMS level multimedia session continuity when the user is moving between 3GPP and non-3GPP access systems.
- The solution shall be able to provide IMS level multimedia session continuity between an access network that supports real-time media on the CS domain and non-real-time media on the PS domain (e.g. UTRAN or GERAN), and an IP-CAN that supports transport of all media types (e.g. WLAN or WiMAX).
- The service disruption when multi-media session continuity occurs should be minimized.
- The impact of the MMSC solution on the radio and transport layers and on the PS core network should be minimized.
- UEs that do not support the functionality described in this TR shall not be impacted.
- The impact to the existing voice continuity procedures as a result of multimedia session continuity should be minimized.
- The signalling load as a result of multimedia session continuity should be minimized.
- All media composing a multimedia session could be subject to session continuity procedures.
- It shall be possible for an IMS user to add /remove one or more media components to/from an ongoing multimedia session that he controls during session transfer.
- It shall be possible for an IMS user to add or remove from a UE media components of an ongoing multimedia session that he controls, which are active in a different UE.
- It shall be possible for an IMS user to retrieve on a UE one or more media components of an ongoing communication session that he controls from other UEs.
- It shall be possible for an IMS user to transfer one or more media components of an ongoing communication session that he controls between different UEs. These media components could be transferred to UEs that already participate in the ongoing session or to new UEs added to the session.
- The solution shall be able to provide IMS-level multimedia session continuity when the session is transferred between UEs with different capabilities (e.g., display resolutions, codecs, video encoding and decoding capabilities, and access network data rate, etc.).
- It shall be possible to register a Public User Identity with multiple contact addresses (at the same or via separate UEs) via IMS registration procedures as defined in TS 23.228 [7], clause 5.2.1. The number of allowed simultaneous registrations is defined by home operator policy.
- It shall be possible to perform correlation of charging data from different access networks when service continuity between these networks is performed.
- It shall be possible to provide multimedia session continuity when the P-CSCF changes.
- It shall be possible for the UE to use IMS mechanisms to transfer its ongoing multimedia sessions to a target access network without requiring any new functionality on the remote party.
- If all the media components of the ongoing multimedia session cannot be transferred, then the selection of the media components, to be transferred, may be based on:
  - Target access network(s) capabilities (if known)

- User preferences and/or operator policies

- Application specific constraints on the selection of a target access network for the transfer of media components (e.g. lip sync for a real time audio/video conference require the audio and video bearers to be transferred to the same target Access Network)

Media components that cannot be transferred shall be released, if they cannot be maintained in the source access network.

- It shall be possible for the MMSC UE to initiate a multimedia session transfer procedure based on session transfer policies provided by the network.

- It shall be possible for the MMSC AS to update the session transfer policies in the UE to trigger the initiation of a multimedia session transfer procedure.

- It shall be possible for the transfer originating UE to keep the session control during a session transfer

- It shall be possible for the transfer originating UE to release the session control during a session transfer to a transfer target UE

4.3 Service Requirements

- MMSC subscribers are IMS subscriber. All their services are centralized in IMS regardless of the access networks being used.

5 Multimedia Session Continuity Scenarios

5.1 General

In general, the continuity of multimedia services refers to the capability of continuing ongoing communication sessions with multiple media across different access networks or across different user equipments (UEs). The main need for such continuity arises because (i) UEs with multimedia capabilities can move across a multiplicity of different access networks or because (ii) the users can move the media of their communication sessions across different UEs to best meet their communication preferences.

Transfer of a multimedia session to a different access network may lead to loss of synchronization across various media components (e.g. across voice and video components). The session continuity solution may take such synchronization issues into account for assuring the best user experience.

In this technical report the following multimedia session continuity scenarios are considered.

5.2 PS-PS session continuity

The PS-PS session continuity refers to a particular case of multimedia session continuity in which a session with multiple media is transferred between two different access networks supporting packet switched (PS) communications. The transfer of the session is required due to user's movement from a PS access network (source) to another PS access network (target). To maintain a high-quality of user experience, the session is transferred to and continued on the target PS access network as seamlessly as possible.

A PS-PS session continuity example is illustrated in figure 5.1. In this figure, UE-1 has established a session with voice and data components towards UE-2 over a non-3GPP IP access network (e.g. WiMAX). Later on, UE-1 moves to an area that is better served (e.g. in terms of radio signal quality or in terms of other criteria) by an E-UTRAN access network. The ongoing session and its media are transferred to E-UTRAN and, if possibly, without the two parties to perceive any downgrade to their communications experience. As shown in figure 5.1, the multimedia session transfer might be coupled with a P-CSCF change (P-CSCF-a1 in non-3GPP access and P-CSCF-a2 in E-UTRAN).

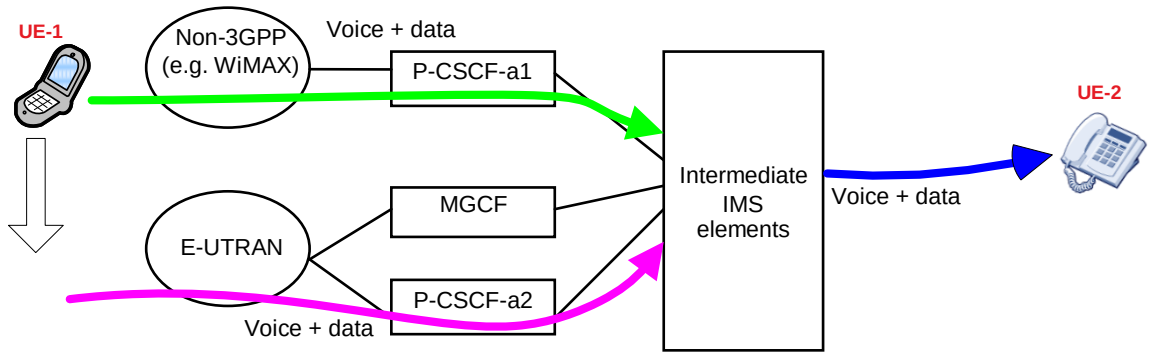


Figure 5.1: An example of PS-PS multimedia session continuity

It is clarified that for the scenario of PS-PS multimedia session continuity:

- All or some ongoing media components in the source access network are transferred to the target access network. If it is not possible or not desired (e.g. due to operator policies) to transfer all media, then part of the media components are transferred and the remaining component(s) are released or kept. The selection of media to be transferred may depend on the solution used to realize the session transfer.

Editor's note: It may not be possible to transfer some media components to the target access network due to limited target access network capabilities. It is FFS if the target access network capabilities can be identified.

- If possible and if allowed (e.g. by user preferences and/or operator policies) some media components may remain in the source access network.

- The source and the target access network can include both 3GPP and non-3GPP IP access systems.

- After the UE hands over to the target access network the same or a different P-CSCF (as shown in figure 5.1) may be used. The solution for PS-PS multimedia session continuity should cope with both cases.

- The underlying transport network may or may not support mobility mechanisms. In case it does support mobility mechanisms the session transfer may be transparent to the application layer, e.g. when the contact address remains the same.

5.3 PS-PS session continuity in conjunction with PS-CS continuity

The PS-PS session continuity in conjunction with PS-CS continuity refers to a particular case of multimedia session continuity in which a session with media on both the CS domain and the PS domain is transferred to an access network supporting only packet switched (PS) communications, or vice versa. The transfer of the session is required due to user's movement from one access network (source) to another access network (target). The typical characteristic of this case is that one access network supports real-time media (usually voice) only on the CS domain (e.g. GERAN or UTRAN) whereas the other access network supports both real-time media and non-real-time media on PS bearers (e.g. E-UTRAN, WiMAX, or WLAN). To maintain a high-quality of user experience, the session is transferred to and continued on the target access network as seamlessly as possible.

An example of PS-PS session continuity in conjunction with PS-CS continuity is illustrated in figure 5.2. UE-1 has established a session with voice and data components towards UE-2 over a non-3GPP access network that supports IMS Multimedia Telephony (WLAN). Later, UE-1 moves to a GERAN or UTRAN access network, which supports voice only on CS bearers. Its ongoing multimedia session is transferred to and continued on GERAN or UTRAN by splitting the media into two legs: one for voice carried over the CS domain and one for the data carried over the IMS/PS domain.

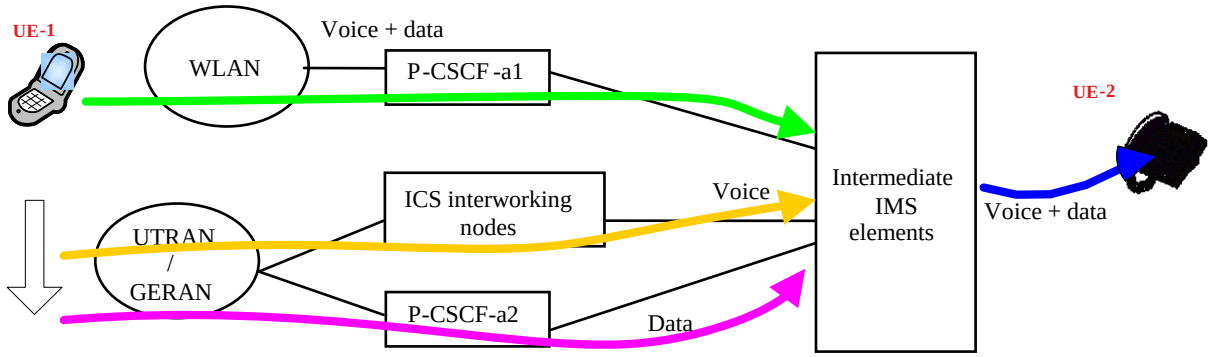


Figure 5.2: An example of continuity scenario involving PS-PS session continuity in conjunction with PS-CS continuity

It is clarified that for the scenario of PS-PS session continuity in conjunction with PS-CS continuity:

- One access network (either the source or the target) supports voice on the CS domain only (such as UTRAN or GERAN), while the other access network supports voice and non-voice components on IP transport bearers (such as WLAN, WiMAX or E-UTRAN).
- If the target access network supports voice on the CS domain only (as shown in figure 5.2), then a voice component is transferred to the CS domain and all other components can be transferred to the PS domain.
- If possible and if allowed (e.g. by user preferences and/or operator policies) some non-voice media components may remain in the source access network.
- If the target access network supports video on the CS domain, then voice and video components can be transferred to the CS domain and all other components can be transferred to the PS domain.
- If the target access network supports all media on IP transport bearers, then all media components active in the CS and PS domain of the source network are transferred to IP transport bearers.

5.4 Mobility of media components of a session between different terminals under the control of the same user

This scenario enables an IMS user to utilize the following capabilities:

1. transfer some or all media components of an ongoing multimedia session between different UEs;
2. retrieve some or all media components of an ongoing multimedia session from different UEs;
3. add new media components in an ongoing multimedia session to different UEs; and
4. remove media components of an ongoing multimedia session from different UEs.

NOTE: The UEs referred to above are under the control of the same user.

By means of the above capabilities the user is provided with session mobility services, i.e. with capabilities to transfer/add/retrieve media components between his different devices.

In this TR the following cases of session mobility are considered.

All the scenarios in this clause assume that the different terminals share the same subscription.

NOTE: Cases where session needs to be transferred between terminals with different subscriptions are FFS.

5.4.1 Mobility of media components of a session between different terminals under the control of the same user without keep control mode

Case 1: Transfer media components to different UEs

This case enables the IMS user to transfer one or more media components of an ongoing multimedia session between different UEs that he owns. In the example shown in figure 5.3, a user has a multimedia session with his device UE-1 with voice and video media components. Subsequently, the user initiates the transfer of the voice component from device UE-1 to device UE-3 and the transfer of the video component from device UE-1 to device UE-4.

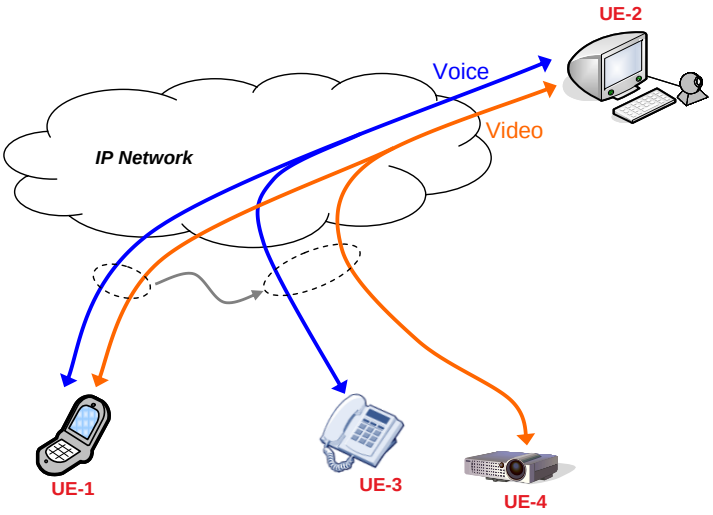


Figure 5.3: An example of media component transfer - The voice component is transferred to UE-3 and the video component is transferred to UE-4

The study should also consider that different access networks can have different access capabilities, e.g., data rates, and different UEs can have different capabilities, e.g., display resolutions, codecs, video encoding and decoding capabilities. In this case as part of the session continuity procedure, the UE may need to re-negotiate the different capabilities, in addition to changing the terminal and access network.

In another example, shown in figure 5.4, the user has an ongoing multimedia session with his UE-1 with three media components: voice, video and text. Subsequently, the user transfers only the voice component of the session to his device UE-3. The video and text components can either resume on device UE-1 or can be released under the control of the user.

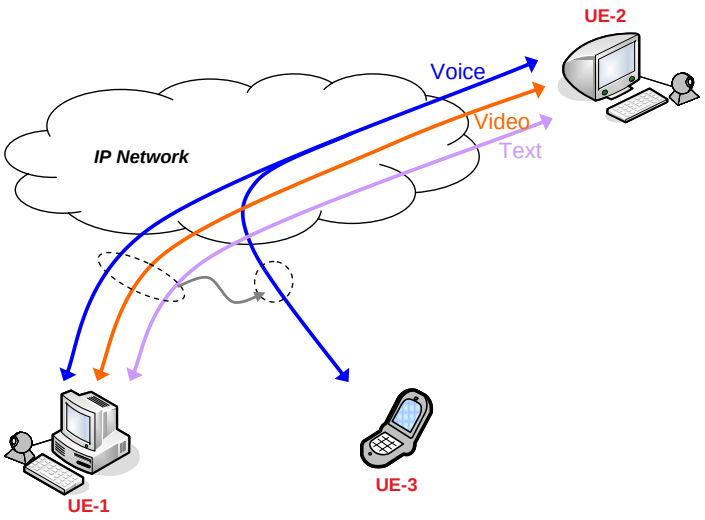


Figure 5.4: An example of media component transfer - The voice component is transferred from UE-1 to UE-3 under the control of the user

Case 2: Retrieve media components from different UEs

Media transfer can also be conducted in the opposite direction as shown in figure 5.5. In this case the user from his device UE-1 retrieves the voice and video components of a session which were previously active on devices UE-3 and UE-4 respectively.

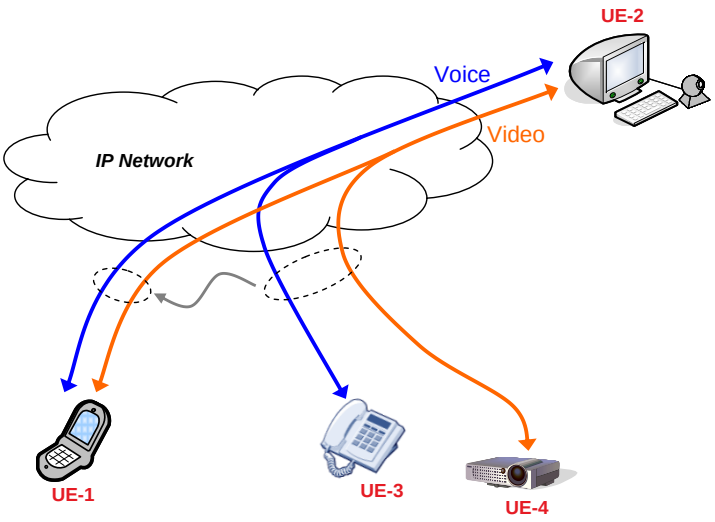


Figure 5.5: An example of media component retrieval - The user uses device UE-1 to retrieve the voice and video components from UE-3 and UE-4 respectively

Case 3: Add new media components to different UEs

In this case, the user adds new media components to an ongoing multimedia session targeted to additional UEs. In the example shown in figure 5.6, a user has initially an ongoing multimedia session with his UE-1 with only a voice component. Subsequently, the user adds a video component to the session which is targeted to his device UE-3.

NOTE: This case refers specifically to the scenario when the user adds new media component(s) from one device to a different device, e.g. from device UE-1 he adds a media component to device UE-3, as shown in figure 5.6. Addition of media component(s) to the same device is considered a trivial case, readily supported by session re-negotiation between two peers.

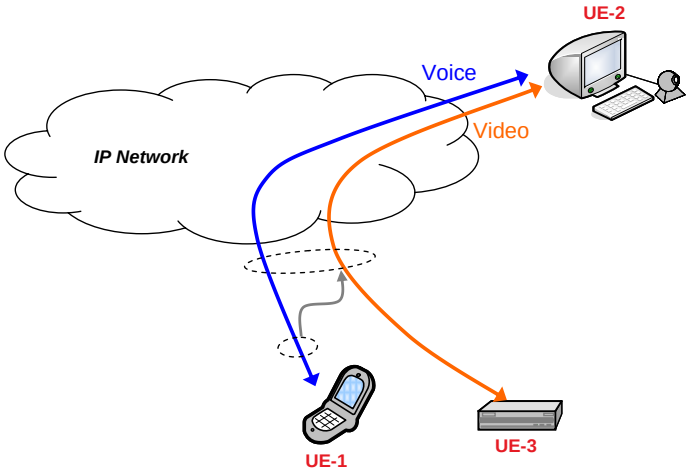


Figure 5.6: An example of media component addition - UE-1 adds a video component to UE-3

There is another case for adding new media components to different UEs, which is when a new added media component(s) request is coming to UE-1, the UE-1 transfers the added media component(s) to UE-3.

Case 4: Remove media components from different UEs

In this case, the user removes existing media components from an ongoing multimedia session on different UEs. In the example shown in figure 5.7, a user has initially an ongoing multimedia session with a voice component on his UE-1 and a video component on his UE-3. Subsequently, the user from device UE-1 removes the video component that is active on device UE-3.

NOTE: This case refers specifically to the scenario when the user, from one device, removes existing media component(s) active on a different device, e.g. from device UE-1 he removes a media components active on device UE-3, as shown in figure 5.7. Removal of media component(s) in the same device is considered a trivial case, readily supported by session re-negotiation between two peers.

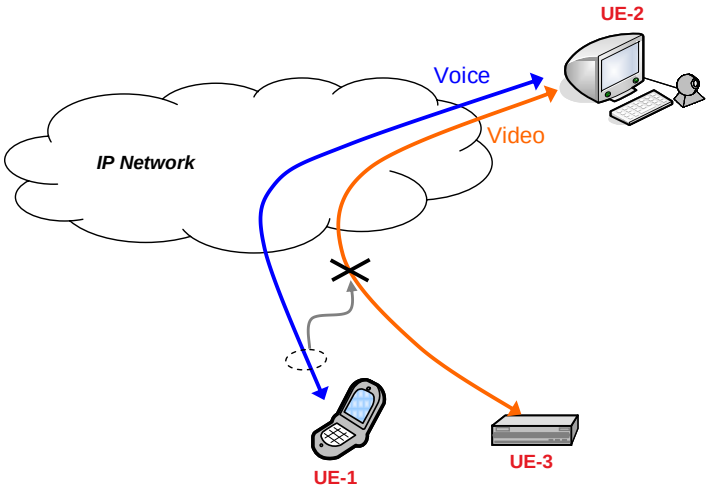


Figure 5.7: An example of media component removal - UE-1 removes the video component active on UE-3

5.4.2 Mobility of media components of a session between different terminals under the control of the same user using keep control mode and release control mode

In addition to the capabilities mentioned in section 5.4.1, this scenario enables an IMS user to utilize the following capabilities:

- allow separation of userage plane (U-plane or media components) and control plane (C-plane or signalling session) while performing the UE transfer.
- select to keep control on the transfer originating UE or release the control to the transfer target UE.

In this TR, the following cases of session mobility are considered.

Case 1: Transfer media components to different UEs with the selection of "keep control" mode

This case enables the IMS user to transfer one or more media components of an ongoing multimedia session between different UEs that he owns. In the example shown in Figure 5.8, a user has a multimedia session with his device UE-1 with voice and video media components. Subsequently, the user selects a "keep control" mode for the transfer of the voice components from device UE-1 to device UE-3 and the transfer of the video component from device UE-1 to device UE-4. With the selection of "keep control" mode, the control plane remains with the device UE-1 after the session transfer is completed and no media remains on the device UE-1.

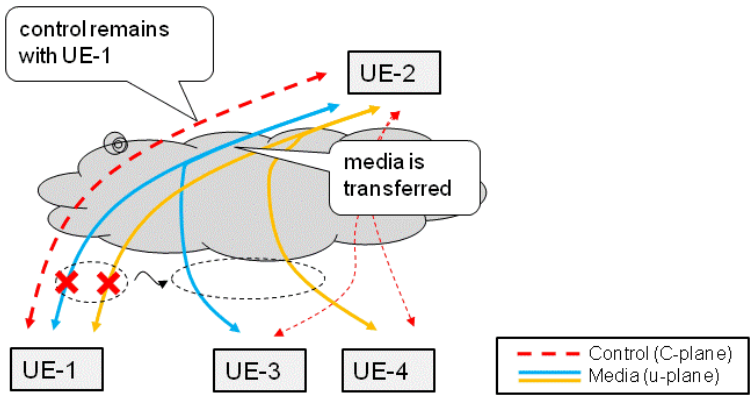


Figure 5.8: An example of media component transfer with the selection of "keep control" mode – The voice component is transferred to UE-3 and the video component is transferred to UE-4. The control plane remains with UE-1

Case 2: Transfer media components to different UEs with the selection of "release control" mode

This case enables the IMS user to transfer one or more media components of an ongoing multimedia session between different UEs that he owns. In the example shown in Figure 5.9, a user has a multimedia session with his device UE-1 with voice and video media components. Subsequently, the user selects a "release control" mode for the transfer of the voice components from device UE-1 to device UE-3 and the transfer of the video component from device UE-1 to device UE-4. With the selection of a "release control" mode, the control plane previously set for the device UE-1 will be terminated after the session transfer is completed and no media remains on the device UE-1. Depending on the policy or the user preferences, the control will be released to a transfer target device (UE-3 in this case).

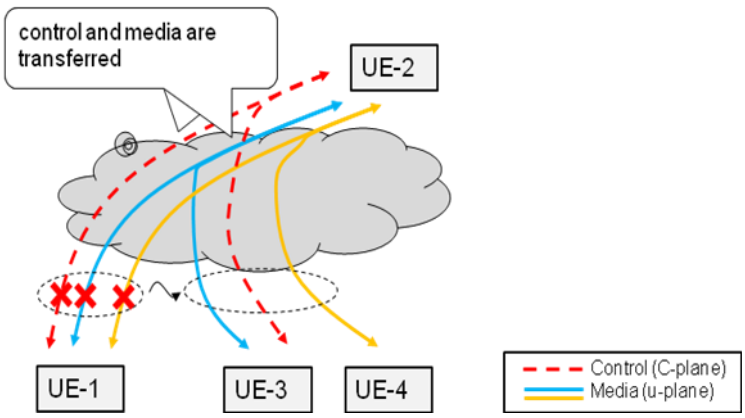


Figure 5.9: An example of media component transfer with the selection of "release control" mode – The voice component is transferred to UE-3 and the video component is transferred to UE-4. The control plane on UE-1 is terminated.

6 Architecture

6.1 General Principles and Description

This MMSC Architecture is based to the following key principle:

- The MMSC solution complements other network mechanisms that provide session continuity (such as radio level handover mechanisms). The MMSC solution should effectively provide handover mechanisms at the IMS level and enable session continuity across different access networks, domains and devices. It is particularly useful when no other lower-level mechanisms exist to enable session continuity.

The MMSC AS in IMS domain is introduced to meet the requirements of the Multimedia Session Continuity.

The MMSC AS extends existing functional capabilities from the VCC Application defined in TS 23.206 [6]. The MMSC AS provides UE-initiated and network-initiated transfer of the multimedia sessions.

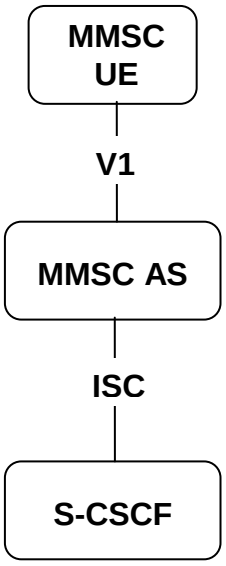
To support Service Continuity between CS and PS of bidirectional speech media in IMS sessions, ICS interworking nodes as specified in TS 23.292 [10] shall be used for the CS leg.

Additionally functionalities to support session split and merger are provided.

6.2 MMSC Architecture Reference Model

SIP protocol enables building blocks for mobility and routing to specific device. However, it cannot always be assured that all such SIP mechanisms will be supported by the session participants (e.g. when one session participant is a legacy PLMN terminal). This creates the need for the network to provide the appropriate functionality to efficiently handle the relevant interworking aspects of session continuity.

The MMSC reference architecture for multimedia session continuity is illustrated in figure 6.1. In this architecture, the MMSC AS is the key AS used to support the session continuity scenarios documented in clause 5.



NOTE: Not all standard interfaces and elements are depicted in the architecture. Interfaces and elements for ICS are not depicted. Both ICS and MMSC specify functions which are provided by a SIP application server. These functions may be collocated as optional functions in a single SIP application server. The interfaces and interactions between them are not specified in this release.

Figure 6.1: MMSC Reference Architecture

6.2.1 MMSC AS

The purpose of the MMSC AS is to provide an IMS-based mechanism for enabling continuity of multimedia sessions between different domains (i.e. CS domain and IMS) and to support all other session continuity scenarios, such as PS-PS continuity, PS-PS in conjunction with CS-PS continuity, and media transfer between different terminals. The MMSC AS acts as a B2BUA.

The MMSC AS comprises a set of functions required to perform multimedia session continuity and anchor/manage multimedia session. The MMSC AS also provides session continuity specific charging data.

The MMSC AS uses the ISC reference point towards the S-CSCF for execution of the Session Transfer functions. The MMSC AS performs the following functions:

- Executes the transfer of the multimedia session between different accesses or domains.
- Anchor the session by inserting 3rd party call control (3PCC) upon call establishment to enable multimedia session continuity.
- Hides and/or translates the SIP mechanisms used by the UE to implement session continuity from the remote terminal which might not support those mechanisms.
- Provides Session Transfer specific charging data.

The MMSC AS also provides the following functions to enable network-initiated multimedia session transfer:

Editor's note: The scope of the network-initiated session transfer is FFS.

- Generate and update session transfer operator policy.
- Sends session transfer information (e.g., operator policy) to the MMSC UE via V1 reference point.
- Analyzes various session continuity related input factors and decide whether to initiate session transfer and which type session continuity scenario should be performed.
- Trigger session transfer procedure by sending session transfer information (e.g., operator policy) to the MMSC UE including a parameter which indicates that session transfer is required.
- Determine for which sessions the network-initiated session transfer can be performed.

Several information (e.g., network load balancing, system maintenance, etc) can be taken into account to decide and maintain session continuity.

Editor's note: It is FFS which factors are taken into account for session transfer execution.

The MMSC AS provides multimedia session splitting/merging functionalities based on different type of session continuity scenarios described in this TR (e.g. PS-PS, PS-PS in conjunction with PS-CS, partial session continuity, session mobility between different terminal etc) and performs the following:

- In case of PS-PS in conjunction with PS-CS session continuity, the MMSC AS combines session information on both PS domain and CS domain before updating the remote party and send combined INVITE to the anchoring point for anchoring.
- In case of combined PS and CS termination, the MMSC AS anchors the combined session and splits the sessions on both PS and CS domains.

When making the decision about session merge, the MMSC AS takes into account the services the sessions belong to. The MMSC AS shall not merge two sessions if they belong to different services. The services can be identified by IMS Communication Service Identifiers as defined in TS 23.228 [7], clause 4.13, or by other means (e.g feature tags).

Editor's note: Other conditions under which the split and merger are performed are FFS.

6.2.2 ICS AS

The functions and role of the ICS AS is defined in TS 23.292 [10].

6.2.3 MMSC UE

The MMSC UE is a User Equipment as defined in clause 3.1. In this architecture, a MMSC UE can support the network- initiated session transfer procedure by communicating with the MMSC AS over the V1 reference point.

The MMSC UE performs the following functions:

- Stores and applies session transfer operator policy for originating calls, session transfer.
- Receives and takes into account session transfer information (e.g. indication and/or session transfer operator policy) from the MMSC AS.
- Perform session transfer based on session transfer related information (e.g. indication and/or session transfer operator policy, user preferences etc).
- Stores VDN/VDI for session transfer execution.
- Allows the stored VDN/VDI values to be updated.

6.2.4 Reference points

6.2.4.1 MMSC AS - S-CSCF, ICCF - S-CSCF reference point (ISC)

The ISC reference point between Serving CSCF and the AS is described in TS 23.002 [8].

6.2.4.2 MMSC AS – MMSC UE reference point (V1)

V1 is a reference point between MMSC UE and the MMSC AS. It is used to transfer Session transfer operator policy from the MMSC AS to the MMSC UE and to support the network-initiated session transfer procedure.

Editor's note: It is FFS which transport mechanism is used to realize this reference point.

6.3 Session Anchoring

Static anchoring techniques are employed upon session establishment in order to provide a 3pcc (3rd party call control) function at the MMSC AS for MMSC subscribers using a MMSC UE. These anchoring mechanisms are the same as those described in TS 23.206 [6].

6.3.1 Multimedia sessions originated by MMSC subscribers

Anchoring of multimedia sessions is controlled by the operator policy. The default policy is all multimedia sessions originated by MMSC subscribers in the IMS are anchored in the MMSC AS in order to facilitate session transfer of the multimedia component to the different domain and access system and/or different UEs.

The MMSC UE is able to initiate a session from different domains and/or PS accesses, for example to initiate a speech component from UTRAN/GERAN and a non-speech component from another PS access. In this case, the sessions for speech and non-speech components are routed to the MMSC AS for anchoring. The MMSC AS makes the decision about session merge and continues the session towards remote party with a single combined multimedia session if appropriate.

6.3.2 Multimedia sessions terminated to MMSC subscribers

Anchoring of multimedia sessions is controlled by the operator policy. The default policy is that all multimedia sessions to MMSC subscribers directed to the IMS are anchored in the MMSC AS in order to facilitate domain transfer and session continuity of the multimedia component to the different domain and access system.

When the MMSC AS receives incoming multimedia session, the MMSC AS decides how to handle the session and takes various factors into account to terminate the session. After that, the session is handled in a different way for example, forwarding to other domain, splitting the session into the separate domains and/or PS accesses, etc.

Editor's note: How to implement splitting the session into the separate domains and/or PS access over different UEs under the control of the same user is FFS.

6.4 Session Transfer

When a MMSC UE is active in a multimedia session, multimedia session continuity between different domains or /access systems, or add/transfer/retrieve media components of an ongoing communication session between different UEs is enabled by execution of the Session Transfer procedures.

MMSC UE multimedia sessions are anchored at the MMSC AS in the home IMS upon session establishment as specified in 6.3. All initial and subsequent Session Transfers are initiated by the MMSC AS in the home IMS or by the UEs according to the session transfer operator policy from MMSC AS.

If the MMSC UE wants to transfer ongoing multimedia session to different PS access or domain, the session transfer procedure can be executed. When the MMSC UE determines that session transfer is desirable and possible based on the session transfer operator policy, a registration is performed by the MMSC UE in the transferring-in domain or access (if the user is not already registered for the transferring-in domain or access). Sessions including session transfer information is established by the MMSC UE toward the MMSC AS in the home IMS. Signalling and bearer resources are allocated in the transferring-in access network and the user's active session is transferred from the transferring-out access network. The MMSC AS in the home IMS executes Session Transfer. Resources in the transferring-out access network are subsequently released. If the MMSC UE is capable of dual mode operation, then the MMSC UE can also maintain part of the media components in the transferring-out access network while transferring the other media components to the transferring-in access network.

NOTE: No special procedures have been studied in the Rel-8 MMSC TR to support the transfer of multimedia sessions between access networks by UEs which are capable of transmitting/receiving on only one of those access networks at a given time.

Initiation of the session transfer procedures for ongoing multimedia session is based on the session transfer operator policy received from the MMSC AS. Various input factors can be taken into account for session transfer.

In case when a session transfer is initiated by an MMSC UE, the MMSC UE sends Session Transfer Information to the MMSC AS in order to trigger session transfer execution. The Session Transfer Information provides the necessary information to the MMSC AS for executing the session transfer.

6.4.1 Multimedia Session Transfer Information

The Multimedia Session Transfer Information (MST Info) represents the information carried in various SIP/SDP and CS call control messages (specified in the applicable information flows), which provides the necessary details for conducting a session continuity operation, such as a PS-PS session transfer, a transfer of media components between different UEs, etc. The MMSC AS and the MMSC UE check the MST Info to determine if and how a session continuity operation needs to be executed.

The MST Info depends on the Multimedia Session Continuity scenario being used. For example, if one media component is to be transferred and the rest kept unchanged, there is no need to identify which media component is added and removed.

The information is encoded in existing SIP messages (SIP headers, SIP payload) or carried in the called party address field (e.g. PSI for requesting session transfer), in order that the behaviour of MMSC AS can be achieved using existing protocol mechanisms where applicable (e.g. Replaces, Refer-To, SDP m-line, c-line, etc..). The definition of new protocol extensions can be considered for cases that cannot be covered by existing means. The information details needed by MMSC AS to perform Multimedia Session Transfer are different for each multimedia session continuity scenario and it is therefore appropriate to define them as part of the related information flows in clause 6.5. This also allows for clear identification of the requirements for each scenario.

The MST Info shall provide the following information:

- A session transfer identifier (FFS if this is really needed)
- For the case of a multimedia session origination / termination, the MST info shall identify:
  - that the SIP message (which carries the MST Info) is a request for a new multimedia session;

  - the access leg over the PS domain, in case the session is split across the CS domain and the PS domain (in which case the MMSC AS needs to do session combining before establishing the remote leg);
  - the media carried over the CS domain, in case the session is split across the CS domain and the PS domain;
  - the access leg over the CS domain, in case the session is split across the CS domain and the PS domain (in which case the MMSC AS needs to do session combining before establishing the remote leg);
  - optionally, an IMS Communication Service Identifier defined in TS 23.228 [7].
- For the case of a multimedia session transfer between different access networks / domains, the MST info shall identify:
  - which session this SIP message is required to replace or update;
  - the media components of the anchored multimedia session affected by the transfer operation (in case of a partial media transfer);
  - whether the SIP message (which carries the MST Info) is a request to transfer a multimedia session with video and voice media components to the CS domain (in which case the remote leg needs to be updated only after the H.245 negotiation is completed; see clause 6.5.4.1).
- For the case of UE transfer, the MST info shall identify:
  - which session this SIP message is required to replace or update;
  - that the SIP message (which carries the MST Info) is a request to perform a specific UE transfer operation, e.g. media transfer, retrieval, addition, removal;
  - the target of the UE transfer operation (e.g. the UE to which media need to be transferred to or retrieved from);
  - the media components affected by the UE transfer operation (i.e. the media to be transferred / retrieved / added / removed).

Editor's note: It is FFS how to convey the Session Transfer Information from the MMSC UE to the MMSC AS with minimizing the impact to the existing CS signalling.

The session transfer identifier has to fulfil the following requirements:

- Each session subject to domain session transfer must have a session identifier.
- The MMSC AS must be able to uniquely identify a single session through the session identifier.
- A UE requesting session transfer must include the session identifier in the request.

6.5 Information flows

6.5.1 MMSC Origination and Termination

6.5.1.1 CS Origination

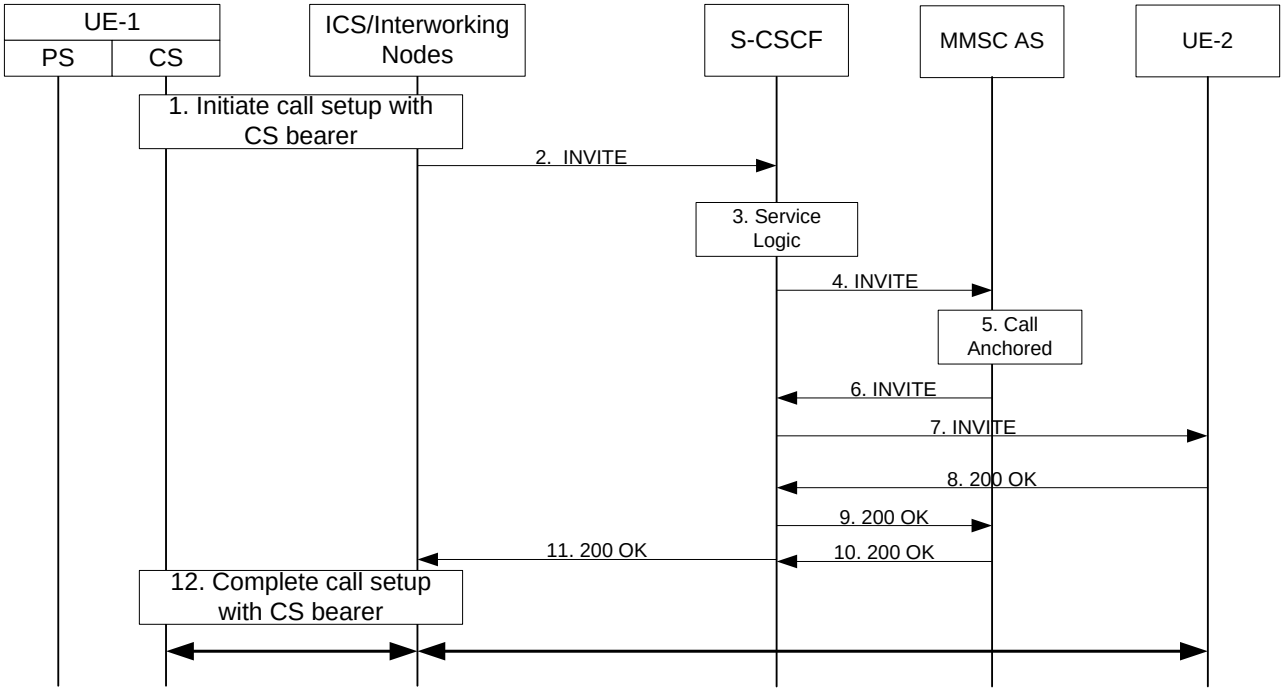


Figure 6.5.1-1: CS origination anchored at the MMSC AS

1. UE-1 initiates a call to UE-2 and request the call to be setup with CS bearer.
2. After processing at ICS/Interworking nodes, the resulting INVITE is sent to the S-CSCF.
3. The S-CSCF invokes appropriate service logics.
4. The S-CSCF forwards the INVITE to the MMSC AS.
5. The session is anchored at the MMSC AS.

6~7. The MMSC AS sends INVITE to the remote end point for session establishment.

8~12. The session is established between UE-1 and the remote end point.

6.5.1.2 CS Termination

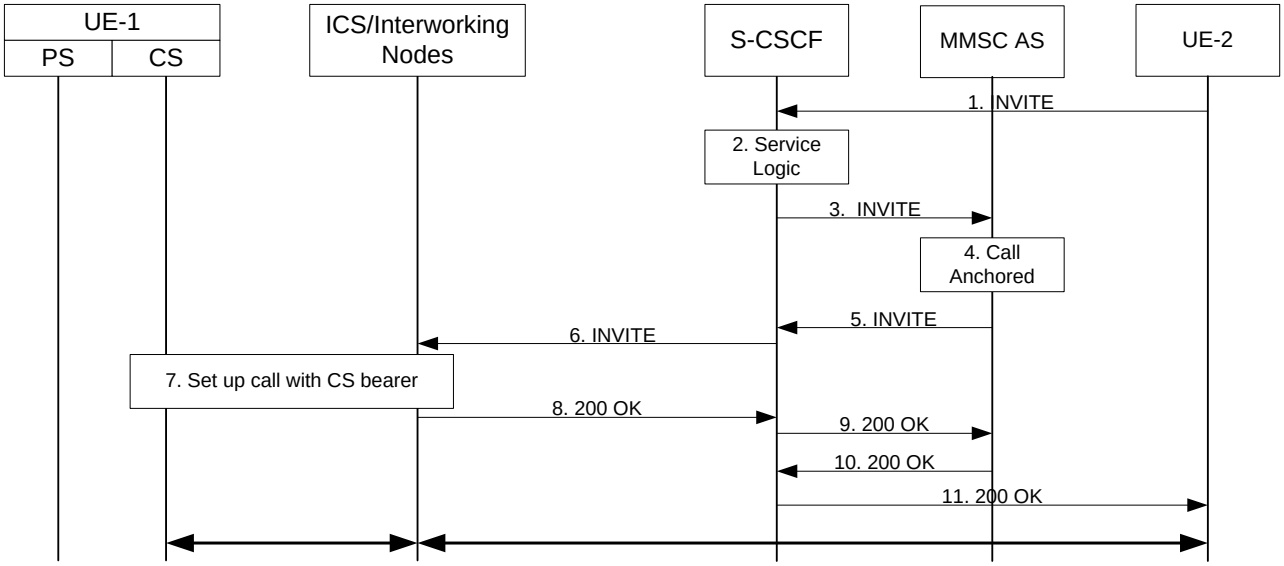


Figure 6.5.1-2: CS termination anchored at the MMSC AS

1. UE-2 sends INVITE to UE-1 to establish a session and the INVITE reaches the S-CSCF serving UE-1.
2. The S-CSCF invokes appropriate service logic for UE-1.
3. The S-CSCF forwards the INVITE to the MMSC AS.
4. The session is anchored at the MMSC AS.

5~6. The MMSC AS determines that the call will be delivered on the CS domain and sends INVITE to the ICS/Interworking nodes.

7. The ICS/Interworking nodes interacts with UE-1 and set up CS call.

8~11. The session is established between UE-1 and the remote end point.

6.5.1.3 PS and CS Combined Origination

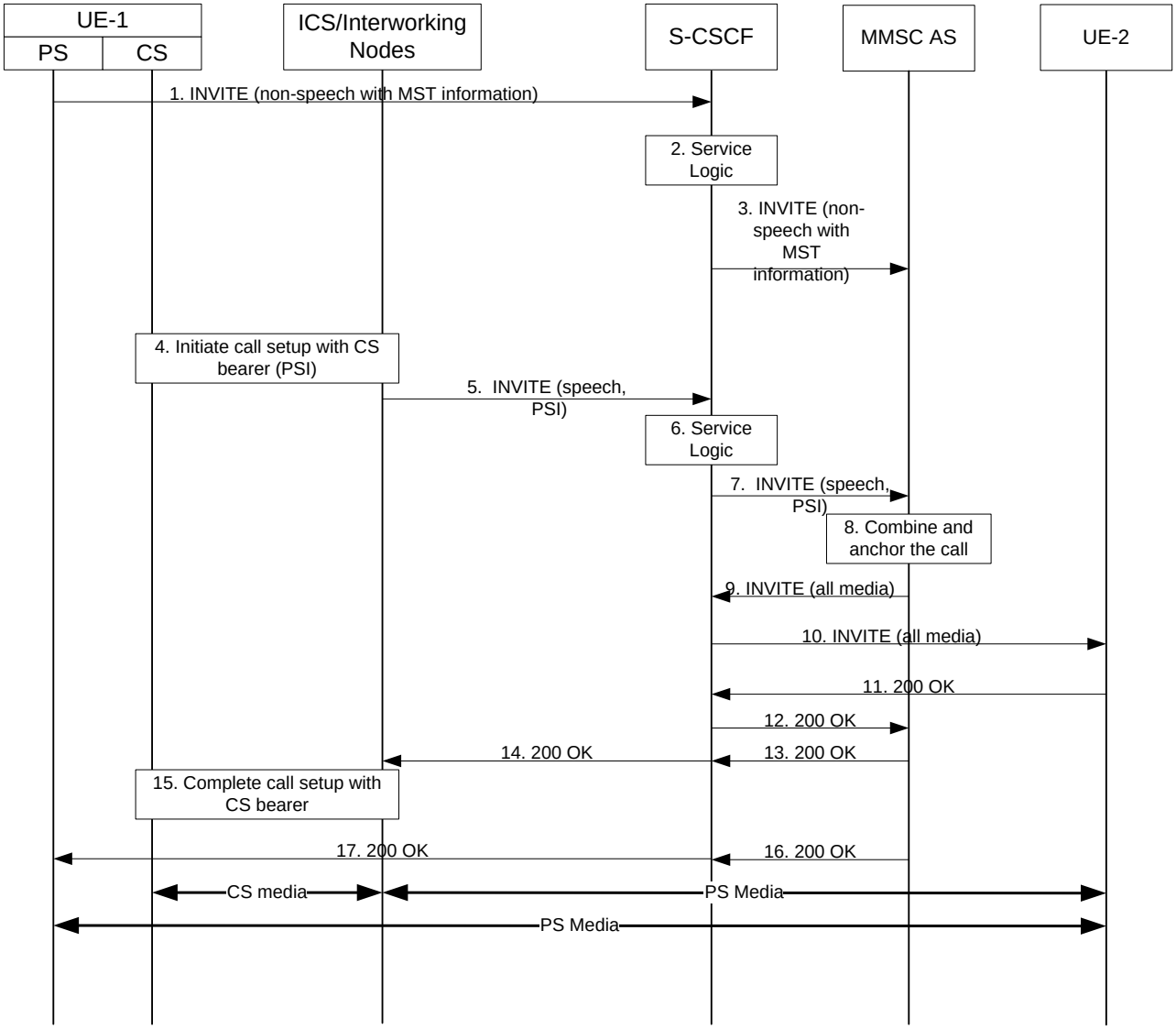


Figure 6.5.1-3: PS and CS combined origination anchored at the MMSC AS

1. UE-1 wants to initiate a multimedia session with UE-2 with speech components carried on CS bearers and non-speech components carried on PS bearers. Therefore the multimedia session is split into two parts, each one corresponding to a separate access leg. UE-1 initiates the establishment of the first access leg by sending and INVITE request with non-speech media components. The INVITE contains MST information indicating that a second access let (with the speech component) will be originated from the CS domain.

2. The S-CSCF executes any service logic as appropriate.

3. The S-CSCF sends the INVITE to the MMSC AS. The MMSC AS identifies that this access leg has to be correlated to a subsequent access leg based on the MST information in the INVITE.

Editor's note: It is FFS whether the MST information includes the called party number that is used to setup the CS bearer in step 5.

4. UE-1 request to set up call with CS bearer. The called party number is set to an identifier such as a PSI DN, which is used to indicate to the MMSC AS that this access leg is to be combined with a PS leg. The DN is either statically configured on the UE or assigned to the UE by the network upon IMS Registration.

Editor's note: Besides PSI DN, other identifier as called party number is FFS.

5. After processing at ICS/Interworking nodes, the resulting INVITE is sent to the S-CSCF.

6. The S-CSCF executes any service logic as appropriate.

7. The S-CSCF sends the INVITE to the MMSC AS. The MMSC AS identifies that this CS leg has to be correlated to a PS leg based on the PSI DN in the INVITE.

NOTE: As step 1 and step 4 are parallel, when either INVITE in step 3 or 7 firstly arrives at MMSC AS, MMSC AS anchors the session and waits for the other INVITE to arrive before performing the combination in step 8.

8. After the MMSC AS receives both the INVITE requests in step 3 and in step 7, the MMSC AS identifies that they are part of the same multimedia session and combines the two access legs of the session by checking the caller's identity and anchor the combined session.

9~10. The MMSC AS sends INVITE to the remote end point for combined session establishment.

11~12. The session is established between UE-1 and the remote end point.

6.5.1.4 PS and CS Combined Termination

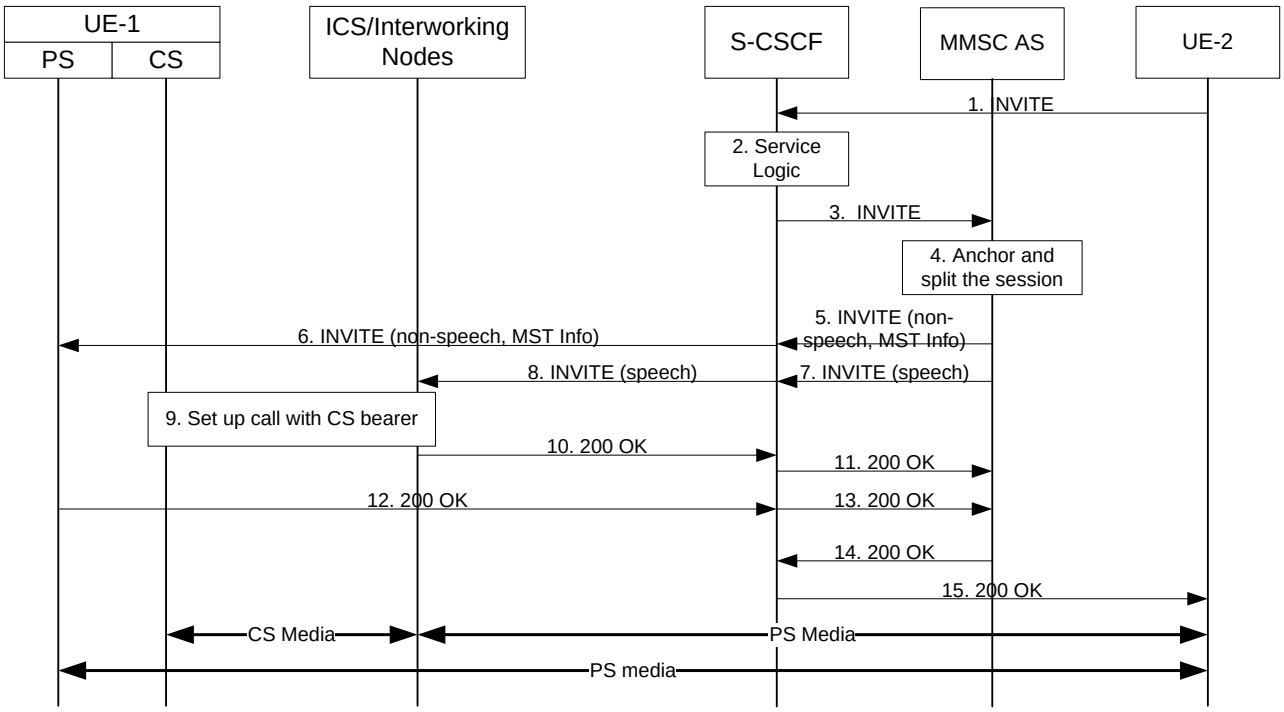


Figure 6.5.1-4: PS and CS combined termination anchored at the MMSC AS

Editor Note: This flow needs revision based on discussion regarding T-ADS execution by the ICS interworking

1. UE-2 sends INVITE to UE-1 to establish a session with both speech and non-speech components.

2. The S-CSCF executes any service logic as appropriate.

3. The S-CSCF forwards the INVITE to the MMSC AS based on iFC triggers.

4. The session is anchored at the MMSC AS. Based on operator policy and on information indicating that UE-1 is accessible over both the PS and CS domains, the MMSC AS decides to split the session over PS and CS domains. This behaviour is similar to the behaviour of a CSI AS specified in TS 23.279 [9]

5~6. The MMSC AS sends INVITE for the non-speech part of the session. The INVITE contains MST information indicating that the speech component will be established from the CS domain.

7~8. The MMSC AS sends INVITE for the speech part of the session and the S-CSCF forwards the INVITE to the ICS/Interworking nodes.

9. The ICS/Interworking nodes set up call to UE-1 with CS bearer.

Editor's Note: It is FFS whether MST information needs to be included in step 7~9.

10~11. The speech part of the session is established.

12~13. The non-speech part of the session is established.

14~15. The session is established between UE-1 and the remote end point.

6.5.2 Information flow for providing PS-PS session continuity

6.5.2.1 PS-PS session continuity with P-CSCF change and full media transfer

UE-1 is on an active multimedia session with UE-2 via one IP-CAN. After changing to a new IP-CAN, obtaining new signalling and media addresses, and completing the session continuity procedures, UE-1 continues the multimedia session with UE-2 on the new IP-CAN. UE-1 is attached to a new P-CSCF after the session continuity procedures.

NOTE: This scenario requires the UE and IMS network to support simultaneous multiple registrations and requires the UE to support dual mode operation in both IP-CAN networks.

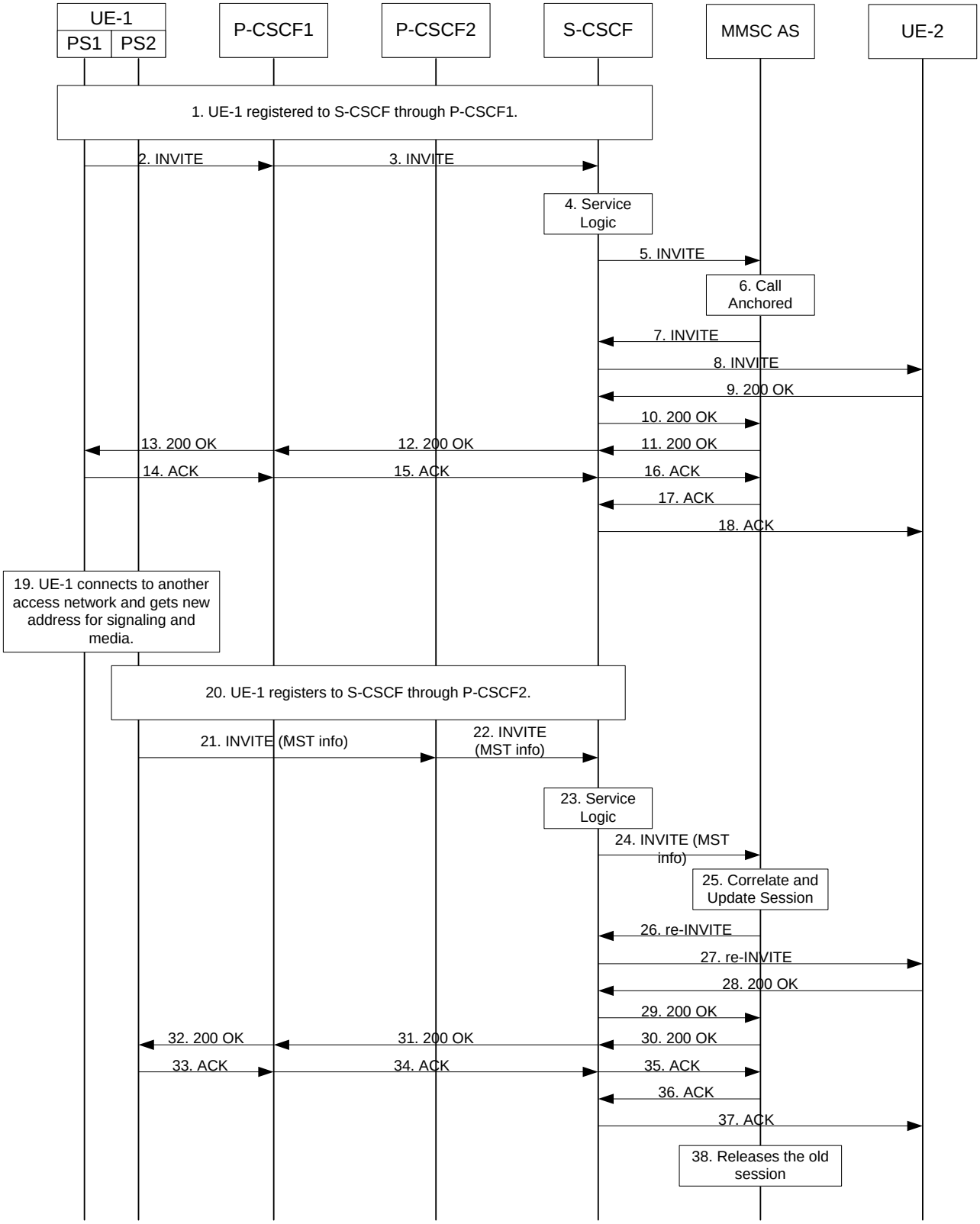


Figure 6.5.2-1: Information flow for PS to PS multimedia session continuity

1. UE-1 on PS1 registers to S-CSCF via P-CSCF1.
2. The MMSC user originates a multimedia session in PS1 access systems.
3. The P-CSCF1 routes the INVITE to the S-CSCF.
4. The S-CSCF invokes the necessary service logic as appropriate.

5. The S-CSCF forwards the INVITE to the MMSC AS over the ISC interface.

6. The MMSC AS anchors the multimedia session depending on operator policy.

7~8. The MMSC AS sends the INVITE to UE-2.

9-13. UE-2 accepts the initial session setup by sending to UE-1 a 200 OK response.

14-18. UE-1 send ACK to UE-2.

19. The UE-1 connects to another IP-CAN, PS2. UE-1 decides to perform PS to PS session continuity based on MMSC policy information received from the IMS Network.

20. UE-1 on PS2 registers to S-CSCF via P-CSCF2.

21. UE-1 sends an INVITE message on the PS2 access system towards the MMSC AS. The INVITE message includes MST information indicating to the MMSC AS that this request is for session continuity.

22. The P-CSCF2 routes the INVITE to the S-CSCF.

23. The S-CSCF invokes the necessary service logic as appropriate.

24. The S-CSCF forwards the INVITE to the MMSC AS over the ISC interface.

25. The MMSC AS correlates and updates the multimedia session based on the ST Information.

26~27. The MMSC AS sends the re-INVITE to UE-2 for session update.

28-32. UE-2 accepts the re-INVITE by sending a 200 OK response.

33-37. UE-1 sends ACK to UE-2.

38. The MMSC AS releases the original call leg established on PS1 IP-CAN.

6.5.2.2 PS-PS session continuity with P-CSCF change and partial media transfer

UE-1 is on an active multimedia session with UE-2 via one IP-CAN. After changing to a new IP-CAN, obtaining new signalling and media addresses, and completing the session continuity procedures, UE-1 transfers part of the multimedia session with UE-2 to the new IP-CAN and keep the remaining part on the original IP-CAN. UE-1 is attached to both the new and old P-CSCFs after the session continuity procedures. The call flow is the same as shown in clause 6.5.2.1. The only difference is that in Steps 21~22, the INVITE needs to indicate that the request is for a partial transfer and instead of releasing the old call leg in Step 38, the AS may send re-INVITE or UPDATE to update session information over the old access leg. In this case, the MST Info included in the INVITE message sent in steps 21~22 shall indicate the media components which need to be transferred to the new PS domain (PS2).

NOTE: This scenario requires the UE and IMS network to support simultaneous multiple registrations and requires the UE to support dual mode operation in both IP-CAN networks.

6.5.2.3a PS-PS session continuity with full media transfer with no P-CSCF change and no change in Signalling address

Editor's Note: It is FFS how NAT traversal and PCC will work for this scenario.

UE-1 is on an active multimedia session with UE-2 via one IP-CAN. After changing to a new IP-CAN, obtaining new media addresses, and completing the session continuity procedures, UE-1 continues the multimedia session with UE-2 on the new IP-CAN. The signalling is still continued using the old IP-CAN.

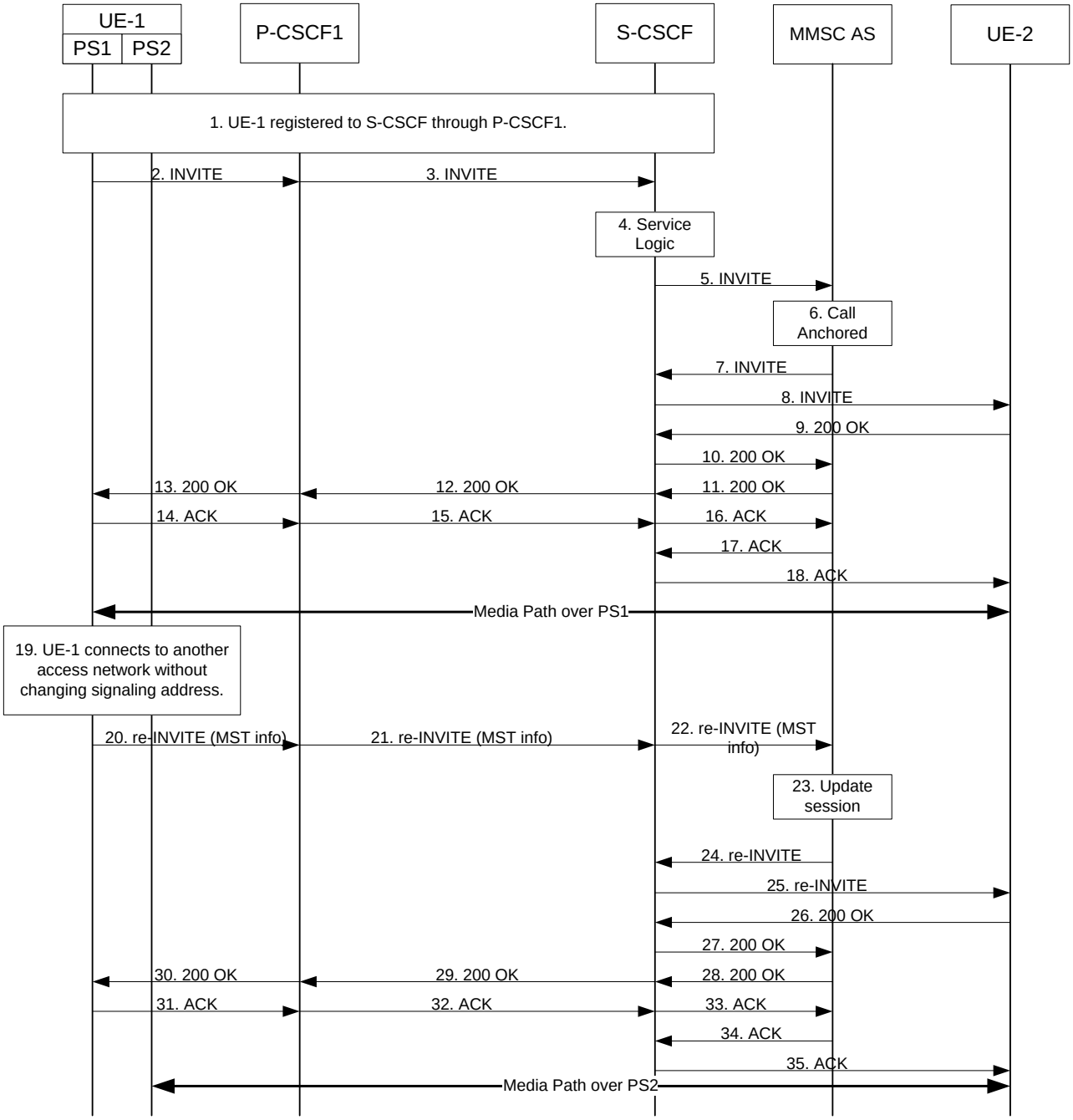


Figure 6.5.2-2a: Information flow for PS to PS multimedia session continuity with no P-CSCF change

1. UE-1 on PS1 registers to S-CSCF via P-CSCF1.
2. UE-1 sends INVITE to originate a multimedia session with UE-2.
3. P-CSCF1 routes the INVITE to the S-CSCF.
4. The S-CSCF invokes the necessary service logic as appropriate.
5. The S-CSCF forwards the INVITE to the MMSC AS over the ISC interface.
6. The MMSC AS anchors the multimedia session depending on operator policy.

7~8. The MMSC AS sends the INVITE to UE-2.

9-13. UE-2 accepts the initial session setup by sending to UE-1 a 200 OK response.

14-18. UE-1 send ACK to UE-2.

19. UE-1 connects to another IP-CAN, PS2 and decides to perform PS to PS session continuity based on MMSC policy information received from the IMS Network.

20~22. UE-1 sends an re-INVITE message on the PS1 IP-CAN towards the MMSC AS. The re-INVITE message includes MST information and notifies the MMSC AS to perform session continuity.

23. The MMSC AS correlates and updates the multimedia session based on the ST Information.

24~25. The MMSC AS sends re-INVITE to UE-2 to update the session.

26-30. UE-2 accepts the re-INVITE by sending a 200 OK response.

31-35. UE-1 sends ACK to UE-2.

6.5.2.3b PS-PS session continuity with full media transfer with no P-CSCF change and with change in Signalling address

UE-1 is on an active multimedia session with UE-2 via one IP-CAN. After changing to a new IP-CAN, obtaining new media addresses, and completing the session continuity procedures, UE-1 continues the multimedia session with UE-2 on the new IP-CAN. The signalling is continued using the new IP-CAN.

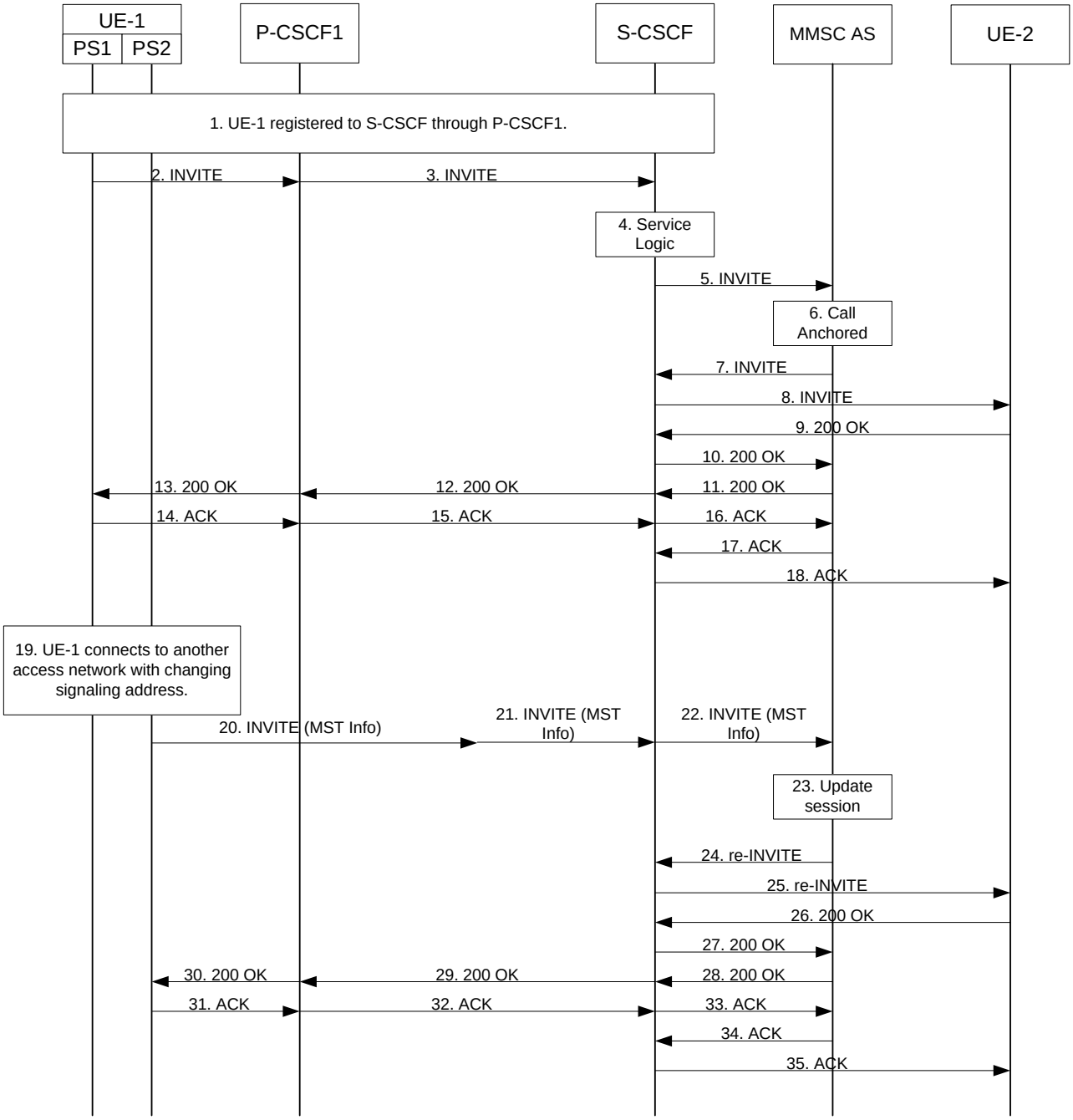


Figure 6.5.2-2b: Information flow for PS to PS multimedia session continuity with no P-CSCF change

1. UE-1 on PS1 registers to S-CSCF via P-CSCF1.
2. UE-1 sends INVITE to originate a multimedia session with UE-2.
3. P-CSCF1 routes the INVITE to the S-CSCF.
4. The S-CSCF invokes the necessary service logic as appropriate.
5. The S-CSCF forwards the INVITE to the MMSC AS over the ISC interface.
6. The MMSC AS anchors the multimedia session depending on operator policy.

7~8. The MMSC AS sends the INVITE to UE-2.

9-13. UE-2 accepts the initial session setup by sending to UE-1 a 200 OK response.

14-18. UE-1 send ACK to UE-2.

19. UE-1 connects to another IP-CAN, PS2 and decides to perform PS to PS session continuity based on MMSC policy information received from the IMS Network.

20~22. UE-1 sends an INVITE message on the PS2 IP-CAN towards the MMSC AS. The INVITE message includes MST information and notifies the MMSC AS to perform session continuity.

23. The MMSC AS correlates and updates the multimedia session based on the ST Information.

24~25. The MMSC AS sends re-INVITE to UE-2 to update the session.

26-30. UE-2 accepts the re-INVITE by sending a 200 OK response.

31-35. UE-1 sends ACK to UE-2.

6.5.2.4a PS-PS session continuity with partial media transfer with no P-CSCF change and no change in Signalling address

Editor's Note: It is FFS how NAT traversal and PCC will work for this scenario.

UE-1 is on an active multimedia session with UE-2 via one IP-CAN. After changing to a new IP-CAN, obtaining new media addresses, and completing the session continuity procedures, UE-1 transfers part of the multimedia session with UE-2 to the new IP-CAN and keep the remaining part on the original IP-CAN. UE-1 is attached to the same P-CSCF after the session continuity procedures. The call flow is the same as shown in clause 6.5.2. 3a. The only difference is that in Steps 20~22, the re-INVITE needs to indicate that the request is for a partial transfer. In this case, the MST Info included in the INVITE message sent in steps 20~22 shall indicate the media components which need to be transferred to the new PS domain (PS2). The signalling is continued using the old IP-CAN.

NOTE: This scenario requires UE-1 to support dual mode operation in both IP-CAN networks.

6.5.2.4b PS-PS session continuity with partial media transfer with no P-CSCF change and with change in Signalling address

UE-1 is on an active multimedia session with UE-2 via one IP-CAN. After changing to a new IP-CAN, obtaining new media addresses, and completing the session continuity procedures, UE-1 transfers part of the multimedia session with UE-2 to the new IP-CAN and keep the remaining part on the original IP-CAN. UE-1 is attached to the same P-CSCF after the session continuity procedures. The call flow is the same as shown in clause 6.5.2.3b. The only difference is that in Steps 20~22, the INVITE needs to indicate that the request is for a partial transfer. The signalling is continued using both the old and new IP-CAN.

NOTE: This scenario requires UE-1 to support dual mode operation in both IP-CAN networks.

6.5.3 Information flows for PS-PS session continuity in conjunction with PS-CS session continuity

6.5.3.1 Session transfer: the multi-media session transferred to combined sessions

Figure 6.5.3-1 describes the information flows for transferring a multi-media session speech via PS2 to CS access in conjunction with PS access.

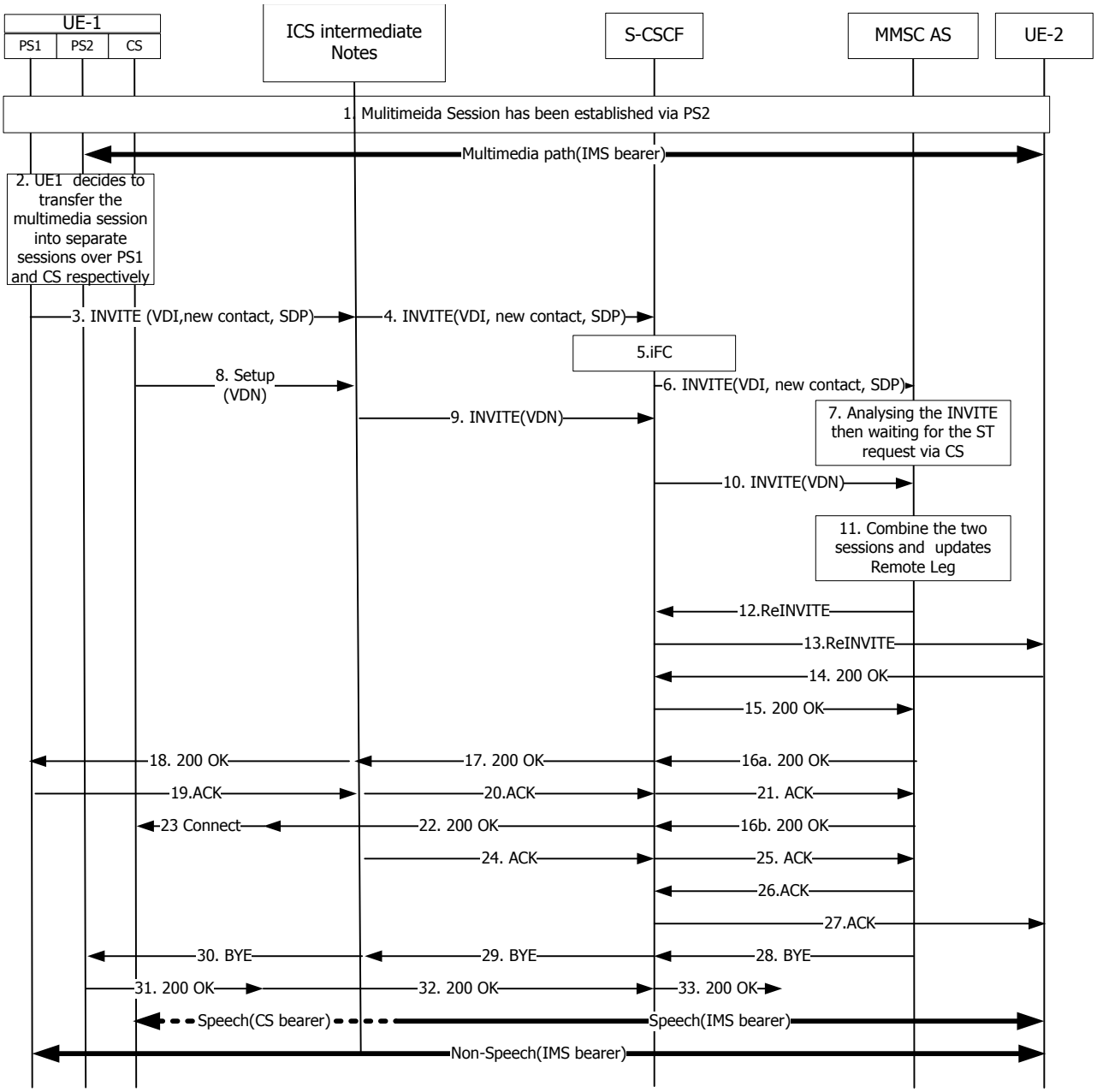


Figure 6.5.3-1: Information flow for session transfer

1. The MMSC user is engaged in an active multimedia session with UE-2 via I-WLAN(PS2).

2-3. UE-1 sends the INVITE request with a new contact information, a suitable information to replace the existing session, VDI and modified SDP (multimedia and hint for CS voice bearer).

4. The session establishment request is routed to the S-CSCF by the P-CSCF.

5. The S-CSCF invokes the MMSC Application as the first Application Server of any Application Servers that need to remain in the path of the call after session transfer.

6. The S-CSCF forwards the INVITE to the MMSC Application over the ISC interface.

7. The MMSC Application analyses the INVITE from which the MMSC is able to derive:

   - That the INVITE is for session transfer;

   - That the INVITE is in conjunction with another call leg:

   - Whether to merge or split the session(s):

- Description of the corresponding transferred session(s) and media(s) to be transferred:

The MMSC decides to wait for the session transfer request in CS access.

8. UE-1 origins a CS call including VDN to indicate to the network that this is a session transfer request.
9. The ICS intermediate Nodes convert the request into IMS SIP format and then forward the converted request to the S-CSCF.

Editor's Note: It is FFS how ICS intermediate Nodes convert the session transfer request received from CS access.

10. The S-CSCF forwards the INVITE to the MMSC Application over the ISC interface from which the MMSC AS is able to derive:

- That the INVITE is for session transfer;
- That the INVITE is in conjunction with another call leg:

11. The MMSC Application correlates the two requests and decides to update the Remote leg.

Editor's Note: It is FFS how to correlate the two requests received from different domains.

12-27. The MMSC Application updates the Remote Leg with the connection information of the received sessions and completes the establishment of the two Access legs.

28-33. The MMSC Application initiates to release the old access leg.

NOTE: The UE-1 may also initiate the release procedure.

6.5.3.2 The two split sessions transferred into one multimedia session over another access

In this flow, the MMSC Application analyses the session transfer information and decide to transfer the media carried in CS bearer to IP-CAN.

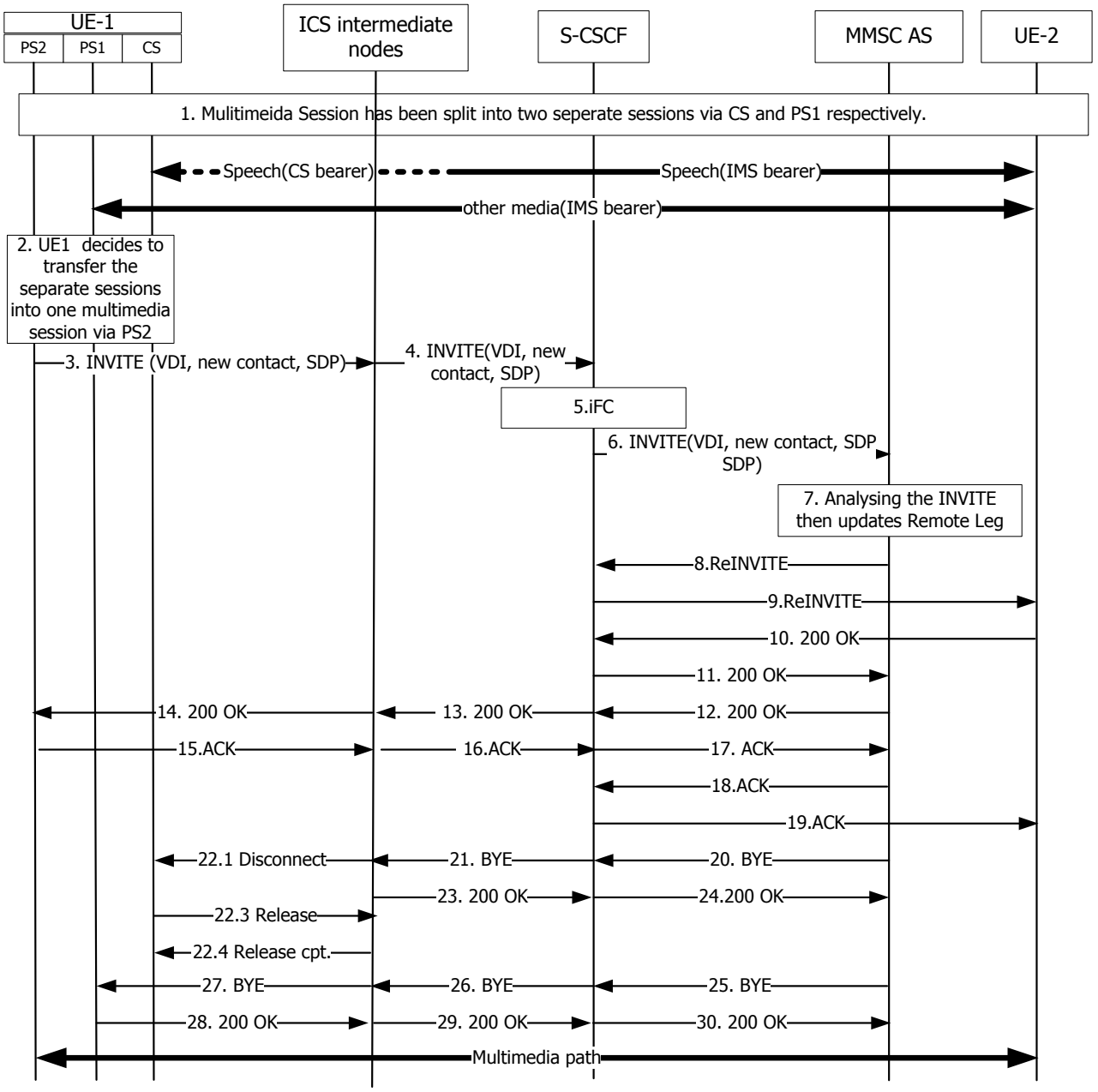


Figure 6.5.3-2: Information flow for CS multimedia session transfer

1. The MMSC user is on an active multimedia session which is split into two separate sessions, one part via PS1 access and the other part via CS access.

2-3. When the UE-1 determines a need to transfer two separate sessions to one session via PS2, the UE-1 subsequently sends the INVITE request with new contact information, suitable information to replace the existing session, the VDI and modified SDP to indicate to the MMSC Application to transfer the split sessions via CS access and PS2 access to the establishing session via PS2 access.

4. The session establishment request is routed to the S-CSCF by intermediate nodes.

5. The S-CSCF invokes the MMSC Application as the first Application Server of any Application Servers that need to remain in the path of the call after session transfer.

6. The S-CSCF forwards the INVITE to the MMSC Application over the ISC interface.

7. The MMSC Application analyses the INVITE from which the MMSC AS is able to derive:

   - That the INVITE is for session transfer;

- Whether to merge or split the session(s):

- Description of the corresponding session(s) and media(s) to be transferred:

8-19. After identifying transfer a multimedia session via PS2, the MMSC Application performs the session transfer by updating the Remote leg with the connection information of the newly updated Access Leg 1.

20-24. The MMSC Application initiates to release the old access leg via CS access in this example, however the UE-1 may initiate to release the source Access Leg.

25-30. The source Access Leg 2(which is one of the Access Legs previously established over PS1) is released by the MMSC Application in this example, however the UE-1 may initiate to release the source Access Leg 2.

6.5.4 Information flow for PS-CS session continuity

6.5.4.1 Session transfer: the real time media component (video and speech) transferred to the CS access

Figure 6.5.4-1 describes the information flows for transfer real time media component (video and speech) to CS access.

In this flow, the MMSC Application needs to wait for the H245 negotiation complete before it updates the remote access leg.

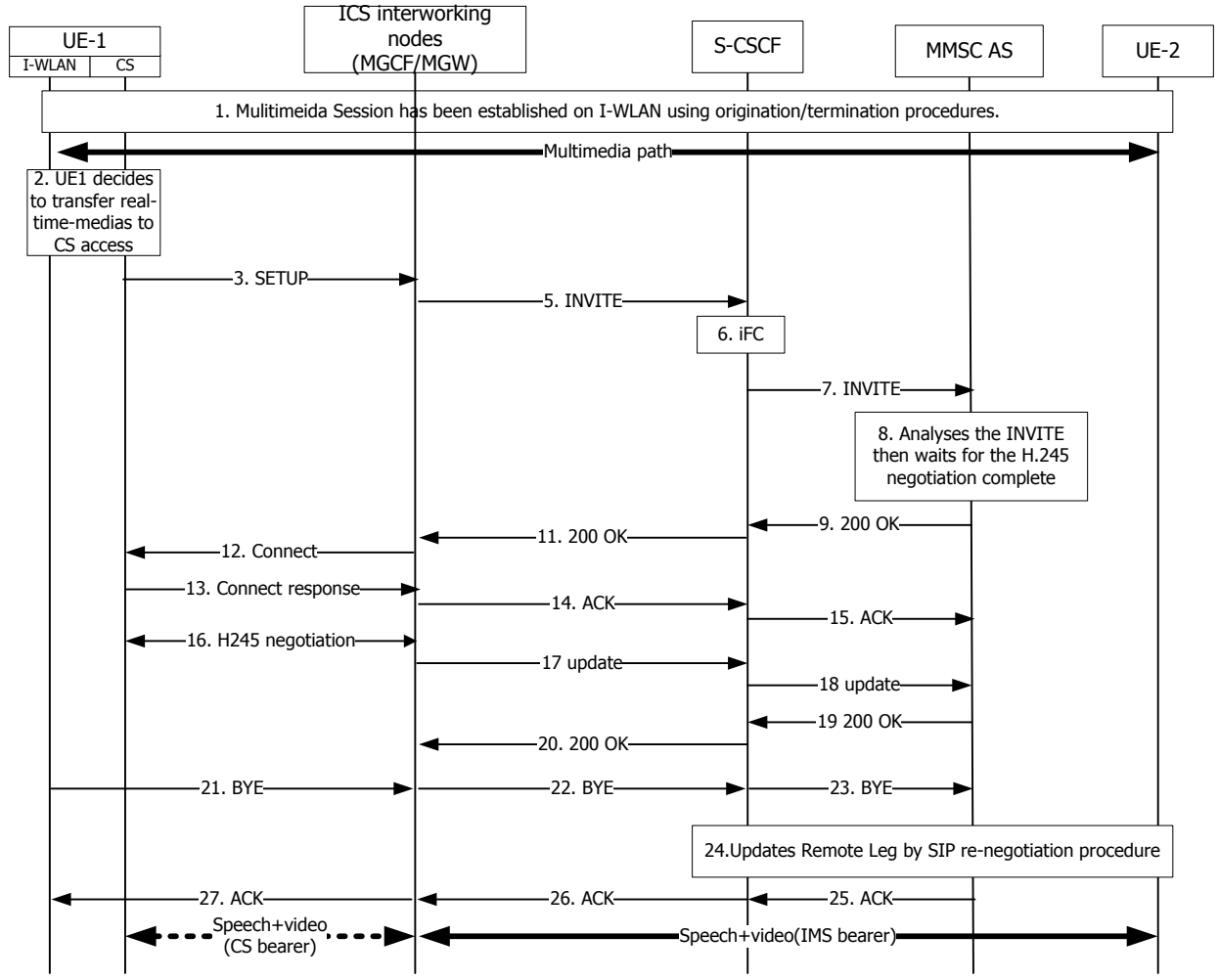


Figure 6.5.4-1: Information flow for CS multimedia session transfer

1. The MMSC user is engaged in an active multimedia session including real-time(including speech and video) and non-real-time media components with UE-2 via I-WLAN.

2-3. UE-1 originates a multimedia call in the CS domain including the VDN and MST information to request the real time media transfer to CS access.

Editor's Note: It is FFS how to transfer the MST information in CS network. Anyhow the solutions shall not have impact on VMSC.

5. The ICS intermediate Nodes convert the request into IMS SIP format and then forward the converted request to the S-CSCF.

Editor's Note: It is FFS how ICS intermediate Nodes convert the session transfer request received from CS access.

6. The S-CSCF invokes the MMSC Application as the first Application Server of any Application Servers that need to remain in the path of the call after session transfer.

7. The S-CSCF forwards the INVITE to the MMSC Application over the ISC interface.

8-15. The MMSC Application analyses the INVITE to derive that the INVITE is a request to transfer a multimedia session with video and voice media components to the CS domain. In order to avoid the service interruption of CS multimedia call the MMSC Application firstly completes the CS leg establishment by sending 200 OK responses to the transfer request and waits for the H.245 negotiation completion and receives ACK request.

16. UE and MGCF/MGW starts in band H245 negotiation.

17-20. After the H245 negotiation is done, MGCF sends Update towards MMSC AS and receives 200 OK response.

21-23. The UE-1 initiates to release the old access leg after the completion of the H.245 in-band negotiation procedure. The release request is forwarded to the MMSC Application.

24. After determining that the H.245 in-band negotiation procedure for the CS multimedia call is complete by the indication received from the UE or the MGCF, the MMSC Application updates the Remote Leg with the connection information of the newly established Access Leg.

25-27. The MMSC Application acknowledges the BYE request with a 200 OK response.

NOTE 1: If the non real time media component will be remained, the source Access Leg may be updated by session re-negotiation.

NOTE 2: If ICS is using the MSC server enhanced for ICS approach, the H.245 negotiation with UE would be executed by the MSC server enhanced for ICS, and the H.245 negotiation complete indication would be sent by the MSC server enhanced for ICS to MMSC AS.

6.5.5 Information flow for providing UE Transfer

6.5.5.1 Information flow for transferring media components to different UEs

6.5.5.1.1 Alternative 1

In this Alternative, a UE requests to transfer one or more media components to another UE (the transfer target) by sending a REFER request to this UE.

In the example flow shown below, UE-1 initiates the media transfer to UE-2 by sending a REFER request to UE-2 populated with the appropriate session transfer information (ST Info). This triggers UE-2 to send an INVITE request to MMSC AS requesting the appropriate media from the Remote UE.

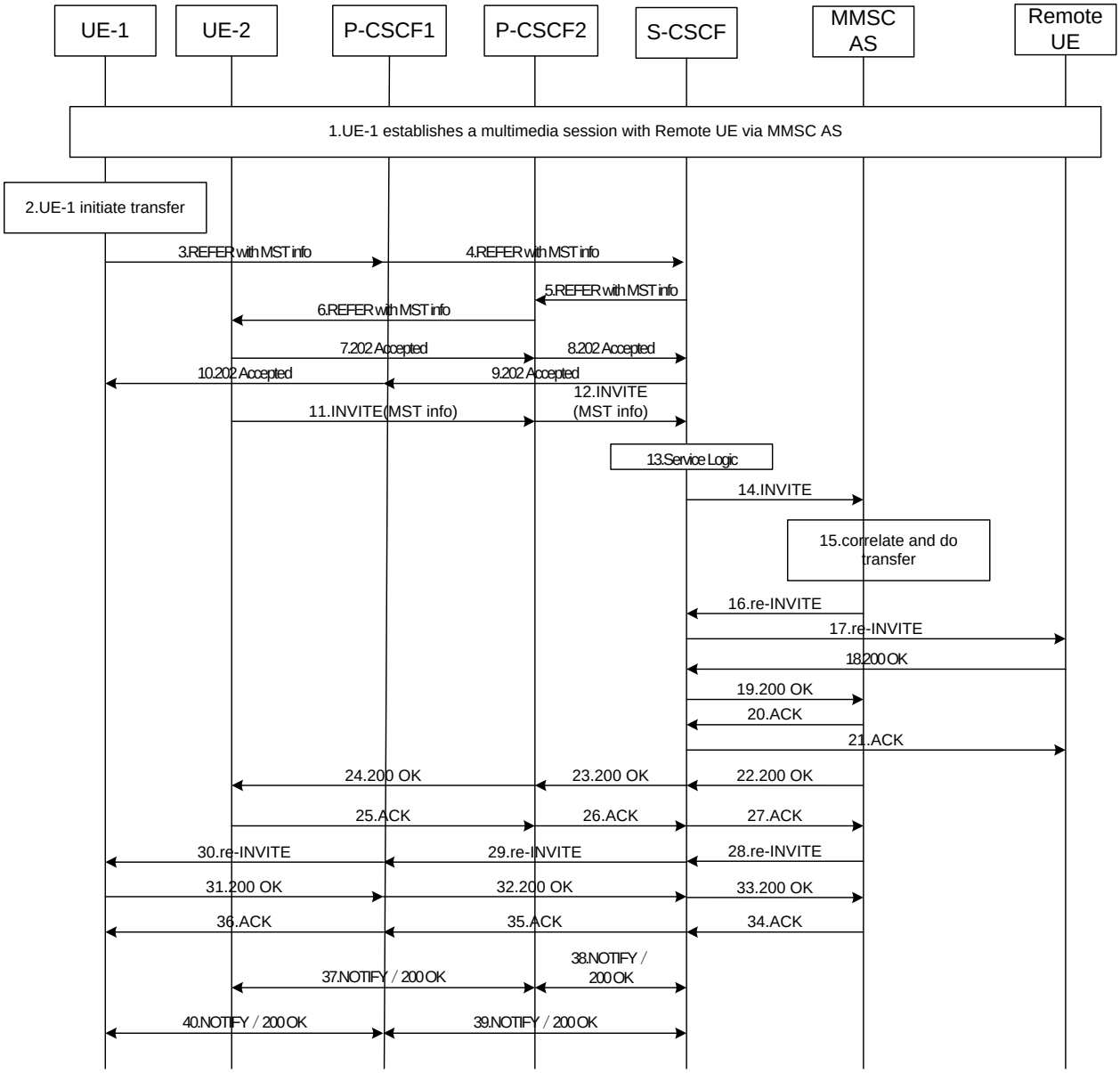


Figure 6.5.5.1-1: UE-1 transfers media components to UE-2

1. UE-1 establishes a multimedia session with Remote UE via MMSC AS.

2. The UE-1 perform session continuity to transfer one media to UE-2 under the control of the MMSC user.

3. The UE-1 originates a REFER in the PS access system towards the UE-2. The REFER message includes MST information which notifies to the MMSC AS that this is for multimedia session continuity to transfer the specified media from the specified session of UE-1 media to the UE-2.

4. The P-CSCF1 routes the REFER to the S-CSCF.

5. The S-CSCF routes the REFER to the P-CSCF2.

6. The P-CSCF2 routes the REFER to the UE-2.

7-10. The UE-2 accepts the transfer request by sending to UE-1 a 202 Accepted response.

NOTE: The above steps may be skipped in case the user initiates media transfer by sending INVITE directly from UE-2 without receiving REFER message from UE-1.

11. The UE-2 originates an INVITE message towards the MMSC AS. The INVITE message includes necessary MST information which notifies to the MMSC AS that this is for multimedia session continuity to transfer the media from UE-1.

12. The P-CSCF2 routes the INVITE to the S-CSCF.

13. The S-CSCF invokes the necessary service logic as appropriate.

14. The S-CSCF forwards the INVITE to the MMSC AS over the ISC interface.

15. The MMSC AS correlates the new access leg with the remote leg of the multimedia session between the MMSC AS and the Remote UE and updates the remote leg.

16. The MMSC AS sends a re-INVITE/UPDATE to the S-CSCF for session update.

17. The S-CSCF routes the re-INVITE/UPDATE to the Remote UE per TS 23.228 [7].

18-19. The Remote UE accepts the re-INVITE/UPDATE by sending a 200 OK response to the MMSC AS.

20-21. The MMSC AS sends an ACK response to the Remote UE.

22-24. The MMSC AS accepts session continuity message from the Remote UE by sending to UE-2 a 200 OK response.

25-27. UE-2 sends an ACK response to the MMSC AS.

28-36. The old access leg which is the access leg previously established is subsequently updated for deleting the transferred media of the multimedia session by the MMSC AS.

NOTE: The old Access Leg may be subsequently released by the MMSC AS optionally.

37-40. UE-2 sends the NOTIFY message to UE-1 via P-CSCF2, S-CSCF and P-CSCF1, and UE-1 responses to UE-2 by sending a 200 OK.

6.5.5.1.2 Alternative 2

In this Alternative, a UE requests to transfer one or more media components to another UE (the transfer target) by sending a REFER request to MMSC AS. The REFER message doesn't need to be sent to the transfer target.

In the example flow shown below, UE-1 has established a multimedia session with a Remote UE, which is anchored at the MMSC AS. The multimedia session contains several media components and UE-1 wants to transfer one or more of them to another UE (i.e. UE-2). The media component(s) which should be transferred to UE-2 are indicated as "multimedia stream-2" whereas the media components which are not affected by the media transfer procedure are indicated as "multimedia stream-1". It is assumed that UE-1 and UE-2 belong to the same subscriber (i.e. they share the same subscription).

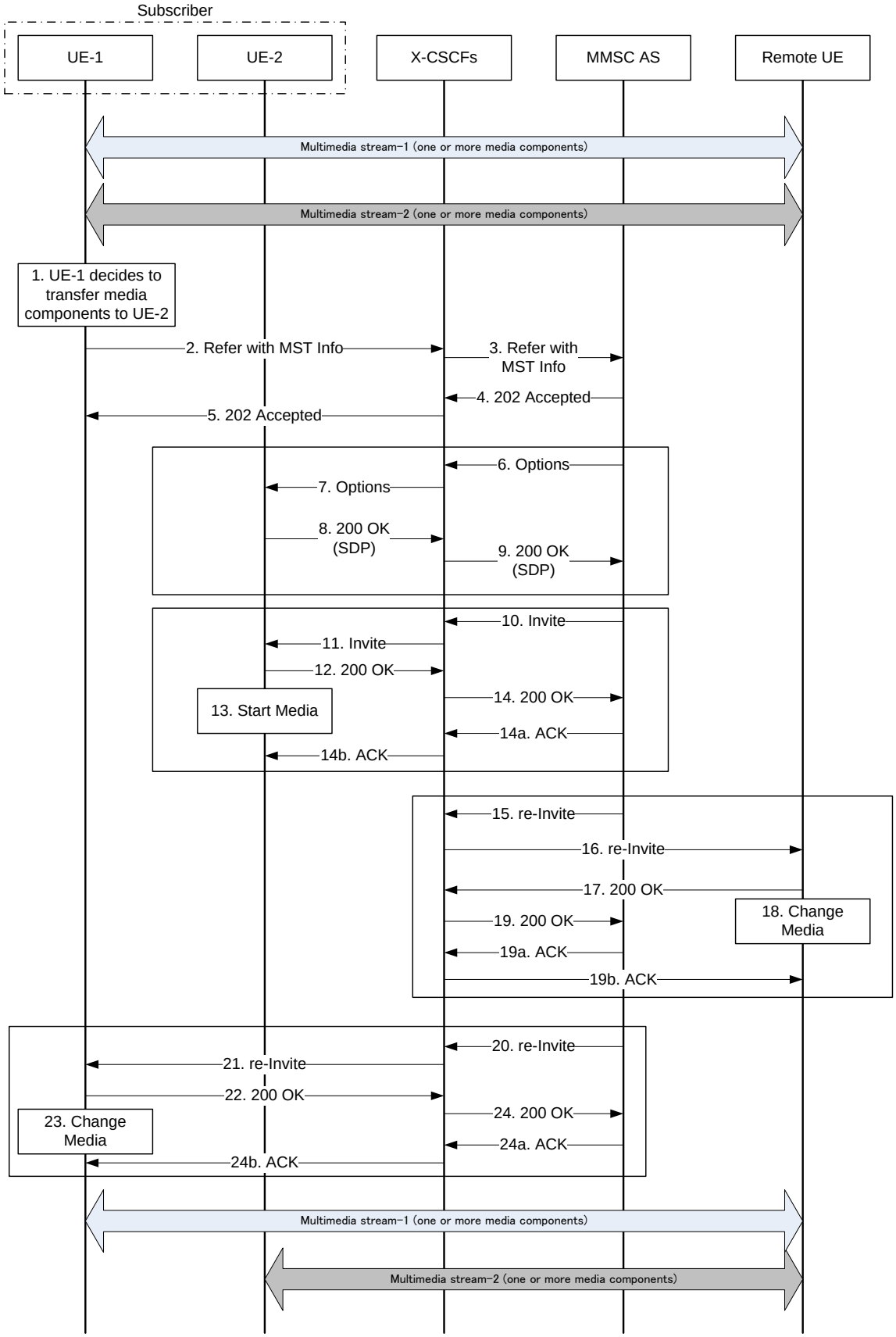


Figure 6.5.5.1-2: UE-1 transfers media components to UE-2

NOTE: For simplicity, not all SIP messages are shown in the figure above.

1. UE-1 decides to transfer some of the media components to UE-2.

2~5. UE-1 sends REFER request to the MMSC AS with MST information, which indicates to MMSC AS that media transfer to UE-2 is requested. The REFER request identifies:

- the type of the requested action (in this case, "transfer media to another device");
- the target of the media addition (i.e. UE-2) in the Refer-To header; and
- details about the existing media component(s) to be transferred, e.g. type of media component(s), the dialog associated with these media components, etc.

The MMSC AS authorizes this request, i.e. it verifies that UE-1 is entitled to request this media transfer to UE-2 and initiates the media component transfer procedure.

Editor's note: How MMSC AS authorizes the request for media transfer is FFS.

6-9. The MMSC AS may request the capabilities of UE-2 (i.e. the supported Codecs, media types, etc.).

10-14. The MMSC AS sends an INVITE request to UE-2 proposing the media parameters corresponding to the transferred media. When UE-2 receives the media parameters, it returns an answer and starts sending/receiving the data stream.

15-19. The MMSC AS sends a re-INVITE to the Remote UE to update the remote leg. The re-INVITE proposes new SDP parameters based on the parameters received from UE-2 in step 14. When the Remote UE receives the new media parameters, it returns an answer and starts the reception/transmission of these media components.

20-24. The MMSC AS proposes new media parameters to UE-1 (by sending a re-INVITE request) in order to deactivate the media components that were transferred to UE-2. When UE-1 receives the media parameters, it returns an answer and stops sending / receiving these media components.

The above steps 15-19 and 20-24 can be executed in parallel.

NOTE: If after media transfer, there are no media components left on UE-1, steps 20-24 will not take place. Instead, the MMSC AS will release the multimedia session with UE-1.

6.5.5.1.3 Flow for transferring media components to different UEs

This signaling flow for media transfer is shown in the figure below. In this example, UE-1 is using an IP-CAN/PS domain and has a multimedia session with a Remote UE, which is anchored at the MMSC AS. The multimedia session contains several media components and UE-1 wants to transfer one or more of them to another UE (i.e. UE-2). In this example, UE-2 is also using an IP-CAN/PS domain. The media component(s) which should be transferred to UE-2 are indicated as "multimedia stream-1" whereas the media components which are not affected by the media transfer procedure are indicated as "multimedia stream-2". It is assumed that UE-1 and UE-2 belong to the same subscriber (i.e. they share the same subscription).

Editor's Note: The transfer of TCP-based media components needs further study.

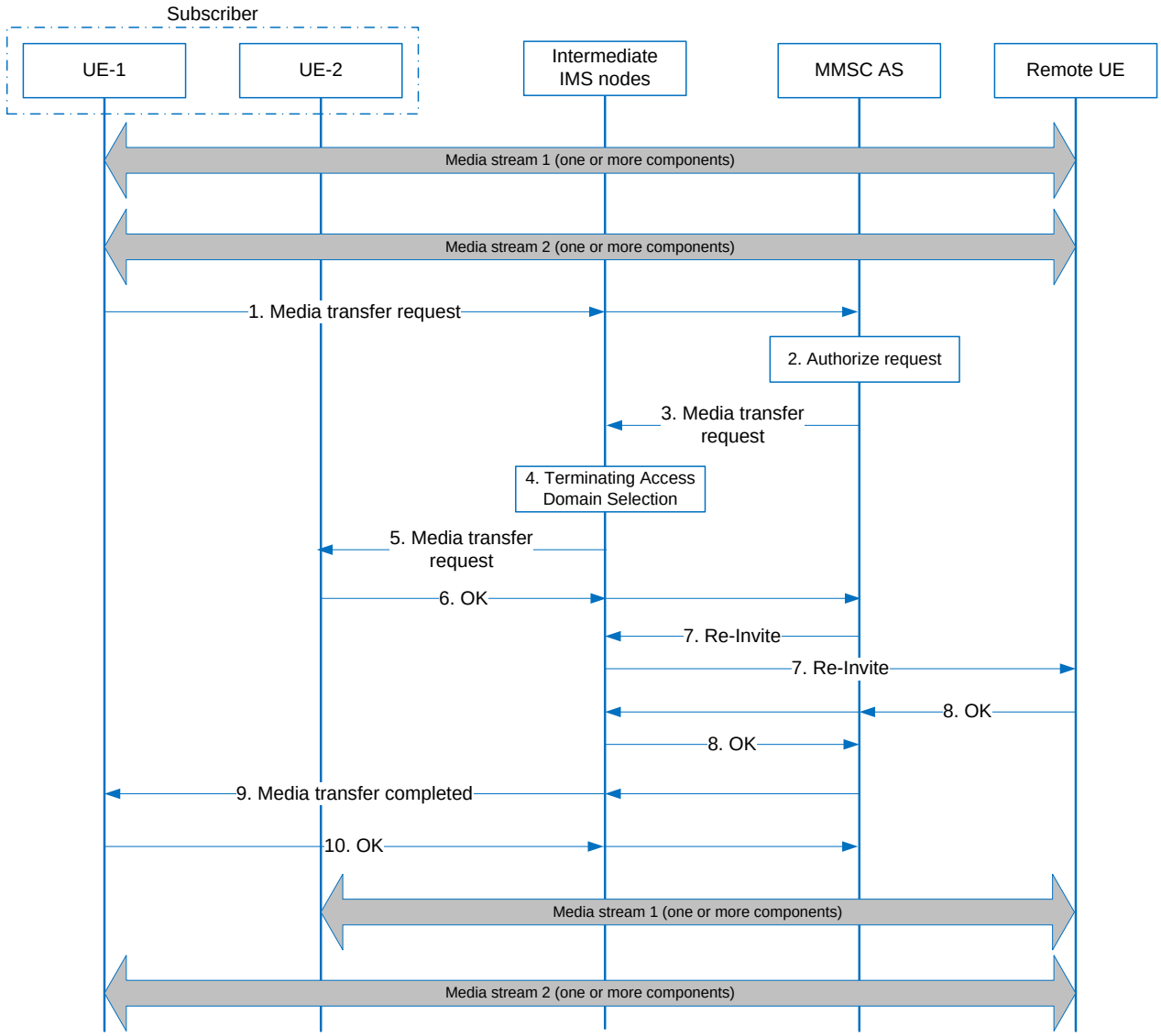


Figure 6.5.5.1-3: Flow for media transfer

1-2. When UE-1 decides to transfer one or more media components to UE-2 it sends a Media Transfer Request (Target, Media, Session Info). The Target identifies the UE that serves as the target of media transfer and Media identifies the active media components that should be transferred. The Session Info identifies an anchored session at the MMSC AS that is associated with this request. The Media Transfer Request is routed to MMSC AS (directly or through iFC), which should authorize the media transfer operation.

NOTE 1: Authorization in this step by MMS AC is required in order to make sure e.g. that both UEs share the same subscription.

NOTE 2: The Media Transfer Request may also include an indication of whether UE-1 wants to keep the control of the transferred session.

3-5. The Media Transfer Request (Media) is sent to UE-2, which identifies the media that need to be established on UE-2. In this step, the terminating access domain is also selected as specified in TS 23.292 [10].

NOTE 3: In the example shown in Figure 6.5.5.1-3, it is assumed that UE-2 is using an IP-CAN/PS domain so the PS domain is selected for terminating the Media Transfer Request. In case UE-2 is using the CS domain, the Media Transfer Request in step 5 is routed to a BGCF/MGCF and it is inter-worked with the CS domain.

6. UE-2 accepts the media transfer request.

7-8. The MMSC AS sends a re-INVITE request to the Remote UE in order to redirect the requested media from UE-1 to UE-2. The Remote UE is identified from the Access Leg information received in step 1. After this step, the Remote UE starts sending the media for stream 1 to UE-2.

9-10. The MMSC AS notifies UE-1 that the media transfer operation was successfully completed and the corresponding media can be deactivated.

6.5.5.2 Information flow for retrieving media components from different UEs

6.5.5.2.1 Alternative 1

In this Alternative, a UE requests retrieval of one or more media components which are currently active in another UE by sending an INVITE request to MMSC AS.

In the example flow shown below, the MMSC AS analyses the multimedia session transfer information (MST info) included in the INVITE request and redirects the media from UE-1 back to UE-2 according to the request from UE-2.

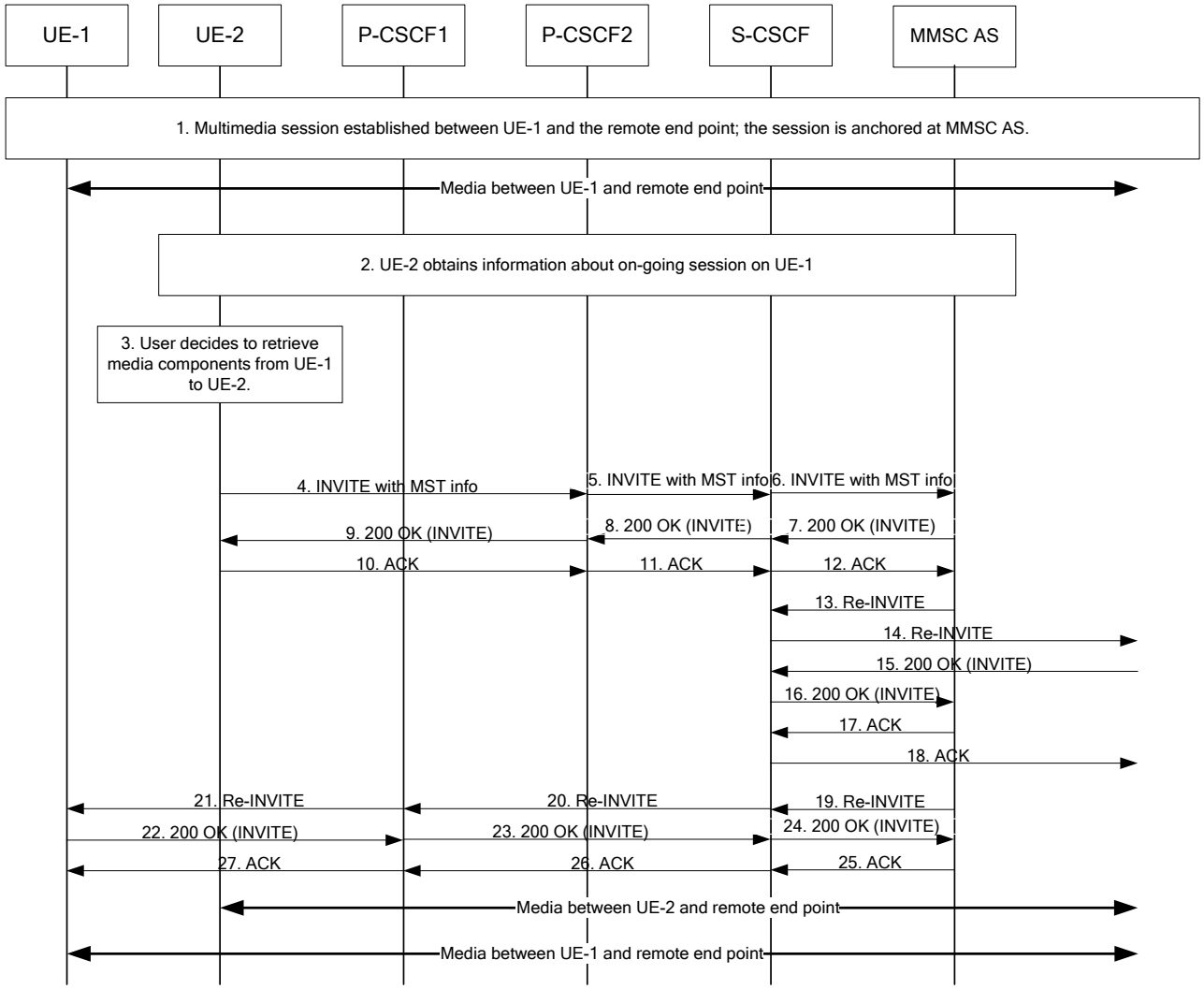


Figure 6.5.5.2-1: UE-2 retrieves media components from UE-1 (UE-2 is not initially involved in the MMSC session)

1. UE-1 is on multimedia session with a remote end point and the session has been anchored at MMSC AS to enable session continuity.

2. UE-2 obtains information about UE-1's on-going session through MMSC AS, for example, by subscribing to UE-1's dialog event package.

3. UE-2 decides to retrieve some of the media components from UE-1.

4~6. UE-2 sends INVITE to the MMSC AS with MST information to indicate that this session is established to retrieve media components from UE-1.

7~12. Session established successfully between the MMSC AS and UE-2.

13~18. MMSC AS sends Re-INVITE to update the existing session with the remote end point.19~27. MMSC AS sends Re-INVITE to update the existing session with UE-1.

NOTE: If all media components are transferred from UE-1 to UE-2, then Step 13~21 will not happen. Instead, the MMSC AS sends BYE to UE-1 to release the session.

If UE-1 has session information about ongoing multimedia session between the UE-2 and remote UE, the UE-1 may send re-INVITE message for session retrieval directly to the MMSC AS. The figure below shows that the UE-1 retrieves the media of UE-2 that transferred from UE-1 in case the UE-1 has session information.

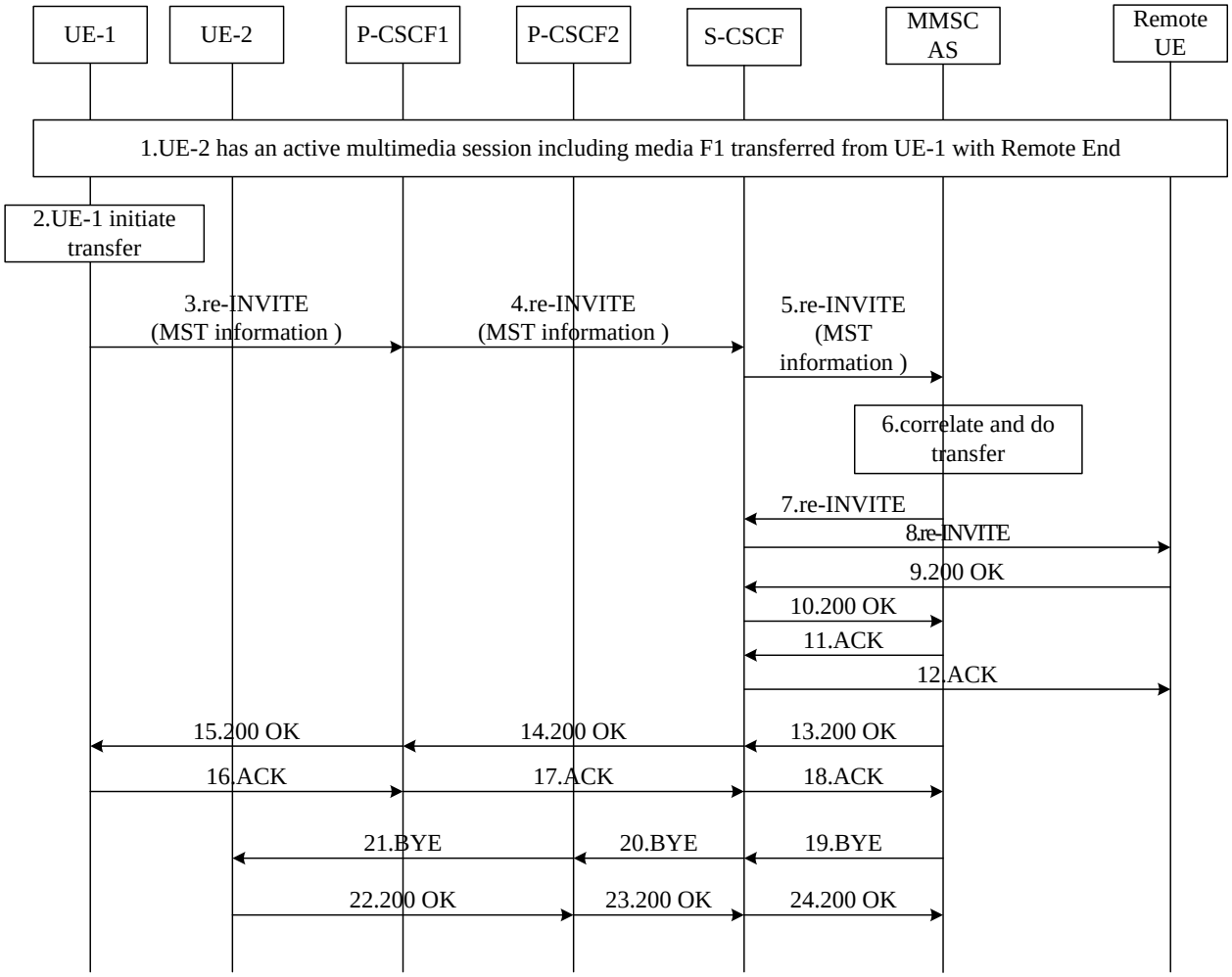


Figure 6.5.5.2-2: UE-1 retrieves media components from UE-2 (UE-2 is initially involved in the MMSC session)

1. UE-2 has an active multimedia session including media F1 transferred from the session S1 of UE-1 with Remote UE. The session S1 still have media with Remote UE.

2. Under the control of the MMSC user, the UE-1 performs session continuity to retrieve the media F1 from UE-2.

3. UE-1 originates a re-INVITE in S1 towards the MMSC AS. The re-INVITE message includes MST information which notifies to the MMSC AS that this is for multimedia session continuity to retrieve the media F1.

4. The P-CSCF1 routes the re-INVITE to the S-CSCF.

5. The S-CSCF forwards the re-INVITE to the MMSC AS over the ISC interface.

6. The MMSC AS correlates and updates the multimedia session based on the ST Information.
7. The MMSC AS sends a re-INVITE/UPDATE to the S-CSCF for session update.
8. The S-CSCF routes the re-INVITE/UPDATE to the Remote UE per TS 23.228 [7].
9. The Remote UE accepts the re-INVITE/UPDATE by sending a 200 OK response.
10. The S-CSCF forwards the 200 OK response to the MMSC AS.

11-12. MMSC AS sends an ACK response to the Remote UE.

13-15. The MMSC AS accepts session continuity message from the Remote UE by sending to UE-1 a 200 OK response.

16-18. UE-1 sends an ACK response to the MMSC AS.

19-24. The old access legs which are the Access legs previously established between UE-2 and MMSC AS is subsequently released by the MMSC AS.

6.5.5.2.2 Alternative 2

In this Alternative, a UE requests retrieval of one or more media components which are currently active in another UE by sending a REFER request to MMSC AS.

In the example flow shown below, UE-2 has established a multimedia session with a Remote UE, which is anchored at the MMSC AS. The multimedia session contains several media components. Another UE (i.e. UE-1) wants to retrieve some of the media components active in UE-2. The media component(s) which should be retrieved by UE-1 are indicated as "multimedia stream-1" whereas the media components which are not affected by the media retrieval procedure (and remain in UE-2) are indicated as "multimedia stream-2". It is assumed that UE-1 and UE-2 belong to the same subscriber.

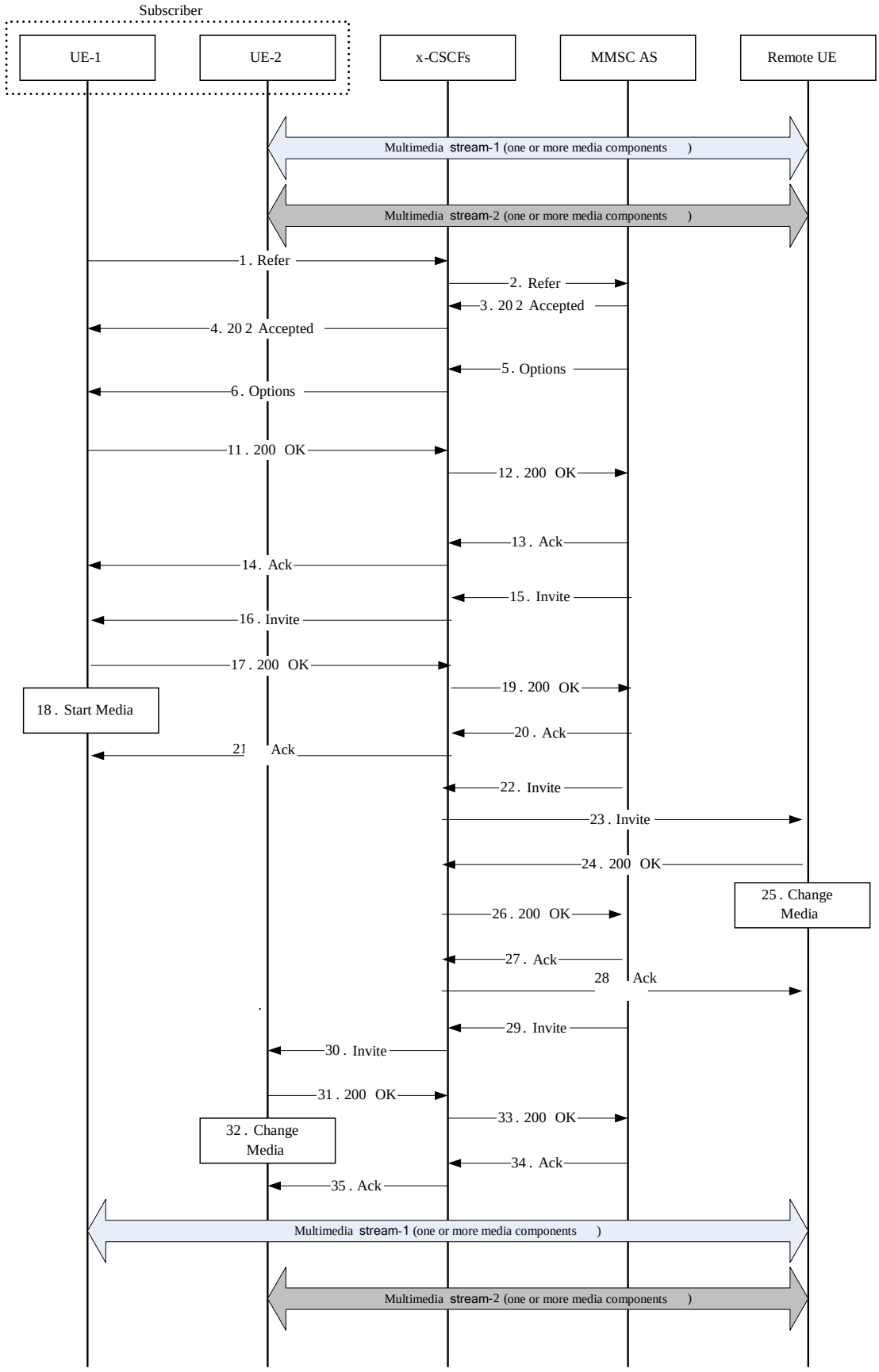


Figure 6.5.5.2-3: UE-1 retrieves some media components from UE-2

1-4. UE-1 initiates the media retrieval by sending a REFER request (1-2) to the MMSC AS. The REFER request identifies:

- the type of the requested action (in this case, "retrieve media from another device");
- the source of the media retrieval (i.e. UE-2) in the Refer-To header; and
- details about the existing media component(s) to be retrieve, e.g. type of media component(s), the UE-2's dialog associated with these media components, etc.

The MMSC AS authorizes this request, i.e. it verifies that UE-1 is entitled to request this media retrieval from UE-2 and initiates the media component transfer procedure.

Editor's Note: How MMSC AS authorizes the request for media retrieval is FFS.

Editor's Note: It is FFS how UE-1 identifies the media component requested for retrieval in case UE-2 has several active media components with the same type.

5-14. The MMSC AS may request the capabilities of UE-1 (i.e. the supported Codecs, media types, etc.).

15-21. The MMSC AS sends an INVITE request to UE-1 proposing the media parameters corresponding to the transferred media. When UE-1 receives the media parameters, it returns an answer and starts sending/receiving the data stream.

22-28. The MMSC AS sends an (re)INVITE to the Remote UE to update the remote leg. The (re)INVITE proposes new SDP parameters based on the parameters received from UE-1 in step 19. When the Remote UE receives the new media parameters, it returns an answer and starts the reception/transmission of these media components.

29-35. The MMSC AS proposes new media parameters to UE-2 in order to deactivate the media components that were transferred to UE-1. When UE-2 receives the media parameters, it returns an answer and stops sending / receiving these media components.

The above steps 22-28 and 29-35 can be executed in parallel.

NOTE: If after media retrieval, there are no media components left on UE-2, steps 29-35 will not take place. Instead, the MMSC AS will release the multimedia session with UE-2.

6.5.5.3 Signalling flow for adding new media components to different UEs

6.5.5.3.1 Alternative 1

In this Alternative, a UE requests to add one or more media components to a multimedia session active in another UE by sending a REFER request to MMSC AS.

In the example flow shown below, UE-1 has established a multimedia session with a Remote UE, which is anchored at the MMSC AS, and wants to add one or more new media components between the Remote UE and another UE (i.e. UE-2). It is assumed that UE-1 and UE-2 belong to the same subscriber.

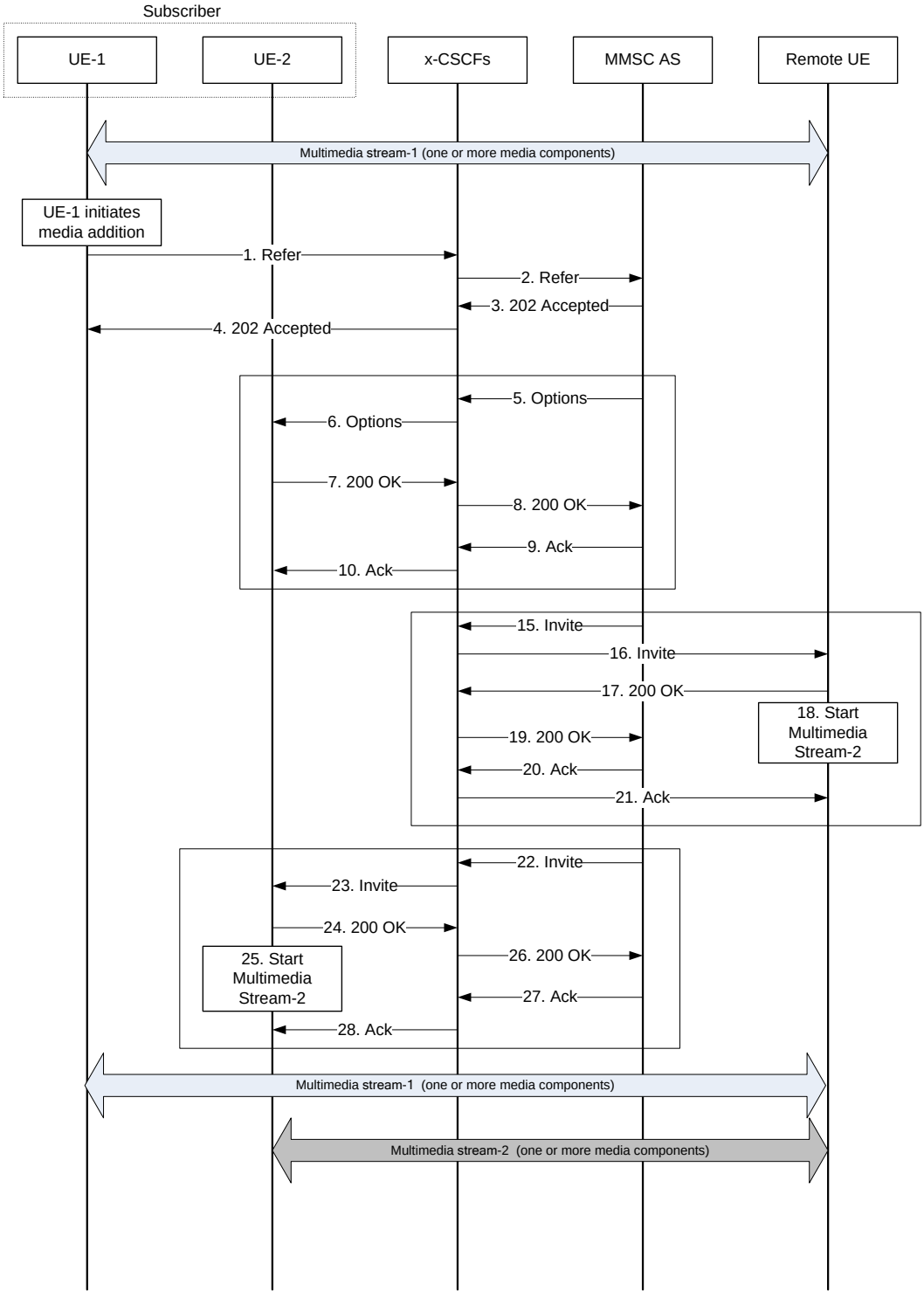


Figure 6.5.5.3-1: UE-1 adds one or more media components to UE-2

1-4. UE-1 initiates the media addition by sending a REFER request (1-2) to the MMSC AS (sent outside the already established dialog with the MMSC AS). The REFER request identifies:

- the type of the requested action (in this case, "add media to an ongoing multimedia session");
- the target of the media addition (i.e. UE-2) in the Refer-To header; and
- details about the media component(s) to be added, e.g. type of media component(s), etc.

The MMSC AS authorizes this request, i.e. it verifies that UE-1 is entitled to request this media addition to UE-2 and, if there is not other session modification in progress with the Remote UE, it initiates the media component addition procedure.

Editor's note: How MMSC AS authorizes the request for media addition is FFS.

5-14. The MMSC AS requests the capabilities of UE-2 (i.e. the supported codecs, media types, etc.)

15-21. The MMSC AS sends an re-INVITE to the Remote UE (15-16) to update the remote leg. The re-INVITE proposes new SDP parameters based on the parameters received from UE-2 in step 12. When the Remote UE receives the new media parameters, it returns an answer and starts the reception/transmission of these media components (17-19).

22-28. The MMSC AS proposes new media parameters to UE-2 (22-23). When UE-2 receives the media parameters, it returns an answer and starts sending / receiving for these media parameters (24-26).

6.5.5.4 Information flow for removing media components from different UEs

6.5.5.4.1 Alternative 1

In this Alternative, a UE requests to remove one or more media components from a multimedia session active in another UE by sending a REFER request to MMSC AS.

In the example flow shown below, a Remote UE has an ongoing multimedia session with UE-1 and UE-2. It exchanges one or more media components with UE-1 and also one or more media components with UE-2. In this example, UE-1 wants to remove all media components between the Remote UE and UE-2. It is assumed that UE-1 and UE-2 belong to the same subscriber.

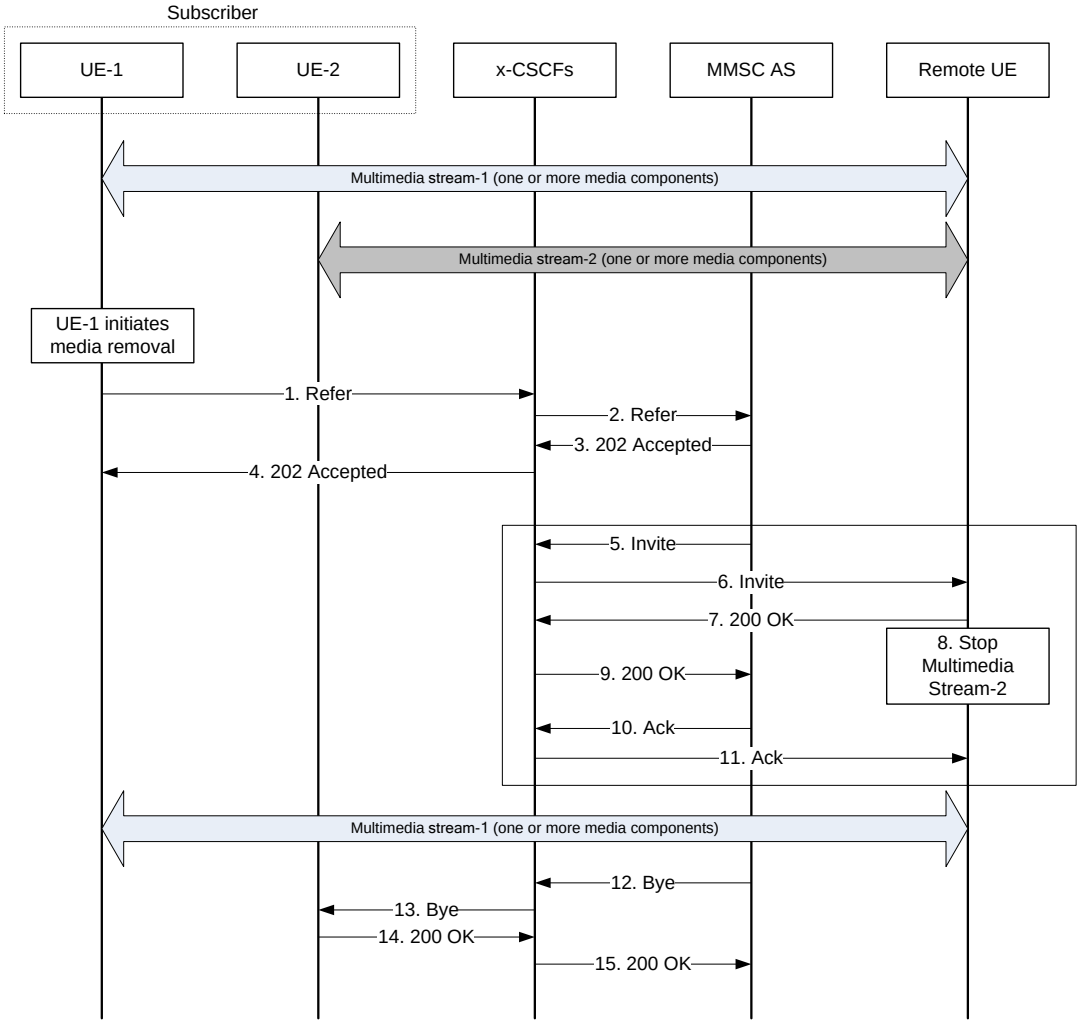


Figure 6.5.5.4.1-1: UE-1 removes the media components active on UE-2

1-4. UE-1 initiates the media removal by sending a REFER request (1-2) to the MMSC AS (sent outside the already established dialog with the MMSC AS). The REFER request identifies:

- the type of the requested action (in this case, "remove media from an ongoing multimedia session");
- the target of the media removal (i.e. UE-2) in the Refer-To header; and
- details about the media component(s) to be removed, e.g. type of media component(s), etc.

The MMSC AS authorizes this request, i.e. it verifies that UE-1 is entitled to request this media removal from UE-2 and, if there is not other session modification in progress with the Remote UE, it initiates the media component removal procedure.

Editor's note: How MMSC AS authorizes the request for media removal is FFS.

5-11. The MMSC AS sends a re-INVITE message and proposes new media parameters (5-6) to the Remote UE that remove all ongoing media components with UE-2. The Remote UE receives the media parameters, returns an answer and stops sending / receiving the identified media components (7-9).

12-15. Since all media components are removed from UE-2, the MMSC AS releases the appropriate dialog with UE-2. This dialog is identified by means of binding information stored in the MMSC AS (i.e. information correlating the dialog with the Remote UE and the dialog with UE-2).

6.5.5.5 Information flow for addition of media components with redirection at the terminating side

6.5.5.5.1 Alternative 1

In the example flow shown below, UE-3 has an ongoing multimedia session with another UE in the originating side. The multimedia session of UE-3 is anchored at the MMSC AS. At some point during the session, a request to add new media components at UE-3 is initiated (for example, by the UE in the originating side). The request for adding new media components at UE-3 triggers the transfer of (all or part of) these media components to UE-4 (which is also a UE of subscriber B).

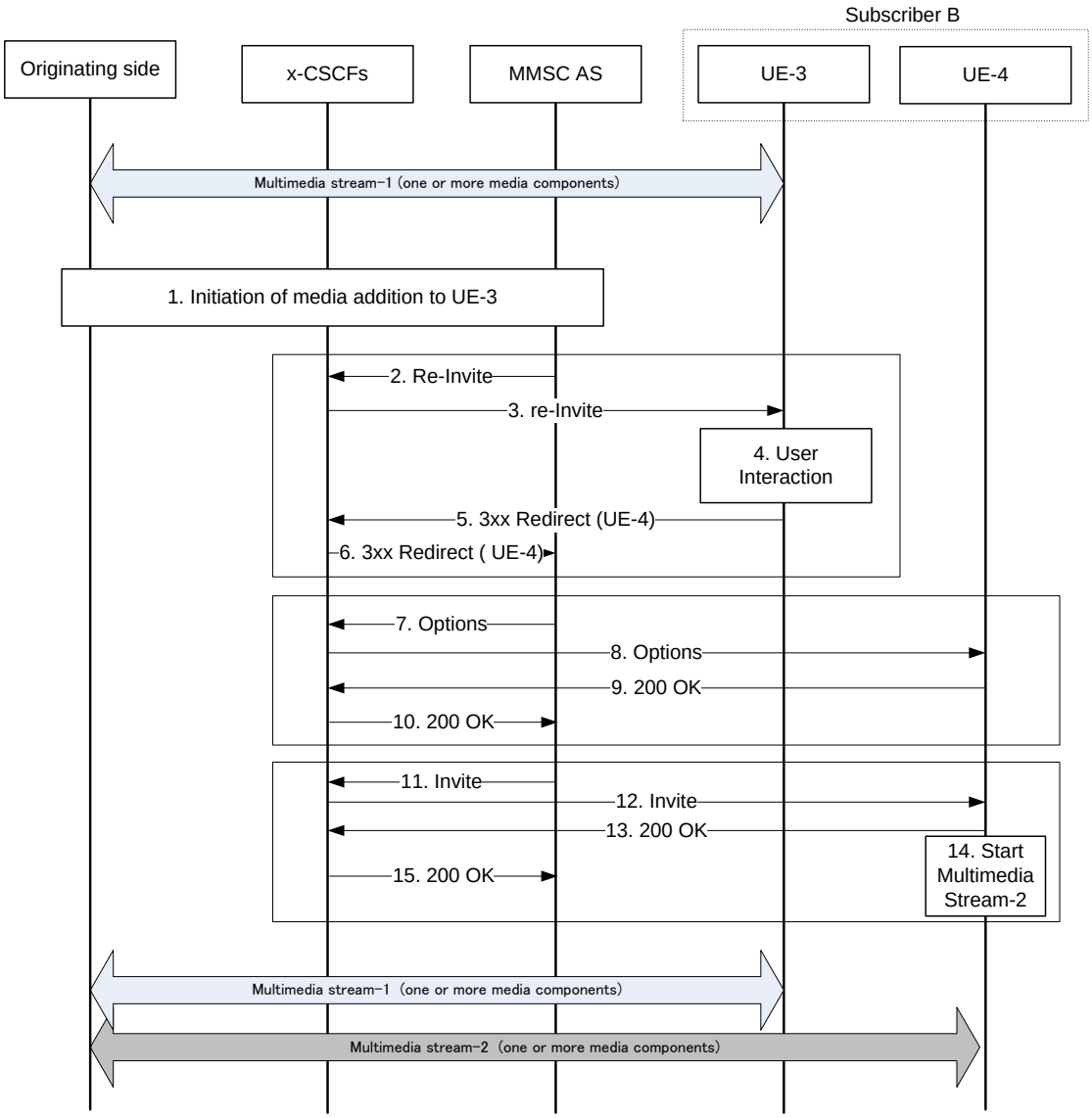


Figure 6.5.5.5-1: UE-3 redirects the addition of new media components to UE-4

NOTE: For simplicity, ACK messages are not shown in the above figure.

1. A request to add new media component(s) at UE-3 is initiated. This may occur for example when a UE in the originating side requests to add one or more media components with the UE-3.

2-6. As a result of the initiation of media addition, a re-INVITE request proposing new SDP parameters is sent to UE-3 to modify the media components of its existing dialog. When UE-3 receives the re-INVITE, it returns a response (e.g. 3xx response) requesting to transfer (all or part of) these media components to UE-4. Optionally,

an interaction takes place at UE-3 which allows the user to specify the device that should accept the new media components. The response from UE-3 identifies:

- the new target of the media addition (i.e. UE-4);
- which media component(s) to be transferred to UE-4;
- which media component(s) to be added to UE-3 (in case only part of the new media components are transferred to UE-4).

7-10. Optionally, the MMSC AS requests the capabilities of UE-4 (e.g. the supported codecs, media types, etc.) in order to determine if all media components requested to be transferred to UE-4 can be supported by UE-4.

NOTE: If some media components cannot be supported by UE-4 (e.g. due to limited capabilities) the MMSC AS does not offer these components to UE-4. It is FFS if the MMSC AS can re-offer these components to UE-3. The example flow shown in figure 6.5.5.x-y assumes that UE-4 can support all new media components requested to be transferred by UE-3.

Editor's note: It is FFS whether the MMSC AS uses the Options request for discovering the UE-4's capabilities before offering the media components to UE-4.

11-15. The MMSC AS sends an INVITE to UE-4 to invite it to the session and add the media components identified in the response from UE-3. When UE-4 receives the new media parameters, it returns an answer and starts the reception/transmission of these media components.

6.6 Network-initiated Multimedia Session Transfer

6.6.1 General

The domain transfer approach as currently defined in Release 7 VCC requires the UE to be the decision maker of domain transfer. The UE continually monitors received signal strengths from both IMS and CS cellular network domains. UE decisions for session transfer can be *loosely* controlled by the network through the provision of appropriate policies in the UE (as specified in TS 23.206 [6] for VCC). Although the transfer of a multimedia sessions initiated by the UE is a simple session transfer approach and possibly adequate for light traffic network conditions, it does not allow the operator to exercise *tight* control of access resource utilization neither allows the system to optimize various operating parameters, such as the overall capacity and performance. This approach is sensible and may prove to be sufficient at least for smaller scale deployments. However, as the number of user sessions, mobility events, and bandwidth consumption increases, the impact on operator network resource consumption must be considered.

It is recognized that in several cases, session transfer initiated by the network advantages as compared to session transfer initiated by the UE. Therefore, it will be beneficial from a system performance point of view to specify appropriate mechanisms for session transfer mechanism initiated by the network.

To exploit the anticipated benefits of session transfer initiated by the network this TR considers mechanisms that allow the functionality performed by the IMS to indicate when and how a session transfer is need to be performed. Focus is given on IMS-layer mechanisms for a multimedia session transfer initiated by the network.

This IMS-layer network-initiated multimedia session transfer mechanism provides the capability to transfer existing multimedia sessions between different PS accesses and or domains.

6.6.2 Session Continuity operator policies

The MMSC AS provides the MMSC UE with session continuity operator policies suitable for the possible access networks that the UE can discover. These operator policies are an extension of the VCC Rel-7 operator policy to cover not only domain transfer but also the session transfer scenarios identified in this TR.

The MMSC AS can change anytime the policies in a specific UE, thus enabling the network to change the preferred access network for originating and transferring multimedia sessions, change the session transfer restrictions and impact the initiation of a session transfer of an established multimedia session.

The session continuity operator policies may be related to the area where the UE is operating in order to allow the Operator to provide consistent information with the access networks that the UE can find in that area.

Session continuity is triggered by the MMSC UE, the MMSC UE shall take the session continuity operator policies into account when deciding which access network to use for outgoing sessions or before considering session transfer. For this reason, a priority order of operator policies versus user preferences shall be defined with MMSC UE by the operator during initial provisioning or via (OMA DM) reference point. Session continuity triggers at the MMSC UE may be influenced by the MMSC AS by updating the operator policies held on the MMSC UE.

Editor's note: The complete call flows for this scenario is FFS.

6.6.2.1 Characteristics of Session Continuity operator policies

The session continuity policies provides the MMSC UE with information that the MMSC UE shall take into account before originating a session and before starting a session transfer procedure, e.g. "move media X to WiFi or WiMAX or UTRAN PS according this order of preference".

The MMSC UE shall be provided with session continuity operator policy during initial provisioning or via V1 reference point. The session continuity operator policy is valid until it is overwritten by the MMSC AS and shall be communicated to the MMSC UE whenever the policy is updated by the operator.

The session continuity operator policy shall indicate:

- which access network is restricted;
- for each media or group of media a list of access networks (ordered according to operator preference) to be used by the MMSC UE for session initiation and/or session transfer, when one or a group of those access networks becomes available;
- the level of priority for initiating session transfer, i.e. whether the MMSC UE shall/should/may start transferring a media component to a target access network when it becomes available, if the other policy requirements are met and if permitted by the lower network layers (core and radio access network).

Editor's note: The transport mechanisms used over the CS domain and the PS domain / IP-CAN for providing / updating the session continuity operator policy are FFS.

6.6.2.2 Update of Session Continuity operator policies

Editor's note: When, why and how often policies may be updated is FFS.

To enable the update of session continuity operator policies, the MMSC UE can maintain a "working" set of session continuity (SC) operator policies in addition to the "provisioned" session continuity (SC) operator policies (which are static operator policies similar to those specified in VCC Rel-7). The characteristics of Working SC operator policies are the following:

Editor's note: Whether the UE needs to maintain two sets of operator policies, static and working, is FFS.

Editor's note: The characteristics below are provided in order to explain the various options / possibilities that exist with a working set of SC operator policies. Which of those characteristics need to be standardized is FFS.

- The Working SC operator policies can be dynamically updated and reset to the provisioned values at any time by the MMSC AS via procedures on the V1 reference point. Dynamic update is feasible over the CS domain and the PS domain / IP-CAN.

Editor's note: The transport mechanisms used over the CS domain and the PS domain / IP-CAN for updating the Working SC operator policies in a UE are FFS.

- Updated Working SC operator policies shall be considered immediately, i.e. the MMSC UE takes into account the updated values and adjusts its behaviour immediately after the Working SC operator policies are updated by the network.
- The Working SC operator policies override the provisioned SC operator policies.
- The Working SC operator policy values are initialized to the provisioned SC operator policy values. They hold working values for operator policy parameters.

- Optionally, the Working SC operator policies may have an expiration time (be time stamped) associated with them thus limiting the time that they are in effect. Upon expiration, the Working SC operator policies are reset to the provisioned operator policies.

- The Working SC operator policies can be disabled or enabled by the network.

With the use of Working SC operator policies the MMSC UE continues being the decision maker of access and/or domain selection and session transfer based on access network availability, user preferences and SC operator policies, as in Rel-7 VCC solution. The main difference from Rel-7 VCC behaviour is that the MMSC UE reacts in real-time to the dynamic changes of the working SC operator policies.

To illustrate how the Working SC policies can be used to facilitate network-initiated session transfers, one typical example scenario is discussed. In this example, the MMSC UE is in GSM CS coverage and has an ongoing voice call anchored in IMS. Its Working SC policies have the following values (in this example we use the policy parameters specified in TS 24.216 [13]):

Preferred Domain: IMS;

Immediate DT: Immediate transfer to the preferred domain *is not required*;

DT CS-to-IMS direction: Can occur;

DT IMS-to-CS direction: Can occur.

Even though the MMSC UE can access IMS over a WLAN it still maintains the voice call over the CS domain (this is because Immediate DT is not required). However, when the MMSC AS decides that a domain transfer to IMS is required (e.g. to optimize some network operating parameters), it can update the working SC policies of the UE with the following values:

Preferred Domain: IMS;

Immediate DT: Immediate transfer to the preferred domain *is required*;

DT CS-to-IMS direction: Can occur;

DT IMS-to-CS direction: Can occur.

Immediately after the update of the Working SC policies, the UE performs a domain transfer (if possible) of its ongoing voice call to IMS because the preferred domain is IMS and immediate transfer to the preferred domain is now required.

7 Impacts and Enhancements to the IM CN subsystem

Editor's note: This clause describes and investigates possible impacts to the IM CN subsystem. And enhancements to the functionalities or entities of IM CN subsystem need to be investigated at this section.

7.1 MMSC and CSI interworking

A call that is subject to MMSC, will always be anchored in the home IMS domain and present a single media session towards the remote party over the NNI. For an IMS originated call CSI is only defined for the terminated scenario, where the CSI AS will receive the combined session. This session can be split according to the rules of CSI thus enabling MMSC and CSI to coexist.

On the terminating side CSI should only be used if MMSC is not available as the MMSC AS provides the same functionalities as the CSI AS.

NOTE: Future developments of the CSI specification should be monitored in order to avoid possible future interactions between MMSC and "CSI origination towards IMS termination with CSI interworking".

8 Coexistence and/or potential interactions with underlying mobility solutions

Editor's note: This clause describes and investigates how IMS-level Multimedia Session Continuity will coexist and/or interact with possible underlying mobility solutions defined by 3GPP. The solutions developed within this study should not have any impacts to underlying mobility solutions.

8.1 General

In a mobility-enabled network environment where both network-level as well as IMS-level mobility mechanisms are provided, it is imperative to investigate the mutual impacts between those mechanisms and adapt them appropriately in order harmonize their coexistence. In order to accomplish this and establish a network environment where IMS-level mechanisms can efficiently co-operate and co-exist with potential underlying mobility mechanisms, this clause investigates the interactions between IMS-level and network-level mobility mechanisms (as defined in 3GPP Rel-8 specifications).

8.2 Impact of underlying mobility mechanisms on IMS

Editor's note: It is FFS whether these issues are in the scope of this study.

In this sub-clause we discuss the impact of user's mobility on IMS under the assumption that the underlying network layers support the mobility mechanisms specified in TS 23.401 [4] and TS 23.402 [5]. In many mobility scenarios, these mechanisms allow the UE to use the same contact address across different IP-CANs, i.e. there is no need for the UE to register a different contact address at every IP-CAN change neither to transfer its ongoing sessions to another contact address. This can help making mobility transparent to the IMS layer. However, as discussed below, even when the UE can use the same contact address across different IP-CANs, its mobility is not completely transparent to the IMS layer.

8.2.1 Access Network Info

Several IMS elements may store the type of access network that is currently used by the UE (as provided in the P-Access-Network-Info header) and use it subsequently for performing access-specific service logic. For example, the Domain Selection Function (DSF, see TS 24.206 [6]) can use the UE's current access network type to determine the domain to be used for terminating an incoming session request. Therefore, when the UE hands over to a new IP-CAN with a different access type from the old IP-CAN (e.g. from GERAN to IEEE 802.11) it is desirable to update the IMS network with its current access network type.

When the network supports extended mobility mechanisms, such as those specified in TS 23.401 [4] and TS 23.402 [5], then the UE may change several IP-CANs during an active multimedia session without updating the IMS network with a new P-Access-Network-Info header, i.e. without sending any SIP signalling until it refreshes the session timers. The same holds true for the case when the UE does not have an active multimedia session. As a consequence, by using extended mobility in the underlying layers the IMS network may not be regularly updated with the UE's current access network type. This could have a significant impact on IMS session terminating procedures or any other IMS procedures which rely on the UE's current access network type.

NOTE: The value inserted by the UE in the P-Access-Network-Info header is considered as un-trusted information by the network.

P-CSCF may derive and/or validate UE's IP-CAN information using PCC mechanisms as specified in TS 23.203 [11]. P-CSCF may also subscribe to IP-CAN update procedures provided by the PCRF via Rx reference point as specified in TS 29.214 [12].

The UE may in the event of IP-CAN change, update the network with its current capabilities and access network information during the normal (re-)registration procedure or may initiate a new (re-)registration only for this purpose. If an ongoing session is refreshed this is enough to update the network with the new access network information.

8.2.2 P-CSCF Discovery

With extended network mobility mechanisms the UE may be able to maintain IP connectivity to the same P-CSCF while moving across several access networks within a single PLMN or across different PLMNs. This capability creates the question of whether the UE needs to perform the P-CSCF discovery procedure (see TS 23.228 [7]) at every IP-CAN change or whether it could reuse the previously discovered P-CSCF.

When to perform a P-CSCF discovery may need to be re-evaluated when the network mobility mechanisms are in effect because in such case the UE could maintain connectivity to the same P-CSCF when moving across different IP-CANs. Frequent P-CSCF re-discoveries seem not useful and could severely impact the continuity of multimedia sessions because every re-discovery can introduce a considerable additional delay to the session transfer procedure especially when DHCP is used.

Ideally, the UE may not perform the P-CSCF discovery in the new IP-CAN if its IP address used to access IMS does not change in the new IP-CAN. However, there are scenarios when the P-CSCF discovery may be required even when the IP address used to access IMS does not change in the new IP-CAN. For example when an operator wants to deploy particular P-CSCFs for particular access networks (e.g. a separate pool of P-CSCFs for WLAN access and another pool for E-UTRAN access). It might also be required in order to allow the UE to proactively re-discover a usable P-CSCF in the new IP-CAN instead of waiting until discovering that its old P-CSCF is not usable any more.

Editor's note: The principle of "P-CSCF re-discovery at every IP-CAN change" needs to be further studied and identify potential methods to minimize the P-CSCF re-discovery impact on session continuity.

8.2.3 Mobility Scenarios with P-CSCF Change

Depending upon the network architecture and deployment scenarios, the UE must register with the S-CSCF via the new P-CSCF after the handover is executed. In this section, such handover scenarios are categorized into non-roaming and roaming cases.

8.2.3.1 Non-roaming case

When different access systems are covered by different P-CSCFs for scalability or operational reasons, P-CSCF change happens due to the movement of the UE between these access systems. Figure 8.1 depicts handover between EUTRAN and non-3GPP access systems, where P-CSCF1 and P-CSCF2 are in charge of the access systems AN-1 and AN-2, respectively.

At some point, the UE is attached to the AN1 and registered with the S-CSCF via P-CSCF1. When the UE moves and attaches to AN2 with an ongoing IMS session, the UE needs to register with S-CSCF via P-CSCF2. In such cases even if the IP-level mobility is provided, in order to maintain the on-going IMS session(s), the UE shall discover P-CSCF2 and send IMS related signalling via P-CSCF2 if P-CSCF1 is no longer available. This will allow P-CSCF2 and PCRF to perform policy and QoS controls (e.g., gate control) that are required at the access gateway (AGW) serving AN-2 in order for the on-going IMS session to continue seamlessly. It is also expected that inter access technology handover happens more frequently than inter PLMN handover and therefore seamless IMS session continuity is very important for a better user experience.

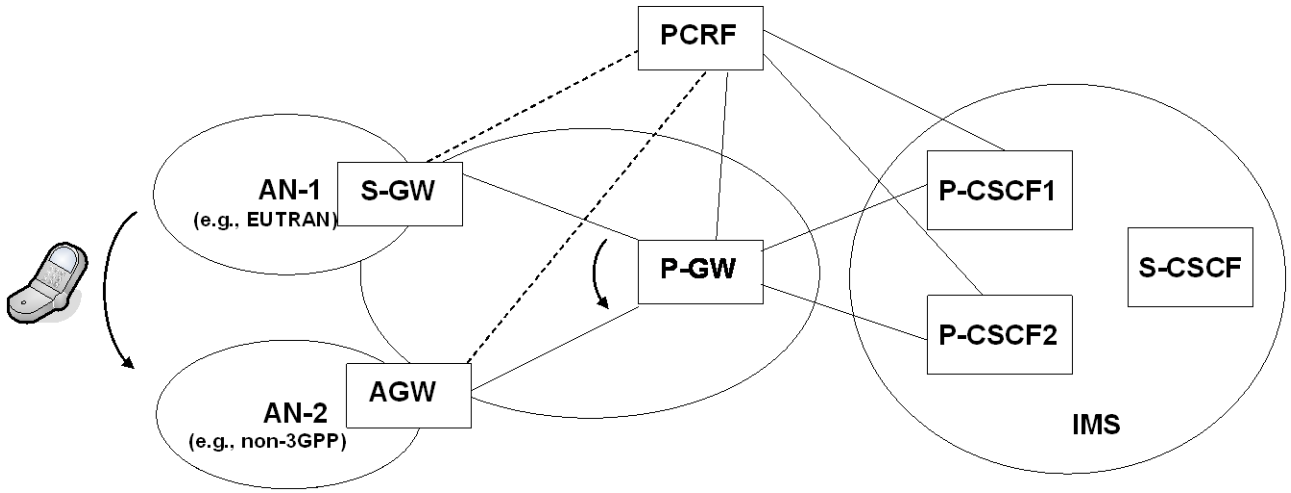


Figure 8.1: Inter access technology handover

8.2.3.2 Roaming case

Figure 8.2 shows that the UE, over the access network AN-2, uses the services provided by the visited IMS (e.g. emergency IP services) and has a security association with the vP-CSCF. When the UE performs an inter-PLMN handover to access network AN-3, even if the network-layer mobility mechanisms can sustain IP connectivity to vP-CSCF, it might not be able to use vP-CSCF any more for various reasons. For instance, if the UE were using emergency IP services in the visited IMS, after handover the vP-CSCF will reject further requests from UE because now the UE has moved to a different PLMN (this is determined from the new value of P-Access-Network-Info header in all subsequent requests). Even in the case of non-emergency IMS services, operator policy may enforce the vP-CSCF to reject requests from UEs from different PLMNs.

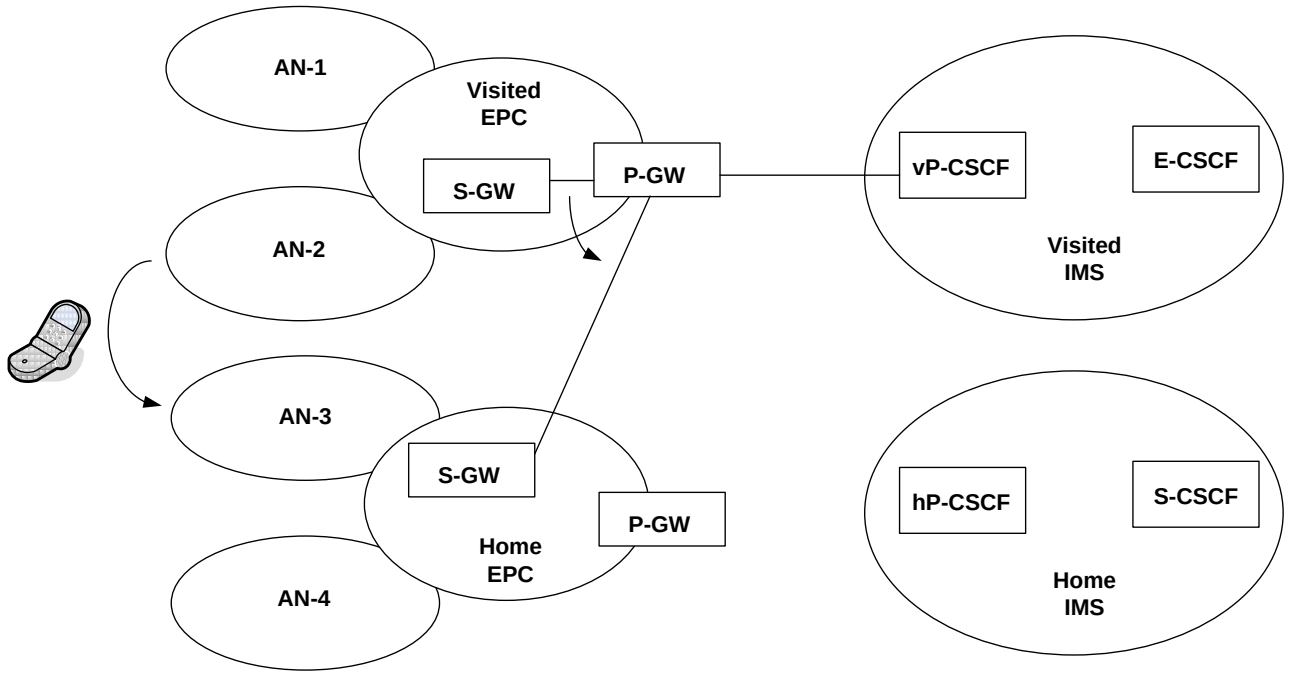


Figure 8.2: Access to visited IMS services after inter-PLMN handover

In further deployment scenarios (see figure 8.3) there might be no inter-PLMN policy interface (S9). In such scenarios, even when the network-layer mobility mechanisms can sustain IP connectivity between the UE and the vP-CSCF after the inter-PLMN handover, there might be no mechanisms to dynamically reserve QoS resources in the target access network (AN-3 in figure 8.3). This lack of policy interworking between different PLMNs could have an impact on IMS layer, as in this case IMS mobility mechanisms might be required for continuing the UE's services through the new PLMN (and through a different P-CSCF).

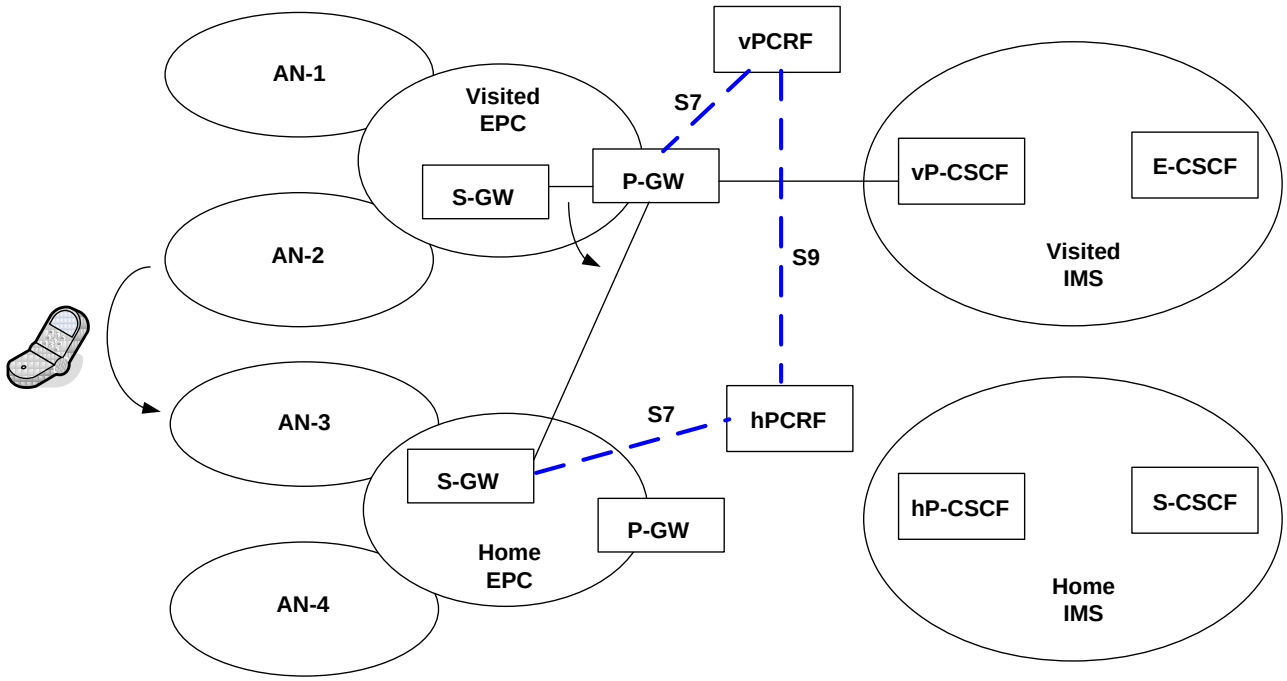


Figure 8.3: Access to visited IMS services after inter-PLMN handover

Editor's note: Other mobility scenarios that require a P-CSCF change are FFS.

Editor's note: There is need to identify in IMS level when the P-CSCF is required to change and thus invoke appropriate re-discovery and IMS mobility mechanisms.

Editor's note: It should be investigated how the selection and use of IP address in UE (i.e. HoA or CoA) affect the session continuity procedure.

8.2.4 PS-PS session continuity with P-CSCF Change under IP-level mobility support

The following simplified information flow describes the use case of PS-PS session continuity when the network layer supports mobility and thus the contact address of the UE does not change when the UE hands over to a different access network. In this use case, the P-CSCF changes after the handover due to the change of the coverage of the P-CSCF (i.e, one for 3GPP access and another for non-3GPP access), thus the UE needs to discover a new P-CSCF and to register with the S-CSCF via the new P-CSCF in order to transfer the ongoing session to this new access network. A typical use case and network configurations are illustrated in clause 8.2.3. In summary, it is assumed that:

i) The UE does not change the IP address after it moves to the new access network;

ii) A new P-CSCF is used in the new access network;

iii) S-CSCF does not change;

iv) The PCRF may or may not change; and

v) The UE is an MMSC UE.

GW 1 and GW 2 in the information flow refer to S-GW (3GPP access in a different PLMN) or the access gateway (non-3GPP access).

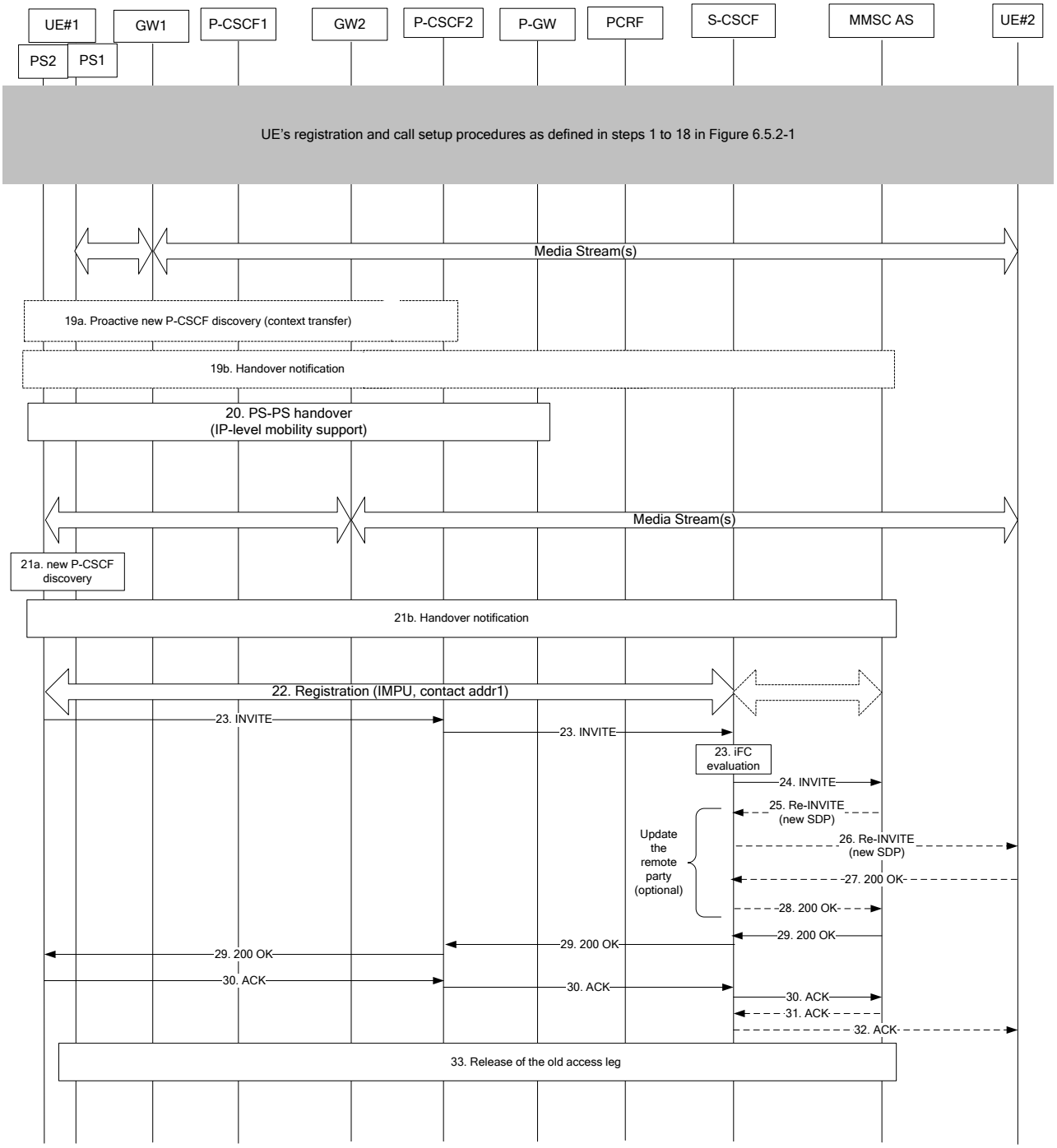


Figure 8.4: Signalling flow for providing PS-PS session continuity with P-CSCF change under IP-level mobility support

A step-by-step description of the signalling flow is shown below:

1-18. These steps are identical to the steps described in clause 6.5.2.1.

19a. UE#1 may be able to discover the new P-CSCF to be used in the target network before the handover and the necessary context transfer may occur between the current P-CSCF and the new P-CSCF.

19b. If UE#1 has discovered a new P-CSCF in step 19a, the UE informs the MMSC AS about the handover of UE#1 (via the current P-CSCF and the S-CSCF), whereby the MMSC AS can properly handle the incoming sessions and maintain the on-going session(s) during UE#1's handover interval.

Editor's note: The details of how the new P-CSCF is discovered are FFS. (e.g., it could be a simple operator's policy that whenever the UE changes from 3GPP access to non-3GPP access, it needs to discover a new P-CSCF).

Editor's note: The trigger for the UE to send the handover notification is FFS.

20. Later, UE#1 discovers and attaches to a new access network (e.g. an I-WLAN). Since IP-level mobility is provided, the IP address of UE#1 does not change before and after the handover.

21a. If the proactive P-CSCF discovery is not performed at step 19, UE#1 discovers a new P-CSCF (P-CSCF#2) that is applicable in the new access network.

21b. If the UE has discovered a new P-CSCF in step 21 (a), the UE informs the MMSC AS about the handover of the UE (via the current P-CSCF and the S-CSCF), whereby the MMSC AS can properly handle and maintain the on-going session(s) during the UE's handover.

22. Although the contact address of UE#1 does not change, due to the change of the P-CSCF, UE#1 is required to register with S-CSCF via the new P-CSCF. Again, 3rd-party registration may optionally be used

Editor's note: The UE of 3rd-party registration is FFS.

23. To transfer its ongoing video sharing session from the old access network to the new access network, UE#1 sends an INVITE effectively requesting to replace the previous dialog settings, which includes the route set. This INVITE creates a new dialog between UE#1 and MMSC AS.

Editor's note: It is FFS whether the INVITE message sent in this step includes a Replaces header (this initiates a new dialog). The name and details of the AS will be resolved later.

24-28. Since the IP address of UE#1 does not change, it may not be needed to send a re-INVITE (or UPDATE) message to UE#2. However, if some conditions (e.g. QoS) have changed, MMSC AS updates the existing dialog with UE#2 by sending a re-INVITE (or UPDATE) message with a new SDP.

29. MMSC AS responds to the INVITE sent by UE#1 with a 200 OK effectively accepting the request to transfer the video sharing session from the old access network to the new one.

30. The old access leg is released.

9 Conclusion

9.1 Conclusion on multimedia session continuity scenarios

Voice call continuity between CS and PS (incl. WLAN) and the identified multimedia session continuity scenarios in this TR shall be captured as the scenarios for the technical specification for IMS Service Continuity.

9.2 Conclusion on MMSC architecture and anchoring solution

The MMSC AS comprises a set of following high-level functions to perform multimedia session continuity and anchor/manage multimedia session.

- anchor all the multimedia sessions;
- execute the session transfer of multimedia session;
- enable network-initiated multimedia session transfer by updating and providing session transfer policies stored in the UE;
- provides multimedia session splitting/merging functionalities.

The MMSC reference architecture extends the set of domain transfer functionalities of Rel-7 VCC Application to support multimedia sessions in addition to voice. It is recommended to document the MMSC AS and set of its functionalities in the technical specification for IMS Service Continuity.

9.3 Conclusion on session transfer operator policy

It is recommended to standardize the session transfer operator policy which is an enhancement of the VCC Rel-7 operator policy to cover not only domain transfer but also session transfer scenarios identified in this TR.

The V1 reference point has been defined to convey the session transfer operator policy.

9.4 Conclusion on the relationship between ICS and MMSC

Clear demarcation between ICS and MMSC with respect to session/merge split functionality is only possible in the event that ICS is implemented as a SIP application. It is therefore recommended to specify MMSC with the assumption that when ICS is implemented in a network it is done so using an ICS AS, as described in TR 23.892 [14].

Both ICS and MMSC specify functions which are provided by a SIP application server. These functions may be collocated as optional functions in a single SIP application server.

9.5 Conclusion on specification of session split/merger functionality

Both ICS and MMSC specify functionality to split and merge of SIP sessions.

IMS Service Continuity specification shall include the specification of session split/merge function as needed for SIP sessions without any speech or speech and video component which use the CS RAB.

IMS Service Continuity specification shall include the specification of a session split/merge function needed for adding or deleting new media to an existing session when media is carried simultaneously over two access networks, one of which might be CS access. This covers the cases in which media is added or deleted or media components are transferred to another access.

TS 23.292 [10] shall specify split/merge of SIP sessions, with at least one speech or speech and video component which use the CS RAB, for session originations and terminations which use the Gm reference point of ICS as specified in 3GPP TS 23.292 [10].

The session split/merge of SIP sessions with at least one speech or speech and video component which use the CS RAB need not be specified for session originations and terminations which use the I1 reference point of ICS, see 3GPP TS 23.292 [10].

9.6 Conclusion on T-ADS and session split/merger functionality for MMSC and ICS

If the MMSC and ICS are collocated in a single logical application which provides T-ADS and session split/merger functionality for all ICS and MMSC scenarios, interactions and interfaces between ICS and MMSC need not be specified. It is recommended that functions of ICS and MMSC are specified as optional collocated functions of a single application server in this release.

9.7 Conclusion on the applicable scope of MMSC

It is recommended to handle the cases in the following list as the applicable scope of MMSC Rel-8 specification, and be used to concentrate further study work to reach conclusions.

MMSC Rel-8 is applicable:

- in the case of PS-PS session continuity, when:
- underlying mobility is not used; or
- transferring part of media components between access networks; or
- in the case of PS-CS session continuity;

- to the mobility of media components of a session between different terminals under the control of the same user;

- when underlying mobility is used but is not sufficient to maintain the session, e.g. when QoS re-negotiation and/or P-CSCF re-discovery is required.

9.8 Conclusion on Single Radio MMSC

MMSC Rel-8 specification supports the transfer of multimedia sessions between access networks by UEs which are capable of simultaneous transmitting/receiving on those access networks.

No special procedures have been studied in Rel-8 MMSC TR to support the transfer of multimedia sessions between access networks by UEs which are capable of transmitting/receiving on only one of those access networks at a given time.

9.9 Conclusion on Session Transfer Information

The Session Transfer Information defined in clause 6.4.1 is encoded in existing SIP messages (SIP headers, SIP payload) or carried in the called party address field (e.g. PSI for requesting session transfer) according to existing protocol mechanisms where applicable. The information details needed by MMSC AS for each multimedia session continuity scenario will be identified in the related information flows in clause 6.5 and the requirements will be derived from there.

The terms Session Transfer Information and MST information will not be used in the TS.

9.10 Conclusion on UE Transfer information flows

It is recommended to use the flows for media transfer shown in clause 6.5.5.1-3 as a baseline for the specification work in the SC TS. The stage-3 details of the flows should be handled by the stage-3 working groups.

9.11 Conclusion on Keep and Release Control Mechanism in UE Transfer Mode

Mobility of media components of a session between different terminals under the control of the same user using keep control and release control mode, mentioned scenario in section 5.4.2 is recommended to consider early stage of post Rel-8 time frame.

Annex A:
Change history

Change history								
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**Old**	**New**
2008-06	SP-40	SP-080361	-	-	-	MCC Update for presentation to TSG SA for Approval	1.3.0	2.0.0
2008-06	-	-	-	-	-	MCC Editorial update after TSG Approval to version 8.0.0 (Rel-8)	2.0.0	8.0.0