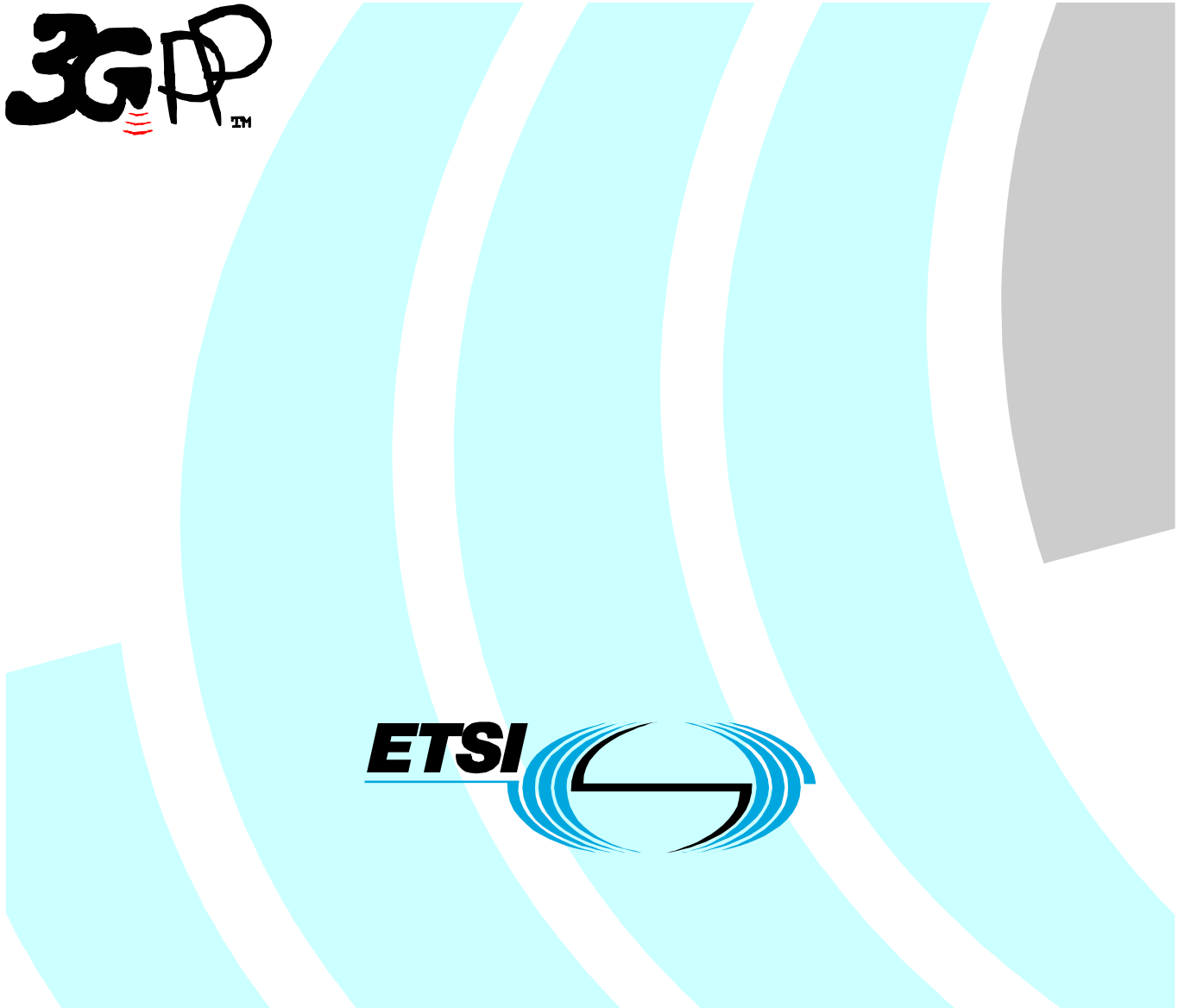
ETSI TS 123 172 V5.0.0 (2002-06)

Technical Specification

**Universal Mobile Telecommunications System (UMTS);
Technical realization of Circuit Switched (CS)
multimedia service;
UDI/RDI fallback and service modification;
Stage 2
(3GPP TS 23.172 version 5.0.0 Release 5)**



Reference
DTS/TSGN-0323172v500

Keywords
UMTS

ETSI

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Foreword

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Contents

Foreword

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

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1 Scope

The present document describes the Service Change and UDI Fallback (SCUDIF) feature. This service is available to UDI/RDI multimedia calls and allows users to achieve successful call establishment when end to end circuit-switched (CS) multimedia is not possible (fallback to speech) or when signalling of the feature is not possible in the network (fallback to preferred service or speech). Furthermore, it allows the users to swap between a multimedia service and basic speech during an established call.

NOTE: In the present document, the term "multimedia" refers to UDI/RDI multimedia unless specifically stated.

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 and/or edition number or version number) or non-specific.
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- 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 23.153: "Out of Band Transcoder Control; Stage 2".

[3] 3GPP TS 24.008: "Mobile Radio Interface Layer 3 specification; Core network protocols; Stage 3".

[4] 3GPP TS 26.103: "Speech Codec List for GSM and UMTS".

[5] 3GPP TS 27.001: "General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS)".

[6] 3GPP TS 29.007: "General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN)".

[7] 3GPP TS 29.205: "Application of Q.1900 series to bearer-independent circuit-switched core network architecture; Stage 3".

[8] 3GPP TS 22.101: "Service aspects; Service principles".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the terms and definitions given in 3GPP TR 21.905 [1] and the following apply:

Editor's note: To be completed.

fallback: when two services (multimedia and speech) are proposed but only one of them is available or wanted, only the service available (preferred or less preferred) is selected, and the other one is discarded

service change: when two services (multimedia and speech) are available during the active state of a call, users may request a service change to switch between the two services

3.2 Abbreviations

For the purposes of the present document, the abbreviations given in 3GPP TR 21.905 [1] and the following apply:

Editor's note: To be completed.

BC	Bearer Capability
BC1	First Bearer Capability in a message (preferred service)
BC2	Second Bearer Capability in a message (less preferred service)
BCa	Bearer Capability of the currently selected service
BCb	Bearer Capability of the service to switch to
BCmm	Bearer Capability multimedia
BCsp	Bearer Capability speech
MMI	Man-Machine Interface
O-MSC	Originating MSC
O-UE	Originating UE
RI	Repeat Indicator
SCUDIF	Service Change and UDI/RDI Fallback
T-MSC	Terminating MSC
T-UE	Terminating UE

4 Service change and fallback for UDI/RDI multimedia

4.1 General Requirements

The Service Change and UDI Fallback (SCUDIF) is a function which applies to UDI/RDI multimedia calls (see 3GPP TS 22.101 [8], clause 7.2.1), and shall support the following:

a) Fallback to speech during call setup: allow a user to attempt to set up a multimedia call, and try a speech connection if the former doesn't succeed;

b) Fallback to the less preferred service (speech or multimedia) during call setup: allow the terminating side via specific settings for this service in the terminal to accept or reject a multimedia call, without interrupting the call setup;

c) Fallback to the preferred service (speech or multimedia) or speech during call setup: allow the call setup to proceed with a single service if the transit network does not support the signalling of this functionality;

d) BC negotiation at the terminating side: allow the terminating side via specific settings for this service in the terminal to turn a speech call (with service change) into a multimedia call and vice-versa;

e) Service change: allow a speech call to be turned to multimedia by either of parties, and back to speech, through a successful in call modification procedure;

f) Allow any of the users to reject a multimedia request from the other party while in speech mode.

To fulfil:

- service request signalling between the UE and the MSC;
- service request signalling across the Core Network.

This functionality is not supported for multimedia with Fixed Network User Rate set to 32 kbit/s. In this case, the MSC shall revert to a multimedia only call.

4.2 Access Call Control Signalling

Using the repeat indicator value "support of service change and fallback", as described in 3GPP TS 24.008 [3], clause 5.3.6, together with two BC-IEs, a multimedia and a speech, it is possible to request a service change and fallback functionality, while still maintaining the backwards compatibility with non-supporting terminals.

4.2.1 Mobile originating side - initiation of call setup

By sending a SETUP message with a Repeat Indicator set to "support of service change and fallback", a multimedia BC-IE, and a speech BC-IE (see figure 4.1), a terminal may request a call to be set with the capability to fallback to either a speech only, a multimedia only call or to use service change later during the active state of the call (the first BC-IE indicates the preferred service).

After checking the provisioning, and verifying that the functionality is supported, the MSC replies in the CALL PROCEEDING message with either the two BCs in the same order (or no BC to indicate that it accepts the proposed settings - see figure 4.2), or with a single BC (multimedia or speech - see figure 4.3).

In the case the MSC ignores the SETUP message if the presence of a reserved value for the Repeat Indicator is set, it sends a STATUS message back to the UE (see figure 4.4), with the Cause Value set to #100, "Conditional IE error" (see 3GPP TS 24.008 [3], clause 8.7.2). The UE then reacts as described in 3GPP TS 24.008 [3], clause 5.5.3.2.2, and may resend a new SETUP message with a single BC, or perform any appropriate action according to its implementation. This also applies in case the MSC returns instead a RELEASE COMPLETE message.

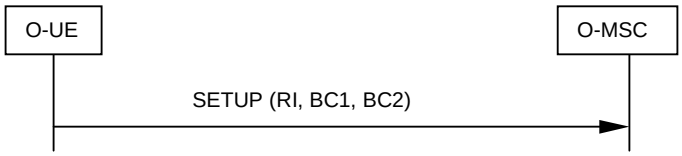
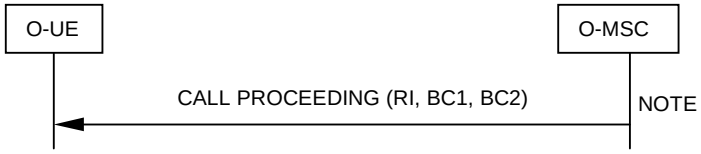


Figure 4.1: SETUP message towards the originating MSC



NOTE: The MSC may send CALL PROCEEDING without RI and BCs to indicate that it accepts the proposed settings sent in the SETUP message.

Figure 4.2: Normal case

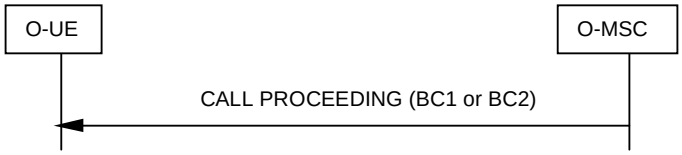
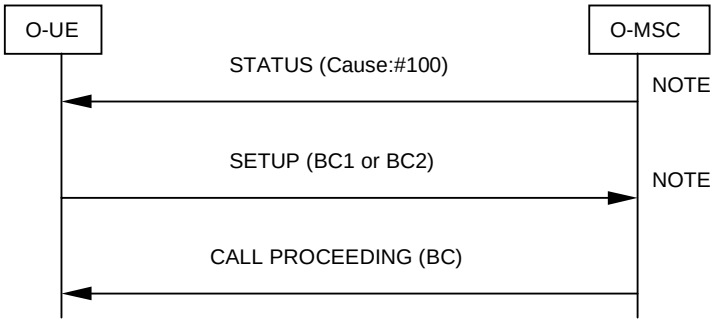


Figure 4.3: Fallback case



NOTE: The sending of the STATUS message from the MSC and the second SETUP message from the UE are implementation dependent.

Figure 4.4: MSC not supporting the RI value

4.2.2 Mobile terminating side

When the terminating MSC receives a request for a multimedia call, it shall check if the called user is provisioned for the service.

The terminating MSC shall include in the SETUP message towards the UE both BC-IEs in the same order as indicated by the incoming request together with the Repeat Indicator set to "service change and fallback in order to invoke the SCUDIF functionality in the called terminal (see figure 4.5).

The terminating UE, based on its capabilities and internal settings, may return the two BC-IEs in the same order (or no BC to indicate that it accepts the proposed settings - see figure 4.6), reversed order (see figure 4.7), or just one BC-IE (either speech or multimedia - see figure 4.8) to the terminating MSC in the CALL CONFIRMED message.

In the case the UE ignores the SETUP message due to the presence of a reserved value for the Repeat Indicator, it sends a STATUS message back to the terminating MSC (see figure 4.9), with the Cause Value set to #100, "Conditional IE error" (see 3GPP TS 24.008 [3], clause 8.7.2). The terminating MSC shall then react according to 3GPP TS 24.008 [3], clause 5.5.3.2.2 and it shall send a new SETUP message with a single BC, either the preferred service BC-IE or the speech BC-IE (fallback to speech), depending on configuration. The call setup then proceeds accordingly.

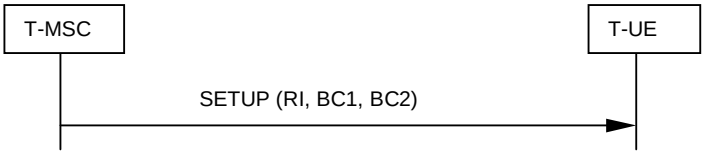
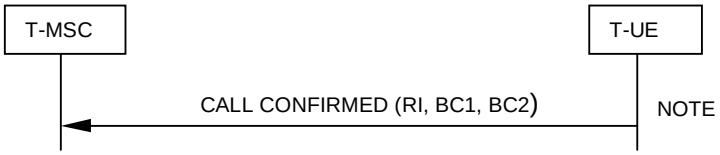


Figure 4.5: SETUP message towards the terminating UE



NOTE: The UE may send the CALL CONFIRMED message without RI and BCs to indicate that it accepts the proposed settings sent in the SETUP message.

Figure 4.6: Normal case

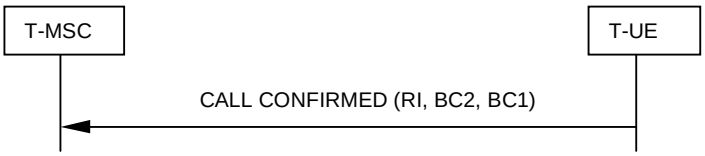
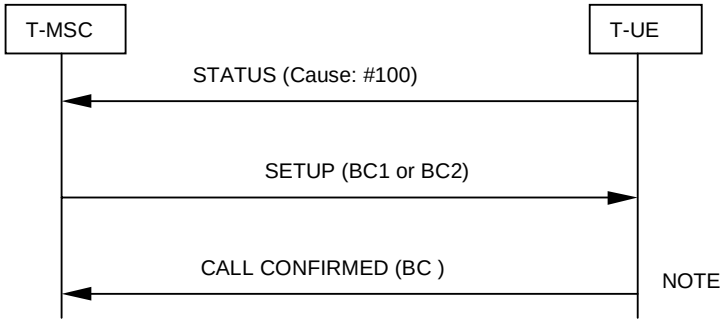


Figure 4.7: Reversed call setup

Figure 4.8: Fallback case



NOTE: The UE may send the CALL CONFIRMED message without BC to indicate that it accepts the proposed settings sent in the SETUP message.

Figure 4.9: UE not supporting the RI value

4.2.3 Mobile originating side - completion of call setup

If the preferred mode, that is the first BC-IE indicated by the originating UE, was selected as the result of negotiations, the call shall be set up normally towards the originating UE.

If the negotiation resulted in a change of the selected mode, i.e. the call was set up as "multimedia first" and changed during the negotiation to a speech call, or vice-versa, because of either fallback or change of selected mode, an In-Call Modification procedure (see 3GPP TS 24.008 [3], clause 5.3.4.3) shall be initiated towards the originating UE after the call control entity has entered the active state, i.e. the CONNECT message has been sent.

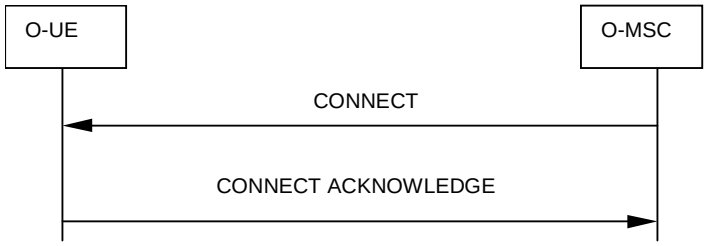


Figure 4.10: Preferred mode selected

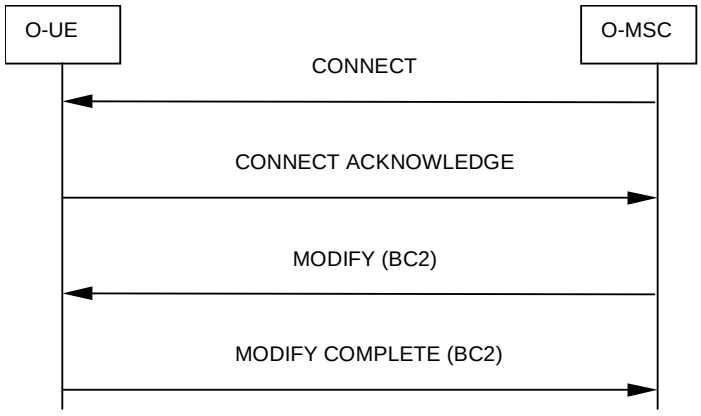


Figure 4.11: Less preferred mode selected, accepted

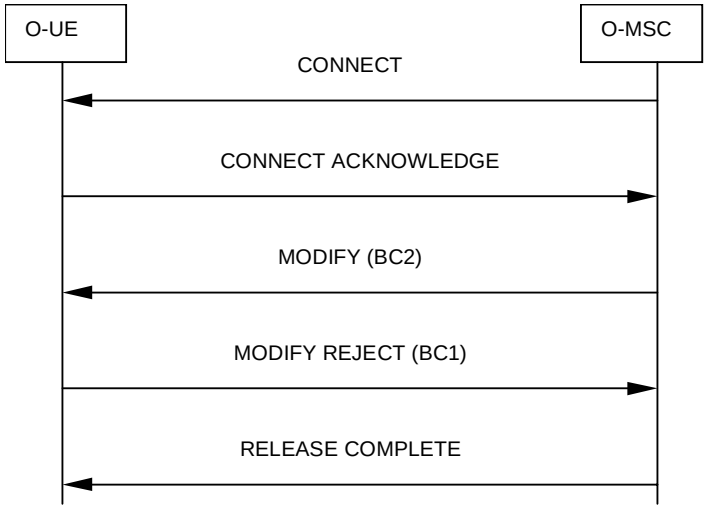


Figure 4.12: Less preferred mode selected, rejected

4.2.4 Service change in the active state

At any given time, if either of call parties wants to change from the current active mode to the other mode via MMI, the terminal shall activate an In-Call Modification procedure. Using this procedure, described in 3GPP TS 24.008 [3], clause 5.3.4.3, the UE shall send a MODIFY message containing the BC-IE to change to. This BC-IE shall be one of those already negotiated at call setup.

As a result, the MSC shall then invoke the service change procedure (see clause 4.3.5). If the request is accepted, the originating MSC sends a MODIFY COMPLETE message to the UE including the BC-IE of the mode to switch to (see figure 4.13). If the request is rejected, the MSC sends a MODIFY REJECT message to the UE including the BC-IE from the current active mode (see figure 4.14).

In the case the MSC has determined that the other mode is unavailable (e.g. a fallback to either mode has occurred), it shall reject the MODIFY request at once by replying with a MODIFY REJECT message.

On the remote side, the MSC shall initiate an In-Call Modification procedure towards the terminal using the MODIFY message. The terminal shall request confirmation from the user unless configured differently. If the change is accepted, the UE shall reply to the MSC with a MODIFY COMPLETE message, whereas a MODIFY REJECT message shall be sent if the change is rejected.

NOTE: Privacy concerns strongly advise that any change to multimedia mode, unless explicitly allowed by the user in the terminal configuration settings, triggers a question to the user in order to confirm or decline the change. The details on how to provide the user interaction are left for implementation.

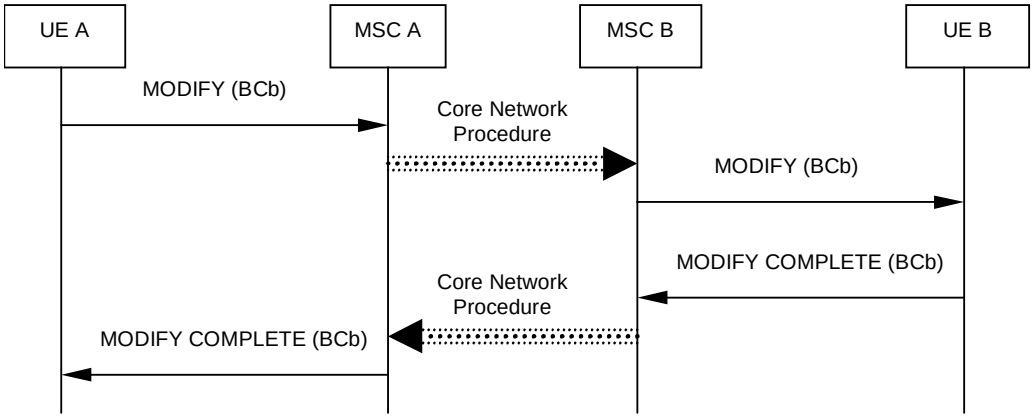


Figure 4.13: Service change requested, accepted

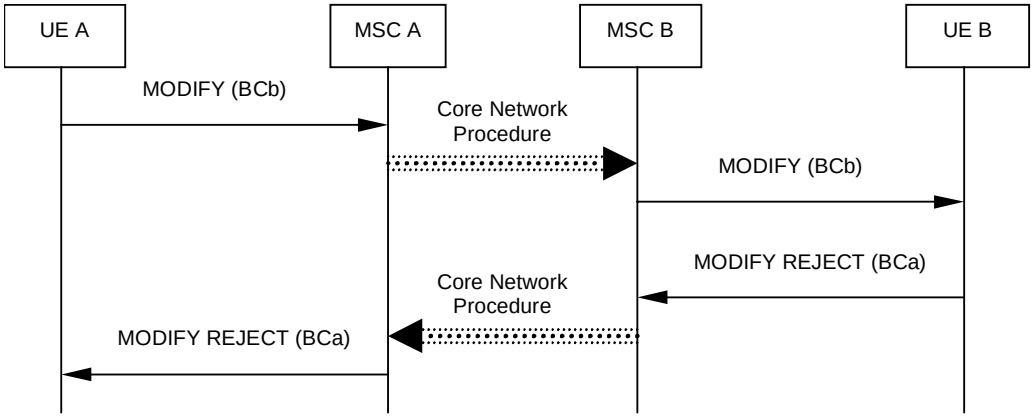


Figure 4.14: Service change requested, rejected

4.3 Core Network procedures

In order to provide the capability in the network to transmit the request for service change and fallback both at call setup and during the active state of a call, the normal Out-of-Band Transcoder Control procedures, described in 3GPP TS 23.153 [2] shall be used. The following text describes the codec to be used, the mapping between the terminal interface described above, and the different IEs to be used for the codec negotiation procedures at both the originating and the terminating MSC.

4.3.1 Multimedia codec

The codec negotiation procedures transmit an ordered list of preferred codecs from the originating to the terminating MSC. A node that requires interaction with the user plane will remove the codecs it does not support. The terminating MSC shall select the codec to use ("selected codec") from the list of available codecs for the call. This selection shall be based on the received list of codecs and on the information given by the terminating UE in the CALL CONFIRMED message.

A dummy codec (defined in 3GPP TS 26.103 [4]) is included in the codec list to indicate that a multimedia call is requested. This codec is in the present document referred to as the 3G-324.M codec.

This codec is only used by the Core Network and shall not be sent from the terminal in the Supported Codec List IE.

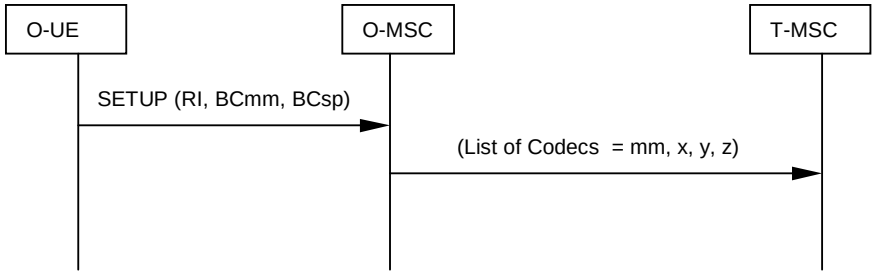
4.3.2 Originating side - initiation of call setup

The originating MSC has a list of supported codec types, listed in order of preference.

If the SETUP message received from the UE contains a Repeat Indicator with a value of "service change and fallback", in addition to a multimedia BC-IE and a speech BC-IE, the MSC shall include a 3G-324.M codec in the list of supported codec types according to the following rule:

- if the multimedia BC-IE is listed first, then the 3G-324.M codec shall be the first codec in the list (see figure 4.15);
- if the speech BC-IE is listed first, then the 3G-324.M codec shall be the last codec in the list (see figure 4.16). In the case that the maximum number of codecs is already reached before insertion of the 3G-324M codec, the optional speech codec with the least preference shall be replaced by the 3G-324.M codec.

The list shall then be sent according to the Out-of-Band Transcoder Control codec negotiation procedures. The TMR field, although mandatory BICC/ISUP parameter, has no meaning when using OoBTC/BICC codec negotiation (the link characteristics and QoS are determined from the codec type and signalled to any intermediate switches via the bearer control protocol) and thus shall be set arbitrarily to "speech". A transit node that requires interaction with the user plane will remove from the list the codecs it does not support. If the 3G-324.M codec is not supported, and thus removed, the call shall be turned into a normal speech call (fallback to speech) and follow the normal call setup procedures.



x, y, z: speech codecs.
mm: dummy multimedia codec.

Figure 4.15: Multimedia BC as first BC

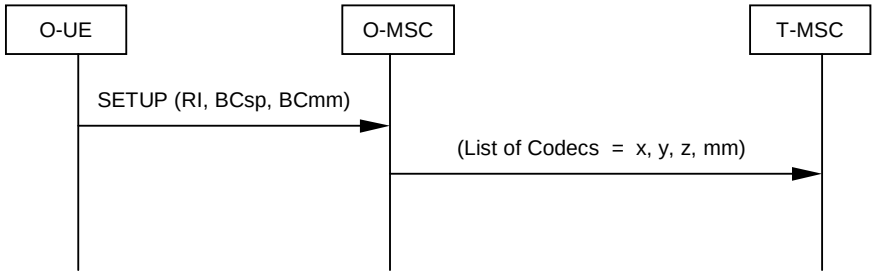


Figure 4.16: Speech BC as first BC

4.3.3 Terminating side

The terminating MSC receives the list of supported codec types, including the 3G-324.M codec. It shall then send a SETUP message towards the terminating UE including a Repeat Indicator with the value "service change and fallback" and two BC-IEs, according to the following rule:

- if the 3G-324.M codec is the first (preferred) codec in the list of supported codecs, then the first BC-IE in the SETUP message is the multimedia BC-IE, and the second BC-IE is the speech BC-IE (see figure 4.17);
- if the 3G-324.M codec is in the list of supported codec types, but not in the first position, then the first BC-IE in the SETUP message is the speech BC-IE, and the second BC-IE is the multimedia BC-IE (see figure 4.18).

The terminating UE answers according to its capabilities in the CALL CONFIRMED message. The terminating MSC shall determine the Selected Codec and construct the list of available codecs according to the following rules:

- if no Repeat Indicator is included, and only a speech BC-IE is received, the MSC shall choose a speech codec as the Selected Codec according to the normal mechanism, and no 3G-324.M codec shall be inserted in the list of available codecs (see figure 4.19);
- if no Repeat Indicator is included, and only a multimedia BC-IE is received, the MSC shall choose the 3G-324.M codec as the Selected Codec, and only the 3G-324.M codec shall be inserted in the list of available codecs (see figure 4.20);
- if the Repeat Indicator is included, and the speech BC_IE is the first BC-IE and the multimedia BC-IE is the second BC-IE, the MSC shall choose a speech codec as the Selected Codec according to the normal mechanism, and both the 3G-324.M codec and speech codecs shall be inserted in the list of available codecs (see figure 4.21);
- if the Repeat Indicator is included, and the multimedia BC-IE is the first BC-IE and the speech BC-IE is the second BC-IE, the Selected Codec shall be the 3G-324.M codec, and both the 3G-324.M codec and speech codecs shall be inserted in the list of available codecs (see figure 4.22).

NOTE: If the UE sends a CALL CONFIRMED message without Repeat Indicator and BCs, it indicates that it accepts the proposed settings sent in the SETUP message, which are then used by the MSC to select the relevant case.

The Selected Codec and the list of available codecs shall be sent back to the originating MSC according to the normal codec negotiation procedure.

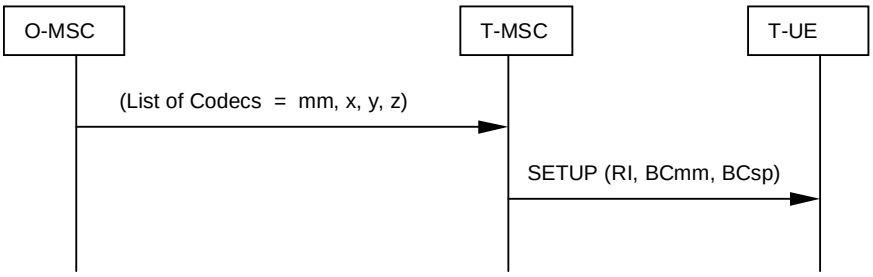


Figure 4.17: 3G-324M codec first

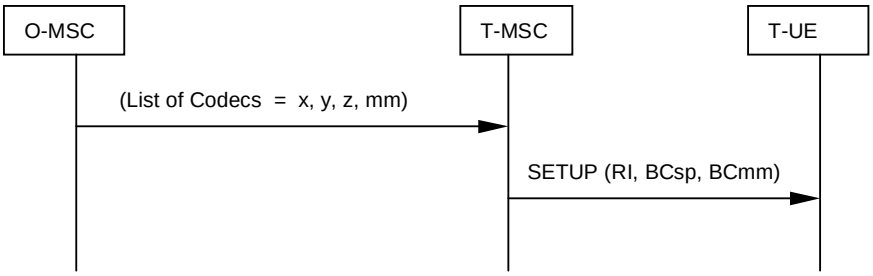
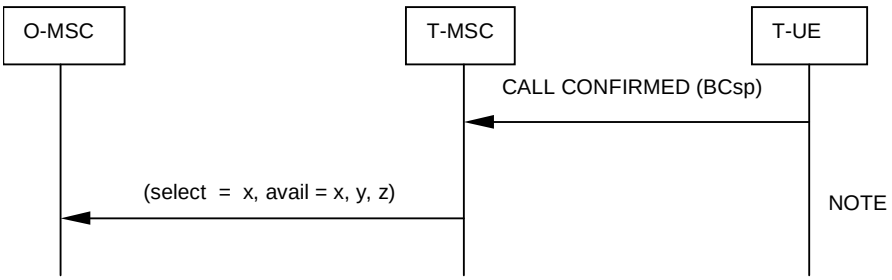


Figure 4.18: Speech codec first



NOTE: The actual speech codec is selected according to OoBTC procedures.

Figure 4.19: Speech only

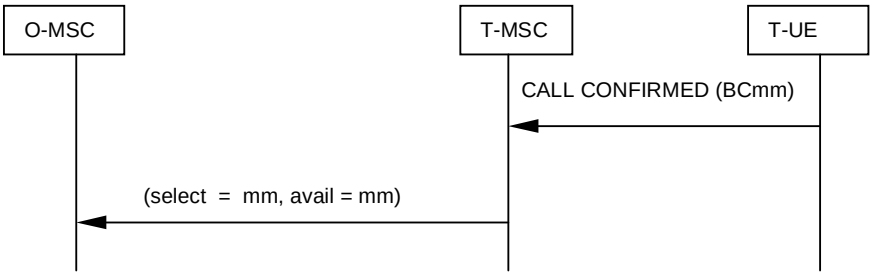
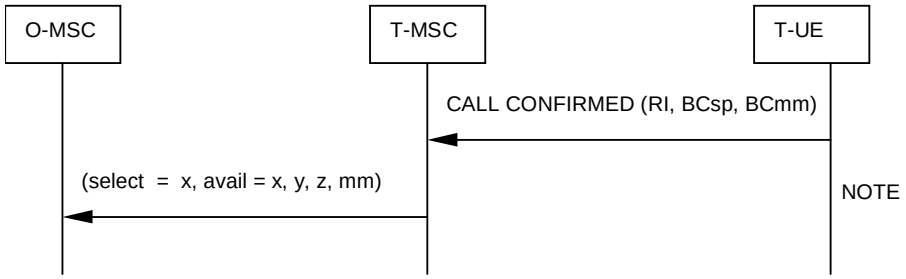
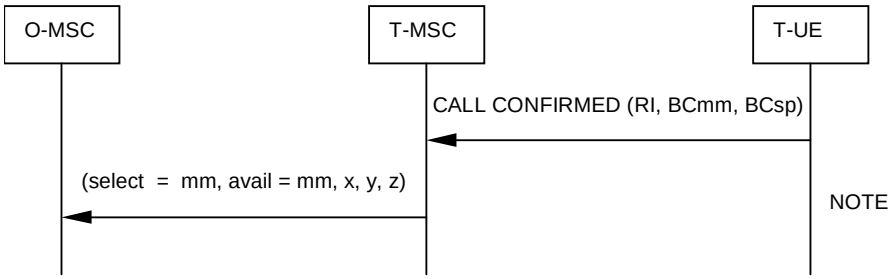


Figure 4.20: Multimedia only



NOTE: The actual speech codec is selected according to OoBTC procedures.

Figure 4.21: Speech preferred



NOTE: The actual list of speech codecs is built according to OoBTC procedures.

Figure 4.22: Multimedia preferred

4.3.4 Originating side - completion of call setup

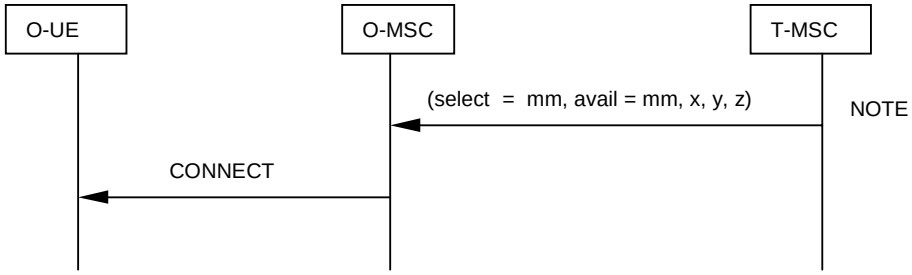
The originating MSC receives the Selected Codec and the list of available codecs, and, depending on the active mode, shall do the following:

The call was set up with a multimedia BC-IE first:

- if the Selected Codec is the 3G-324.M codec, no In-Call Modification procedure is necessary (see figure 4.23). If no speech codecs are included in the list of available codecs, all In-Call Modification procedures initiated by the UE using the speech BC-IE shall be rejected with a MODIFY REJECT message;
- if the Selected Codec is a speech codec, an In-Call Modification procedure to change to speech mode shall take place (see figure 4.24). If the 3G-324.M codec is not included in the list of available codecs, all In-Call Modification procedures initiated by the UE using the multimedia BC-IE shall be rejected with a MODIFY REJECT message.

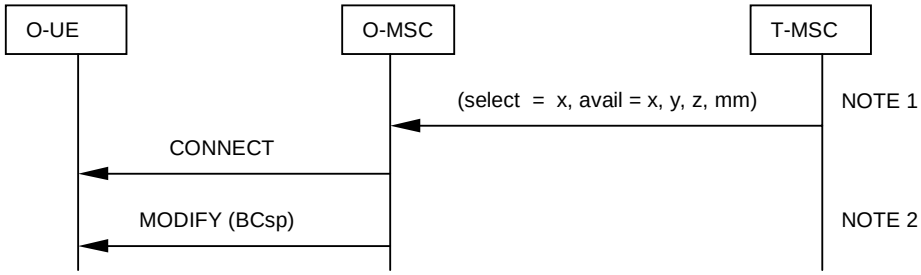
The call was set up with a speech BC-IE first:

- if the Selected Codec is the 3G-324.M codec, an In-Call Modification procedure to change to multimedia mode shall take place (see figure 4.25). If no speech codecs are included in the list of available codecs, all In-Call Modification procedures initiated by the UE using the speech BC-IE shall be rejected with a MODIFY REJECT message;
- if the Selected Codec is a speech codec, no In-Call Modification procedure is necessary (see figure 4.26). If the 3G-324.M codec is not included in the list of available codecs, all In-Call Modification procedures initiated by the UE using the multimedia BC-IE shall be rejected with a MODIFY REJECT message.



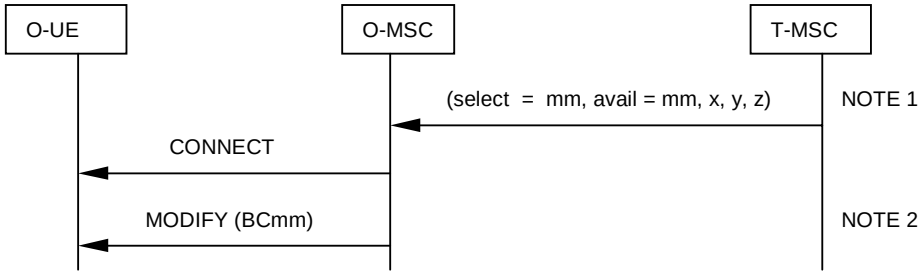
NOTE: Speech codecs (x, y, z) may or may not be present. If they are not present, subsequent MODIFY requests from the UE are rejected.

Figure 4.23: Multimedia preferred, selected



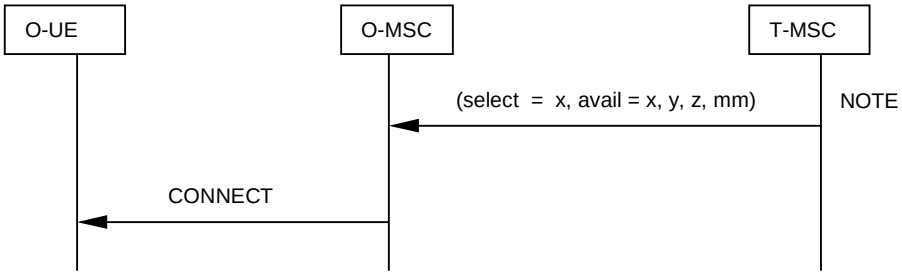
NOTE 1: The multimedia codec (mm) may or may not be present. If it is not present, subsequent MODIFY requests from the UE are rejected.
NOTE 2: see clause 4.2.3 for the In-Call Modification signalling.

Figure 4.24: Multimedia preferred, speech selected



NOTE 1: Speech codecs (x, y, z) may or may not be present. If they are not present, subsequent MODIFY requests from the UE are rejected.
NOTE 2: see clause 4.2.3 for the In-Call Modification signalling.

Figure 4.25: Speech preferred, multimedia selected



NOTE: The multimedia codec (mm) may or may not be present. If it is not present, subsequent MODIFY requests from the UE are rejected.

Figure 4.26: Speech preferred, selected

4.3.5 Service change during the active state

Whenever an In-Call Modification procedure is invoked by a terminal, unless it is not allowed as determined at call setup, the following shall take place:

- if the current mode is the speech mode and the MODIFY message contains a multimedia BC-IE, the normal Out-of-Band Transcoder Control procedures shall be invoked in order to change the Selected Codec to the 3G-324.M codec;
- if the current mode is the multimedia mode and the MODIFY message contains a speech BC-IE, the normal Out-of-Band Transcoder Control procedures shall be invoked in order to change the Selected Codec to the preferred speech codec.

When a MSC detects through an Out-of-Band Transcoder Control procedure that the selected codec has changed from a speech codec to the 3G-324.M codec, or vice-versa, it shall initiate an In-Call Modification procedure towards the UE with a MODIFY message containing the multimedia BC-IE (or the speech BC-IE), unless the new mode has been denied at call setup (see clause 4.2.4).

4.3.6 Interworking with external networks

If the 3G-324.M codec is included in the list of supported codec types received by a Gateway MSC, and the external network does not support BICC or does not support Codec Negotiation, the Gateway MSC shall terminate the codec negotiation and fallback to a single service.

NOTE 1: If the route is known not to support the SCUDIF functionality, the Gateway MSC may decide by configuration to terminate the codec negotiation and follow the procedure described in this clause.

In the case where the 3G-324.M codec is the first in the list, the network decides by configuration to fallback either to a UDI multimedia-only call or to speech. In the case where the 3G-324.M codec is not the first on the list, the call shall fallback to speech only.

If fallback to multimedia occurs, the call control parameters sent towards the external network shall be set according to the setting for multimedia calls, and TMR is set to "64 kbit/s unrestricted". The 3G-324.M codec shall be returned to the originating MSC server as the selected codec and be the only member of the available codec list.

NOTE 2: For multimedia calls, 3GPP TS 27.001 [5], annex B, and 3GPP TS 29.007 [6], table 7A, describe the setting and validity of the PLMN BC-IE as well as the comparable settings of parameters in the PLMN and ISDN BC-IEs. As the ISDN BC-IE parameter values used for UDI/RDI multimedia calls are identical to the BICC USI IE parameter values (see 3GPP TS 29.205 [7]), the setting of call control parameters sent towards the external network in case of fallback to multimedia can be derived straightforward.

If fallback to speech occurs, the call control parameters shall be set according to the setting for speech calls, and TMR is set to "speech". The 3G-324.M codec shall be removed from the available codec list. Speech codec selection shall be made according to normal OoBTC procedures for interworking to external networks, and the selected codec and available codec list returned to the originating MSC server.

Annex A (informative): Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2002-04					First draft of specification presented	1.0.0	1.0.0
2002-06	NP#16	NP-020168	-	-	Approved at NP#16 and placed under change control	2.0.0	5.0.0

History

Document history		
V5.0.0	June 2002	Publication