3GPP TSG CN Plenary **Tdoc NP-010084**
Meeting #11, Palm Springs, U.S.A
14th - 16th March 2001

Source: **TSG CN WG4**

Title: **CRs to Rel-4 on Work Item OoBTC**

Agenda item: **8.10**

Document for: **APPROVAL**

Introduction:

This document contains **15** CRs on **Rel-4** Work Item **"OoBTC"**, that have been agreed by **TSG CN WG4**, and are forwarded to TSG CN Plenary meeting #11 for approval.

Spec	CR	Rev	Doc-2nd-Level	Phase	Subject	Cat	Ver_C
23.153	003	1	N4-010166	Rel-4	Alignment of codec modification procedures with current BICC CS2 procedures	D	4.0.0
23.153	004	1	N4-010167	Rel-4	Alignment of codec modification procedures with current BICC CS2 procedures	C	4.0.0
23.153	005	1	N4-010168	Rel-4	Alignment of codec modification procedures with current BICC CS2 procedures	C	4.0.0
23.153	006	1	N4-010169	Rel-4	Interaction with CCBS	C	4.0.0
23.153	009	1	N4-010174	Rel-4	Editorials and minor corrections	D	4.0.0
23.153	001	1	N4-010175	Rel-4	Correct wording of Nb / Iu UP protocol	D	4.0.0
23.153	007	2	N4-010202	Rel-4	Chapter 5.6, establishment of additional calls	C	4.0.0
23.153	015		N4-010233	Rel-4	Alignment of SRNS Relocation with 3G TS 23.205	F	4.0.0
23.153	016		N4-010234	Rel-4	Inter-MSC Serving Area SRNS Relocation	D	4.0.0
23.153	020		N4-010266	Rel-4	Reference to Q.2630 in certain diagrams should be bearer independent	D	4.0.0
23.153	012	2	N4-010292	Rel-4	Change of terminology from "Node X" to "MSC Server X"	D	4.0.0
23.153	014	1	N4-010294	Rel-4	Alignment of codec modification procedures with current BICC CS2 procedures	C	4.0.0
23.153	017	1	N4-010295	Rel-4	General Improvements	D	4.0.0
23.153	021	1	N4-010299	Rel-4	Initialisation Issues	C	4.0.0
23.153	022	2	N4-010306	Rel-4	Avoiding double description of Iu framing package procedure	F	4.0.0

3GPP TSG-CN4 Meeting #06 **Tdoc N4-010175**
BEIJING, CHINA 15th 19th January 2001

CR-Form-v3

CHANGE REQUEST

⌘ **23.153** **CR** **001** ⌘ rev **01** ⌘ Current version: **4.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network ☐

Title:	⌘	Correct wording of Nb / Iu UP protocol
Source:	⌘	CN4
Work item code:	⌘	OoBTC
Date:	⌘	2001-01-17
Category:	⌘	**D**
Release:	⌘	REL-4

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	This document proposes text for 23.153 to cope with TSG CN WG3 requirement not to use the term “Iu UP” for the Nb interface. The changes proposed are to use the terms Iu UP as the User Plane specification for the Iu interface and Nb UP as the User Plane Specification for the Nb interface. Iu Framing Protocol is the User Plane Framing Protocol for 3GPP and is common to both interfaces.
Summary of change:	⌘	Correct wording of Nb UP and Iu UP and Iu framing protocol
Consequences if not approved:	⌘	Misleading standards

Clauses affected:	⌘	2, 3.1, 3.2,4.1, 5.4, 5.7, 5.8, 6.1, 6.2, 6.4, 6.6, 6.7, 6.8
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be

downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

*****first modified section *****

2 References

The following documents contain provisions that, 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.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] 3G TS 23.107: "QoS Concept and Architecture"

[2] 3G TS 24.008: "Mobile radio interface layer 3 specification Core Network Protocols –Stage 3"

[3] 3G TS 25.413: "UTRAN Iu Interface RANAP Signalling"

[4] 3G TS 25.415: "UTRAN Iu Interface User Plane Protocols"

[5] 3G TS 26.103: "Speech codec list for GSM and UMTS"

[6] Q.1902.x: "Bearer Independent Call Control, CS2"

[7] Q.765.5:" Application Transport Mechanism for Bearer Independent Call Control"

[8] 3G TS 23.205, Bearer-independent CS Core Network.

[9] 3G TS 33.106, Lawful Interception Requirements

[10] 3G TS 28.062, Inband Tandem Free Operation (TFO) of Speech Codecs.

[11] 3G TS 23.009, Handover Procedures.

[12] 3G TS 29.415, ~~Application Of Iu UP framing protocol on Core Network Nb Interface (Nb User P)lane Protocols~~Core Network Nb User Plane Protocols

**** next modified section ****

3 Definitions and abbreviations

3.1 Definitions

For the purposes of this specification the following definition apply:

Codec: A codec is a device to encode information from its original representation into an encoded form and to decode encoded information into its original representation.

Tandem Free Operation: Tandem Free Operation is the configuration of a connection with two transcoders that support TFO protocol and whose external coding schemes are compatible, thus enabling compressed speech to pass between them. When the TFO protocol is not

supported by both transcoders or the coding schemes are not compatible then normal "Tandem" operation occurs and PCM encoded speech is passed between them.

Transcoder: A transcoder is a device to change the encoding of information from one particular encoding scheme to a different one. Most commonly to/from a compressed speech algorithm from/to PCM.

Transcoder Free Operation: Configuration of a speech or multimedia call for which no transcoder device is physically present in the communication path and hence no control or conversion or other functions can be associated with it.

Out of Band Transcoder Control:

Capability of a system to negotiate the types of codecs and codec modes on a call per call basis through out-of-band signalling. Out-of-Band Transcoder Control is required to establish Transcoder Free Operation.

Default PCM Codec: This is the network default codec for speech in PCM domain, for example ITU G.711.

Transcoding free link (TrFL): A transcoding free link is a bearer link, where compressed voice is being carried between bearer endpoints. Within the UMTS network, the compressed voice is transmitted in Iu/- Nb User Plane format, depending on the related interface.

Tandem free link (TFOL): A tandem free link is a bearer link between transcoders that are operating in Tandem Free Operation mode, i.e. bypassing the transcoding functions. The involved transcoders can be a UMTS transcoder or a GSM TRAU with TFO functionality.

Transcoder free operation (TrFO):

This term is applicable to calls that have no transcoders involved in the connection between the source codecs. For mobile to mobile calls this is UE to UE, although the connection could be UE to another type of terminal. TrFO operation is considered a concatenation of TrFLs between RNCs.
In case of mobile to fixed network calls the term “Transcoder free operation” is applicable for the TrFLs carrying compressed speech. The TrFO usually ends at the Gateway to the PSTN where the speech is transcoded e.g. to G.711.

Tandem free and Transcoding free operation (TaTrFO):

Tandem free and transcoding free link operation is the concatenation of "transcoding free links" and "tandem free links".

Iu Framing: This is the framing protocol used for the speech packets on both the Iu User Plane interface and the Nb User Plane interface. The Iu framing protcol is specified by [4].

**** next modified section ****

3.2 Abbreviations

Abbreviations used in this specification are listed in GSM 01.04.

For the purposes of this specification the following abbreviations apply:

APM Application Transport Mechanism

BC Bearer Control

BICC Bearer Independent Call Control

CC Call Control

CCD	Conference Call Device
CFNRy	Call Forward on No Reply
CFNRc	Call Forward Not Reachable
IN	Intelligent Network
Iu FP	**Iu Framing Protocol**
OoBTC	Out-of-Band Transcoder Control
QoS	Quality of Service
RAB	Radio Access Bearer
TFO	Tandem Free Operation
TICC	Transport Independent Call Control
TrFO	Transcoder Free Operation
UP	User Plane

**** next modified section ****

4 Out-of-Band Transcoder control functionality

4.1 OoBTC Requirements

The OoBTC mechanism shall support the following:

- The capability to negotiate the preferred codec type to be used between two end nodes and to avoid the use of transcoders in the network at call set-up.

  The originating UE indicates the list of its supported codec types for codec negotiation. This list shall be conveyed to the terminating MSC. The terminating UE indicates its list of supported codec types to the terminating MSC.

  Where no compatible codec type can be selected between the UEs then the default PCM coding shall be selected. The originating MSC shall insert a transcoder in the path from the originating UE. Codec selection for the terminating UE is then performed within the terminating MSC, independently of the originating MSC.

  Note: For a codec type supporting various modes, the described functionality shall also be applicable to negotiate the set of codec modes common to originating and terminating UEs. Other negotiations such as Initialisation and Rate control are performed at a later point in time by the Iu~~/Nb~~ framing~~UP~~ protocol.

- The capability to control the presence of transcoders in the network after call set-up.

  Where a change to the call state of a transcoder free connection occurs, such that compressed speech cannot be maintained, it shall be possible to insert a transcoder or pair of transcoders where needed in the path. If this results in change to the encoding of the speech in other nodes then it shall be possible to inform the end points of this segment that the speech coding is changed. Such examples where this could occur are:

  - SS interruptions (e.g. A to B call connection becomes to multiparty call connection.)
  -
  - Handover to an incompatible partner.
  - Synchronisation loss

Where a change in call state as described above is temporary then it shall be possible to return to a transcoder free connection by removing the inserted transcoders and informing the endpoints that the connection has resumed to compressed speech encoding.

- The codec types comprise codecs for speech in the first phase. The transcoder control should have enough expandability to support future enhancements of codec types.
- The transcoder control procedure shall not cause a perceivable time lag in the cases of establishing transcoder free connection and reverting to normal (double transcoded) call connection in the cases described above for control of the presence of transcoders.
- The capability to insert transcoder (in cases where a TrFO connection is not possible) at the most appropriate location, i.e. to save bandwidth it should be located at the CN edge between an ATM or IP transport network and a STM network.
  - When a transport network cannot maintain compressed voice then reversion to the default PCM coding shall occur. A transcoder shall be inserted at that point and OoBTC procedures terminated. TrFO link is then possible between that point and the preceding nodes.
  - When a Non-TrFO call reaches the UMTS CN then OoBTC procedures are initiated from that point and after codec negotiation has been performed, if compressed voice can be supported through the CN then a transcoder is inserted at the edge of the CN.
- The OoBTC signalling procedures shall be supported by the call control protocol on the Nc interface, for example codec negotiation, codec modification, codec list modification, codec renegotiation, and codec list re-negotiation. BICC CS2 [6] supports such a mechanism, through the APM procedures defined by [7].

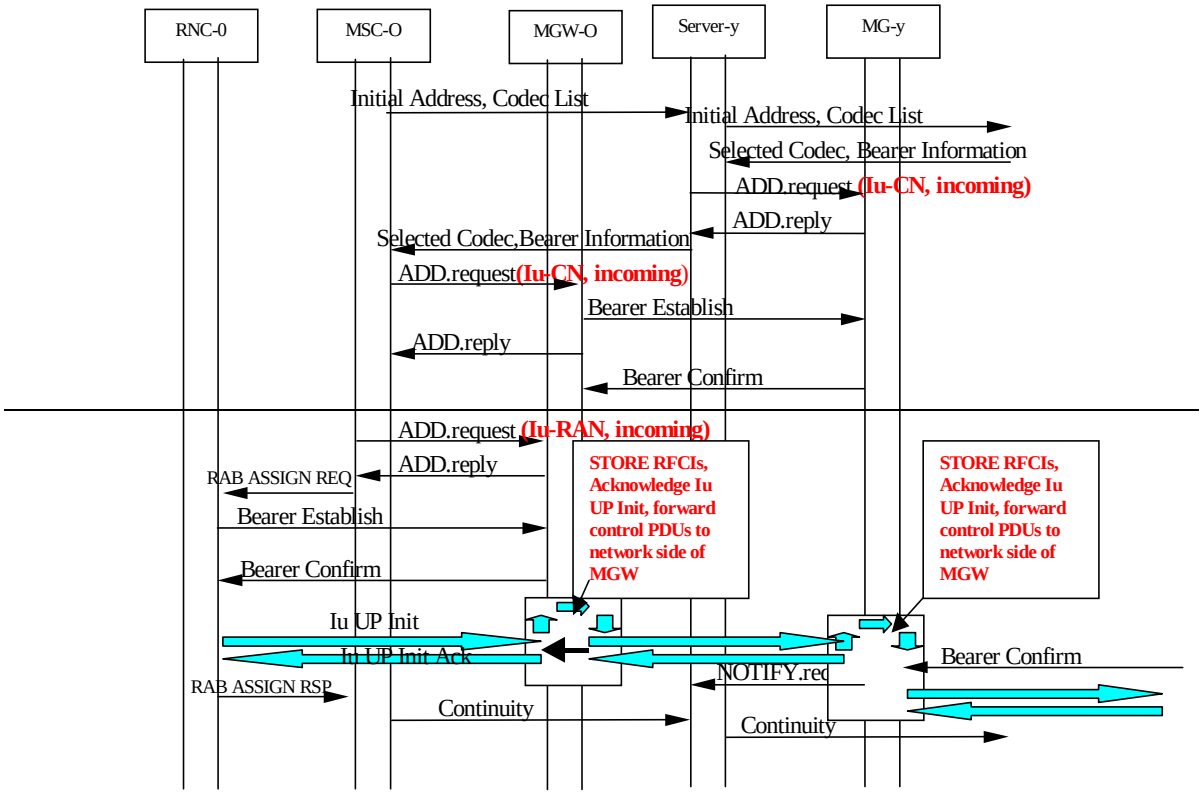
**** next modified section ****

5.4 ~~Iu- and Nb~~ UP Framing Protocol Handling for TrFO

5.4.1 Framing Protocol Initialisation

For TrFO calls the compressed speech is carried end to end (RNC to RNC or between RNC and other compressed voice terminal). In 3GPP Core Networks compressed voice framing protocol shall be specified~~carried~~ by ~~using~~ the Nb~~Iu~~ User Plane ~~Protocol~~ specification. The specification for Iu interface is defined in [~~4~~9], the specification for the Nb ~~User Plane Protocol~~ interface is defined in [12]. The framing protocol for these interfaces is the same, Iu framing and is thus described as such, for both the Iu interface and the Nb interface. For compressed voice only the support mode is used, thus for TrFO the ~~Iu~~ UP Initialisation procedure defined for the Nb UP ~~protocol~~ shall be supported by the CN, when a CN MGW is required to establish a connection ~~with the Iu UP protocol~~. ~~The definition of the Nb UP protocol shall not prevent the MGW to revert to transparent operation. For the sake of simplicity the UP protocols used on Iu and Nb interfaces are termed *Iu UP* till the end of this specification.~~

The Iu Framing~~UP~~ Protocol is established through the CN in a forward direction, independently of the bearer establishment direction. The Notify message to indicate bearer establishment shall not be sent until the ~~Iu UP~~Iu framing has been initialised. The continuity message (COT) shall not be sent forward until the Notify message has been received from the MGW and also the COT from the previous server has been received. The sequences for mobile originated calls are shown in figures 5.4/1 and 5.4/2 for forward bearer and backward bearer establishment, respectively. The parameters in the Add Request messages in the Figures are described in further detail in chapter 5.4.5.



~~Figure 5.4.1/1: Iu UP Protocol Establishment, Mobile Originating call, forward bearer.~~

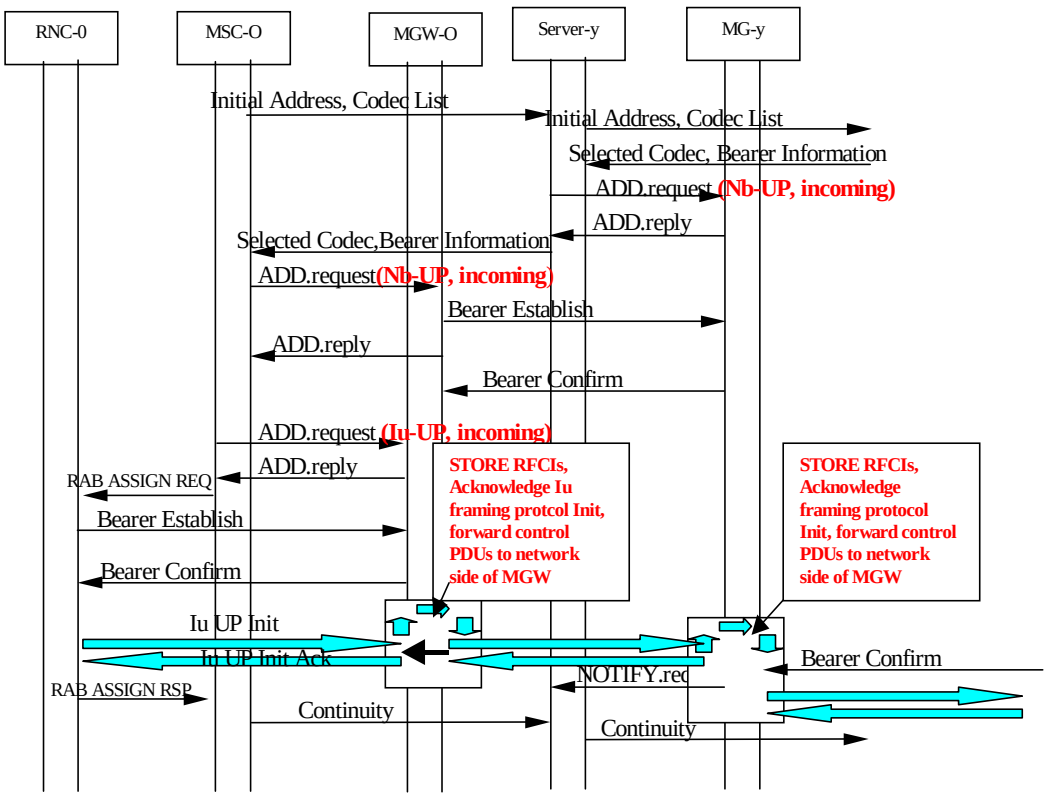
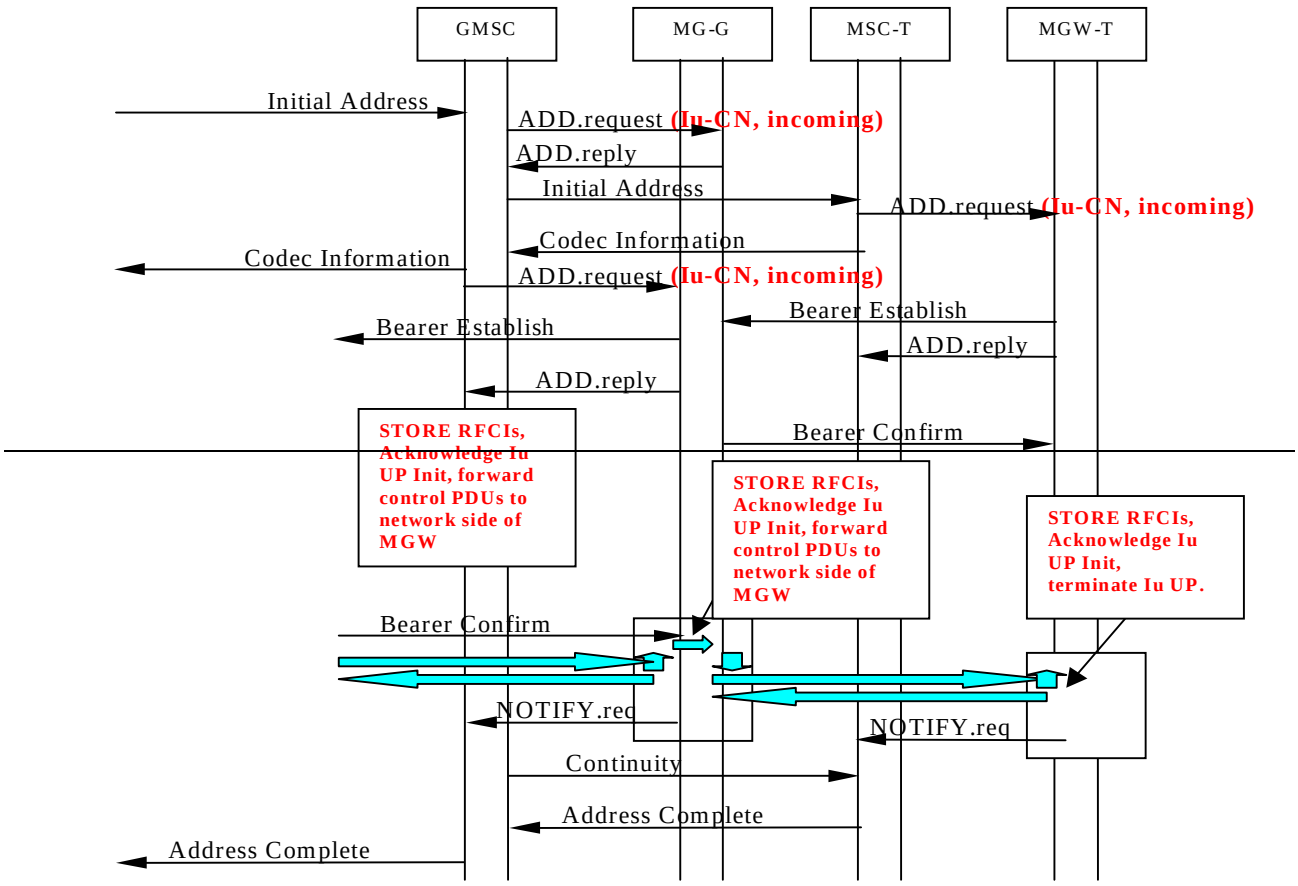


Figure 5.4.1/1: Iu Framing Protocol Establishment, Forward Bearer



~~Figure 5.4.1/2: Iu UP Establishment, backward bearer.~~

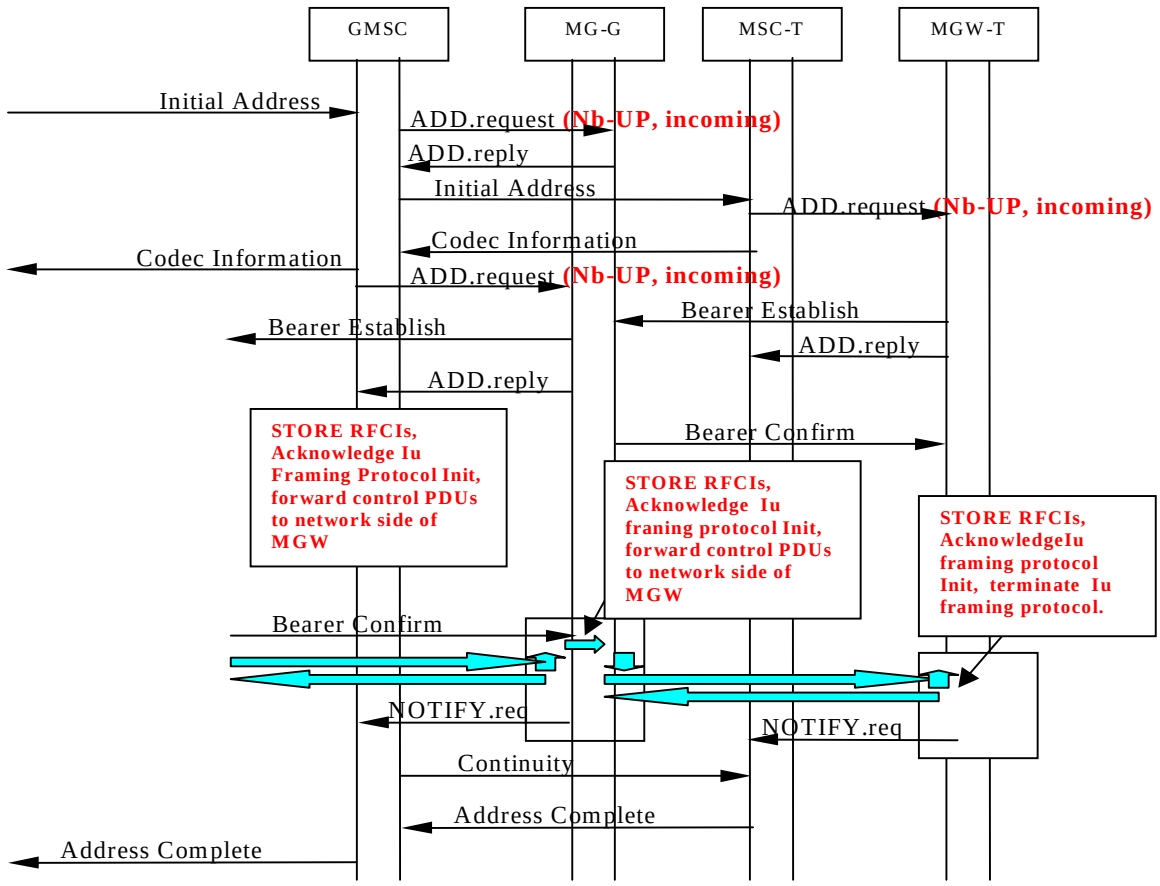


Figure 5.4.1/2: Iu Framing Protocol Establishment, backward bearer.

The transport independent call control procedures in [8] shall support a continuity mechanism, as described above.

5.4.2 RFCI Storage

RAB Subflow Combination Identifiers are allocated to the SDU formats sent to the RNC by the MSC in the RAB Assignment. This allocation is then sent in the ~~Iu UP~~Iu framing Initialisation PDU by the RNC in the User Plane. For further details see [3] and [4].

During the TrFO call establishment each MGW linked into the call shall store the RFCIs received from ~~Iu UP~~Iu framing PDU Type 14.

After the out of band codec negotiation has been performed, if the originating side is a UTRAN, then on request from the MSC for a RAB Assignment, it shall initiate the Iu user plane. If the originating side is a network that does not support ~~Iu UP~~Iu framing then the ~~Iu UP~~Iu framing initialisation is initiated by the GMSC, as described in detail in Chapter 6.7. An Initialisation Protocol Data Unit (PDU) shall be sent to the first MGW in the call connection. Each initialisation leg is acknowledged per TrFO Link, i.e. per MGW-MGW interface. The subsequent initialisation is performed using the same RFCI set as received from the preceding node, independently of the Stream mode directions (i.e. if the terminations are not through connected).

This is shown figure 5.4.2/1.

Figure 5.4.2/1: RFCI Storage and subsequent initialisation in MGW

When the MGW terminations are through-connected and the RFCIs at both terminations are matching, then the MGW may revert to transparent mode; the RNCs shall not perform any subsequent ~~Iu UP~~Iu framing initialisations without explicit request by the serving MSCs.

All succeeding MGWs in the path shall behave in a similar way as described above.

5.4.3 RFCI Mismatch Resolution

At the terminating end of a TrFO connection with ~~Iu UP~~Iu framing initialised to the terminating MGW, the originating RFCI allocation is stored. The terminating RNC is then requested to perform a RAB Assignment towards the terminating MGW. This results in an ~~Iu UP~~Iu framing initialisation, where the allocation of the RFCI values is independent from the Originating RNC's allocation. These values may then be different to the originating RNC's set.

The terminating MGW shall acknowledge the ~~Iu UP~~Iu framing Initialisation and compare the RFCI values stored from the originating side. If the allocated index values do not match then the MGW shall initiate an ~~Iu UP~~Iu framing Initialisation PDU towards the terminating RNC with the RFCI allocation as defined by the preceding node (previously stored in the MGW). This is shown in figure 5.4.3/1

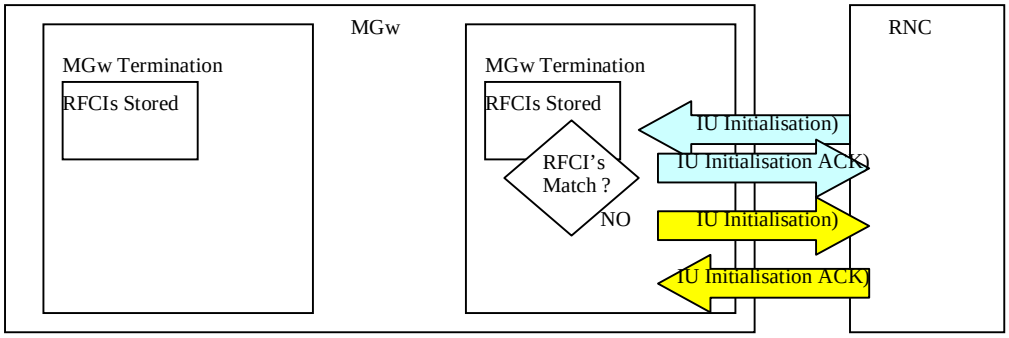


Figure 5.4.3/1:RFCI Mismatch Resolution

Further details of the TrFO call establishment are described in chapter 6.

This resolution handling is required also during RNC relocation; further details are described in chapter 6.

5.4.4 TrFO Break

The event and procedure when a TrFO connection must be interrupted at a certain point in the path, e.g. due to a supplementary service invocation or for handover/relocation, is termed "TrFO Break". A TrFO Break occurs at a MGW directed by the appropriate Sever. During this period the Iu User Plane protocol is terminated by this MGW, in general at both sides of the MGW. This means that it must respond to new Initialisation PDUs and Inband Rate Control PDUs. The MGW inserts a TrFO Break Function, which then makes use of the stored RFCI values, in order to perform the required ~~Iu UP~~Iu framing protocol functions and interpret the payload. Further call scenarios for specific services that incur a TrFO break are described in chapter 6.

5.4.5 MGW Control Protocol ~~Iu UP~~Iu framing Package properties

The following is a summary of the ~~Iu UP~~Iu framing H.248 requirements; the procedures are valid for ~~Iu UP~~Iu framing in Support Mode:

Additional Package Properties:

~~Iu UP~~Iu framing Termination Type: Values - Iu-RAN (Iu Interface)

- Iu-CN (Nb Interface)

~~Iu UP~~Iu framing Initialisation Procedure: Values - Incoming

- Outgoing

Procedures:

~~Iu UP~~Iu framing Initialisation procedure is always acknowledged between MGW peers. If a request for a Notification for the bearer establishment is requested then this shall not be sent until the acknowledgement for the ~~Iu UP~~Iu framing initialisation has also be returned.

The RFCI parameters are always stored against the MGW termination that received the ~~Iu UP~~Iu framing initialisation.

If a MGW has ~~Iu UP~~Iu framing termination property Initialisation Procedure = Incoming then it expects to received an Initialisation (either internally or externally).

If a MGW has ~~Iu UP~~Iu framing termination property Initialisation Procedure = Outgoing then it generates a network originated Initialisation PDU.

If a MGW has two terminations in the same context defined as supporting ~~Iu UP~~Iu framing package, then on receipt of an Iu Initialisation procedure from one side it shall forward the ~~Iu UP~~Iu framing initialisation procedure on to the peer MGW. This procedure shall be performed independently of the through-connection of the terminations in the context, but is dependent on the bearer connection from the other termination to its peer MGW being established.

If a MGW has one termination with Type = Iu-UP~~RAN~~ and one with type Nb-UP~~Iu-CN~~ in the same context then no forwarding of ~~Iu UP~~Iu framing initialisation out from the Iu-UP~~RAN~~ termination shall be performed until an ~~Iu UP~~Iu framing initialisation has been received at the Iu-UP~~RAN~~ side. If the RFCI values stored at the Iu-CN termination do not match the RFCI values stored at the Iu-RAN side then "RFCI Matching" may be performed to the Iu-RAN side – ~~Iu UP~~Iu framing initialisation is sent with the RFCI values from the Iu-CN side. No "RFCI Matching" is permitted at the Iu-CN side.

"RFCI Matching" may be delayed if terminations are not through-connected, triggered by connection modification otherwise it shall be performed immediately, this is implementation option

If "RFCI Matching" is not performed the MGW shall map the indexes for Iu frames from one side to the RFCI indexes from the other side.

If a MGW has two Iu-RAN terminations connected to the same context then the "RFCI Matching" is performed to the termination latest defined.

If a MGW has two terminations with ~~Iu UP~~Iu framing package connected to the same context and both RFCI sets match then the MGW may switch into ~~Iu UP~~Iu framing transparent mode – no monitoring of the Iu frames is performed, provided that the terminations are through-connected.

If a H.248 procedure is received when a MGW is in transparent mode (but ~~Iu UP~~Iu framing is defined as support mode) that requires interpretation or interaction with the ~~Iu UP~~Iu framing then the MGW shall switch back to support mode, i.e. perform monitoring or termination of the ~~Iu UP~~Iu framing protocol.

5.7 Inband Rate Control

Inband rate control shall only allow the RNCs to set the maximum codec mode (maximum bitrate) from the set of codec modes that have been negotiated out of band. This procedure is called Maximum Rate Control. The final maximum mode selected results from a rate control request from one side and the maximum rate supported at the receiving side; the lower rate of these is selected. . This is known as Distributed Rate Decision. In TrFO maximum rate control shall be supported through the ~~Iu UP~~Iu framing protocol and through transit networks supporting compressed voice. The maximum rate control procedures are further defined within the Iu UP protocol [4].

When the MSC requests for a RAB to be assigned, it shall always define 1 speech mode SDU (lowest rate), DTX SDU and no data SDU as non-rate controllable. Other SDU formats for higher rates shall be defined as rate controllable.

At SRNS relocation the new RNC shall send a rate control frame at Relocation Detect indicating its current maximum rate, it will receive in the acknowledgement the current maximum rate from the far end. This procedure is called Immediate Rate Control. Again the distributed rate decision means both RNCs will operate within a common limit.

5.8 DTMF Handling For TrFO Connections

DTMF from the UE is sent via DTAP procedures out-band. For a TrFO call the Originating MSC shall use an out-band DTMF procedure, all CN nodes shall support this procedure in their call control protocol. The out-band DTMF procedure shall also be used when TrFO is not achieved in order that TFO is possible. Insertion of DTMF in the PCM payload can result in the break of the TFO connection.

For terminating calls DTMF may need to be received by the core network (for voice-prompted services, voicemail control procedures etc). If the DTMF is received out-band then out-band procedures shall be maintained in core network.

If the DTMF is received for a TrFO call from an external network inband, in I.366.2 profile or RTP payload type, then the gateway MGW which interworks between ~~Iu UP~~Iu framing and the external framing protocol shall report the DTMF tones via H.248 procedures to its server. The server shall then use out-band procedures to pass the DTMF through the CN. See Figure 5.9/1.

The MGW may also optionally pass DTMF inband where such an option exists for the Nb interface, and is supported by the proceeding MGW.

Transcoding to default PCM to send DTMF tones shall be avoided for TrFO connections.

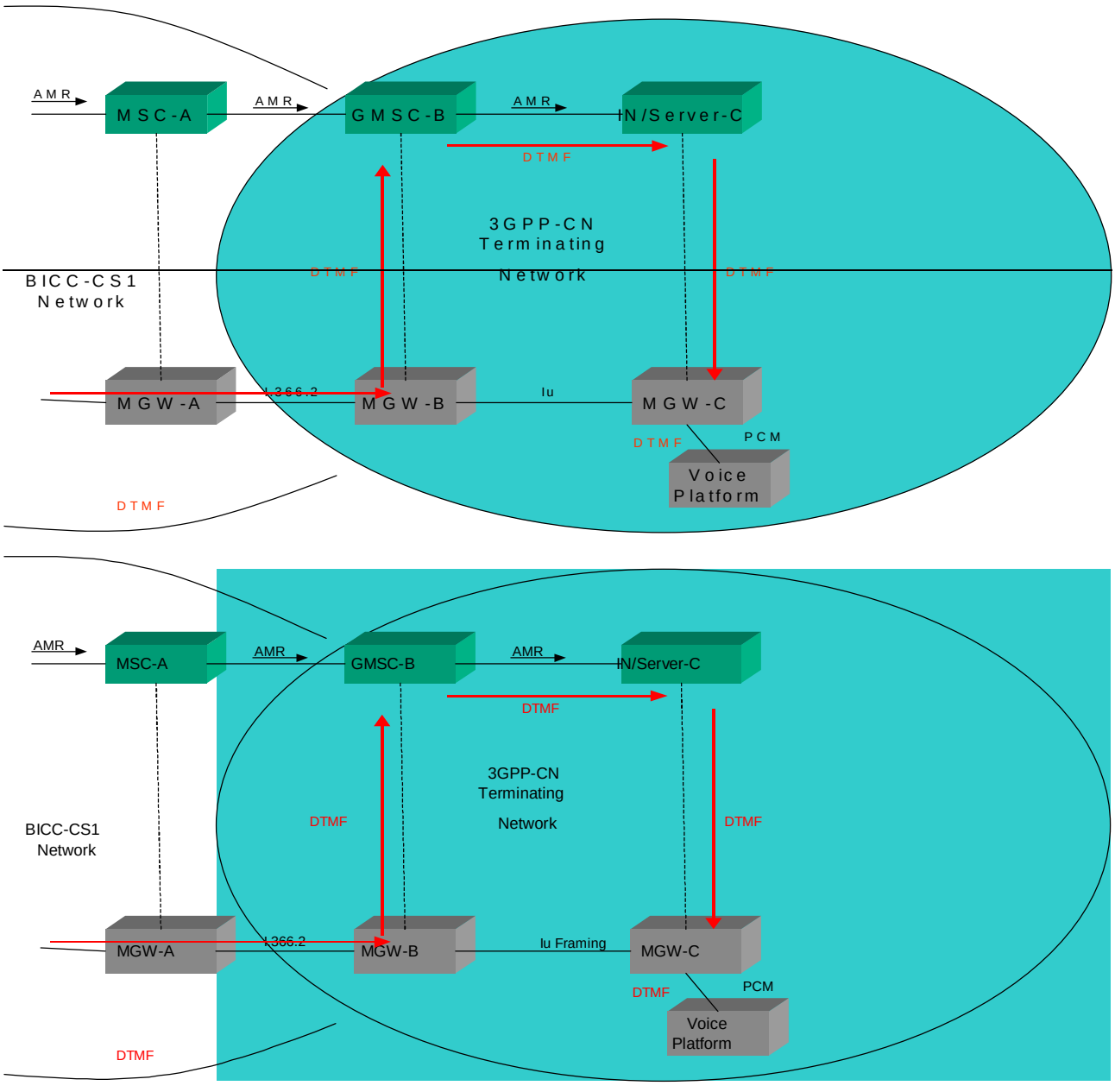


Figure 5.9/1:DTMF received inband from external network

**** next modified section ****

6 Detailed Call Procedures

6.1 Mobile to Mobile TrFO Call Establishment

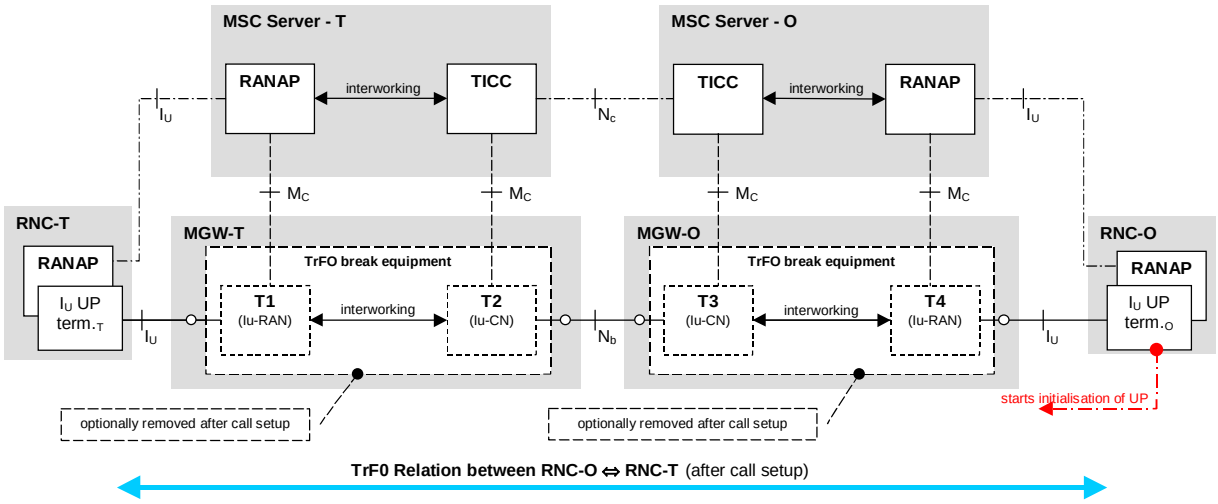


Figure 6.1/1: Configuration during Call Setup of a Mobile to Mobile Call.

Following network and protocol entities are involved in the scenario, outlined in Figure 6.1/1:

RNC-T, **RNC-O**: terminating/originating RNCs

MSC Server-T, MSC Server-O: MSC Servers, performing service, i.e. codec negotiation

MGW-T, **MGW-O:** terminating/originating MGWs with the optional capability to insert/remove so called

TrFO break equipment: (**TBE**s), i.e. contexts containing an UTRAN- and a CN side I_U framing~~UP~~ termination (**T1** – **T4**), inter-working in a distinct manner on control level. [Note: *context* is meant to be the H.248 specific throughout the document]. It is aimed to design protocols for TrFO in a way, that these pieces of HW can be removed after call setup phase to allow to revert to "simple" AAL2 switching in case of ATM transport.

I_U FP~~UP~~ term.$_T$, **I_U FP~~UP~~ term.$_O$**: Terminating- and originating-side TrFO peers (I_U framing~~UP~~ terminations in RNC's in Figure 6.1/1)

RANAP, **TICC**:C-plane protocol incarnations, responsible for codec negotiation, controlling the respective interfaces (I_U, N_C), creating, modifying, removing etc. terminations and contexts.

The final configuration is (at least logically) an end to end TrFO relation between RNC-T and RNC-O with the option to remove the TBEs from the user data path, i.e. to revert to pure AAL2 switching in case of ATM Transport.

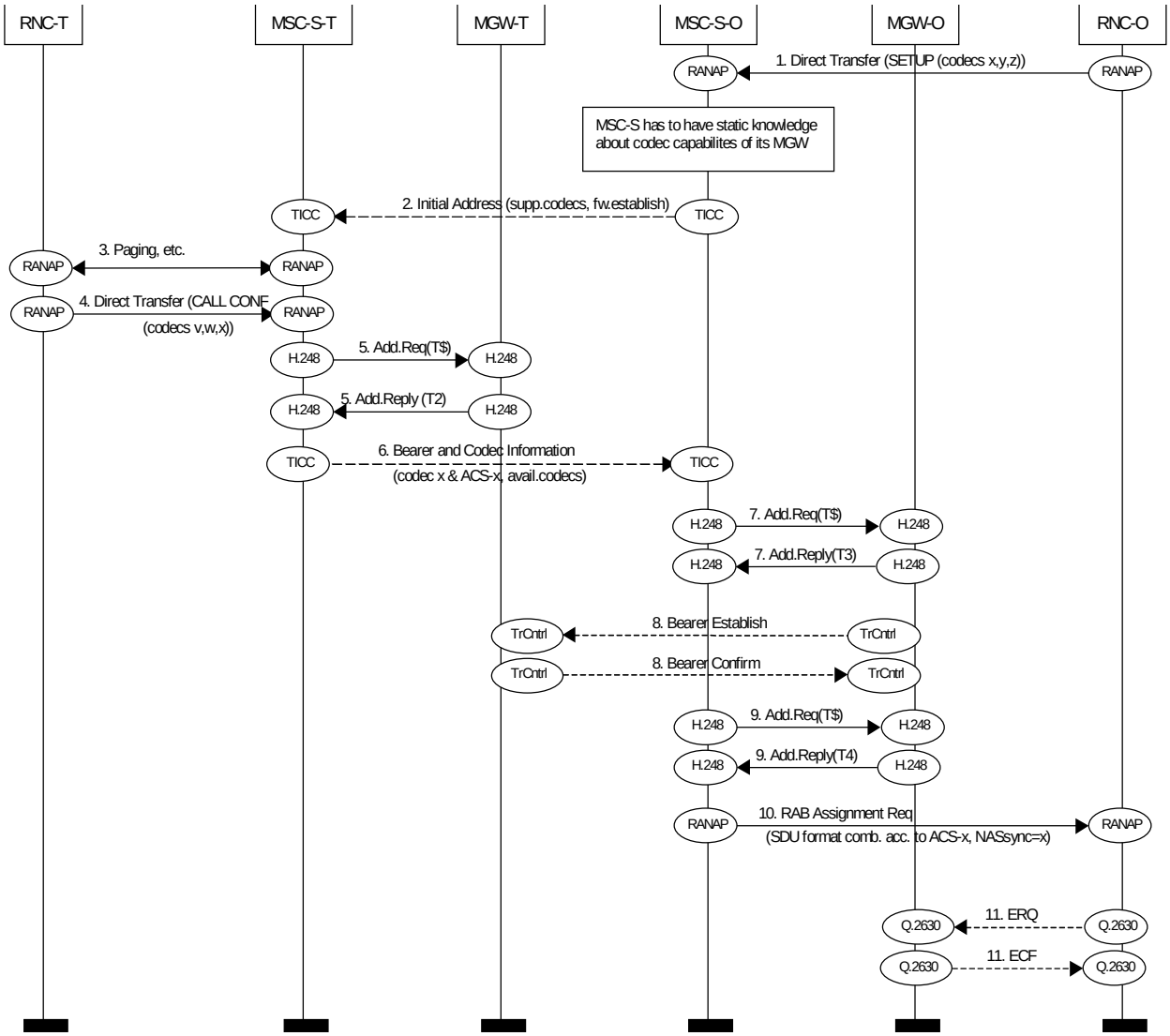
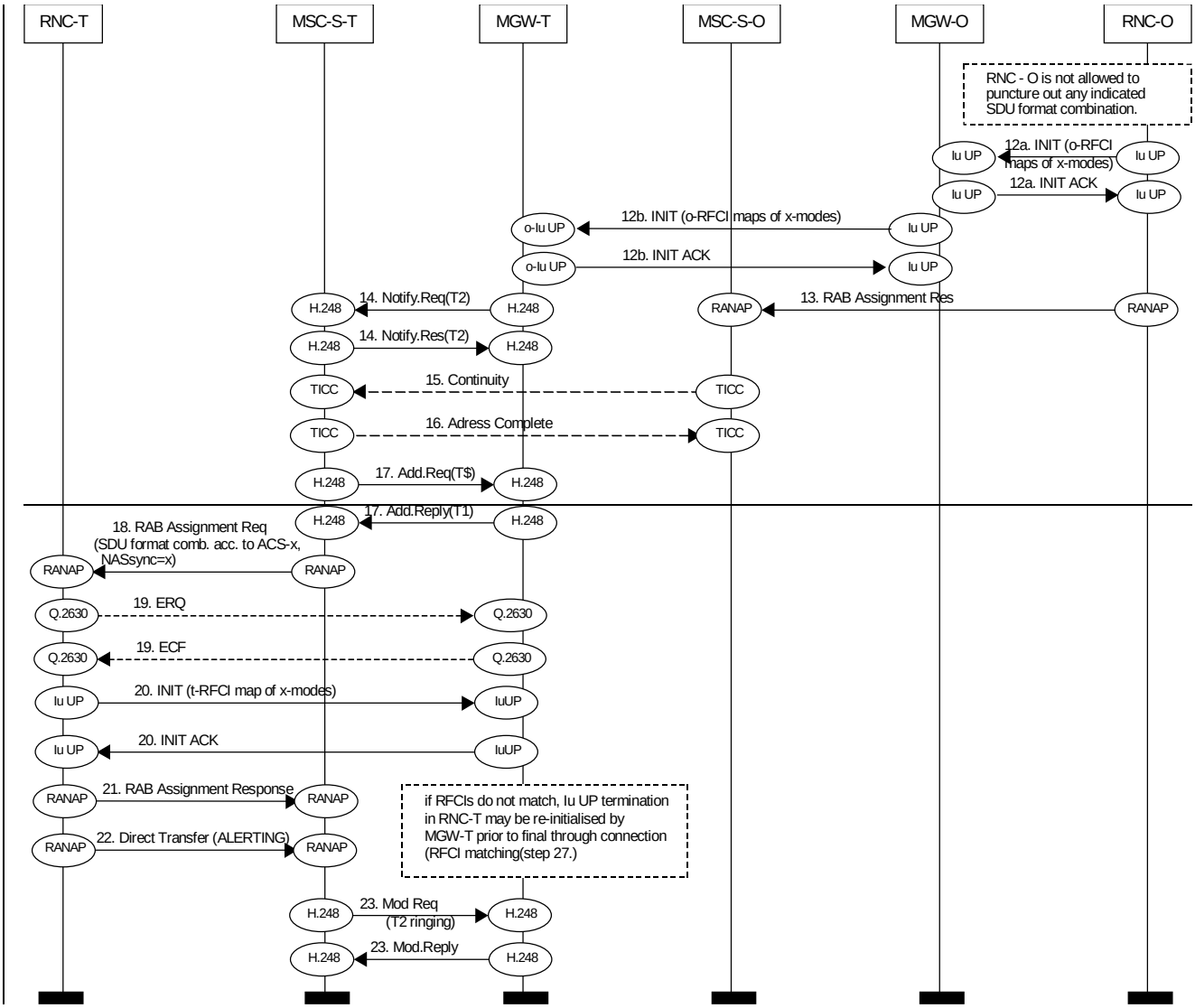


Figure 6.1/2: Call Setup. Mobile to Mobile Call. Message Flow part 1.


RNC-T
MSC-S-T
MGW-T
MSC-S-O
MGW-O
RNC-O
RNC - O is not allowed to puncture out any indicated SDU format combination.
Iu UP
12a. INIT (o-RFCI maps of x-modes)
12a. INIT ACK
o-Iu UP
12b. INIT (o-RFCI maps of x-modes)
12b. INIT ACK
H.248
14. Notify.Req(T2)
14. Notify.Res(T2)
RANAP
13. RAB Assignment Res
TICC
15. Continuity
16. Adress Complete
17. Add.Req(T$)
17. Add.Reply(T1)
18. RAB Assignment Req (SDU format comb. acc. to ACS-x, NASsync=x)
Q.2630
19. ERQ
19. ECF
20. INIT (t-RFCI map of x-modes)
20. INIT ACK
IuUP
21. RAB Assignment Response
22. Direct Transfer (ALERTING)
if RFCIs do not match, Iu UP termination in RNC-T may be re-initialised by MGW-T prior to final through connection (RFCI matching(step 27.)
23. Mod Req (T2 ringing)
23. Mod.Reply

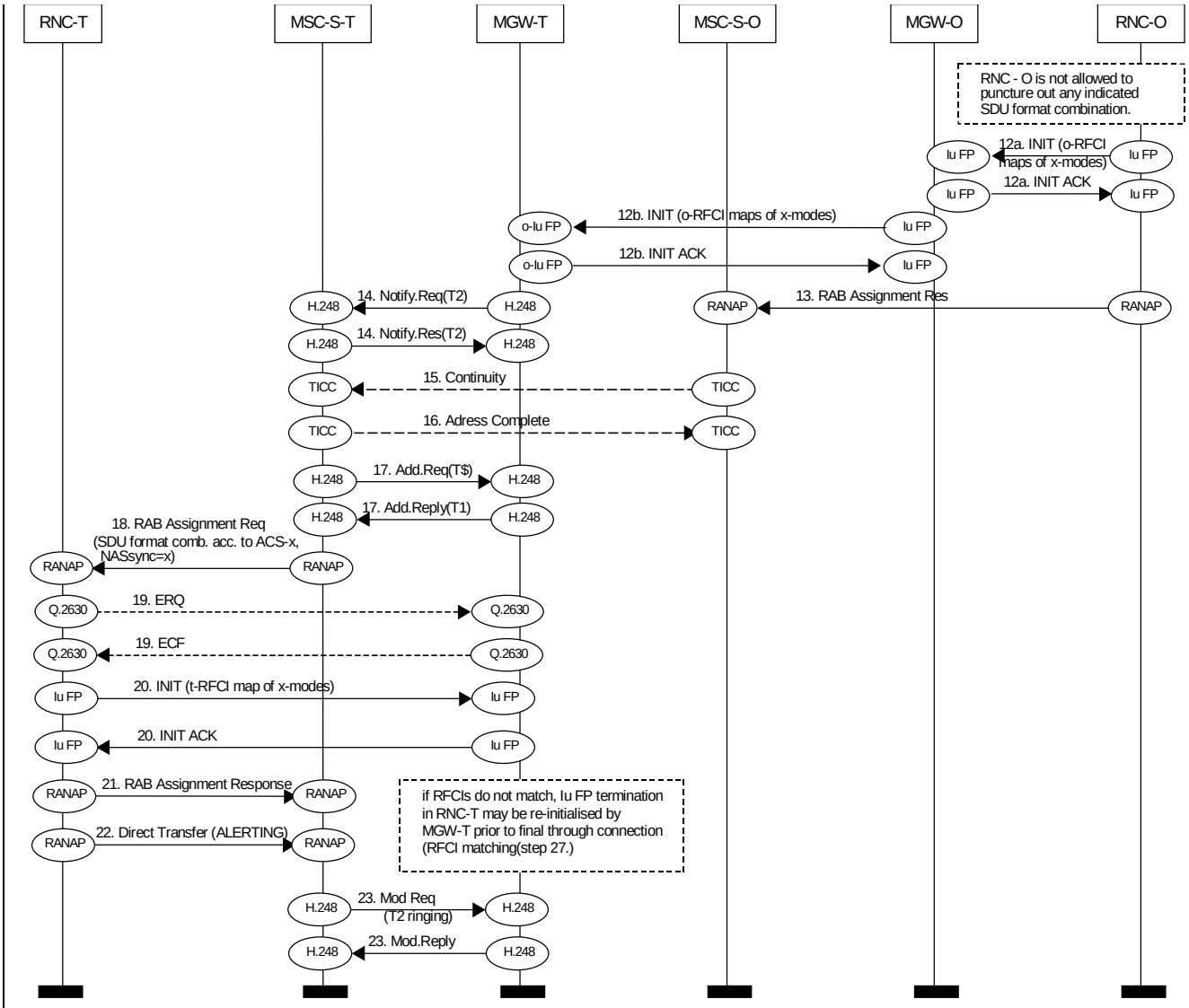
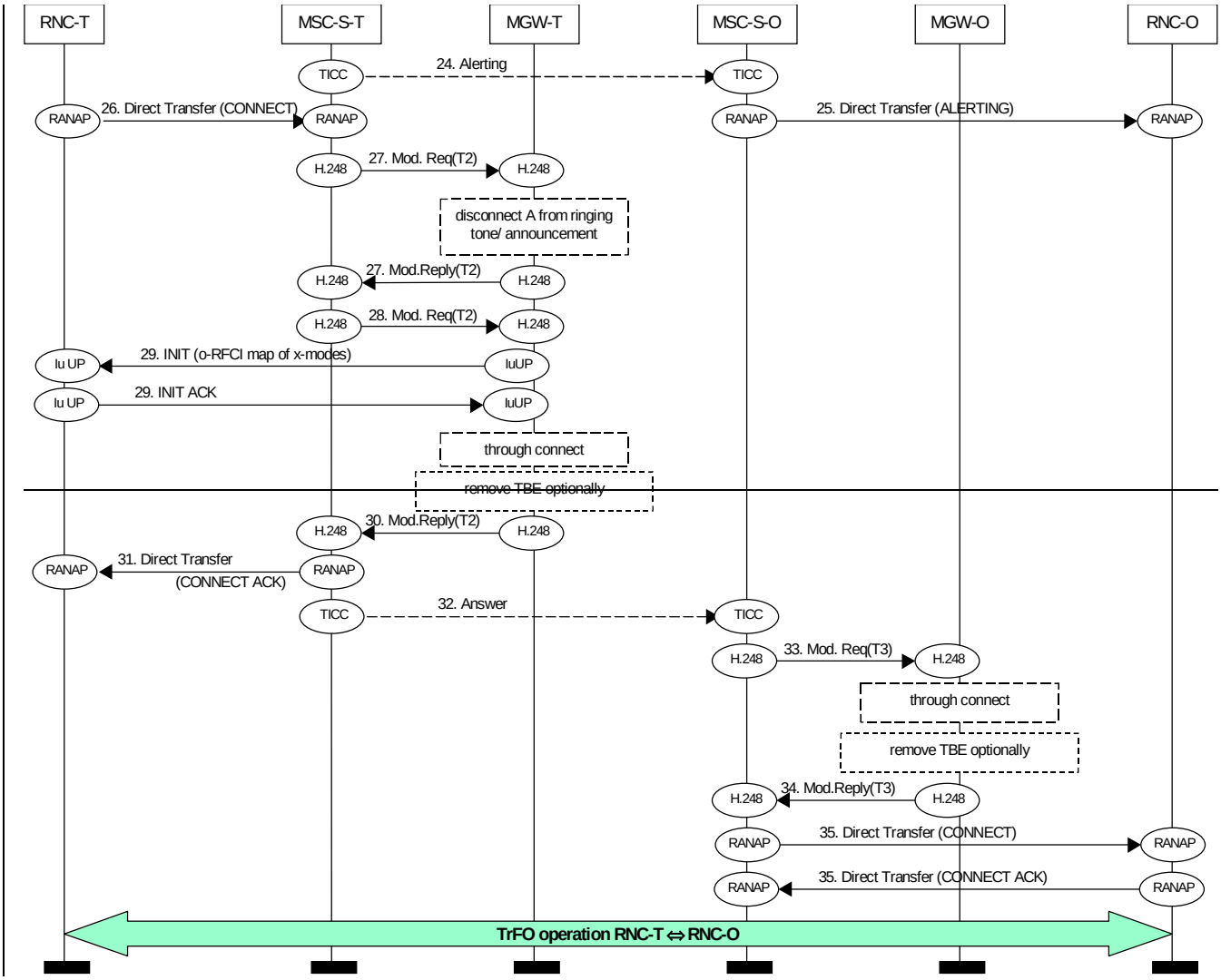


Figure 6.1/3: Call Setup. Mobile to Mobile Call. Message Flow part 2.


RNC-T
MSC-S-T
MGW-T
MSC-S-O
MGW-O
RNC-O
TICC
24. Alerting
RANAP
26. Direct Transfer (CONNECT)
25. Direct Transfer (ALERTING)
H.248
27. Mod. Req(T2)
disconnect A from ringing tone/ announcement
27. Mod.Reply(T2)
28. Mod. Req(T2)
Iu UP
29. INIT (o-RFCI map of x-modes)
luUP
29. INIT ACK
through connect
remove TBE optionally
30. Mod.Reply(T2)
31. Direct Transfer (CONNECT ACK)
32. Answer
33. Mod. Req(T3)
34. Mod.Reply(T3)
35. Direct Transfer (CONNECT)
35. Direct Transfer (CONNECT ACK)
TrFO operation RNC-T ⇔ RNC-O

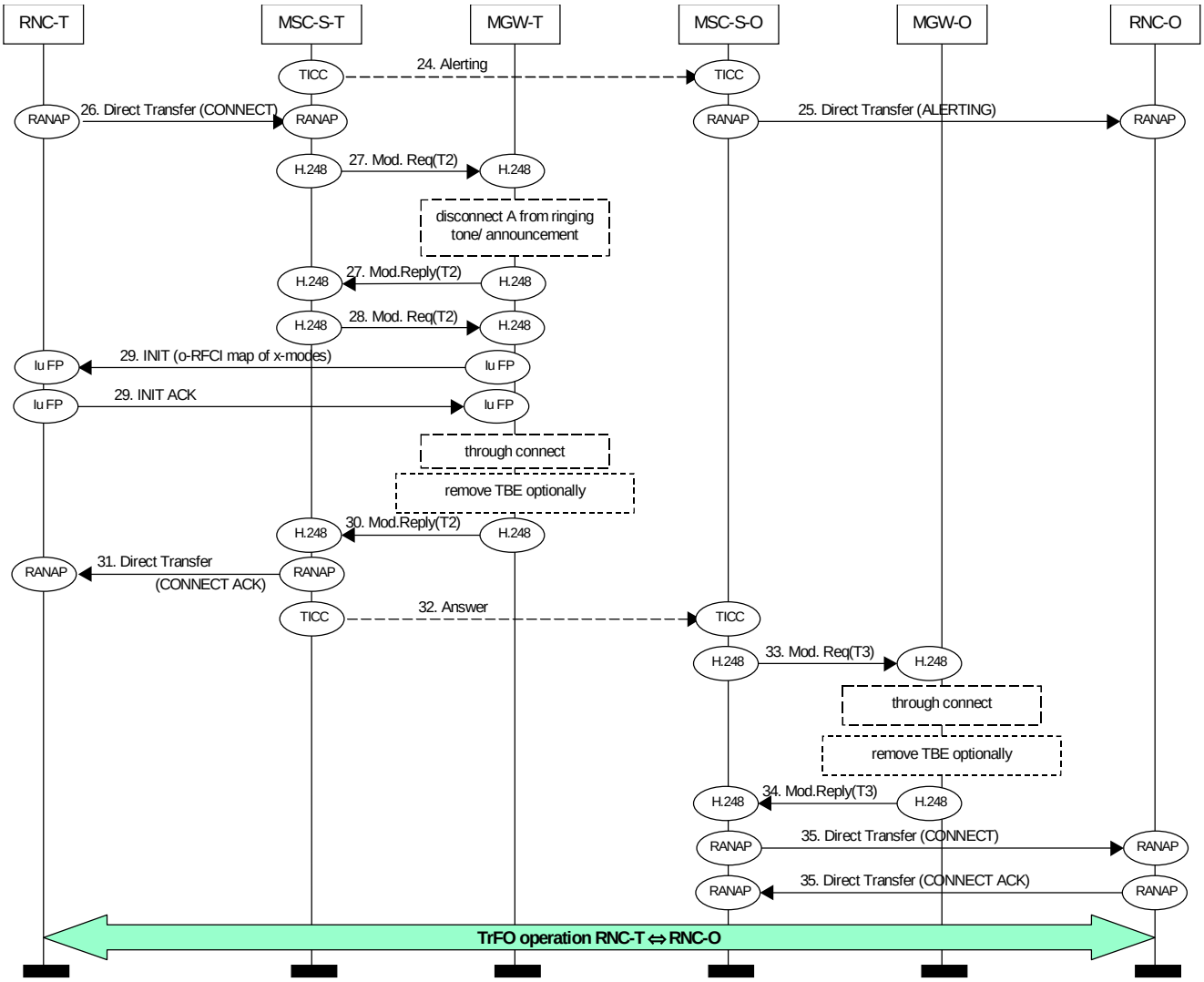


Figure 6.1/4: Call Setup. Mobile to Mobile Call. Message Flow part 3.

Codec negotiation

Step 1. to 6. gives the codec negotiation phase. The mobiles inform the network about their capabilities (1. and 4.). Afterwards the MSC-Server performs codec negotiation according to chapter 5.6.

Network side bearer establishment

MSC-T/MSC-O shall request seizure of network side bearer terminations with ~~IuUP~~Iu FP properties (see steps 5. and 7.). Intermediate CN nodes that may perform certain service interactions (e.g. IN nodes) have to seize terminations with ~~IuUP~~Iu FP properties as well.

RAB Assignment

RAN side terminations with ~~IuUP~~Iu FP property have to be seized (9. and 17.) before sending RAB Assignment (steps 10. and 18.), that contains RAB parameters according to the selected codec and the negotiated ACS. In addition, the respective NAS synchronisation indicator shall be included.

6.2 SRNS Relocation during TrFO

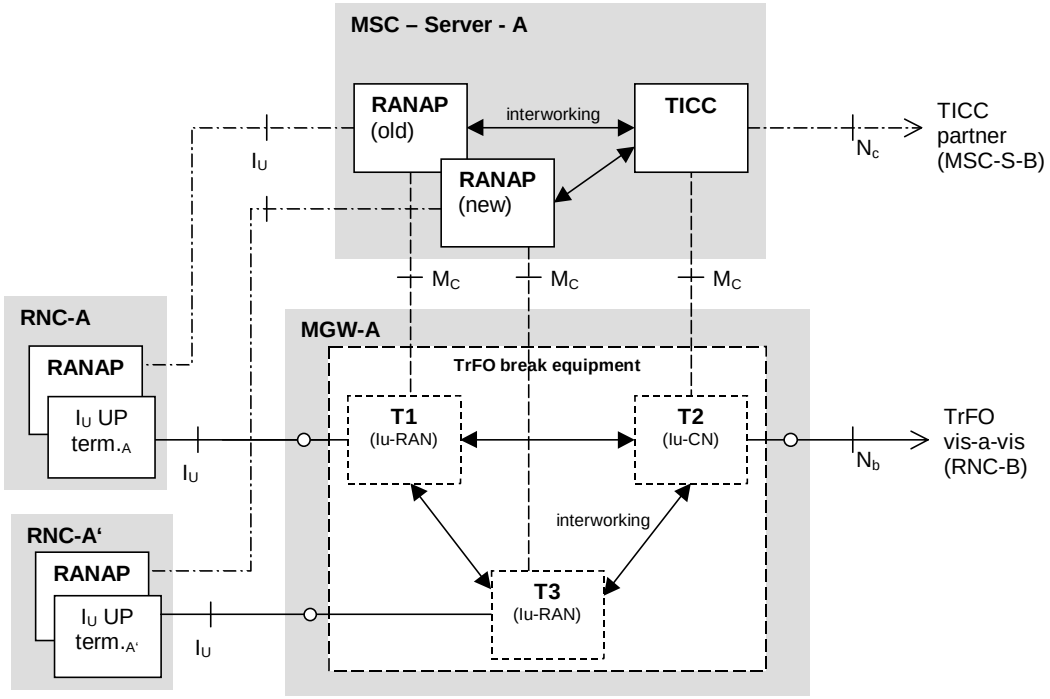


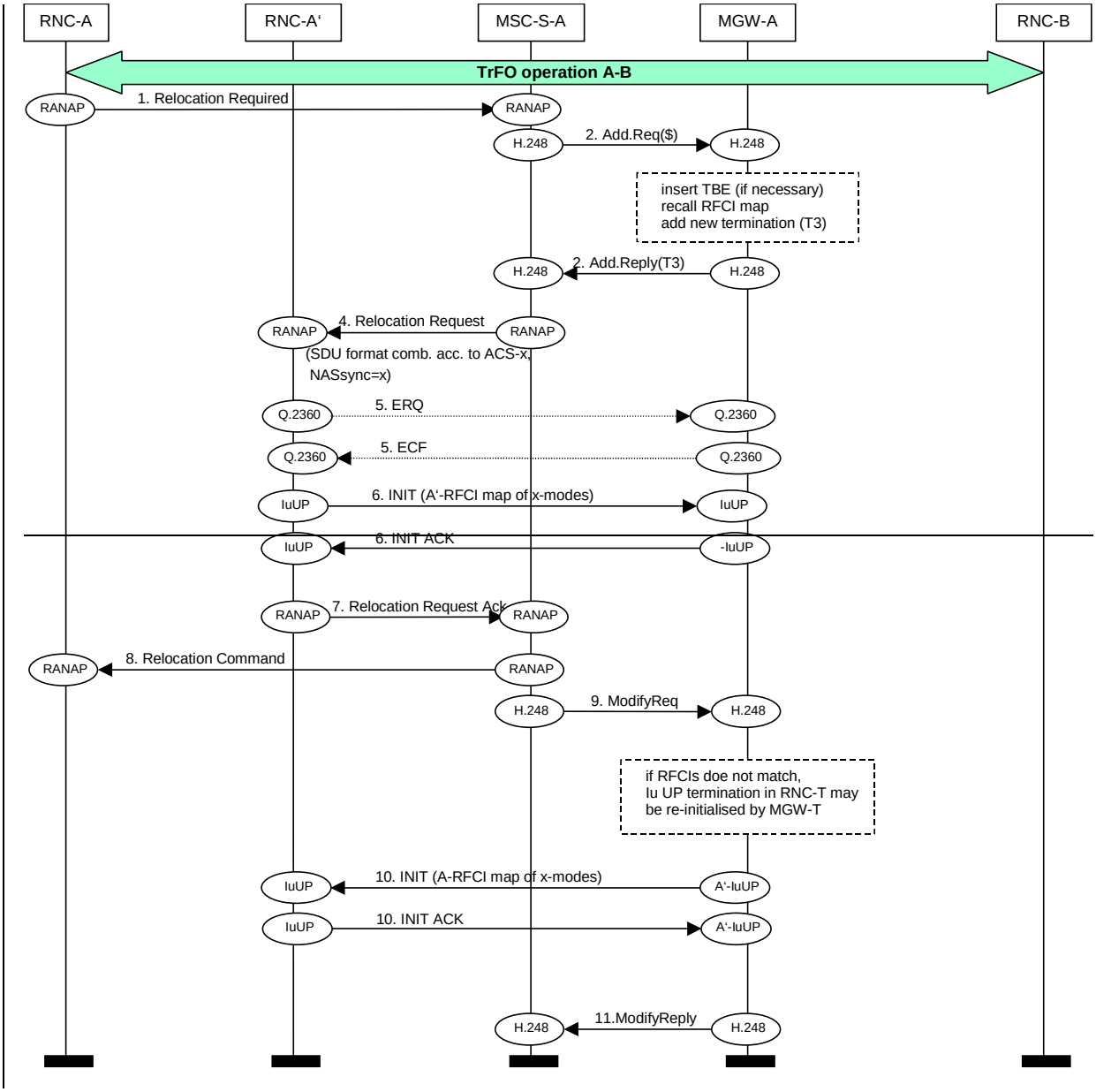
Figure 6.2/1: Configuration during SRNS Relocation

Figure 6.1/1 shows the configuration during relocation. After setting up the new I_U interface (towards RNC-A') until releasing the old one, the original TrFO relation (A⇔B) and the target TrFO relation (A'⇔B) exist in parallel. Within the respective context (TBE) interworking between T1, T2 and T3 is necessary:

T3 will perform initialisation towards RNC-A'.

T2 will hide initialisation performed on $I_{U,A'}$ from RNC-B.

If the option to remove the TBE was applied after call setup, the whole context (TBE) needs to be inserted prior to performing SRNS Relocation. Initialisation data need to be available within MGW-A. After Relocation, the context (TBE) may be removed again, i.e. the MGW-A again acts as a pure AAL2 switch.


RNC-A
RNC-A'
MSC-S-A
MGW-A
RNC-B
TrFO operation A-B
RANAP
1. Relocation Required
RANAP
H.248
2. Add.Req($)
H.248
insert TBE (if necessary)
recall RFCI map
add new termination (T3)
H.248
2. Add.Reply(T3)
H.248
RANAP
4. Relocation Request
RANAP
(SDU format comb. acc. to ACS-x,
NASsync=x)
Q.2360
5. ERQ
Q.2360
Q.2360
5. ECF
Q.2360
IuUP
6. INIT (A'-RFCI map of x-modes)
IuUP
IuUP
6. INIT ACK
-IuUP
RANAP
7. Relocation Request Ack
RANAP
RANAP
8. Relocation Command
RANAP
H.248
9. ModifyReq
H.248
if RFCIs doe not match,
Iu UP termination in RNC-T may
be re-initialised by MGW-T
IuUP
10. INIT (A-RFCI map of x-modes)
A'-IuUP
IuUP
10. INIT ACK
A'-IuUP
H.248
11.ModifyReply
H.248

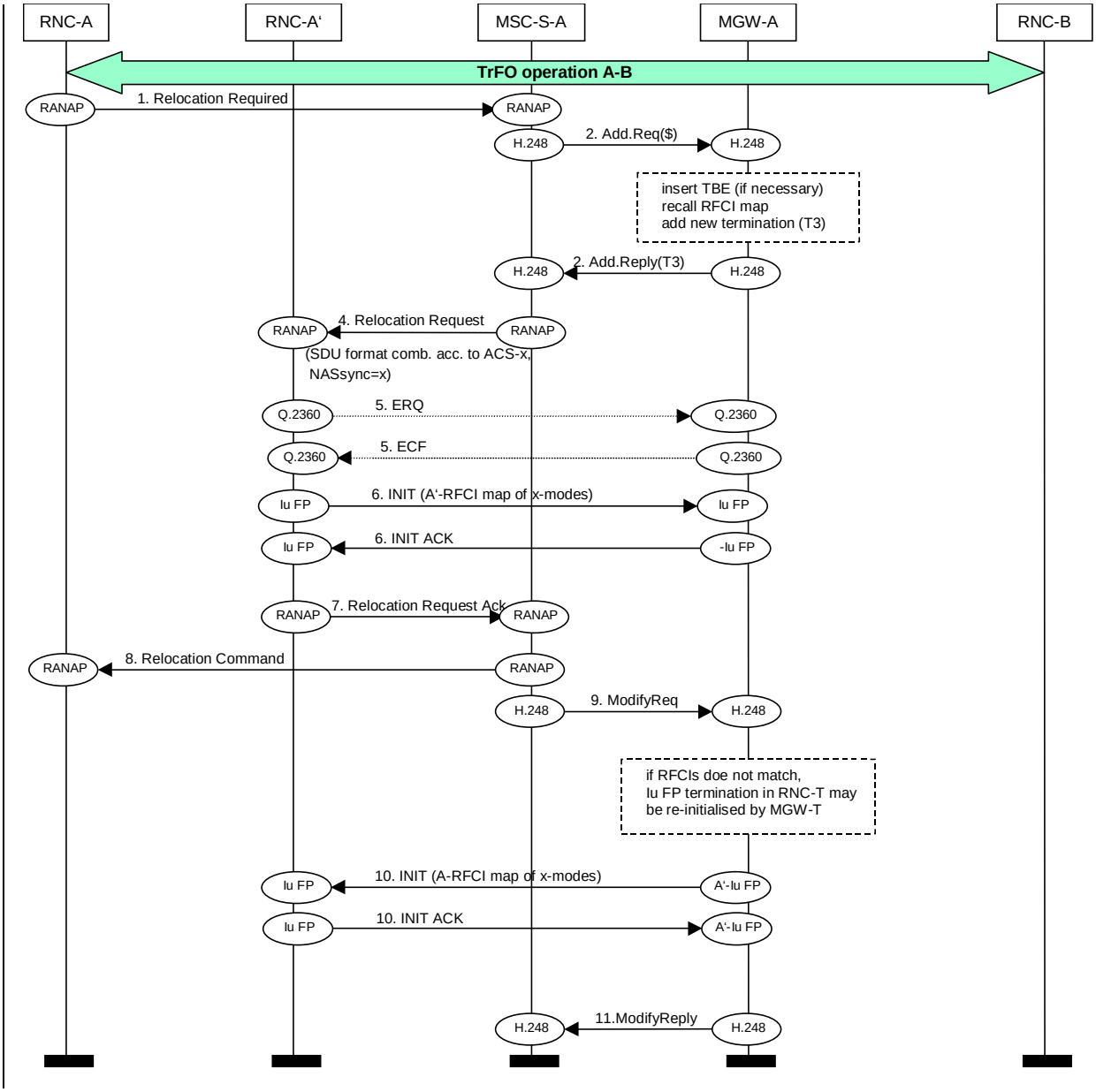


Figure 6.2/2:SRNS Relocation and TrFO. Flow chart part 1.

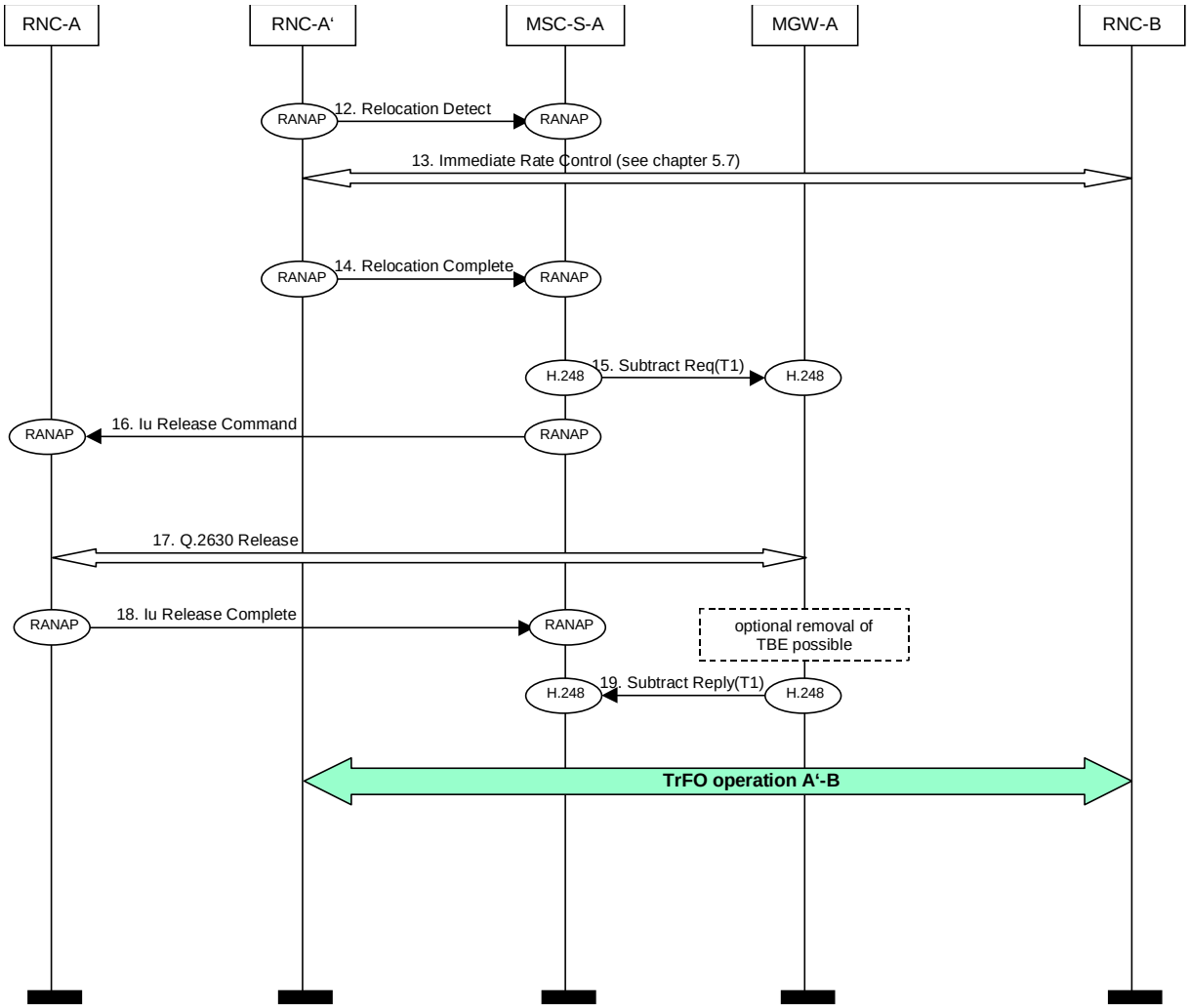


Figure 6.2/3 SRNS Relocation and TrFO. Flow chart part 2.

RAB Assignment on the new Iu leg:

A RAN side terminations with ~~IuUP~~Iu FP property (T3) has to be added to the already seized call context (step 2.) before sending Relocation Request (4.), that contains all the RAB parameters already applied on the Iu leg towards RNC-A.

UP initialisation

RNC-A' shall accept the requested set of codec modes and is not allowed to puncture out any negotiated mode. The INIT frames shall be according to the RAB parameters received.

At reception of an INIT frame from the new RNC, the termination at MGW-A shall not perform forwarding of the ~~IuUP~~Iu FP initialisation. The MGW shall check whether the received RFCI allocations match the stored RFCI allocation. If it does not match, it may re-initialise the ~~IuUP~~Iu FP towards RNC-A' at this point in time.

Removal of TrFO Break Equipment (TBE)

If the MGW supports the removal of TBEs, it shall insert the TBE before seizing the additional termination. It may again remove the TBE after performing RFCI matching and through-connection of the new termination and the termination to the far end party.

-

**** next modified section ****

6.4 Information flow for interaction with Multiparty SS

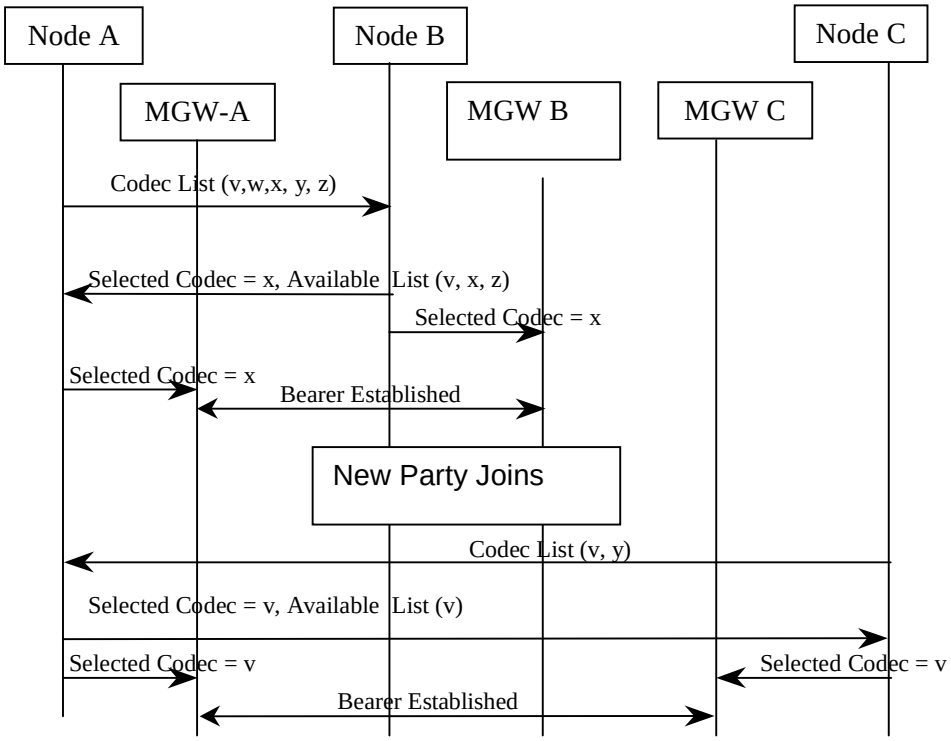


Figure 6.4/1: Multi-party Call

The operation of the MGW for conference calls is implementation dependent. The sequence in Figure 6.4/1 shows three connections to the MGW, where two were configured TrFO and have matching codecs but the third connection could not be made with the same codec type.

The ~~Iu UP~~Iu framing connections for each multi-party call leg shall be terminated in the MGW where the multi-party call is controlled. The MGW shall control each connection independently during the multi-party call.

When the multi-party call is released, if two parties remain in the connection it shall be possible to either revert directly to a TrFO connection if both codecs match or OoBTC procedures could be performed to modify one or both of the codec types to achieve a TrFO connection. However, if the Server does not perform this then the MGW shall continue to resolve the difference in codecs by internal transcoding procedures.

**** next modified section ****

6.6 Call Hold/Call Wait

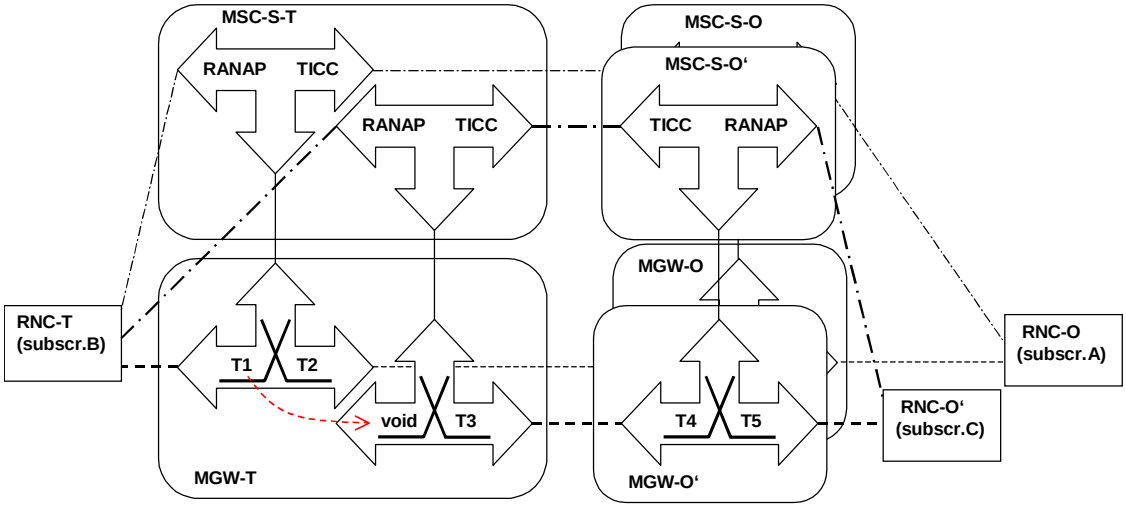


Figure 6.6/1: Configuration during Call Hold / Call Wait scenario

This scenario assumes subscriber C (served by RNC-O') calls subscriber B (served by RNC-T), currently in communication with subscriber A. Subscriber C receives a tone/announcement, applied by terminating side. Then subscriber B puts subscriber A on Hold and A receives an announcement (applied again by terminating side.)

MGW-O has to establish an originating side call context (T4, T5), MGW-T the respective terminating one (T3 only, T1 from subscriber will be moved to it during the scenario), the B party context has to be inserted into path again (if TBE was removed).

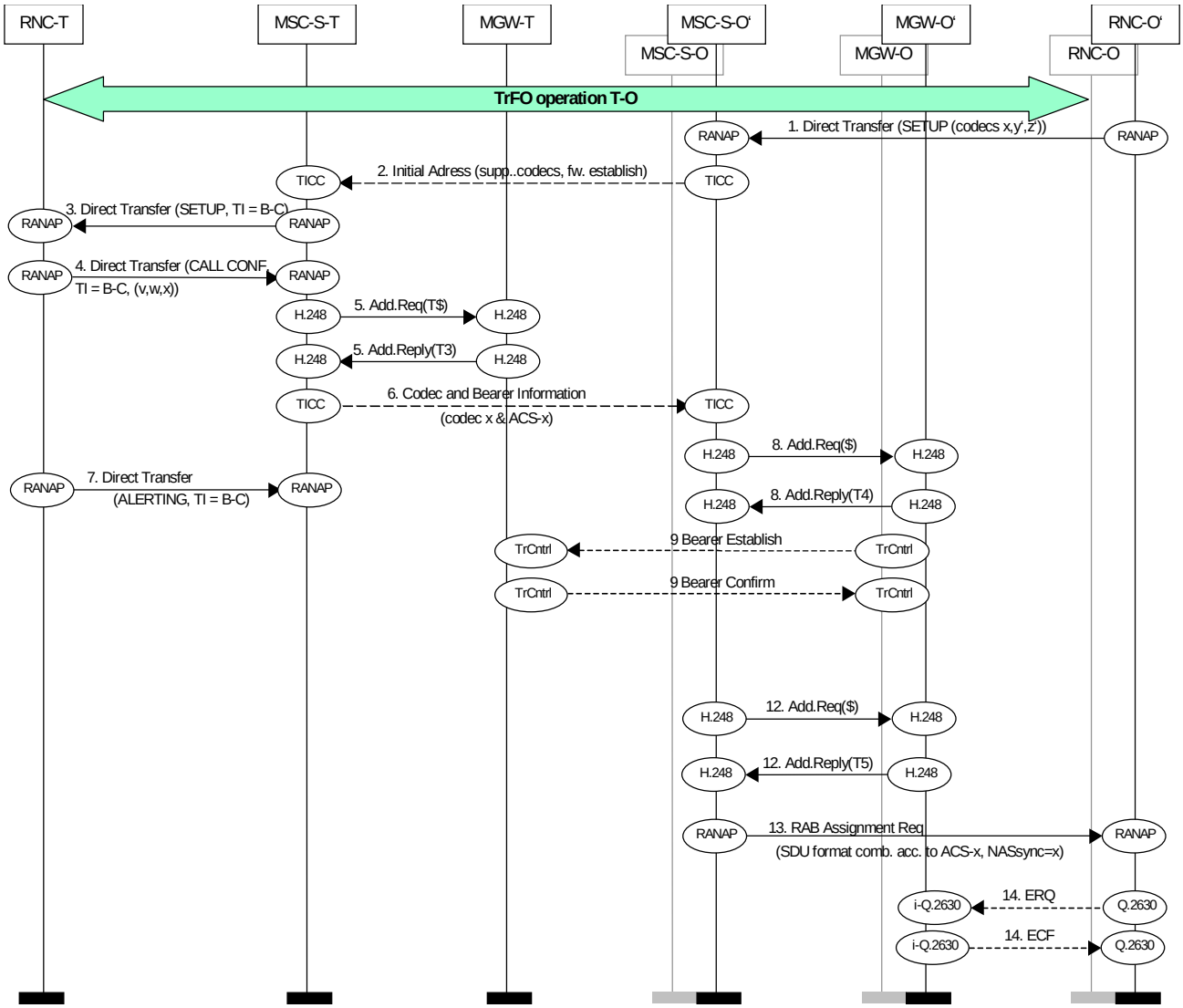
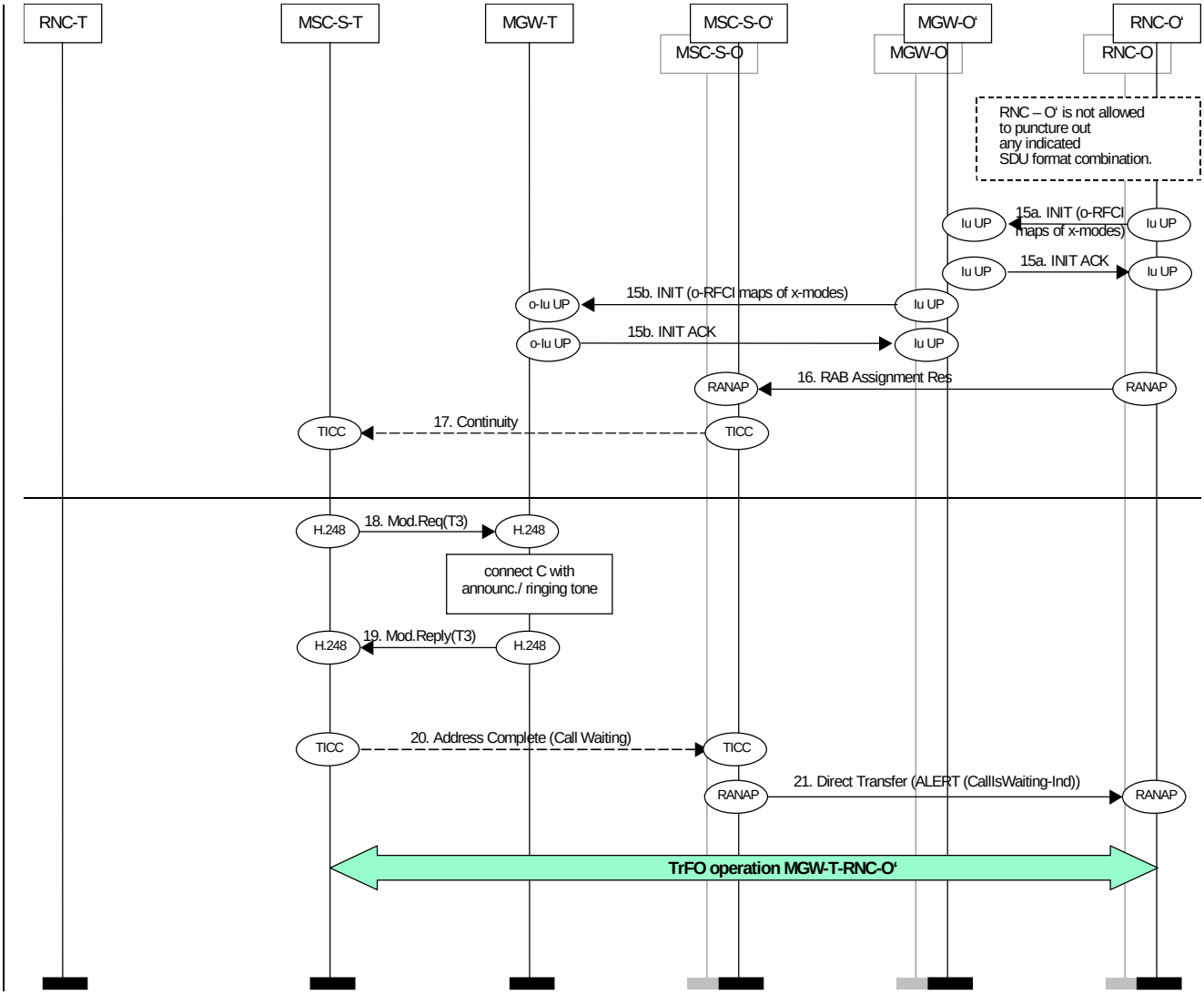


Figure 6.6/2: Call Hold/Call Wait and TrFO. Message flow part 1.


RNC-T
MSC-S-T
MGW-T
MSC-S-O'
MSC-S-O
MGW-O'
MGW-O
RNC-O'
RNC-O
RNC – O' is not allowed to puncture out any indicated SDU format combination.
Iu UP
15a. INIT (o-RFCI maps of x-modes)
15a. INIT ACK
o-Iu UP
15b. INIT (o-RFCI maps of x-modes)
15b. INIT ACK
RANAP
16. RAB Assignment Res
TICC
17. Continuity
H.248
18. Mod.Req(T3)
connect C with announc./ ringing tone
19. Mod.Reply(T3)
20. Address Complete (Call Waiting)
21. Direct Transfer (ALERT (CallIsWaiting-Ind))
TrFO operation MGW-T-RNC-O'

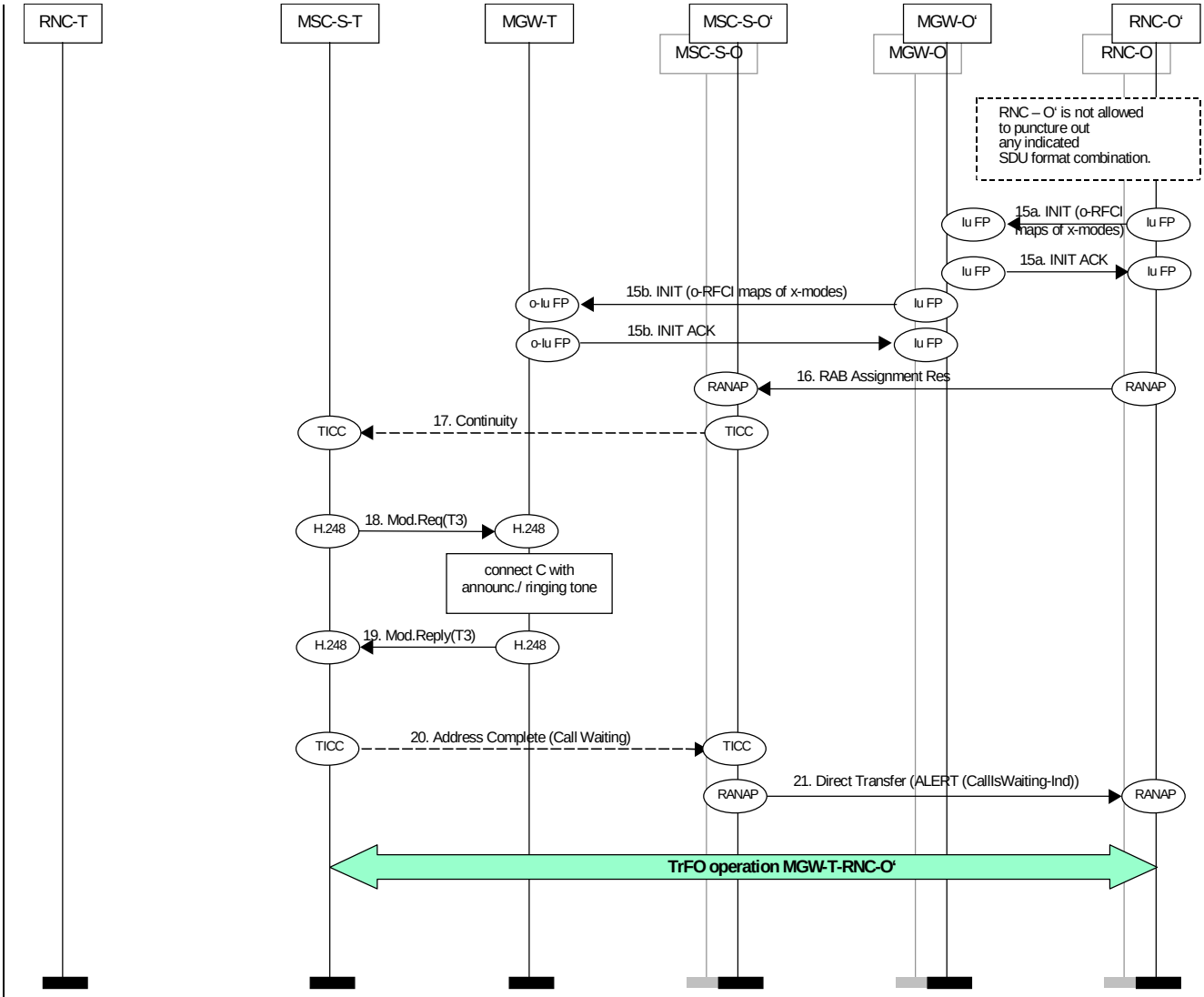


Figure 6.6/3: Call Hold/Call Wait and TrFO. Message flow part 2.

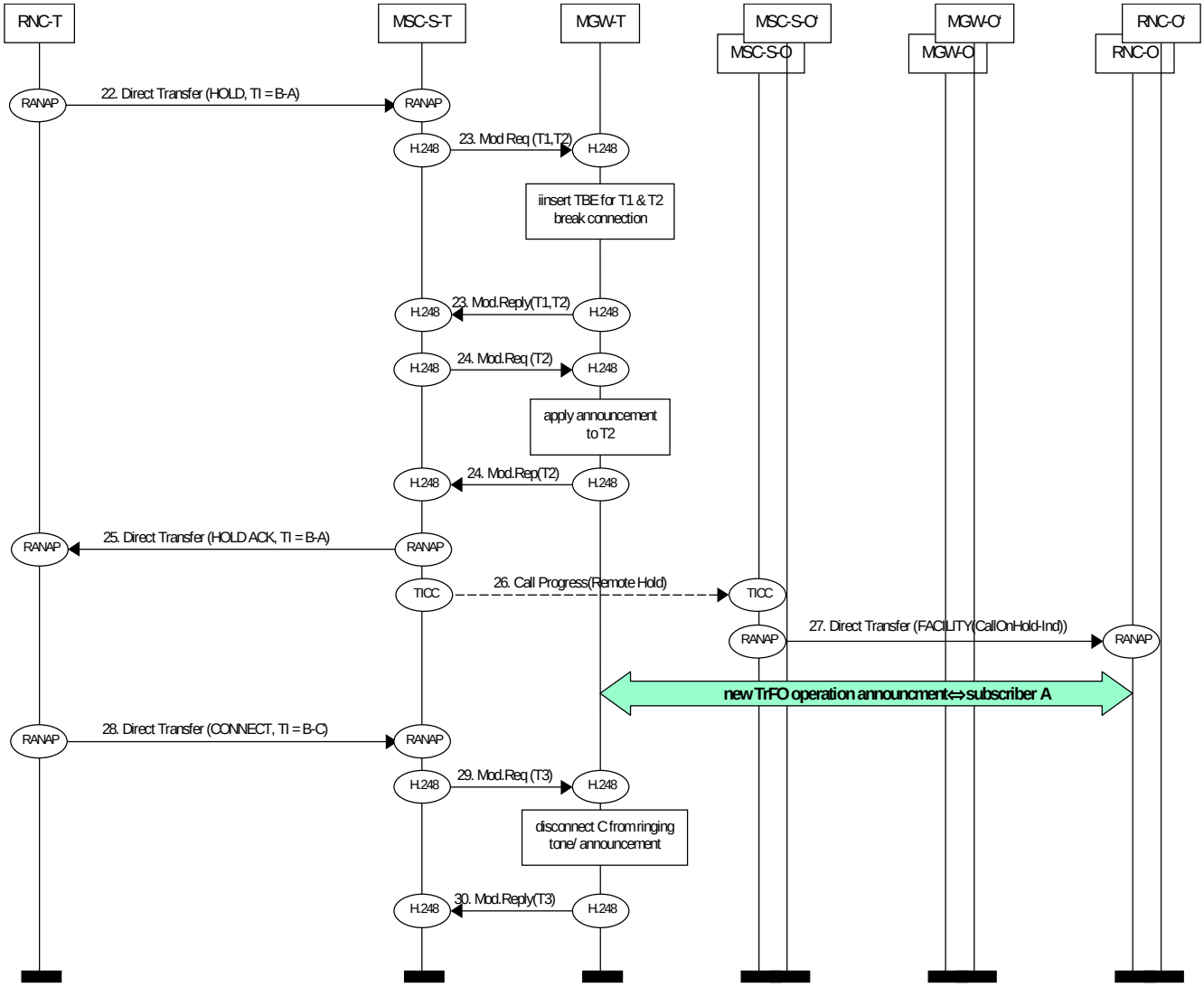
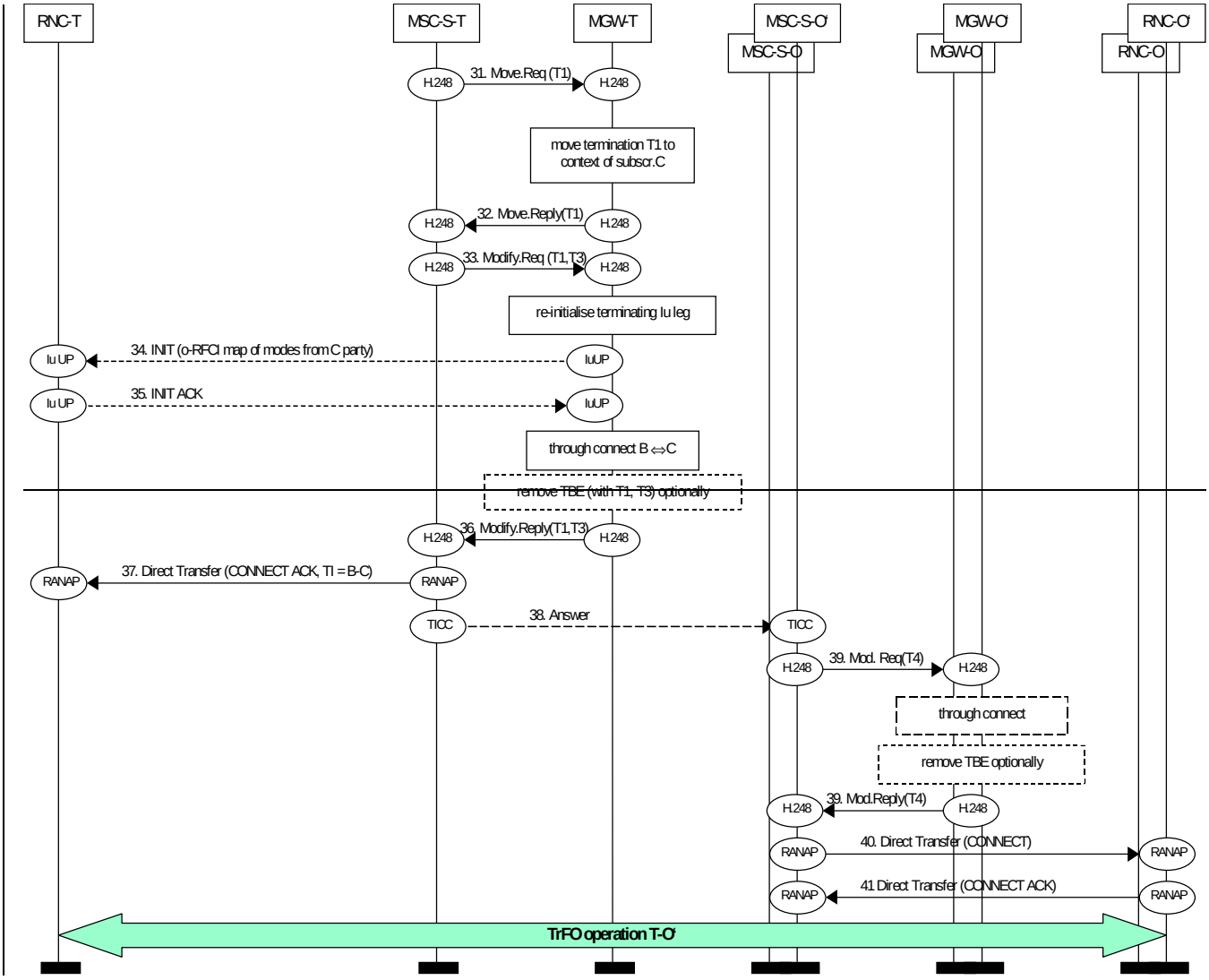


Figure 6.6/4: Call Hold/Call Wait and TrFO. Message flow part 3.


RNC-T
MSC-S-T
MGW-T
MSC-S-O'
MSC-S-O
MGW-O'
MGW-O
RNC-O'
RNC-O
H.248
31. Move.Req (T1)
move termination T1 to context of subscr.C
32. Move.Reply(T1)
33. Modify.Req (T1,T3)
re-initialise terminating Iu leg
Iu UP
IuUP
34. INIT (o-RFCI map of modes from C party)
35. INIT ACK
through connect B ⇔ C
remove TBE (with T1, T3) optionally
36. Modify.Reply(T1,T3)
RANAP
37. Direct Transfer (CONNECT ACK, TI = B-C)
TICC
38. Answer
39. Mod. Req(T4)
through connect
remove TBE optionally
39. Mod.Reply(T4)
40. Direct Transfer (CONNECT)
41 Direct Transfer (CONNECT ACK)
TrFO operation T-O'

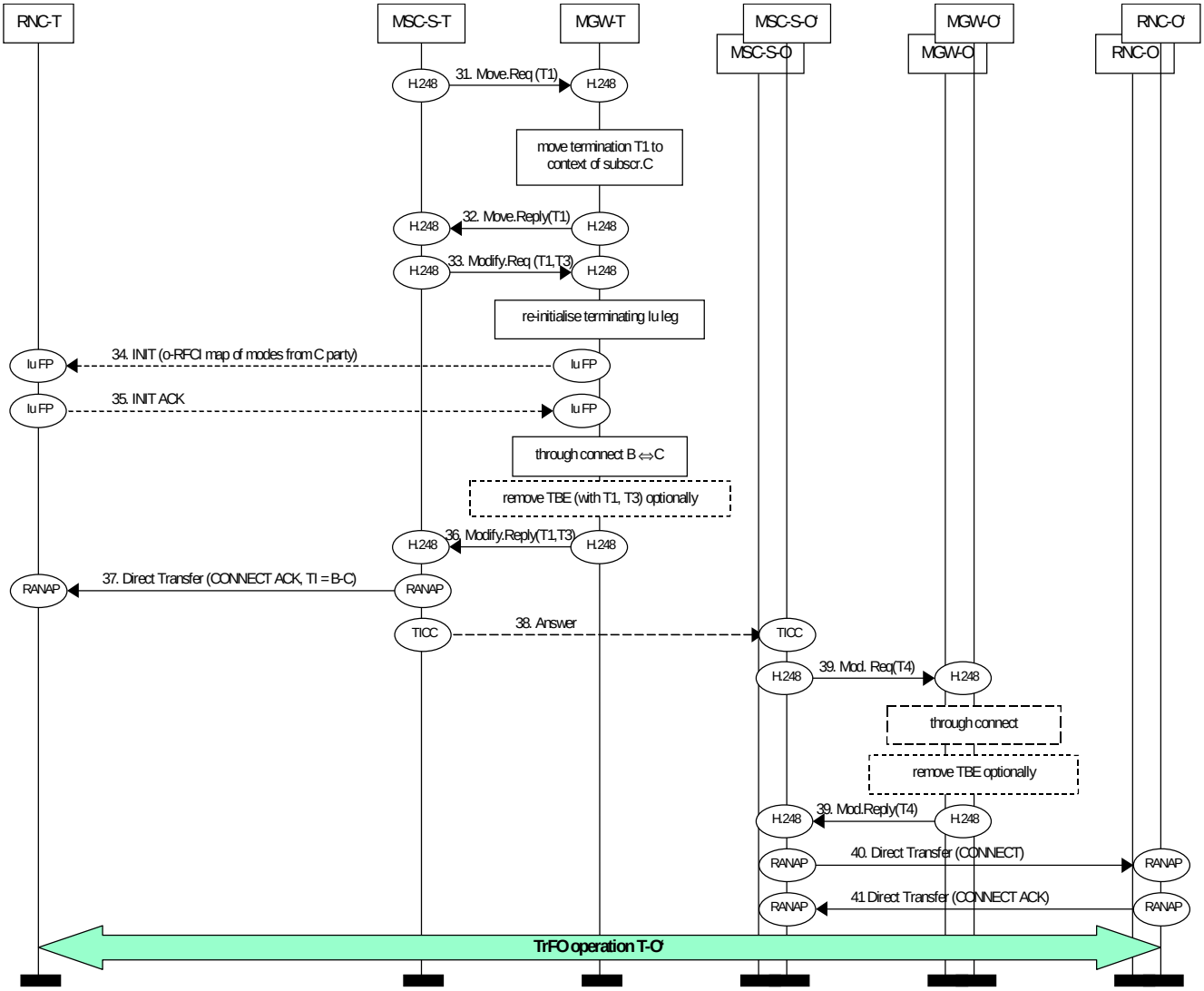
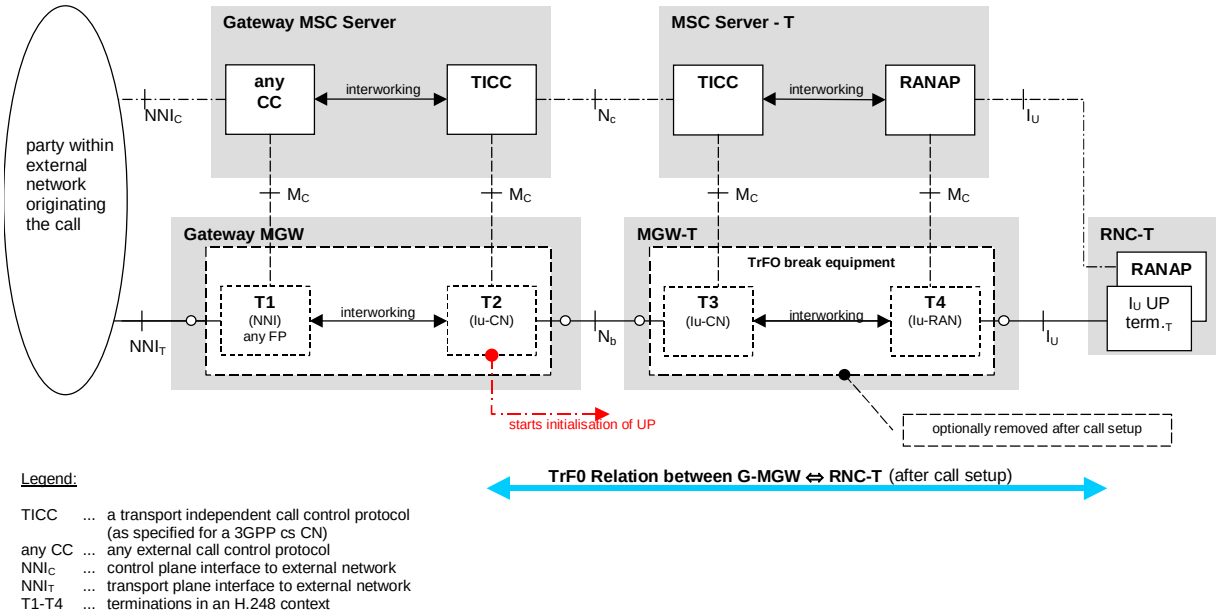


Figure 6.6/5: Call Hold/Call Wait and TrFO. Message flow part 4.

**** next modified section ****

6.7 External Network to Mobile TrFO Call Establishment



Legend:

TICC ... a transport independent call control protocol (as specified for a 3GPP cs CN)
any CC ... any external call control protocol
NNI_C ... control plane interface to external network
NNI_T ... transport plane interface to external network
T1-T4 ... terminations in an H.248 context

Figure 6.7/1. Configuration during Call Setup of a External Network to Mobile Call.

The description of Figure 6.1/1 (Configuration during Call Setup of a Mobile to Mobile Call) within chapter 6.1 applies for the network and protocol entities involved in the External Network to Mobile Call scenario with following modifications:

No RNC-O is present – a party served by an external network originates the call instead

The originating CN nodes are Gateway nodes (Gateway MSC Server / Gateway MGW)

The Gateway MGW call context is no TrFO break equipment in general, i.e. T1 in general do not support the ~~IuUP~~Iu FP framing protocol. Appropriate interworking (in some cases transcoding) has to be performed between T1 and T2.

Therefore Figures 6.1/2 to 6.1/4. (the respective message flows for mobile to mobile call setup) apply in principle as well with appropriate modifications outlined below:

Codec negotiation

Step 1. Until 6., that give the codec negotiation phase in Figure 6.1/2, shall be applied with following modifications:

There is no originating UE involved in this negotiation phase

If the preceding node of the Gateway MSC-Server doesn't support OoBTC procedures for compressed voice types, the Gateway MSC-Server shall initiate OoBTC procedures in order to enable transcoders placement at the edge gateway node.

The edge gateway node shall always send the complete list of the codec types and modes it supports for this type of call setup.

UP initialisation

The main difference compared to the Mobile to Mobile call setup is, that the CN side termination of the Gateway MGW (T2 in figure 6.7/1) shall start the initialisation of the ~~IuUP~~Iu FP according to the result of the codec negotiation. The forward initialisation principle shall be followed in any setup scenario.

6.8 Mobile to External Network TrFO Call Establishment

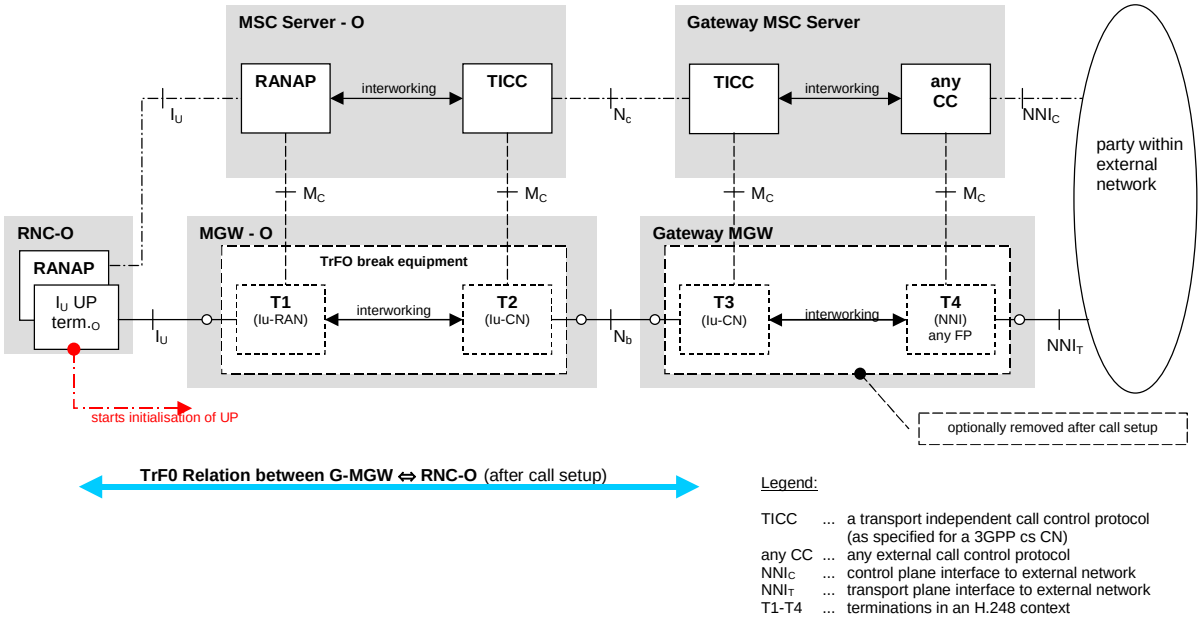


Figure 6.8/1. Configuration during Call Setup of a Mobile to External Network Call.

The description of Figure 6.1/1 (Configuration during Call Setup of a Mobile to Mobile Call) within chapter 6.1 applies for the network and protocol entities involved in the External Network to Mobile Call scenario with following modifications:

No RNC-T is present – a party served by an external network is the terminating side of the call instead

The terminating side CN nodes are Gateway nodes (Gateway MSC Server / Gateway MGW)

The Gateway MGW call context is no TrFO break equipment in general, i.e. T4 in general do not support the ~~IuUP~~Iu FP framing protocol. Appropriate interworking (in some cases transcoding) has to be performed between T3 and T4.

Therefore Figures 6.1/2 to 6.1/4. (the respective message flows for mobile to mobile call setup) apply in principle as well with appropriate modifications outlined below:

Codec negotiation

Step 1. Until 6., that give the codec negotiation phase in Figure 6.1/2, shall be applied with following modifications:

There is no terminating UE involved in this negotiation phase.

If the succeeding node of the Gateway MSC-Server doesn't support OoBTC procedures for compressed voice types, the Gateway MSC-Server terminates the OoBTC procedures in order to enable transcoders placement at the edge gateway node.

The edge gateway node shall accept the codec MSC-O prefers and shall not puncture out any codec mode.

3GPP TSG-CN4 Meeting #06 **Tdoc N4-010166**
BEIJING, CHINA 15th 19th January 2001

CR-Form-v3

CHANGE REQUEST

⌘ **23.153** **CR** **003** ⌘ rev **1** ⌘ Current version: **4.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	Alignment of codec modification procedures with current BICC CS2 procedures
Source:	⌘	CN4
Work item code:	⌘	OoBTC
Date:	⌘	2001-01-17
Category:	⌘	**D**
Release:	⌘	REL-4

Use one of the following categories:
- ***F*** *(essential correction)*
- ***A*** *(corresponds to a correction in an earlier release)*
- ***B*** *(Addition of feature),*
- ***C*** *(Functional modification of feature)*
- ***D*** *(Editorial modification)*

Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	General editorial improvements.
Summary of change:	⌘	Codec Modification chapter updated
Consequences if not approved:	⌘	

Clauses affected:	⌘	1, 4, 5.4.3, 5.6, 5.8, 6.4		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

How to create CRs using this form:

Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

*****first modified section *****

1 Scope

This Technical Specification specifies the stage 2 description of the Out-of-Band Transcoder Control for speech services. . It describes the principles and procedures to support Transcoder Free Operation, Tandem Free Operation and the interworking between TrFO and TFO. Transcoder at the edge is also part of this specification.

~~Cellular networks depend heavily on codecs to provide their services. Codecs are necessary to compress speech in order to utilise efficiently the expensive bandwidth resources both in the radio interface and in the transmission networks.~~

~~Unnecessary transcoding of speech significantly degrades quality and, therefore, cellular systems try to avoid it for mobile-to-mobile calls when both UEs and the network support a common codec type.~~

~~Digital cellular systems support an increasing number of codec types. As a result, in order to allocate transcoders for a call inside the network, and to select the appropriate codec type inside the UEs, signalling procedures are defined to convey the codec type selected for a call to all the affected nodes (UEs and (potential) transcoding points inside the network). Also, codec negotiation capabilities are being defined to enable the selection of a codec type supported in all the affected nodes, i.e. to resolve codec mismatch situations. This codec negotiation maximises the chances of operating in compressed mode end-to-end for mobile-to-mobile calls.~~

~~Although the main reason for avoiding transcoding in mobile-to-mobile calls has been speech quality, the transmission of compressed information in the CN and CN-CN interface of the cellular network also offers the possibility of bandwidth savings.~~

~~To allow transport of information in a compressed way in transmission networks, these networks make use of thetransport -independent call control protocol as specified in [8] that provides means for signalling codec information, negotiation and selection of codecs end-to-end.~~

**** next modified section ****

4 Out-of-Band Transcoder control functionality

Cellular networks depend heavily on codecs to provide their services. Codecs are necessary to compress speech in order to utilise efficiently the expensive bandwidth resources both in the radio interface and in the transmission networks.

Unnecessary transcoding of speech significantly degrades quality and, therefore, cellular systems try to avoid it for mobile-to-mobile calls when both UEs and the network support a common codec type.

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Although the main reason for avoiding transcoding in mobile-to-mobile calls has been speech quality, the transmission of compressed information in the CN and CN-CN interface of the cellular network also offers the possibility of bandwidth savings.

To allow transport of information in a compressed way in transmission networks, these networks make use of thetransport -independent call control protocol as specified in [8] that provides means for signalling codec information, negotiation and selection of codecs end-to-end.

4.1 OoBTC Requirements

The OoBTC mechanism shall support the following:

- The capability to negotiate the preferred codec type to be used between two end nodes and to avoid the use of transcoders in the network at call set-up.

The originating UE indicates the list of its supported codec types for codec negotiation. This list shall be conveyed to the terminating MSC. The terminating UE indicates its list of supported codec types to the terminating MSC.

Where no compatible codec type can be selected between the UEs then the default PCM coding shall be selected. The originating MSC shall insert a transcoder in the path from the originating UE. Codec selection for the terminating UE is then performed within the terminating MSC, independently of the originating MSC.

Note: For a codec type supporting various modes, the described functionality shall also be applicable to negotiate the set of codec modes common to originating and terminating UEs. Other negotiations such as Initialisation and Rate control are performed at a later point in time by the Iu UP protocol.

- The capability to control the presence of transcoders in the network after call set-up.

  Where a change to the call state of a transcoder free connection occurs, such that compressed speech cannot be maintained, it shall be possible to insert a transcoder or pair of transcoders where needed in the path. If this results in change to the encoding of the speech in other nodes then it shall be possible to inform the end points of this segment that the speech coding is changed. Such examples where this could occur are:

  - SS interruptions (e.g. A to B call connection becomes to multiparty call connection.)
  - Handover to an incompatible partner.
  - Synchronisation loss

  Where a change in call state as described above is temporary then it shall be possible to return to a transcoder free connection by removing the inserted transcoders and informing the endpoints that the connection has resumed to compressed speech encoding.

- The codec types comprise codecs for speech in the first phase. The transcoder control should have enough expandability to support future enhancements of codec types.
- The transcoder control procedure shall not cause a perceivable time lag in the cases of establishing transcoder free connection and reverting to normal (double transcoded) call connection in the cases described above for control of the presence of transcoders.
- The capability to insert transcoder (in cases where a TrFO connection is not possible) at the most appropriate location, i.e. to save bandwidth it should be located at the CN edge between an ATM or IP transport network and a STM network. When Transcoders are inserted, the OoBTC procedures shall provide support for TFO for inband codec negotiation and transmission of compressed speech.
  - When a transport network cannot maintain compressed voice then reversion to the default PCM coding shall occur. A transcoder shall be inserted at that point and OoBTC procedures terminated. TrFO link is then possible between that point and the preceding nodes.
  - When a Non-TrFO call reaches the UMTS CN then OoBTC procedures are initiated from that point and after codec negotiation has been performed, if compressed voice can be supported through the CN then a transcoder is inserted at the edge of the CN.
- The OoBTC signalling procedures shall be supported by the call control protocol on the Nc interface, for example codec negotiation, codec modification, codec list modification, codec renegotiation, and codec list re-negotiation. BICC CS2 [6] supports such a mechanism, through the APM procedures defined by [7].

**** next modified section ****

5.4.3 RFCI Value Correction~~Mismatch Resolution~~

At the terminating end of a TrFO connection with Iu UP initialised to the terminating MGW, the originating RFCI allocation is stored. The terminating RNC is then requested to perform a RAB Assignment towards the terminating MGW. This results in an Iu UP initialisation, where the allocation of the RFCI values is independent from the Originating RNC's allocation. These values may then be different to the originating RNC's set.

The terminating MGW shall acknowledge the Iu UP Initialisation and compare the RFCI values stored from the originating side. If the allocated index values do not match then the MGW shall initiate an Iu UP Initialisation PDU towards the terminating RNC with the RFCI allocation as defined by the preceding node (previously stored in the MGW). This is shown in figure 5.4.3/1

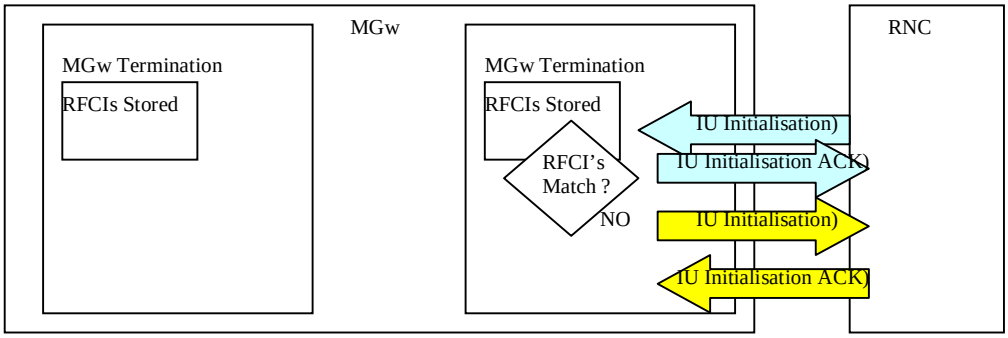

Figure 5.4.3/1:RFCI ~~Mismatch Resolution~~Value Correction

Further details of the TrFO call establishment are described in chapter 6.

This resolution handling is required also during RNC relocation; further details are described in chapter 6.

**** next modified section ****

5.6 CN Node handling of Codec Types & Codec Modes

The supported codec list received by the MSC in DTAP protocol [2] has no priority, whereas the list sent in the OoBTC procedures is sent with a level of preference. In order to support interworking with 2G systems it is recommended that MGWs support 2G EFR codecs and for GSM the FR AMR codec. In order to avoid modifications during handover between 2G and 3G systems the MSC nodes may give preference to a suitable 2G codec.

The originating CN node, while performing speech service negotiation with a terminating CN node, shall indicate the maximum number of modes that shall be selected during speech codec negotiation. This maximum number of supported modes may depend on optimisation strategies applied by the originating CN node.

The terminating CN node receiving this information compares the maximum number of modes received by the originating CN with its own one and shall decide on the minimum of both numbers to be applied as result of the negotiation.

The decision about the actual modes to be selected shall be left to the terminating CN node. In order to provide harmonisation of out of band codec negotiation (TrFO) and inband codec negotiation (TFO) very similar~~the same~~ codec selection mechanisms as those being defined for TFO shall be applied for TrFO, see [10]. These rules shall be taken into account when forwarding a codec list from the originating node to proceeding node, both for TrFO and TFO.

When the MSC node requests a RAB assignment the Subflow Combinations provided shall either all be initialised by the RNC or all rejected with appropriate cause code.

The MSC shall always define “DTX” and “No Data” SDUs in addition to the negotiated speech modes. This is because for TrFO the RAB requested by one RNC must match that requested by the peer RNC – they are effectively the same RAB. If one MSC requires DTX support then the RAB requested by the far end MSC must also support DTX (even if it is not desired by that MSC). As no Out Of Band negotiation for DTX is supported nor DTX control to the UE, DTX shall be mandatory for TrFO connections.

**** next modified section ****

5.8 DTMF Handling For TrFO Connections

DTMF from the UE is sent via DTAP procedures out-band. For a TrFO call the Originating MSC shall use an out-band DTMF procedure, all CN nodes shall support this procedure in their call control protocol. The out-band DTMF procedure shall also be used when TrFO is not achieved in order that TFO is possible. Insertion of DTMF in the PCM payload can result in the break of the TFO connection.

For terminating calls DTMF may need to be received by the core network (for voice-prompted services, voicemail control procedures etc). If the DTMF is received out-band then out-band procedures shall be maintained in core network.

If the DTMF is received for a TrFO call from an external network inband, in I.366.2 profile or RTP payload type, then the gateway MGW which interworks between Iu UP and the external framing protocol shall report the DTMF tones via H.248 procedures to its server. The server shall then use out-band procedures to pass the DTMF through the CN. See Figure 5.9/1.

The MGW may also optionally pass DTMF inband where such an option exists for the Nb interface, and is supported by the proceeding MGW.

Transcoding to default PCM to send DTMF tones shall be avoided for TrFO connections.

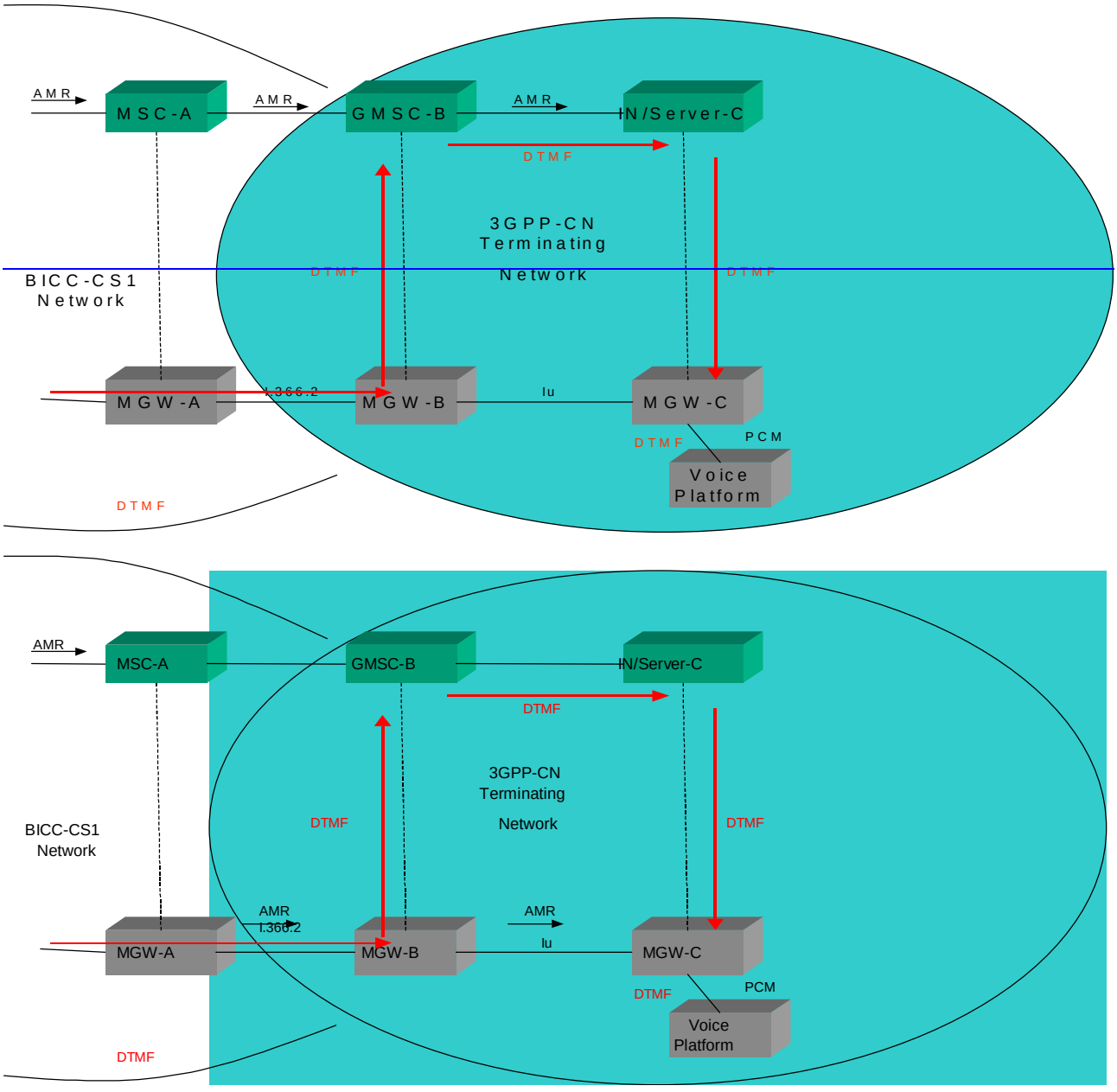

Figure 5.9/1:DTMF received inband from external network

**** next modified section ****

6.4 Information flow for interaction with Multiparty SS

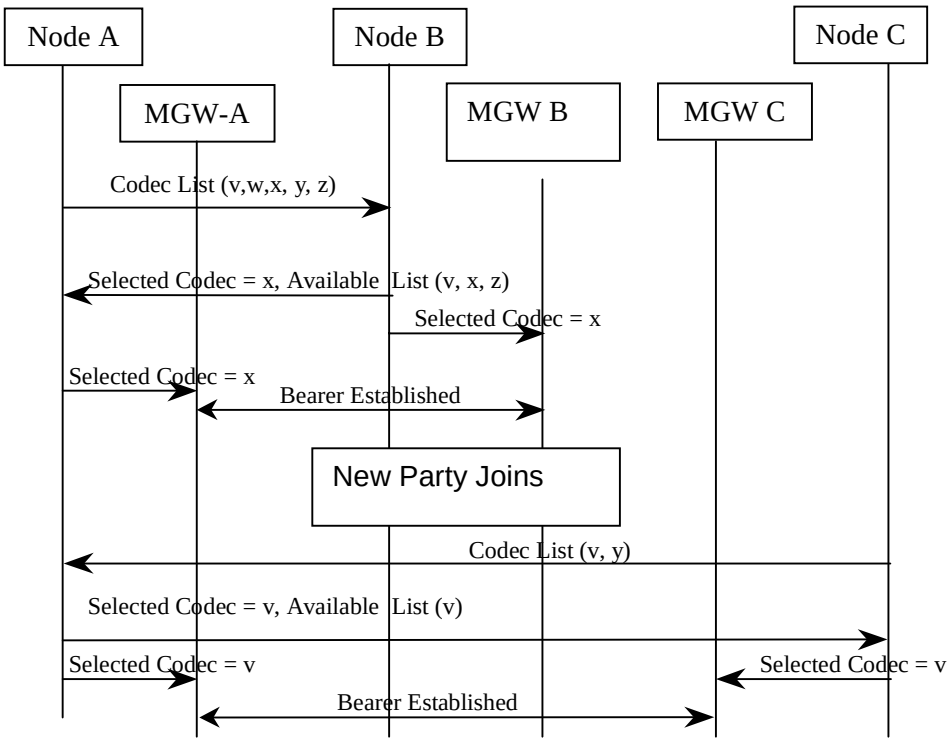

Figure 6.4/1: Multi-party Call

The operation of the MGW for conference calls is implementation dependent. The sequence in Figure 6.4/1 shows three connections to the MGW, where two were configured TrFO and have matching codecs but the third connection could not be made with the same codec type.

The Iu UP connections for each multi-party call leg shall be terminated in the MGW where the multi-party call is controlled. The MGW shall control each connection independently during the multi-party call.

When the multi-party call is released, if two parties remain in the connection it shall be possible to either revert directly to a TrFO connection if both codecs match or OoBTC procedures could be performed to modify one or both of the codec types to achieve a TrFO connection. However, if the Server does not perform this then the MGW shall continue to resolve the difference in codecs by internal transcoding procedures.

Codec modification procedures may be employed (see chapter 5.8.1) if a common codec exists, this is shown in Figure 6.4/2, where codec v is common to all parties.

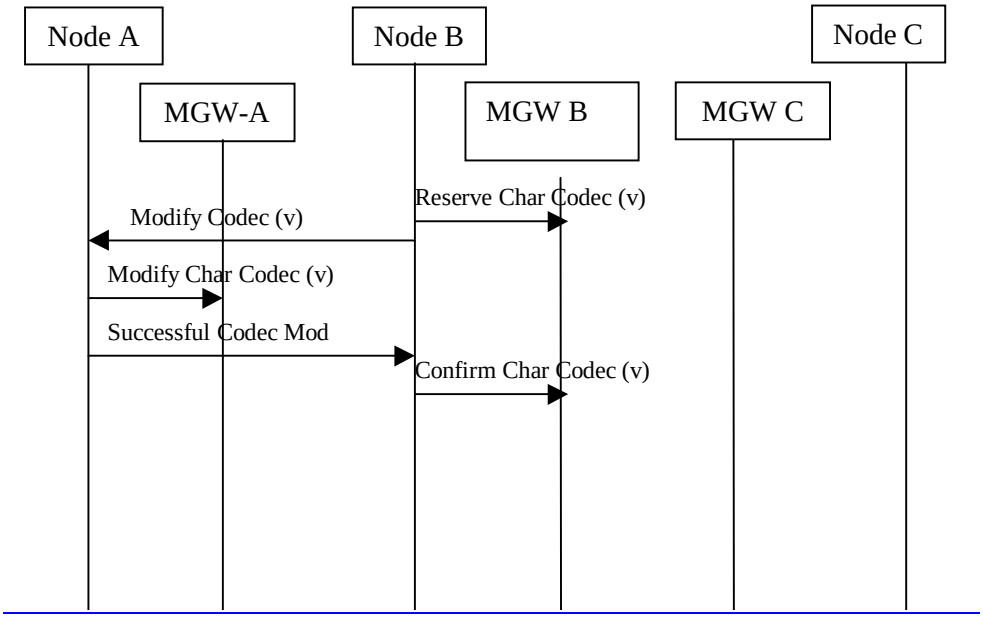

Figure 6.4/2: Multi-party Call, with codec modification

3GPP TSG-CN4 Meeting #06 **Tdoc N4-010167**
BEIJING, CHINA 15th 19th January 2001

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CHANGE REQUEST

⌘ **23.153** **CR** **004** ⌘ rev **01** ⌘ Current version: **4.0.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	Alignment of codec modification procedures with current BICC CS2 procedures
Source:	⌘	CN4
Work item code:	⌘	OoBTC ***Date:*** ⌘ 2001-01-17
Category:	⌘	**C** ***Release:*** ⌘ REL-4

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	TFO Handling erroneous and missing functionality
Summary of change:	⌘	Updates to TFO chapter
Consequences if not approved:	⌘	TFO support in OoBTC not working

Clauses affected:	⌘	5.5		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	29.232
Other comments:	⌘			

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.*****first modified section *****

5.5 TrFO/TFO Codec Negotiation Harmonisation

When OoBTC procedures are initiated to a node where compressed voice cannot be supported (either at the node or to the preceding node) then a transcoder is inserted. This can be due to the transport technology (e.g. TDM) or due to the access technology (e.g. GSM). The OoBTC procedures can result in the following call scenarios:

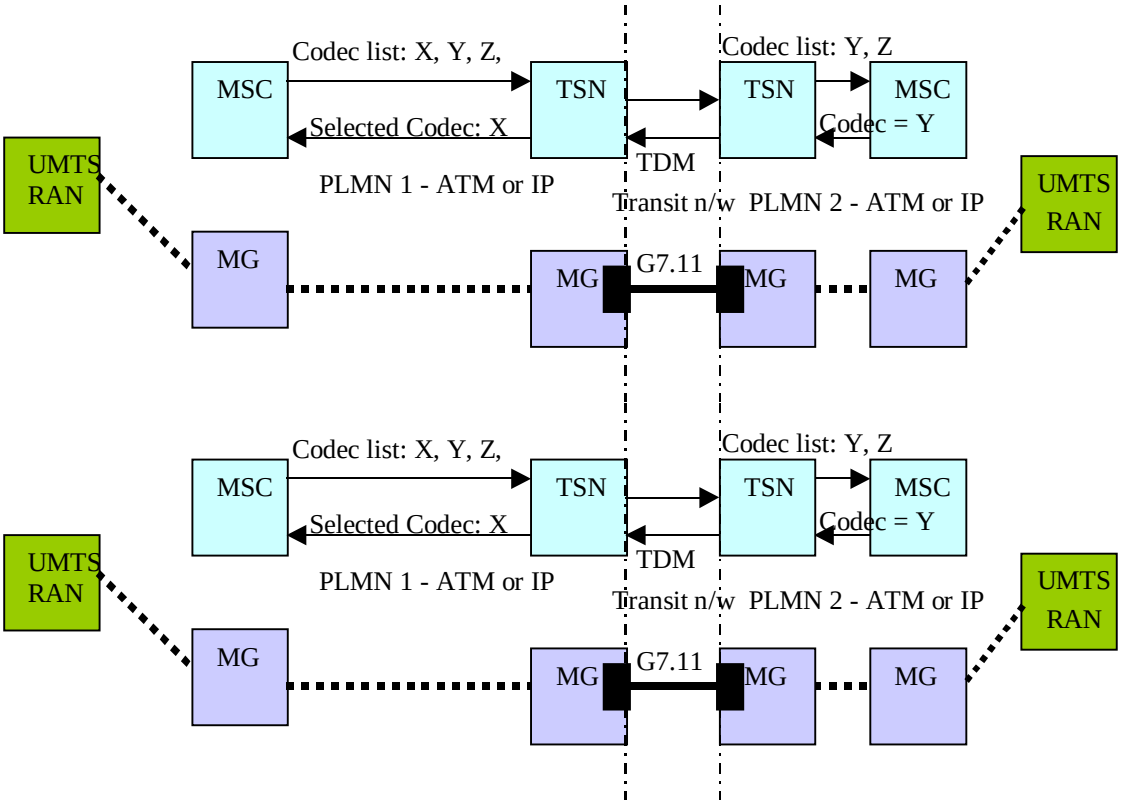


Figure 5.5/1: Cascaded TrFO & Transcoding

In Figure 5.5/ 1 the OoBTC cannot proceed as the call crosses a transit network that does not support compressed voice. The same could occur if the transit network did not support out of band codec negotiation (Support in BICC is optional).

In Figure 5.5/2 the OoBTC procedures result in the call terminating to a GSM access. As the GSM radio access transcodes to default PCM codec, the OoBTC results in default PCM being the only codec that can be selected. The reply is passed back to the originating network, which then inserts a transcoder from default PCM to AMR for the UMTS radio access.

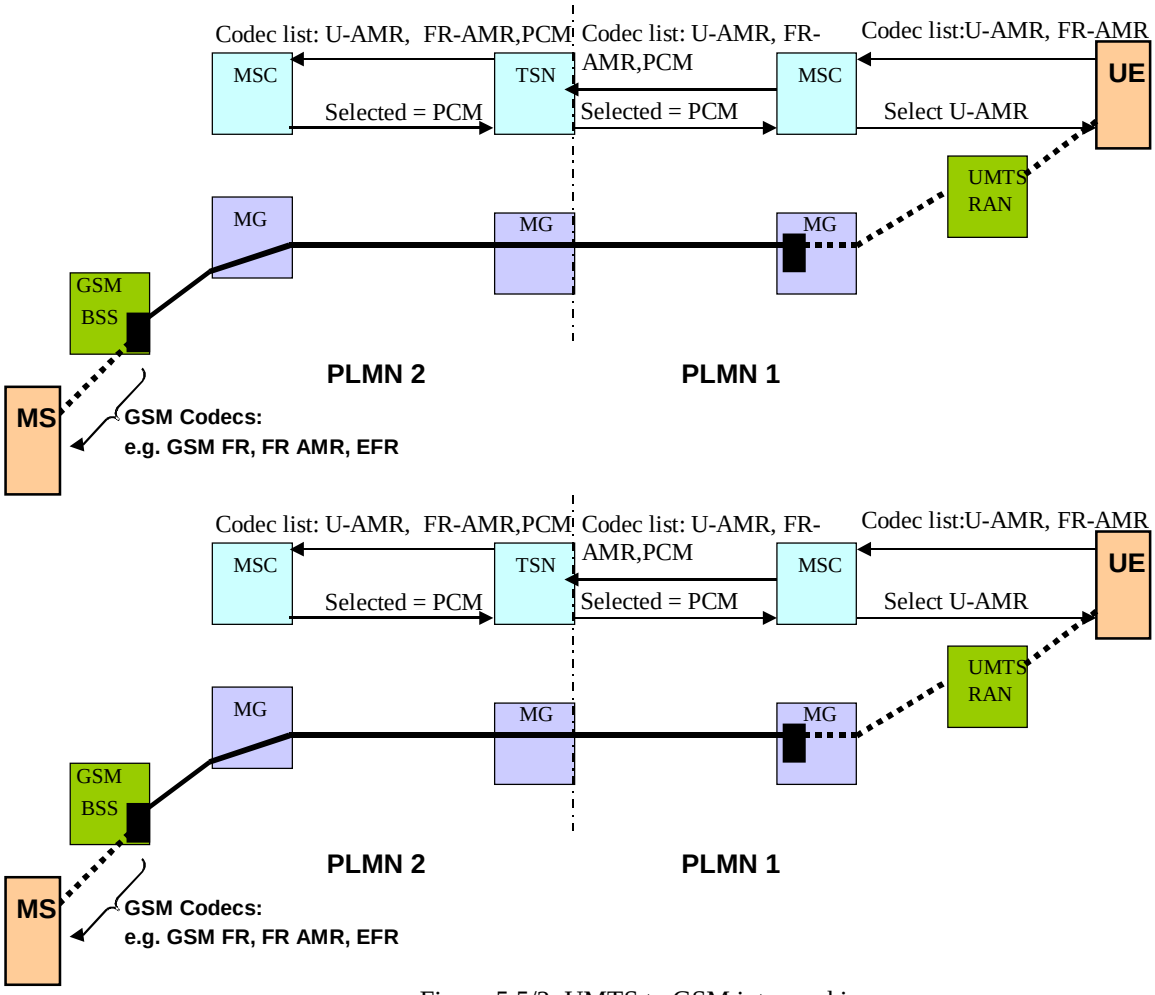
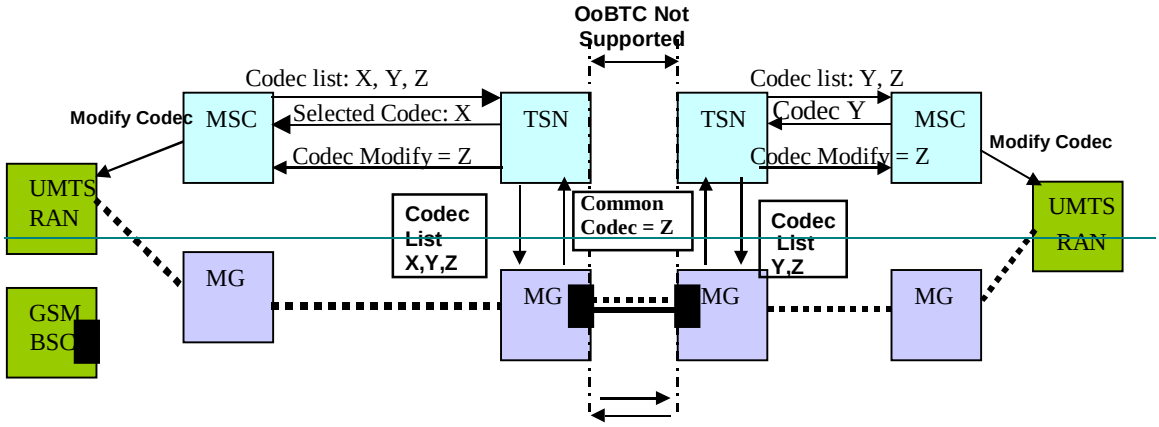
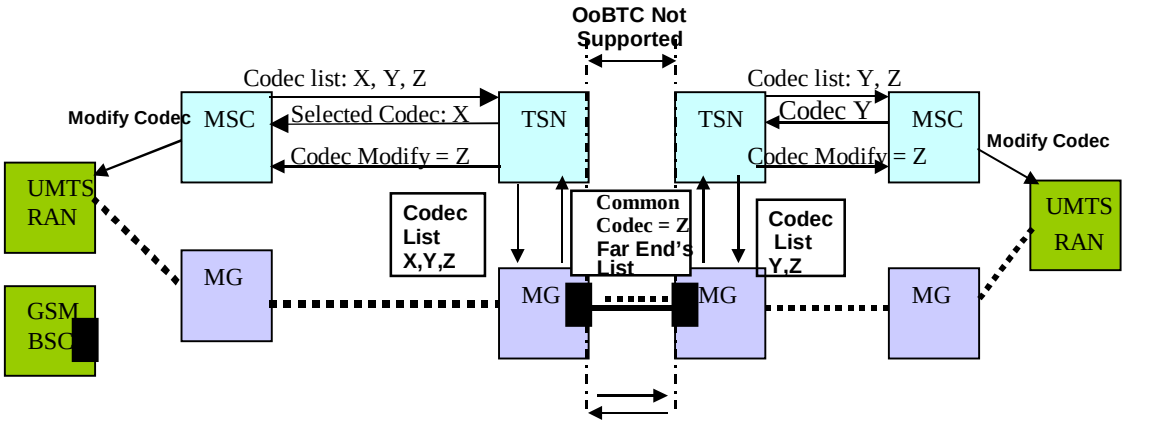


Figure 5.5/2: UMTS to GSM interworking

For TFO to establish between the transcoders in the above scenarios, each TRAU must send a codec list inband after the call has been established. If a common codec type is available (determined by pre-defined rules, described in TFO specification [10]) then the OoBTC procedures need to be informed so that a codec modification can be performed. This is shown in Figure 5.5/3. Note – a modification could also be required when a common codec type has been selected but the ACS is not common.



Inband TFO Codec Negotiation



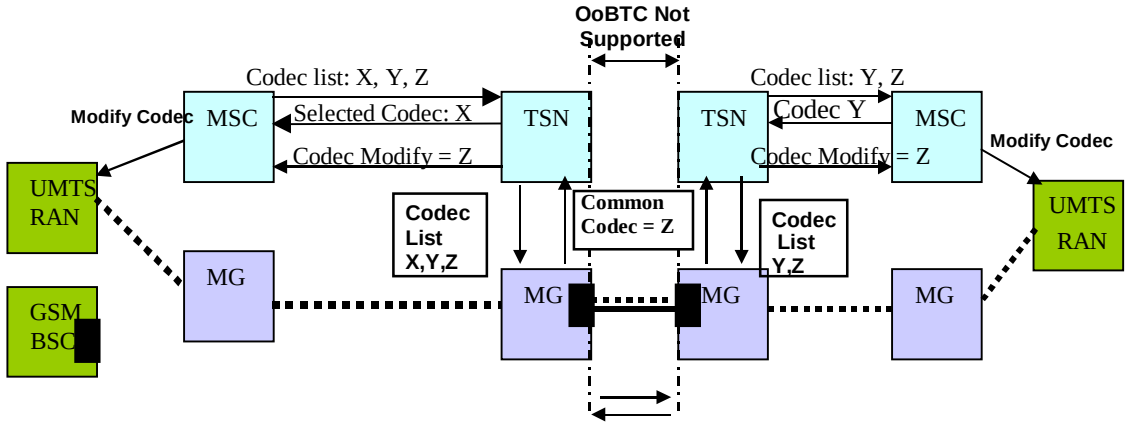


Figure 5.5/3: TFO support by OoBTC signalling

In H.248, the vertical MG control protocol, the coding types are specified by Media Stream Property, as defined by Annex C of H.248 specification. ~~This stream property only allows one codec type to be specified. It does not permit a list of codecs to be sent to the MG. Further no property exists currently that defines the support of TFO. A TFO package for H.248 is defined to include the requirements for TFO.~~A specific package is used for TFO.

The basic requirements are listed below:

i) Property for Codec List (same format as for [5])

ii) Event for common codec determined by TFO protocol

iii) Event for Far End's Codec List

~~iii)~~iv) Procedures to define TFO

The TFO package allows the Server to request the MGW to initiate TFO protocol towards a far end transcoder. The package includes a property to turn off the TFO (TFO_Active); this may be required prior to TrFO break situations such as handover. The control of the level of negotiation is performed by the "Optimisation Mode" parameter in the Codec List IE see [5]. This allows a node to indicate if the ACS may be punctured or not and~~,~~ this is mapped to the appropriate parameter in the TFO protocol by the MGW.

The MGW returns Notification Events for the Far End's Codec List and Common Codec as selected by the Codec Selection mechanism in TFO. The Server then compares the "Far End Codec List" with its previously negotiated Available Codec List. If the lists are not the same then a Codec List Modification is also performed.

3GPP TSG-CN4 Meeting #06 **Tdoc N4-010168**
BEIJING, CHINA 15th 19th January 2001

CR-Form-v3

CHANGE REQUEST

⌘ **23.153** **CR** **005** ⌘ rev **01** ⌘ Current version: **4.0.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	Alignment of codec modification procedures with current BICC CS2 procedures
Source:	⌘	CN4
Work item code:	⌘	OoBTC ***Date:*** ⌘ 2001-01-17
Category:	⌘	**C** ***Release:*** ⌘ REL-4

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F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	Addition of TrFO Break Recovery
Summary of change:	⌘	Chapter describing TrFO break Recovery added
Consequences if not approved:	⌘	Unclear handling after TrFO Break, incomplete standards

Clauses affected:	⌘	5.4
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.*****first modified section *****

5.4.4 TrFO Break

The event and procedure when a TrFO connection must be interrupted at a certain point in the path, e.g. due to a supplementary service invocation or for handover/relocation, is termed “TrFO Break”. A TrFO Break may occur~~s~~ at a MGW as a consequence of a command directed by the associated ~~ppropriate~~ Server. During this period the Iu User Plane protocol is terminated by this MGW, in general at both sides of the MGW. This means that it must respond to new Initialisation PDUs and Inband Rate Control PDUs. The MGW inserts a TrFO Break Function, which then makes use of the stored RFCI values, in order to perform the required Iu UP protocol functions and interpret the payload. Further call scenarios for specific services that incur a TrFO break are described in chapter 6.

5.4.x TrFO Break Recovery

During the TrFO break situation the individual connections are free to change, the RFCIs may have changed and also the rate control (maximum rate, current rate). After the service that caused the TrFO break is complete, the MGW shall check if ~~it can return to~~ TrFO.can be re-established. If the coding schemes are matching but the RFCI’s have changed then RFCI value correction can be performed at~~towards~~ the RNC side. In order to correct any changes in rate control between two RNCs, the MGW shall send a rate control request from each Termination, with the current rate and maximum rate applied at the other ~~t~~Termination. This will then result in the Distributed Rate Decision between the two RNCs in the call.

3GPP TSG-CN4 Meeting #06 **Tdoc N4-010169**
BEIJING, CHINA 15th 19th January 2001

CR-Form-v3

CHANGE REQUEST

⌘ **23.153** **CR** **006** ⌘ rev **1** ⌘ Current version: **4.0.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Interaction with CCBS
Source:	⌘	CN4
Work item code:	⌘	OoBTC
Date:	⌘	08.01.2001
Category:	⌘	**C**
Release:	⌘	Rel-4

Use one of the following categories:
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C *(Functional modification of feature)*
D *(Editorial modification)*
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2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	The case were Bearer set up is performed before set up in a Bearer independet CS CN is not reflected in the specification.
Summary of change:	⌘	The CR contains one change in chapter 7.12 - In case of CCBS Recall it is an option that a bearer can be established before setup message is received. If a bearer is assigned before setup and the selected codec received from the preceding node is different to the one which is used to establishe the bearer, bearer modification has to be performed.
Consequences if not approved:	⌘	

Clauses affected:	⌘	7.12
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

*** Modified section****

7.12 Completion of Calls to Busy Subscriber (~~GSM~~ TS ~~03~~23.~~0~~93)

~~No impact.~~ Within CCBS there exists an option for CCBS calls where a bearer can be established before setup in the state "CC-establishment confirmed". If the selected codec after setup is different to the one which was used to establish the bearer, RAB assignment(modify) may be required when RAB parameters are different.

3GPP TSG-CN4 Meeting #06 **Tdoc N4-010202**
BEIJING, CHINA 15th 19th January 2001

CR-Form-v3

CHANGE REQUEST

⌘ **23.153** **CR** **007** ⌘ rev **2** ⌘ Current version: **4.0.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	chapter 5.6, establishment of additional calls
Source:	⌘	CN4
Work item code:	⌘	OoBTC
Date:	⌘	2001-01-11
Category:	⌘	**C**
Release:	⌘	REL-4

Use one of the following categories:
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B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
REL-4 *(Release 4)*
REL-5 *(Release 5)*

Reason for change:	⌘	In case of e.g. CH/CW and related MPTY scenarios there exists already an established bearer with an initialised IuUP between the RNC and the related MGW. If the subscriber wants to setup an additional call, this may result in a different ACS than already selected. The possibility of re-initialisation of the UP and bearer re-establishment of already established TrFO links can be reduced, if the already applied ACS is sent with the highest preference within the codec list.
Summary of change:	⌘	
Consequences if not approved:	⌘	increasing signalling load

Clauses affected:	⌘	5.6		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

5.6 CN Node handling of Codec Types & Codec Modes

The supported codec list received by the MSC in DTAP protocol [2] has no priority, whereas the list sent in the OoBTC procedures is sent with a level of preference. In order to support interworking with 2G systems it is recommended that MGWs support 2G EFR codecs and for GSM the FR AMR codec. In order to avoid modifications during handover between 2G and 3G systems the MSC nodes may give preference to a suitable 2G codec.

The originating CN node, while performing speech service negotiation with a terminating CN node, shall indicate the maximum number of modes that shall be selected during speech codec negotiation. This maximum number of supported modes may depend on optimisation strategies applied by the originating CN node.

The terminating CN node receiving this information compares the maximum number of modes received by the originating CN with its own one and shall decide on the minimum of both numbers to be applied as result of the negotiation.

The decision about the actual modes to be selected shall be left to the terminating CN node. In order to provide harmonisation of out of band codec negotiation (TrFO) and inband codec negotiation (TFO) the same codec selection mechanisms being defined for TFO shall be applied for TrFO. These rules shall be taken into account when forwarding a codec list from the originating node to proceeding node, both for TrFO and TFO.

Whenever one or several TrFO links have been already established and initialised, the CN node (e.g. the serving CN in case of Call Hold scenarios, the visited CN node in case of Call Forwarding scenarios, etc.) initiating a subsequent codec negotiation, shall give the already negotiated codec type, including its ACS, highest preference to reduce the possibility of performing bearer re-establishment or UP re-initialisation of the already established and initialised TrFO links.

When the MSC node requests a RAB assignment the Subflow Combinations provided shall either all be initialised by the RNC or all rejected with appropriate cause code.

The MSC shall always define “DTX” and “No Data” SDUs in addition to the negotiated speech modes. This is because for TrFO the RAB requested by one RNC must match that requested by the peer RNC – they are effectively the same RAB. If one MSC requires DTX support then the RAB requested by the far end MSC must also support DTX (even if it is not desired by that MSC). As no Out Of Band negotiation for DTX is supported nor DTX control to the UE, DTX shall be mandatory for TrFO connections.

3GPP TSG-CN4 Meeting #06 **Tdoc N4-010174**
BEIJING, CHINA 15th 19th January 2001

CR-Form-v3

CHANGE REQUEST

⌘ **23.153** **CR** **009** ⌘ rev **1** ⌘ Current version: **4.0.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network ☐

Title:	⌘	Editorials and minor corrections
Source:	⌘	CN4
Work item code:	⌘	OoBTC
Date:	⌘	2001-01-12
Category:	⌘	**D**
Release:	⌘	REL-4

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change: ⌘ This document proposes minor corrections and editorials to be incorporated within the current version of 23.153. A necessary CR will be re-submitted, as soon as v.4.0.0 will become available.

The proposed changes are as follows:

- Chapter 1: mobile-to-fixed calls should be mentioned as well.
- Chapter 4.2: editorials and reference to [10]
- in 5.2/1 codec „v“ should be selected, according to 5.1, where preference-ordered codec lists are exchanged. Figure 6.4/1 has been modified accordingly.
- in 5.4.5 the rule “ If a MGW has two Iu-RAN terminations connected to the same context then the “RFCI Matching” is performed to the termination latest defined.” has been slightly reworded.
- in figure 6.2/2, the box after step 9., RNC-T/MGW-T should be RNC-A‘/MGW-A
- and some typos etc.

Summary of change: ⌘ Editorials and Minor Corrections

Consequences if not approved: ⌘

Clauses affected: ⌘

Other specs affected: ⌘ ☐ Other core specifications ⌘
☐ Test specifications
☐ O&M Specifications

Other comments: ⌘

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

******First modified section*****

1 Scope

This Technical Specification specifies the stage 2 description of the Out-of-Band Transcoder Control for speech services.

Cellular networks depend heavily on codecs to provide their services. Codecs are necessary to compress speech in order to utilise efficiently the expensive bandwidth resources both in the radio interface and in the transmission networks.

Unnecessary transcoding of speech significantly degrades quality and, therefore, cellular systems try to avoid it for mobile-to-mobile calls when both UEs and the network support a common codec type.

Although the main reason for avoiding transcoding in mobile-to-mobile calls has been speech quality, the transmission of compressed information in the CN and CN-CN interface of the cellular network also offers the possibility of bandwidth savings. Therefore Out-of-Band Transcoder Control is not limited to mobile-to-mobile calls but can be applied for calls to or from an external network as well.

Digital cellular systems support an increasing number of codec types. As a result, in order to allocate transcoders for a call inside the network, and to select the appropriate codec type inside the UEs, signalling procedures are defined to convey the codec type selected for a call to all the affected nodes (UEs and (potential) transcoding points inside the network). Also, codec negotiation capabilities are being defined to enable the selection of a codec type supported in all the affected nodes, i.e. to resolve codec mismatch situations. This codec negotiation maximises the chances of operating in compressed mode end-to-end for mobile-to-mobile calls.

~~Although the main reason for avoiding transcoding in mobile-to-mobile calls has been speech quality, the transmission of compressed information in the CN and CN-CN interface of the cellular network also offers the possibility of bandwidth savings.~~

To allow transport of information in a compressed way in transmission networks, these networks make use of thetransport -independent call control- protocol as specified in [8] that- provides means for signalling codec information, negotiation and selection of codecs end-to-end.

******Next modified section*****

2 References

The following documents contain provisions that, 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.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] ———3G TS 23.107: "QoS Concept and Architecture"

[2] 3G TS 24.008: "Mobile radio interface layer 3 specification Core Network Protocols –Stage 3"

[3] 3G TS 25.413: "UTRAN Iu Interface RANAP Signalling"

[4] 3G TS 25.415: "UTRAN Iu Interface User Plane Protocols"

[5] 3G TS 26.103: "Speech codec list for GSM and UMTS"

[6] Q.1902.x: "Bearer Independent Call Control, CS2"

[7] Q.765.5:" Application Transport Mechanism for Bearer Independent Call Control"

[8] 3G TS 23.205, Bearer-independent CS Core Network.

[9] 3G TS 33.106, Lawful Interception Requirements

[10] 3G TS 28.062, Inband Tandem Free Operation (TFO) of Speech Codecs.

[11] 3G TS 23.009, Handover Procedures.

******Next modified section*****

4 Out-of-Band Transcoder control functionality

4.1 OoBTC Requirements

The OoBTC mechanism shall support the following:

- The capability to negotiate the preferred codec type to be used between two end nodes and to avoid the use of transcoders in the network at call set-up.

  The originating UE indicates the list of its supported codec types for codec negotiation. This list shall be conveyed to the terminating MSC. The terminating UE indicates its list of supported codec types to the terminating MSC.

  Where no compatible codec type can be selected between the UEs then the default PCM coding shall be selected. The originating MSC shall insert a transcoder in the path from the originating UE. Codec selection for the terminating UE is then performed within the terminating MSC, independently of the originating MSC.

  Note: For a codec type supporting various modes, the described functionality shall also be applicable to negotiate the set of codec modes common to originating and terminating UEs. Other negotiations such as Initialisation and Rate control are performed at a later point in time by the Iu UP protocol.

- The capability to control the presence of transcoders in the network after call set-up.

  Where a change to the call state of a transcoder free connection occurs, such that compressed speech cannot be maintained, it shall be possible to insert a transcoder or pair of transcoders where needed in the path. If this results in change to the encoding of the speech in other nodes then it shall be possible to inform the end points of this segment that the speech coding is changed. Such examples where this could occur are:

  - SS interruptions (e.g. A to B call connection becomes to multiparty call connection.)
  -
  - Handover to an incompatible partner.
  - Synchronisation loss

  Where a change in call state as described above is temporary then it shall be possible to return to a transcoder free connection by removing the inserted transcoders and informing the endpoints that the connection has resumed to compressed speech encoding.

- The codec types comprise codecs for speech in the first phase. The transcoder control should have enough expandability to support future enhancements of codec types.
- The transcoder control procedure shall not cause a perceivable time lag in the cases of establishing transcoder free connection and reverting to normal (double transcoded) call connection in the cases described above for control of the presence of transcoders.
- The capability to insert transcoder (in cases where a TrFO connection is not possible) at the most appropriate location, i.e. to save bandwidth it should be located at the CN edge between an ATM or IP transport network and a STM network.

- When a transport network cannot maintain compressed voice then reversion to the default PCM coding shall occur. A transcoder shall be inserted at that point and OoBTC procedures terminated. TrFO link is then possible between that point and the preceding nodes.
- When a Non-TrFO call reaches the UMTS CN then OoBTC procedures are initiated from that point and after codec negotiation has been performed, if compressed voice can be supported through the CN then a transcoder is inserted at the edge of the CN.

- The OoBTC signalling procedures shall be supported by the call control protocol on the Nc interface, for example codec negotiation, codec modification, codec list modification, codec renegotiation, and codec list re-negotiation. BICC CS2 [6] supports such a mechanism, through the APM procedures defined by [7].

4.2 Relationship between OoBTC and In-band TFO

OoBTC is used before call set-up to attempt to establish an UE-UE transcoder free connection. If successful the result is a saving of transcoding equipment in the path and provides a cost efficient transmission.
The In-band TFO protocol (described in [10]) is activated after call set-up only if transcoders are inserted in the path. In case two transcoders in tandem (a pair of transcoders with PCM coding~~ed~~ between them) are able to communicate to each other (both support TFO), then the inband TFO protocol allows the transcoders to compare coding schemes. If compatible codec types exist, the transcoders are able to overwrite the PCM coding with the pure compressed speech (effectively bypassing the transcoding functions). In-band TFO provides fast fallback mechanisms in case the TFO connection can not be maintained (insertion of CCD, DTMF, tones, etc). In-band TFO provides no direct saving of transmission costs.

If the OoBTC fails to establish the TrFO and transcoders are required, then in-band TFO may be used after call set-up. Inband TFO shall be the fallback mechanism when transcoders cannot be avoided, either at set-up or during the communication phase. In-band TFO shall be used for interworking with the 2G systems (e.g. GSM).

******Next modified section*****

5.2 Simple call set-up

The signalling flow for the simple call set-up case is illustrated in figure 5.2/1. Codec negotiation is done prior to the establishment of bearer connections, so that appropriate bearer resources are committed to the call. In the proposed sequence, the codec negotiation starts with the IAM message containing the list of supported codec types (in this example v, w, x, y, z), sent by the Originating MSC (O-MSC). Transit nodes may puncture out (i.e. delete) codec types from the list (in this example y). The terminating MSC (T-MSC) selects the codec type (here v~~x~~) The selected codec is conveyed in an APM message, together with the remaining list of alternative, but currently not selected codec types (here v, x, z).

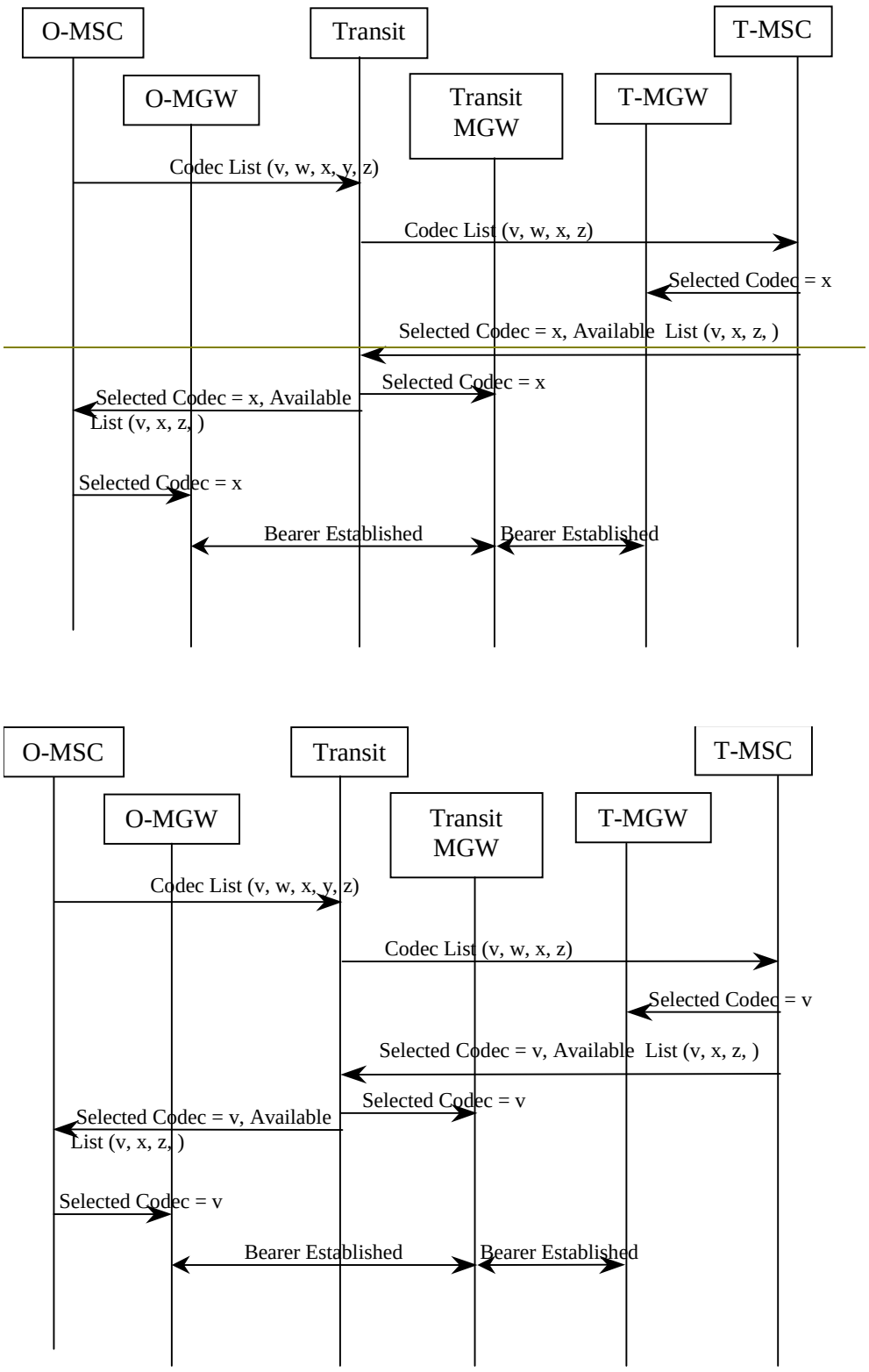


Figure 5.2/1. Basic Codec Negotiation Sequence

The codec list for BICC is specified according to [7], where each 3GPP codec entry is defined according to [5].

******Next modified section*****

5.3 Media Gateway Control for Codec Handling

The general handling of MGW control procedures are detailed in [8]. Specific handling related to the control of the speech encoding is detailed in Figure. 5.3/1

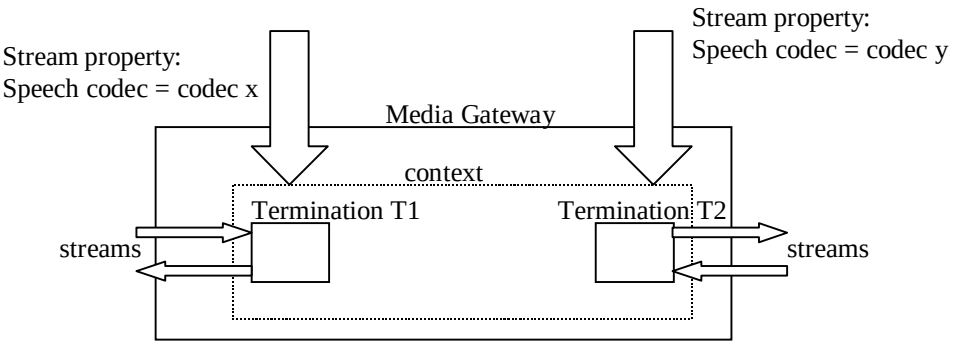


Figure 5.3/1. MGW control for speech codec

The handling of transcoding between one codec type (media stream property applied at one termination) and ~~the~~ another codec type (media stream property at other termination) is a function of the MGW. The media stream property for Audio Codec Type is defined in Annex C of the ITU-T MGW control protocol, H.248.

******Next modified section*****

5.4 Iu UP Framing Protocol Handling for TrFO

5.4.1 Framing Protocol Initialisation

For TrFO calls the compressed speech is carried end to end (RNC to RNC or between RNC and other compressed voice terminal). In 3GPP Core Networks compressed voice shall be carried using the Iu User Plane Protocol. The specification for Iu interface is defined in [~~9~~4]. For compressed voice only the support mode is used, thus for TrFO the Iu UP Initialisation procedure shall be supported by the CN, when a CN MGW is required to establish a connection with the Iu UP protocol.

The Iu UP Protocol is established through the CN in a forward direction, independently of the bearer establishment direction. The Notify message to indicate bearer establishment shall not be sent until the Iu UP has been initialised. The continuity message (COT) shall not be sent forward until the Notify message has been received from the MGW and also the COT from the previous server has been received. The sequences for mobile originated calls are shown in figures 5.4/1 and 5.4/2 for forward bearer and backward bearer establishment, respectively. The parameters in the Add Request messages in the Figures are described in further detail in chapter 5.4.5.

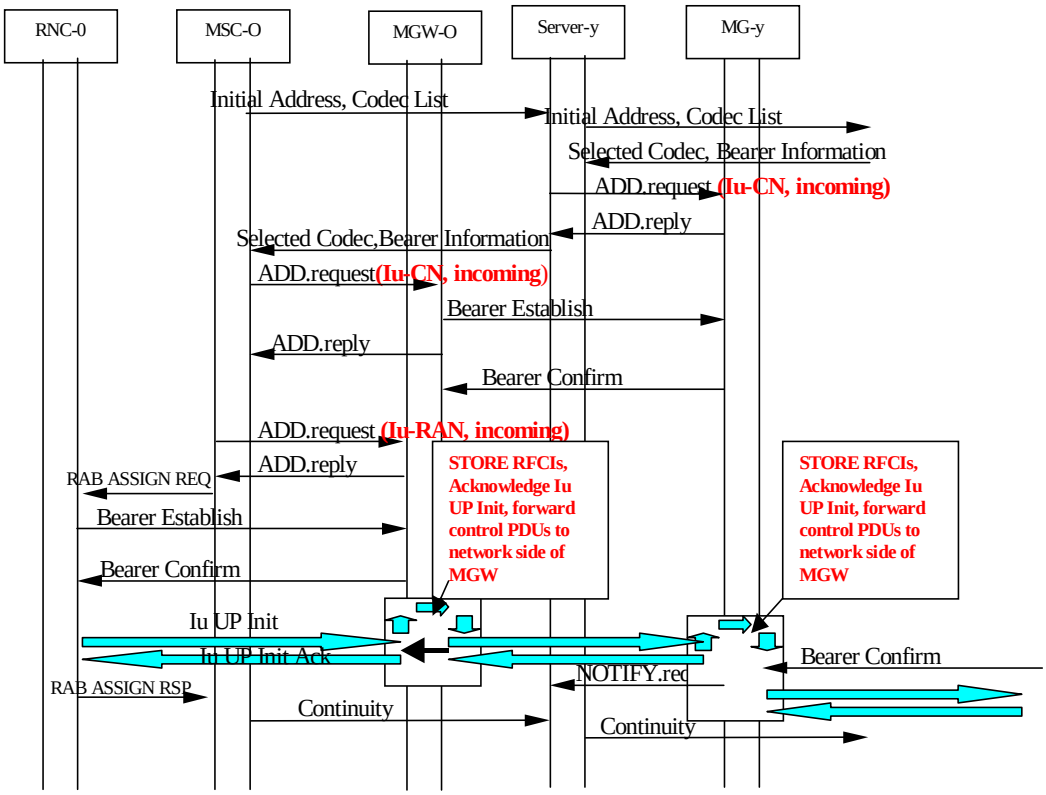


Figure 5.4.1/1: Iu UP Protocol Establishment, Mobile Originating call, forward bearer.

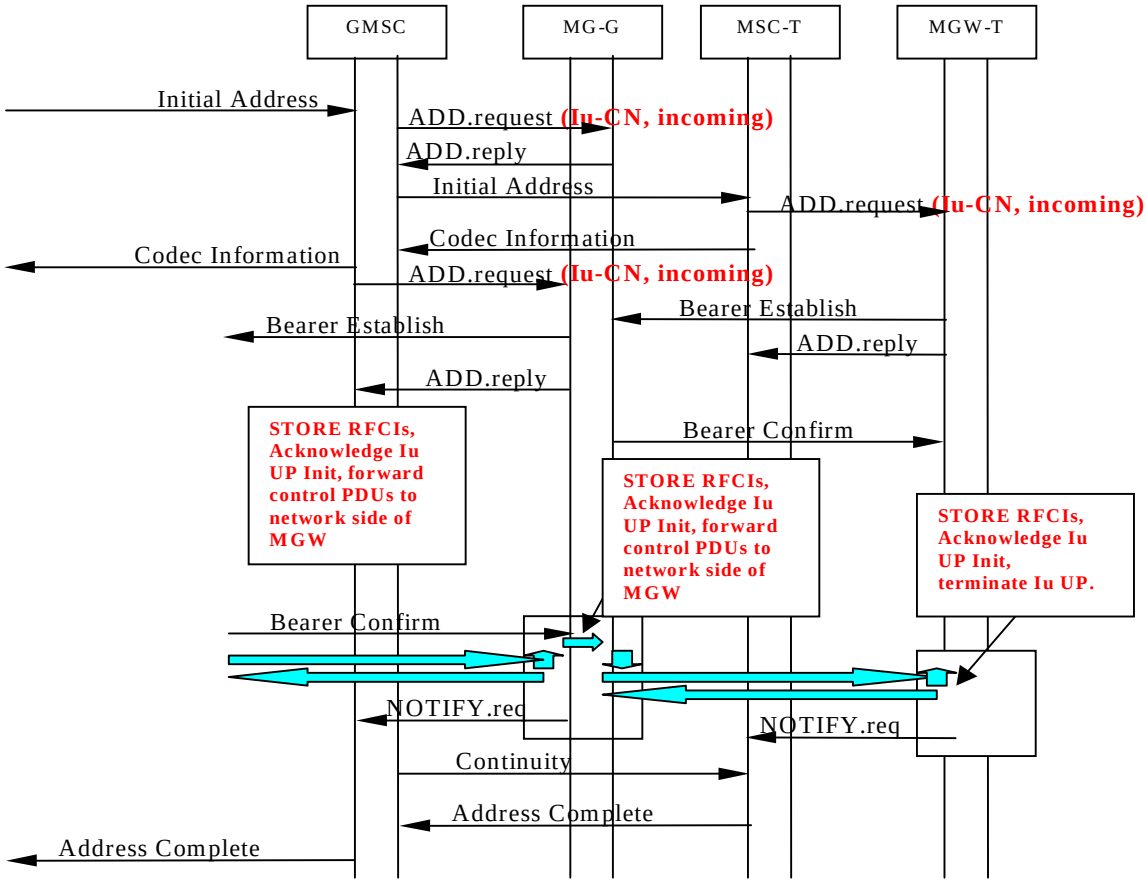


Figure 5.4.1/2: Iu UP Establishment, backward bearer.

The transport independent call control procedures in [8] shall support a continuity mechanism, as described above.

******Next modified section*****

5.4.4 TrFO Break

The event and procedure when a TrFO connection must be interrupted at a certain point in the path, e.g. due to a supplementary service invocation or for handover/relocation, is termed “TrFO Break”. A TrFO Break occurs at a MGW directed by the appropriate Server. During this period the Iu User Plane protocol is terminated by this MGW, in general at both sides of the MGW. This means that it must respond to new Initialisation PDUs and Inband Rate Control PDUs. The MGW inserts a TrFO Break Function, which then makes use of the stored RFCI values, in order to perform the required Iu UP protocol functions and interpret the payload. Further call scenarios for specific services that incur a TrFO break are described in chapter 6.

******Next modified section*****

5.4.5 MGW Control Protocol Iu UP Package properties

The following is a summary of the Iu UP H.248 requirements; the procedures are valid for Iu UP in Support Mode:

Additional Package Properties:

Iu UP Termination Type: Values ____- —Iu-RAN————————

——— ——— - —Iu-CN

Iu UP Initialisation Procedure: Values__ -- Incoming

——— _ -- Outgoing

Procedures:

Iu UP Initialisation procedure is always acknowledged between MGW peers. If a request for a Notification for the bearer establishment is requested then this shall not be sent until the acknowledgement for the Iu UP initialisation has also be returned.

The RFCI parameters are always stored against the MGW termination that received the Iu UP initialisation.

If a MGW has Iu UP termination property Initialisation Procedure = Incoming then it expects to receive~~d~~ an Initialisation (either internally or externally).

If a MGW has Iu UP termination property Initialisation Procedure- = Outgoing then it generates a network originated Initialisation PDU.

If a MGW has two terminations in the same context defined as supporting Iu UP package, then on receipt of an Iu Initialisation procedure from one side it shall forward the Iu UP initialisation procedure on to the peer MGW. This procedure shall be performed independently of the through-connection of the terminations in the context, but is dependent on the bearer connection from the other termination to its peer MGW being established.

If a MGW has one termination with Type =- Iu-RAN and one with type Iu-CN in the same context then no forwarding of Iu UP initialisation out from the Iu-RAN termination shall be performed until an Iu UP initialisation has been received at the Iu-RAN side. If the RFCI values stored at the Iu-CN termination do not match the RFCI values stored at the Iu-RAN side then “RFCI Matching” may be performed to the Iu-RAN side – Iu UP initialisation is sent with the RFCI values from the Iu-CN side. No “RFCI Matching” is permitted at the Iu-CN side.

“RFCI Matching” may be delayed if terminations are not through-connected, triggered by connection modification otherwise it shall be performed immediately, this is implementation option

If “RFCI Matching” is not performed the MGW shall map the indexes for Iu frames from one side to the RFCI indexes from the other side.

If a MGW has two Iu-RAN terminations connected to the same context then the “RFCI Matching” is performed to the termination latest defined.

If a MGW has two terminations with Iu UP package connected to the same context and both RFCI sets match then the MGW may switch into Iu UP transparent mode – no monitoring of the Iu frames is performed, provided that the terminations are through-connected.

If a H.248 procedure is received when a MGW is in transparent mode (but Iu UP is defined as support mode) that requires interpretation or interaction with the Iu UP then the MGW shall switch back to support mode, i.e. perform monitoring or termination of the Iu UP protocol.

5.5 TrFO/TFO Codec Negotiation Harmonisation

When OoBTC procedures are initiated to a node where compressed voice cannot be supported (either at the node or to the preceding node) then a transcoder is inserted. This can be due to the transport technology (e.g. TDM) or due to the access technology (e.g. GSM). The OoBTC procedures can result in the following call scenarios:

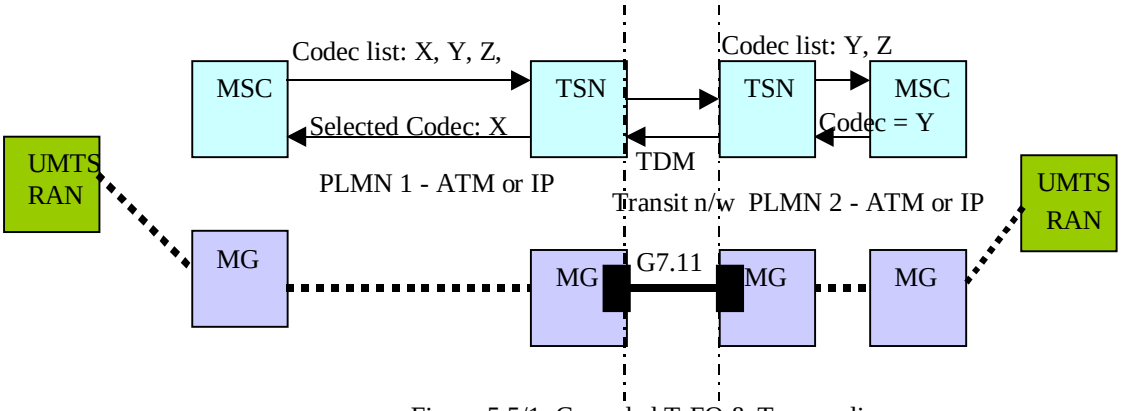


Figure 5.5/1: Cascaded TrFO & Transcoding

In Figure 5.5/ 1 the OoBTC cannot proceed as the call crosses a transit network that does not support compressed voice. The same could occur if the transit network did not support out of band codec negotiation (Support in BICC is optional).

In Figure 5.5/2 the OoBTC procedures result in the call terminating to a GSM access. As the GSM radio access transcodes to default PCM codec, the OoBTC results in default PCM being the only codec that can be selected. The reply is passed back to the originating network, which then inserts a transcoder from default PCM to AMR for the UMTS radio access.

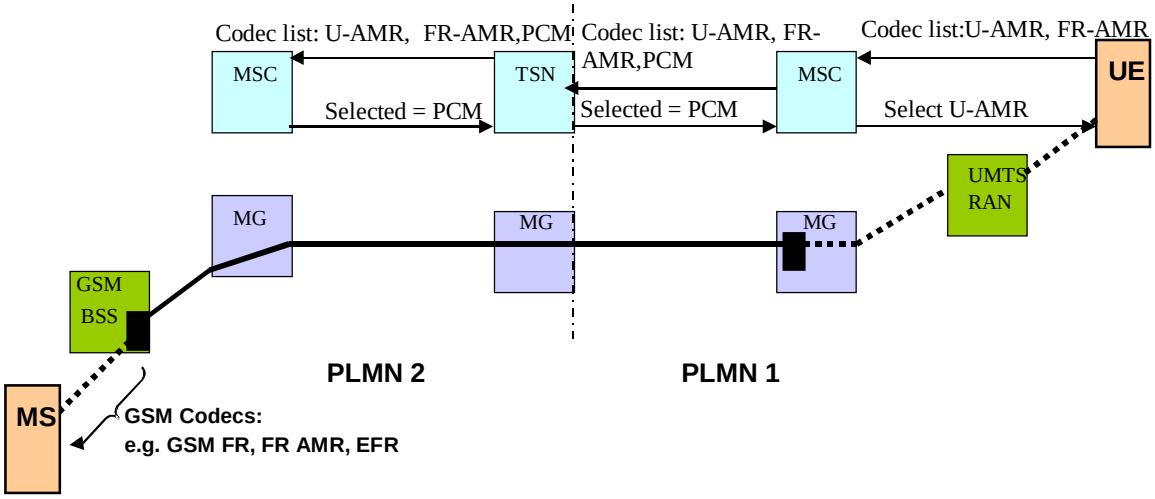
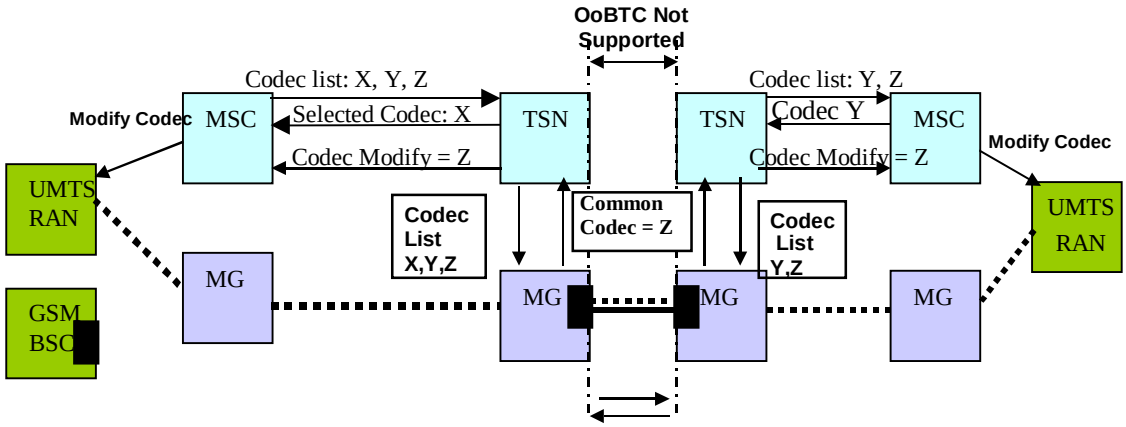


Figure 5.5/2: UMTS to GSM interworking

For TFO to establish between the transcoders in the above scenarios, each TRAU must send a codec list inband after the call has been established. If a common codec type is available (determined by pre-defined rules, described in TFO specification [10]) then the OoBTC procedures need to be informed so that a codec modification can be performed. This is shown in Figure 5.5/3. Note – a modification could also be required when a common codec type has been selected but the ACS is not common.



Inband TFO Codec Negotiation

Figure 5.5/3: TFO support by OoBTC signalling

In H.248, the vertical MG control protocol, the coding types are specified by Media Stream Property, as defined by Annex C of H.248 specification. This stream property only allows one codec type to be specified. It does not permit a list of codecs to be sent to the MG. Further no property exists currently that defines the support of TFO. A TFO package for H.248 is defined to include the requirements for TFO.

The basic requirements are listed below:

i) Property for Codec List (same format as for [5])

ii) Event for common codec determined by TFO protocol

iii) Procedures to define TFO

******Next modified section*****

5.6 CN Node handling of Codec Types & Codec Modes

The supported codec list received by the MSC in DTAP protocol [2] has no priority, whereas the list sent in the OoBTC procedures is sent with a level of preference. In order to support interworking with 2G systems it is recommended that MGWs support 2G EFR codecs and for GSM the FR AMR codec. In order to avoid modifications during handover between 2G and 3G systems the MSC nodes may give preference to a suitable 2G codec.

The originating CN node, while performing speech service negotiation with a terminating CN node, shall indicate the maximum number of modes that shall be selected during speech codec negotiation. This maximum number of supported modes may depend on optimisation strategies applied by the originating CN node.

The terminating CN node receiving this information compares the maximum number of modes received by the originating CN with its own one and shall decide on the minimum of both numbers to be applied as result of the negotiation.

The decision about the actual modes to be selected shall be left to the terminating CN node. In order to provide harmonisation of out of band codec negotiation (TrFO) and inband codec negotiation (TFO) the same codec selection mechanisms being defined for TFO shall be applied for TrFO. These rules shall be taken into account when forwarding a codec list from the originating node to proceeding node, both for TrFO and TFO.

When the MSC node requests a RAB assignment the Subflow Combinations provided shall either all be initialised by the RNC or all rejected with appropriate cause code.

The MSC shall always define “DTX” and “No Data” SDUs in addition to the negotiated speech modes. This is because for TrFO the RAB requested by one RNC must match that requested by the peer RNC – they are effectively the same

RAB. If one MSC requires DTX support then the RAB requested by the far end MSC must also support DTX (even if it is not desired by that MSC). As no Out Of Band negotiation for DTX is supported nor DTX control to the UE, DTX shall be mandatory for TrFO connections.

******Next modified section*****

5.7 Inband Rate Control

Inband rate control shall only allow the RNCs to set the maximum codec mode (maximum bitrate) from the set of codec modes that have been negotiated out of band. This procedure is called Maximum Rate Control. The final maximum mode selected results from a rate control request from one side and the maximum rate supported at the receiving side; the lower rate of these is selected. . This is known as Distributed Rate Decision. In TrFO maximum rate control shall be supported through the Iu UP protocol and through transit networks supporting compressed voice. The maximum rate control procedures are further defined within the Iu UP protocol [4].

When the MSC requests for a RAB to be assigned, it shall always define 1 speech mode SDU (lowest rate), DTX SDU and no data SDU as non-rate controllable. Other SDU formats for higher rates shall be defined as rate controllable.

At SRNS relocation the new RNC shall send a rate control frame at Relocation Detect indicating its current maximum rate, it will receive in the acknowledgement the current maximum rate from the far end. This procedure is called Immediate Rate Control. Again the distributed rate decision means both RNCs will operate within a common limit.

******Next modified section*****

5.8 DTMF Handling For TrFO Connections

DTMF from the UE is sent via DTAP procedures out-band. For a TrFO call the Originating MSC shall use an out-band DTMF procedure, all CN nodes shall support this procedure in their call control protocol. The out-band DTMF procedure shall also be used when TrFO is not achieved in order that TFO is possible. Insertion of DTMF in the PCM payload can result in the break of the TFO connection.

For terminating calls DTMF may need to be received by the core network (for voice-prompted services, voicemail control procedures etc). If the DTMF is received out-band then out-band procedures shall be maintained in core network.

If the DTMF is received for a TrFO call from an external network inband, in I.366.2 profile or RTP payload type, then the gateway MGW which interworks between Iu UP and the external framing protocol shall report the DTMF tones via H.248 procedures to its server. The server shall then use out-band procedures to pass the DTMF through the CN. See Figure 5.9/1.

The MGW may also optionally pass DTMF inband where such an option exists for the Nb interface, and is supported by the proceeding MGW.

Transcoding to default PCM to send DTMF tones shall be avoided for TrFO connections.

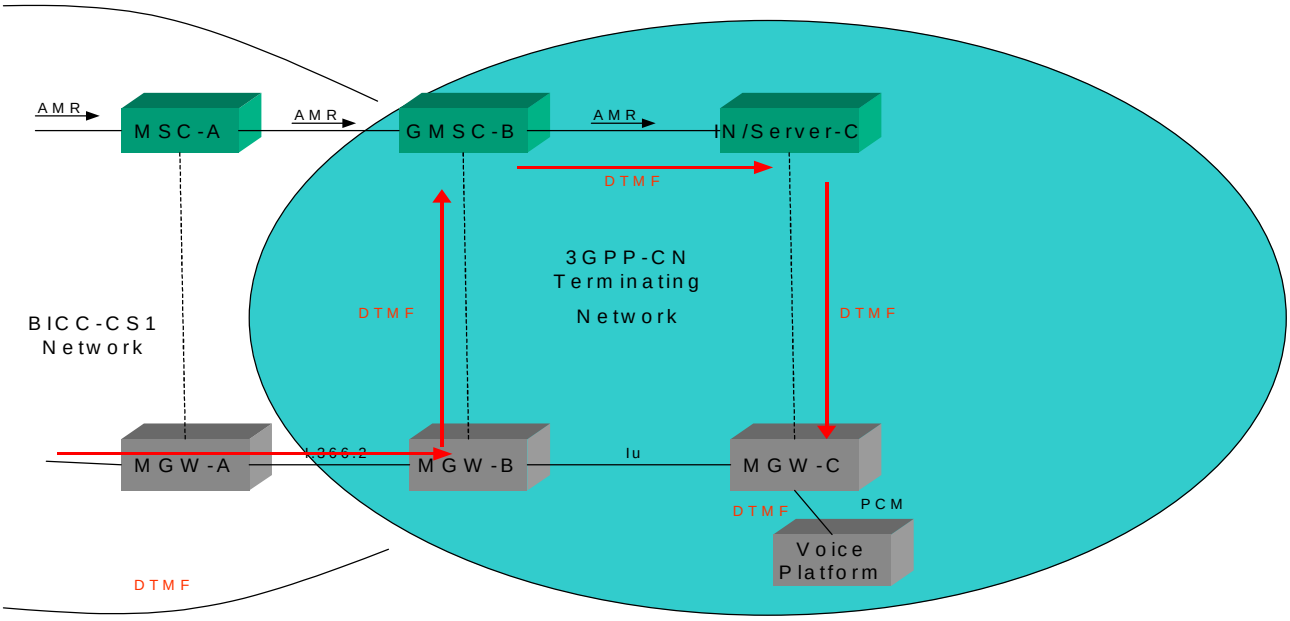


Figure 5.9/1:DTMF received inband from external network

******Next modified section*****

6 Detailed Call Procedures

6.1 Mobile to Mobile TrFO Call Establishment

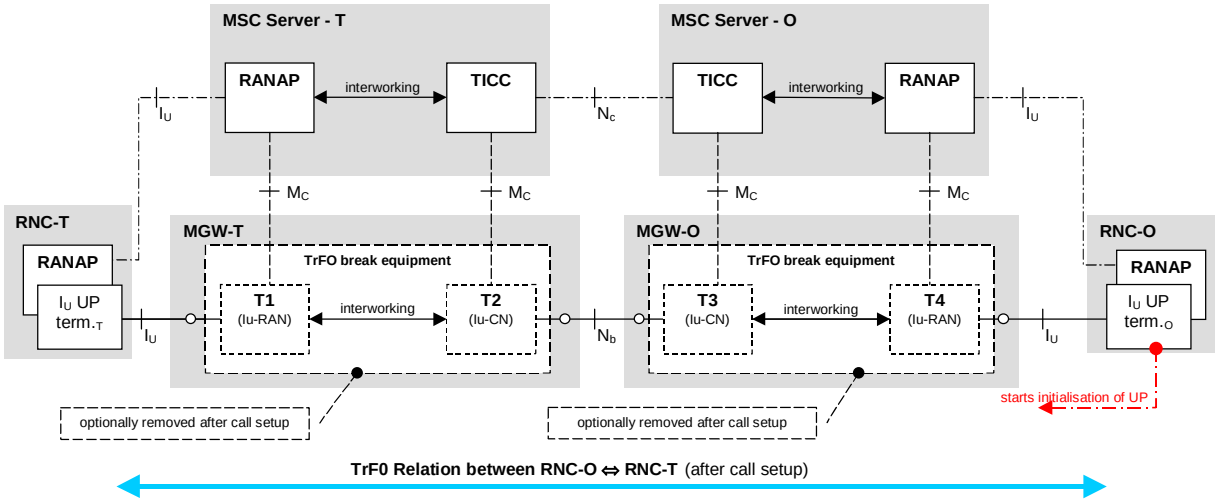


Figure 6.1/1: Configuration during Call Setup of a Mobile to Mobile Call.

Following network and protocol entities are involved in the scenario, outlined in Figure 6.1/1:

RNC-T, **RNC-O**: terminating/originating RNCs

MSC Server-T, MSC Server-O: MSC Servers, performing service, i.e. codec negotiation

MGW-T, **MGW-O:** terminating/originating MGWs with the optional capability to insert/remove so called

TrFO break equipment: (**TBE**s), i.e. contexts containing an UTRAN- and a CN side I_U UP termination (**T1** – **T4**), inter-working in a distinct manner on control level. [Note: *context* is meant to be the H.248 specific throughout the document]. It is aimed to design protocols for TrFO in a way, that these pieces of HW can be removed after call setup phase to allow to revert to "simple" AAL2 switching in case of ATM transport.

I_U UP term.$_T$, **I_U UP term.$_O$**: Terminating- and originating-side TrFO peers (I_U UP terminations in RNC's in Figure 6.1/1)

RANAP, **TICC**:C-plane protocol incarnations, responsible for codec negotiation, controlling the respective interfaces (I_U, N_C), creating, modifying, removing etc. terminations and contexts.

The final configuration is (at least logically) an end to end TrFO relation between RNC-T and RNC-O with the option to remove the TBEs from the user data path, i.e. to revert to pure AAL2 switching in case of ATM Transport.

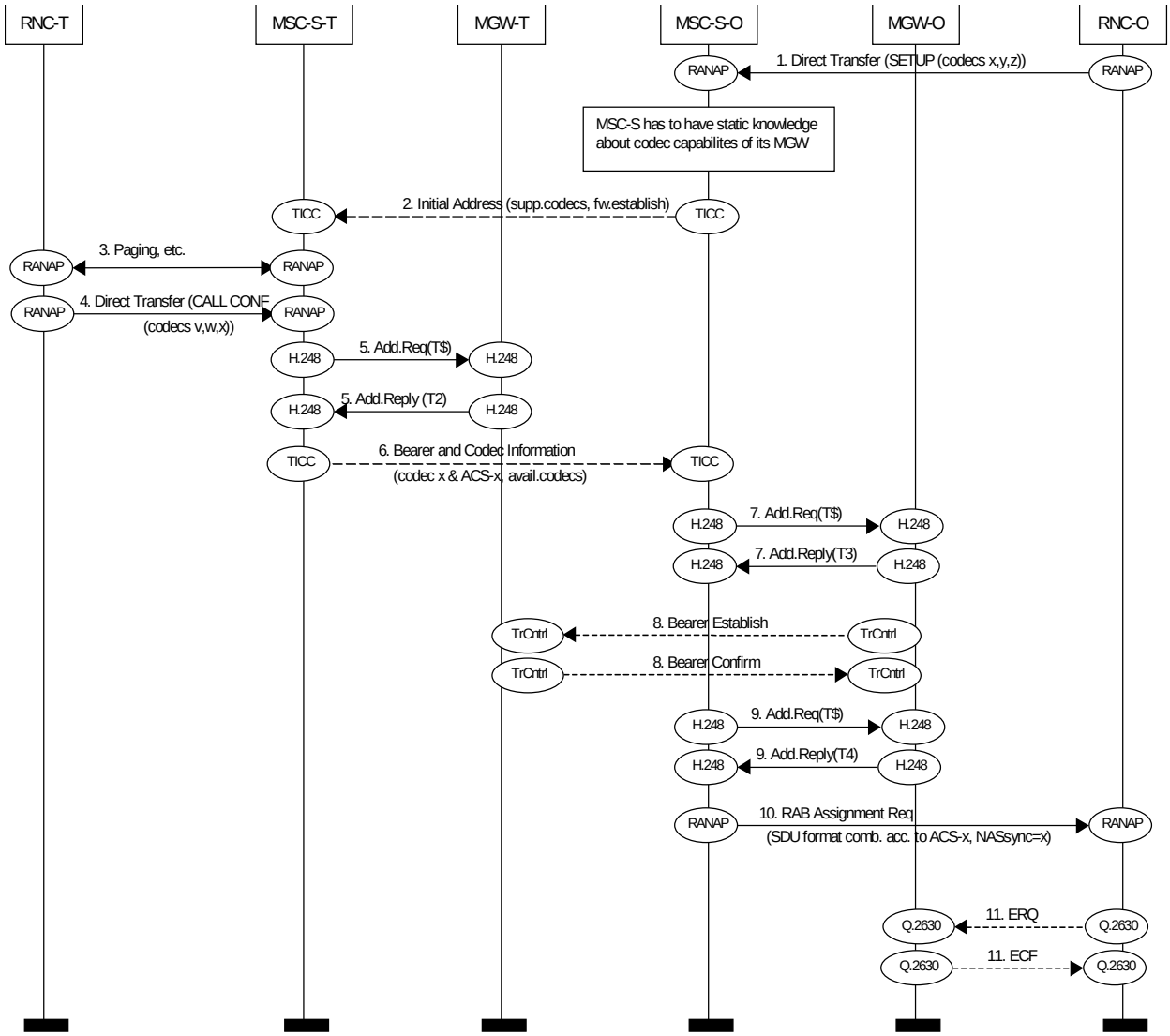


Figure 6.1/2: Call Setup. Mobile to Mobile Call. Message Flow part 1.

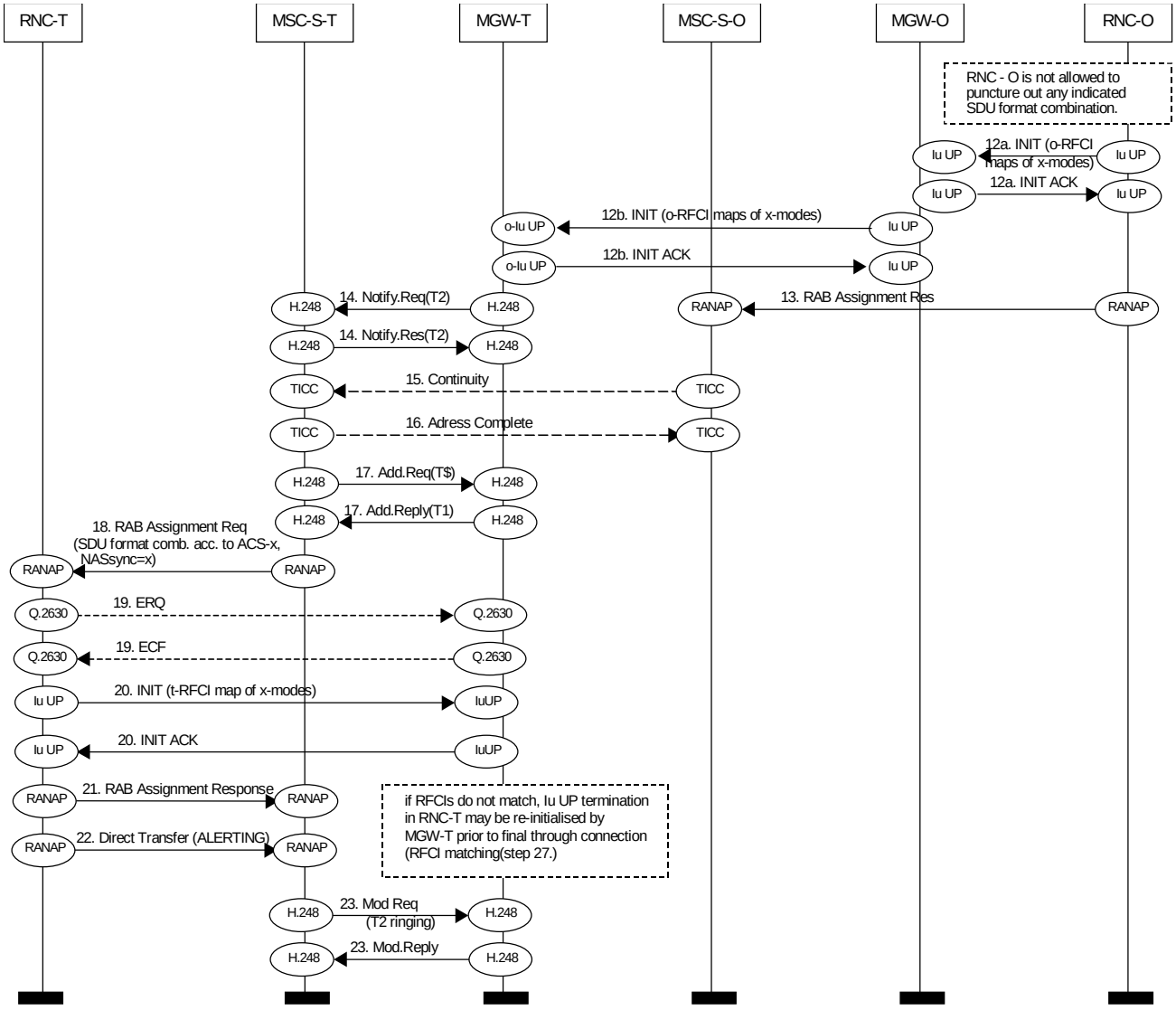


Figure 6.1/3: Call Setup. Mobile to Mobile Call. Message Flow part 2.

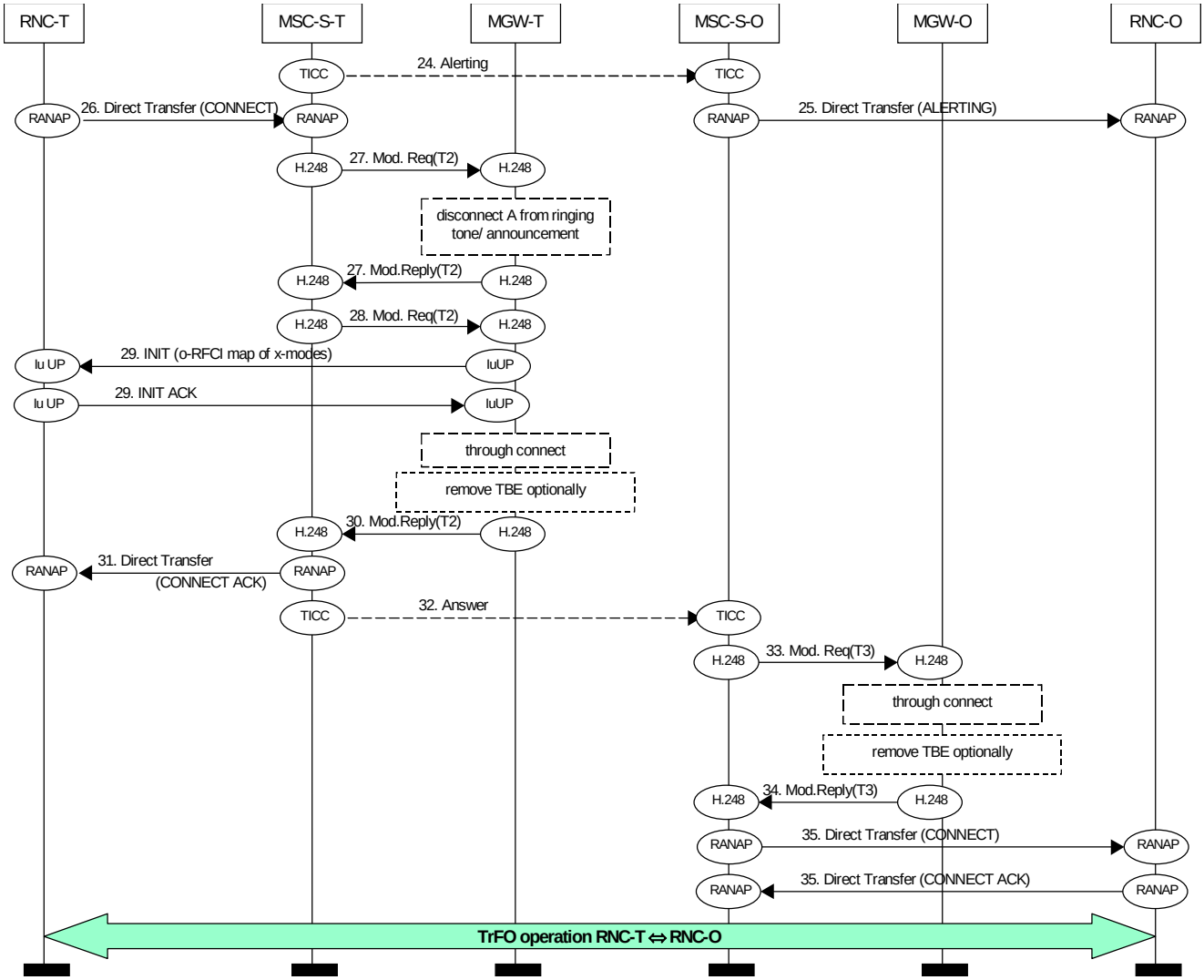


Figure 6.1/4: Call Setup. Mobile to Mobile Call. Message Flow part 3.

Codec negotiation

Step 1. to 6. gives the codec negotiation phase. The mobiles inform the network about their capabilities (1. and 4.). Afterwards the MSC-Server performs codec negotiation according to chapter 5.6.

Network side bearer establishment

MSC-T/MSC-O shall request seizure of network side bearer terminations with IuUP properties (see steps 5. and 7.). Intermediate CN nodes that may perform certain service interactions (e.g. IN nodes) have to seize terminations with IuUP properties as well.

RAB Assignment

RAN side terminations with IuUP property have to be seized (9. and 17.) before sending RAB Assignment (steps 10. and 18.), that contains RAB parameters according to the selected codec and the negotiated ACS. In addition, the respective NAS synchronisation indicator shall be included.

6.2 SRNS Relocation during TrFO

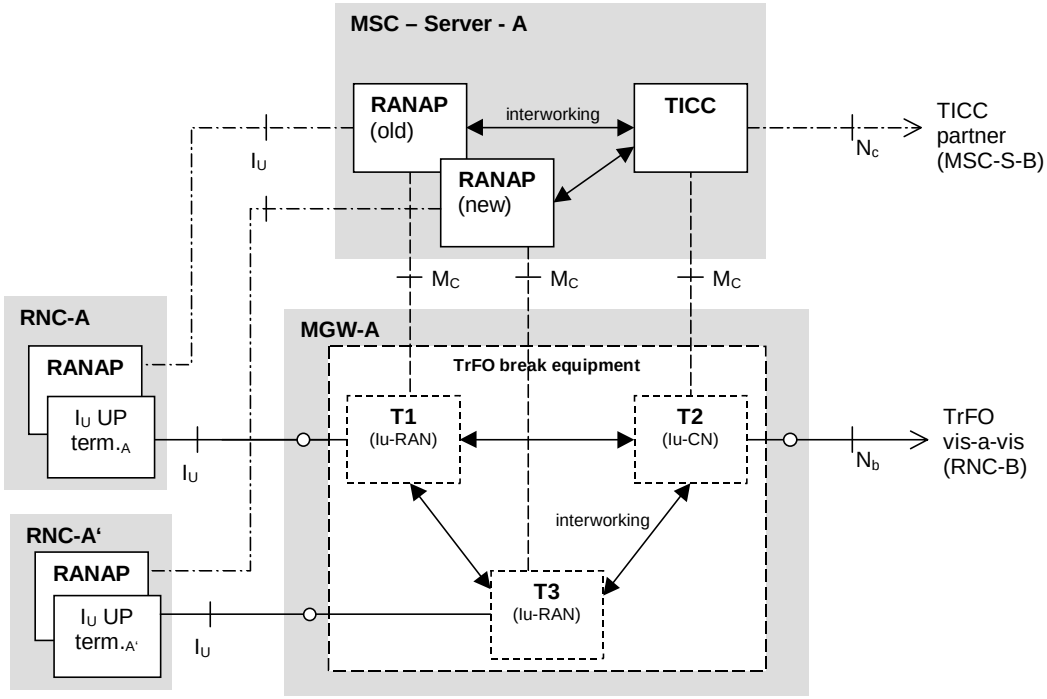


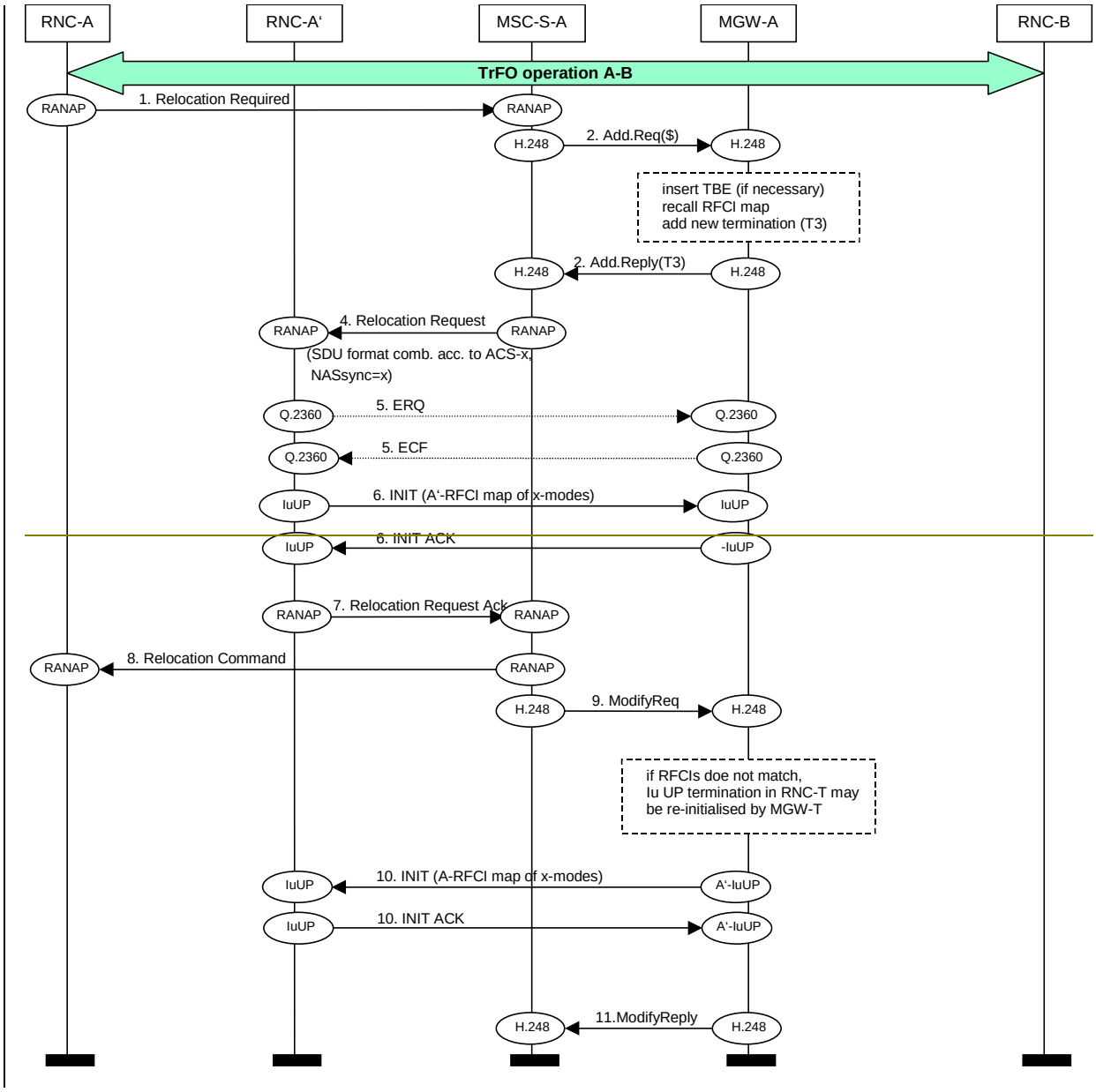
Figure 6.2/1: Configuration during SRNS Relocation

Figure 6.1/1 shows the configuration during relocation. After setting up the new I_U interface (towards RNC-A') until releasing the old one, the original TrFO relation (A⇔B) and the target TrFO relation (A'⇔B) exist in parallel. Within the respective context (TBE) interworking between T1, T2 and T3 is necessary:

T3 will perform initialisation towards RNC-A'.

T2 will hide initialisation performed on $I_{U,A'}$ from RNC-B.

If the option to remove the TBE was applied after call setup, the whole context (TBE) needs to be inserted prior to performing SRNS Relocation. Initialisation data need to be available within MGW-A. After Relocation, the context (TBE) may be removed again, i.e. the MGW-A again acts as a pure AAL2 switch.


RNC-A
RNC-A'
MSC-S-A
MGW-A
RNC-B
TrFO operation A-B
RANAP
1. Relocation Required
RANAP
H.248
2. Add.Req($)
H.248
insert TBE (if necessary)
recall RFCI map
add new termination (T3)
H.248
2. Add.Reply(T3)
H.248
RANAP
4. Relocation Request
RANAP
(SDU format comb. acc. to ACS-x,
NASsync=x)
Q.2360
5. ERQ
Q.2360
Q.2360
5. ECF
Q.2360
IuUP
6. INIT (A'-RFCI map of x-modes)
IuUP
IuUP
6. INIT ACK
-IuUP
RANAP
7. Relocation Request Ack
RANAP
RANAP
8. Relocation Command
RANAP
H.248
9. ModifyReq
H.248
if RFCIs doe not match,
Iu UP termination in RNC-T may
be re-initialised by MGW-T
IuUP
10. INIT (A-RFCI map of x-modes)
A'-IuUP
IuUP
10. INIT ACK
A'-IuUP
H.248
11.ModifyReply
H.248

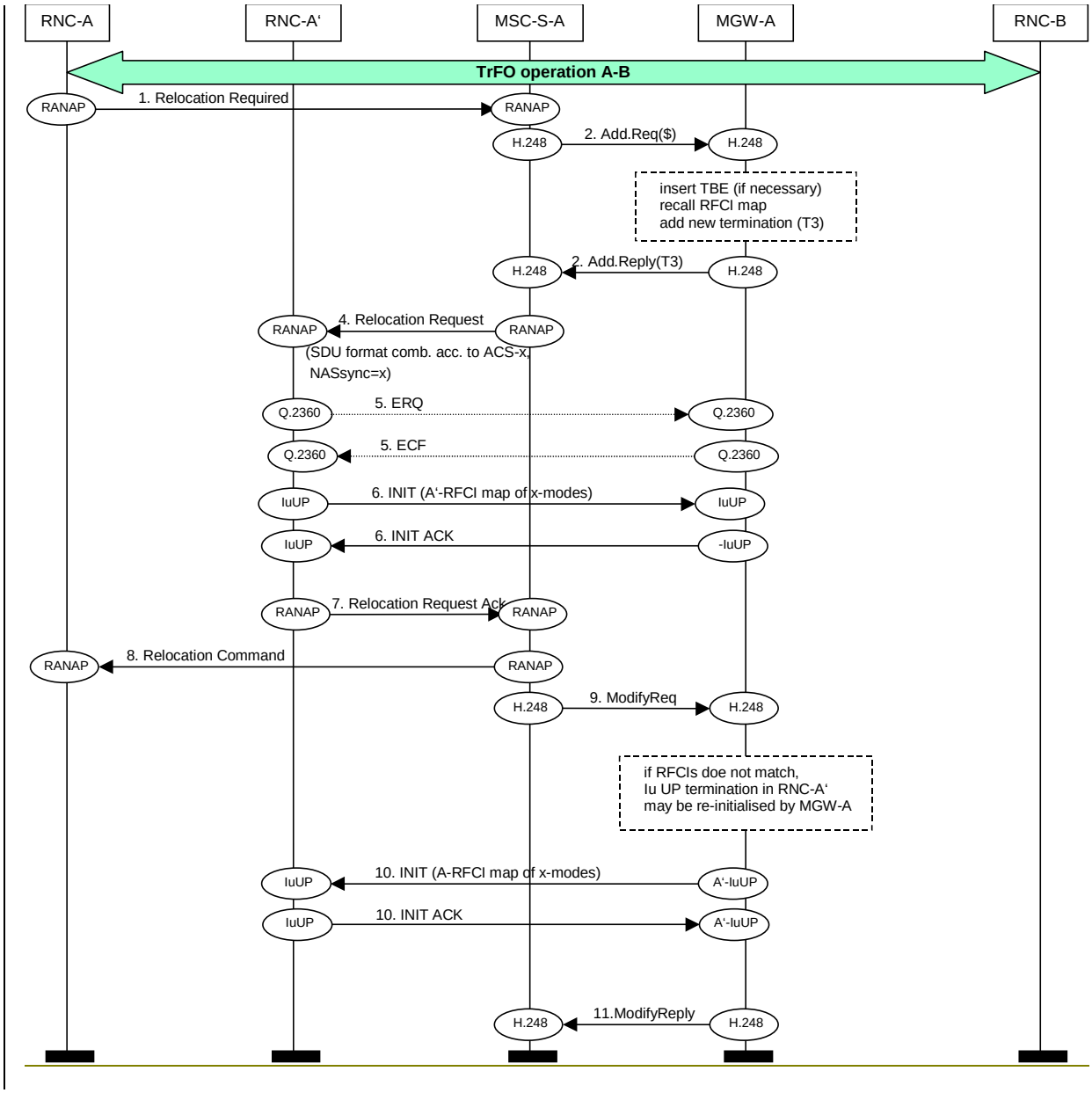


Figure 6.2/2:SRNS Relocation and TrFO. Flow chart part 1.

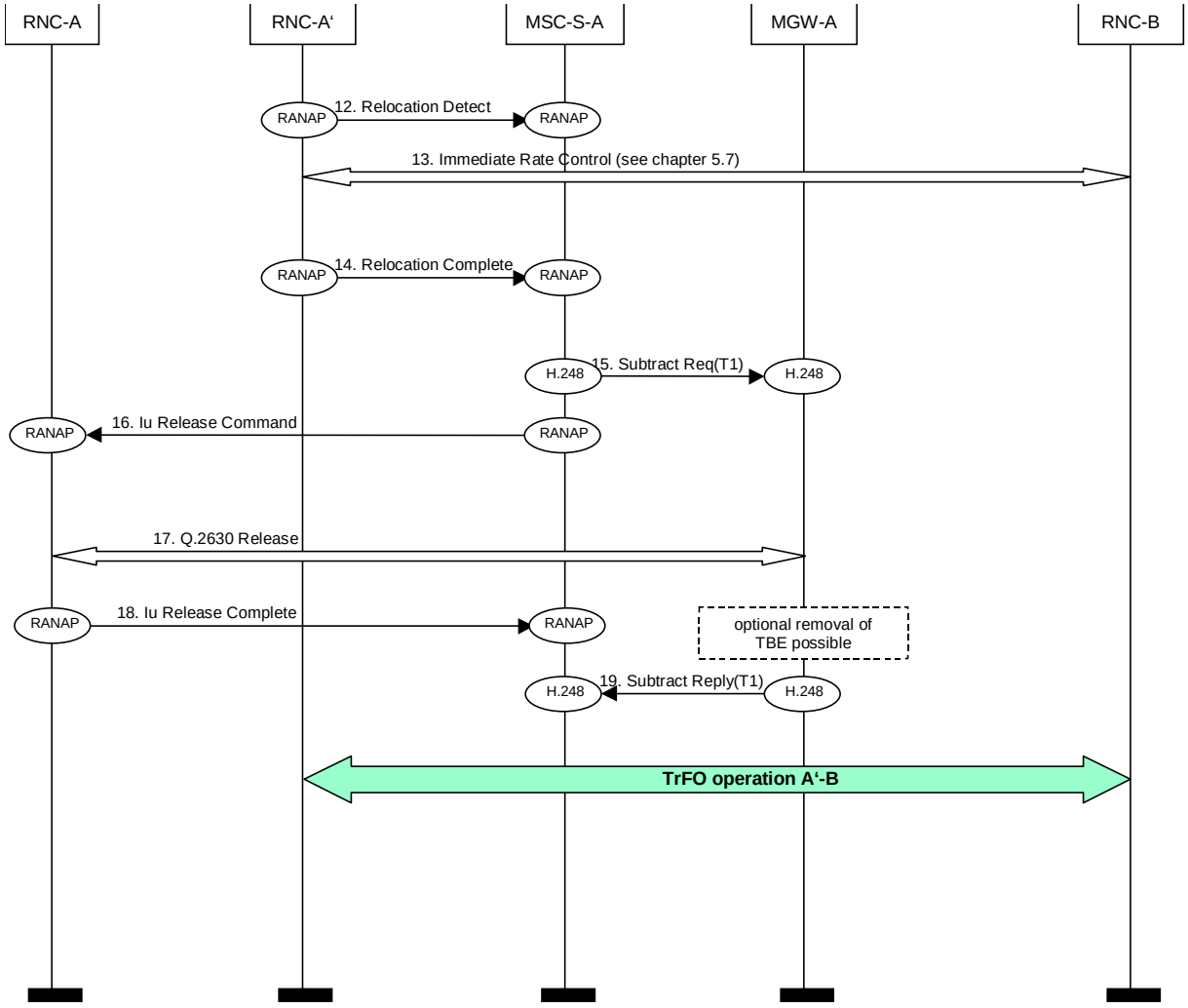


Figure 6.2/3 SRNS Relocation and TrFO. Flow chart part 2.

RAB Assignment on the new Iu leg:

A RAN side terminations with IuUP property (T3) has to be added to the already seized call context (step 2.) before sending Relocation Request (4.), that contains all the RAB parameters already applied on the Iu leg towards RNC-A.

UP initialisation

RNC-A' shall accept the requested set of codec modes and is not allowed to puncture out any negotiated mode. The INIT frames shall be according to the RAB parameters received.

At reception of an INIT frame from the new RNC, the termination at MGW-A shall not perform forwarding of the IuUP initialisation. The MGW shall check whether the received RFCI allocations match the stored RFCI allocation. If it does not match, it may re-initialise the IuUP towards RNC-A' at this point in time.

Removal of TrFO Break Equipment (TBE)

If the MGW supports the removal of TBEs, it shall insert the TBE before seizing the additional termination. It may again remove the TBE after performing RFCI matching and through-connection of the new termination and the termination to the far end party.

3GPP TSG-CN4 Rel-4 Ad Hoc Meeting **Tdoc N4-010292**
Madrid, SPAIN from 13th to 15th February 2001

CR-Form-v3

CHANGE REQUEST

⌘ **23.153** **CR** **012** ⌘ rev **2** ⌘ Current version: **4.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Change of terminology from "Node X" to "MSC Server X"
Source:	⌘	CN4
Work item code:	⌘	Bearer Independent Architecture
Date:	⌘	February 14, 2001
Category:	⌘	**D**
Release:	⌘	Rel-4

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 *(GSM Phase 2)*
R96 *(Release 1996)*
R97 *(Release 1997)*
R98 *(Release 1998)*
R99 *(Release 1999)*
REL-4 *(Release 4)*
REL-5 *(Release 5)*

Reason for change:	⌘	Change of wording to prevent usage of UTRAN terminology - Node B
Summary of change:	⌘	The change is in figure 5.8.1/1: Codec Modification of Control Procedures, of changing the text in the boxes "Node A", "Node B" and "Node C" to "MSC Server A", "MSC Server B", and "MSC Server C", respectively. The same change applies to figure 6.4/1.
Consequences if not approved:	⌘	

Clauses affected:	⌘			
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

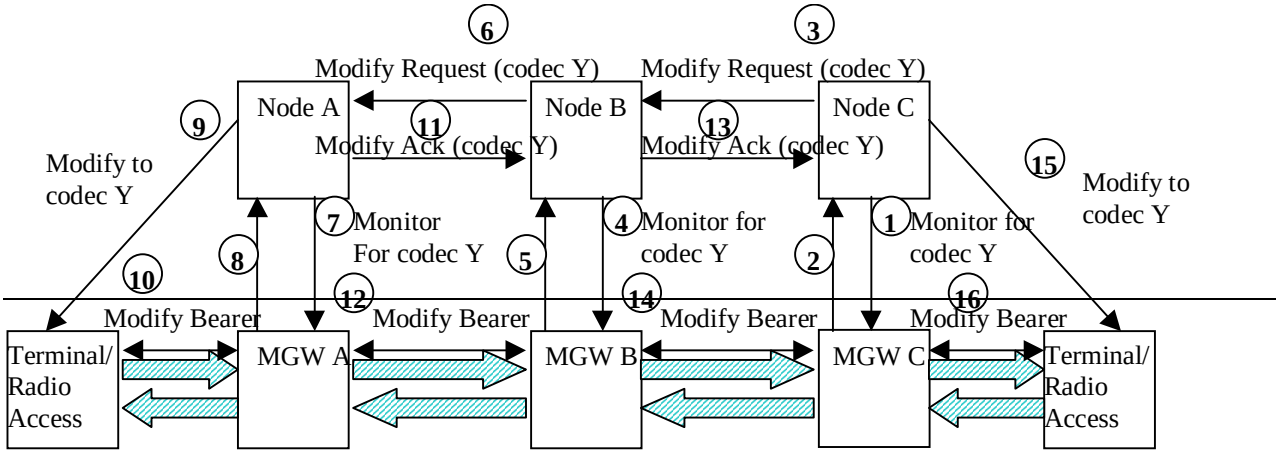


Figure 5.8.1/1: Codec Modification Control Procedures

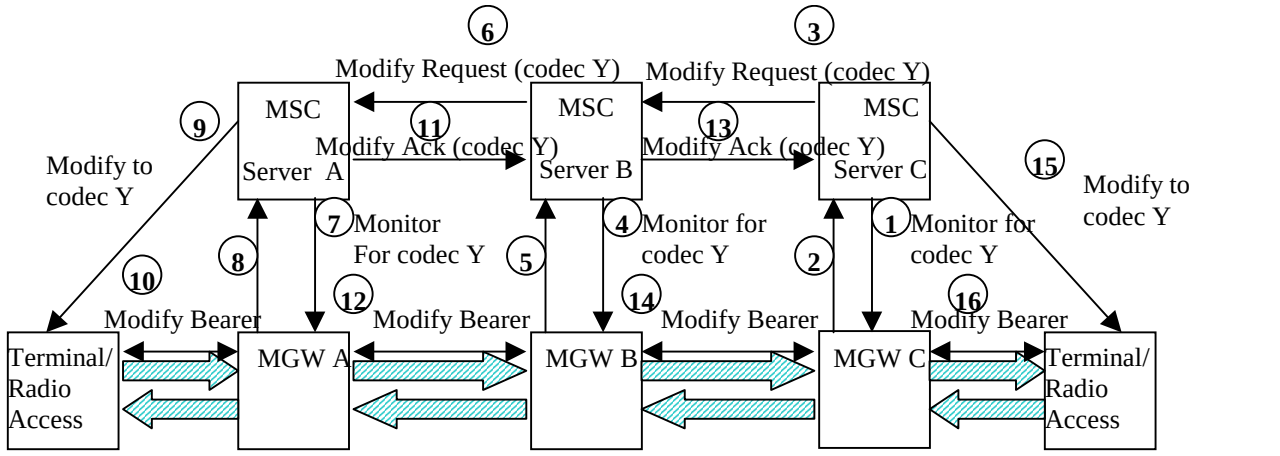


Figure 5.8.1/1: Codec Modification Control Procedures

6.4 Information flow for interaction with Multiparty SS

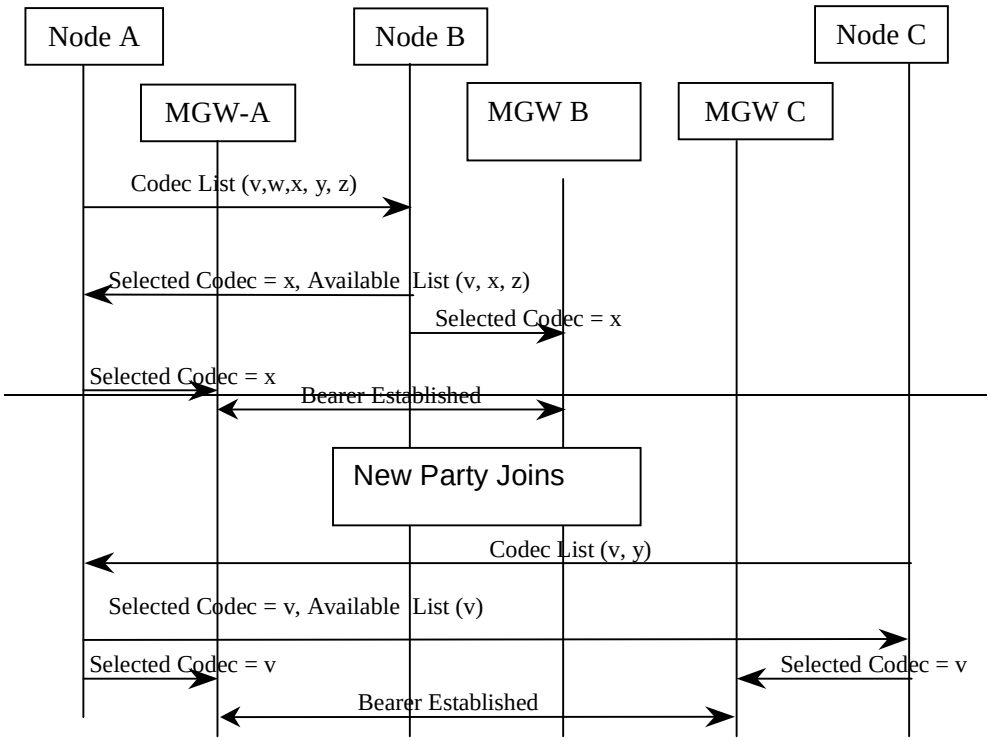


Figure 6.4/1: Multi-party Call

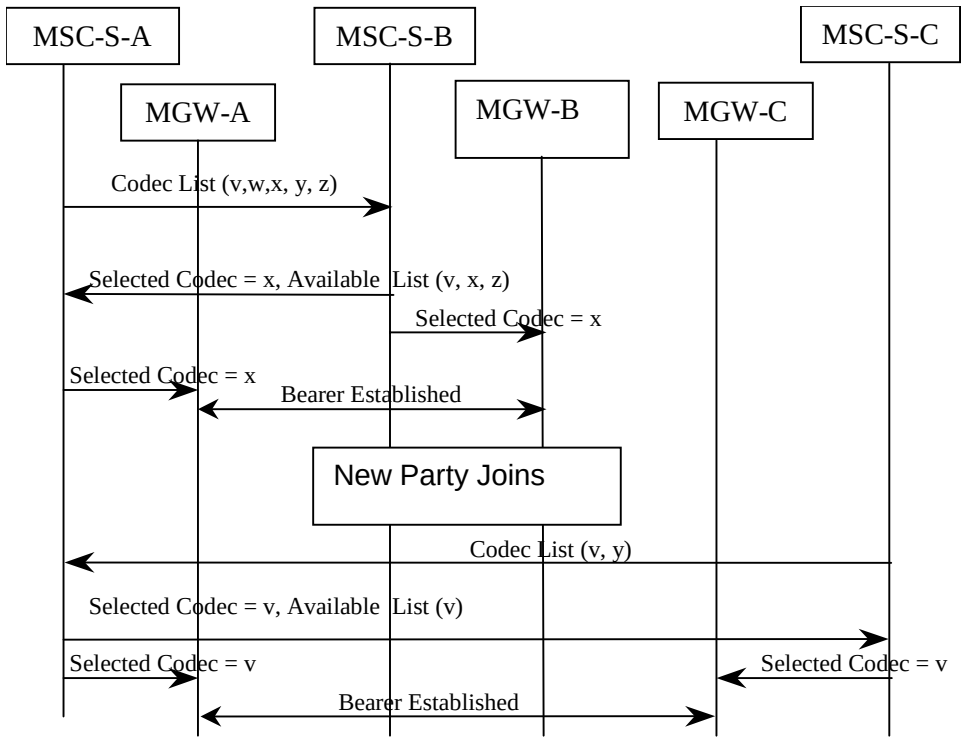


Figure 6.4/1: Multi-party Call

3GPP TSG-CN4 Rel-4 Ad Hoc Meeting **Tdoc N4-010294**
Madrid, SPAIN from 13th to 15th February 2001

CR-Form-v3

CHANGE REQUEST

⌘ **23.153** **CR** **014** ⌘ rev **1** ⌘ Current version: **4.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	Alignment of codec modification procedures with current BICC CS2 procedures
Source:	⌘	CN4
Work item code:	⌘	OoBTC
Date:	⌘	2001-02-07
Category:	⌘	**C**
Release:	⌘	REL-4

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	The stage 3 for for BICC CS2 (Q.1902.4) provides the means to achieve the codec modification and mid-call negotiation procedures described in the 23.153. This CR improves the description and adds mid-call procedures.
Summary of change:	⌘	Codec Modification chapter updated
Consequences if not approved:	⌘	Procedures not in line with stage 3 procedures.

Clauses affected:	⌘	5.8
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	**Replaces CR002 !!!!!!!!!!!!!!**

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at: http://www.3gpp.org/3G_Specs/CRs.htm. Below is a brief summary:

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2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.

3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

5.8 Modification Procedures

The OoBTC procedures shall support the following modification mechanisms:

i) modify Selected Codec (codec type or Active Codec Set~~modes~~)

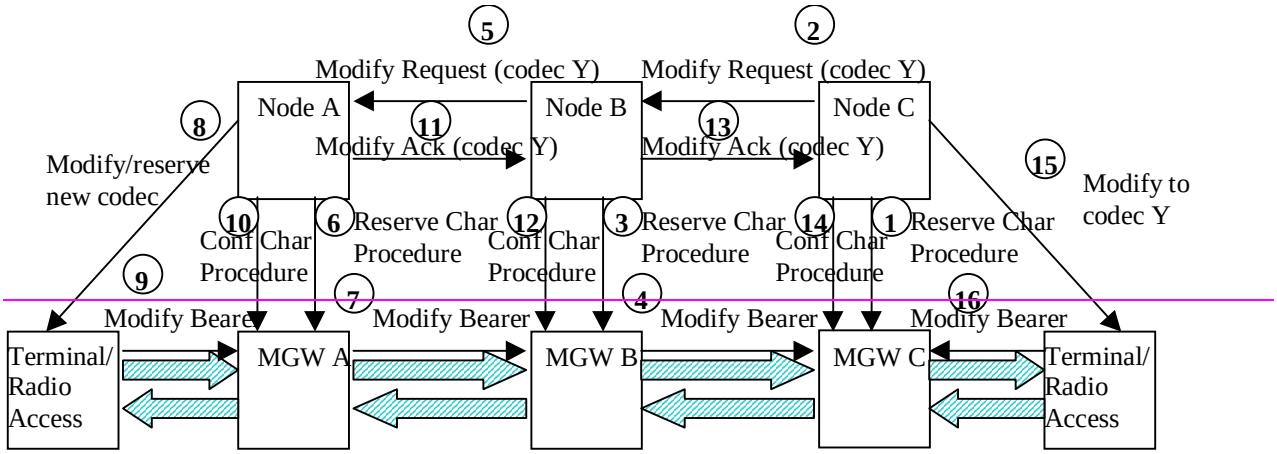
ii) modify Available Codec List (reduction of Available Codec)

iii) mid-call codec negotiation, codec type and available codec list

The specific call flows when such procedures may be required are detailed in Chapter 6.

5.8.1 Modification of Selected Codec

In Figure 5.8.1/1 the basic codec modification procedure is shown. The principle is that the request for modification is made from one node through the network. This Figure is an example; the codec modification procedure may be initiated by any node within the call. ~~,~~ Ee~~a~~ch node with an MGW connection indicates to its MGW that a codec modification may occur with a "reserve characteristics" procedure. ~~,~~ T~~t~~his ~~also~~ prepares the MGW for a bearer modification (based on the bearer requirements of the new codec) and reserves the resources for the new codec. When the far end node is reached and the modification can be accepted, Modify Acknowledgement is returned. ~~and~~ I~~i~~f the bearer must be increased then (as shown in the Figure 5.8.1/1, actions 4,7,9,16) each MGW performs the required bearer modification, "modify characteristics" procedure, back to the preceding node prior to the server sending on the request for modification to the succeeding node. ~~.~~ If bearer decrease is needed then no change to the bearer shall be made at this stage.



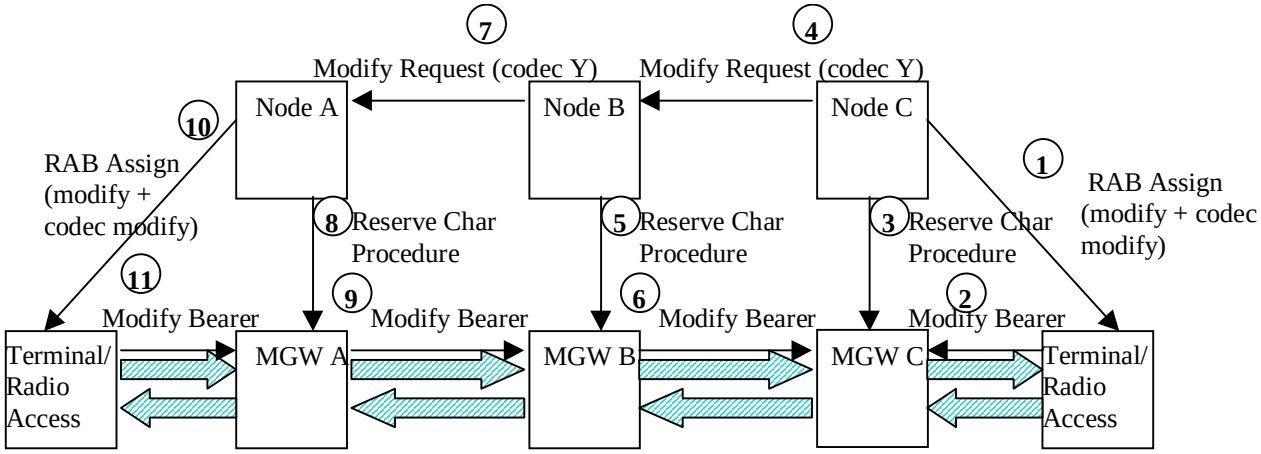
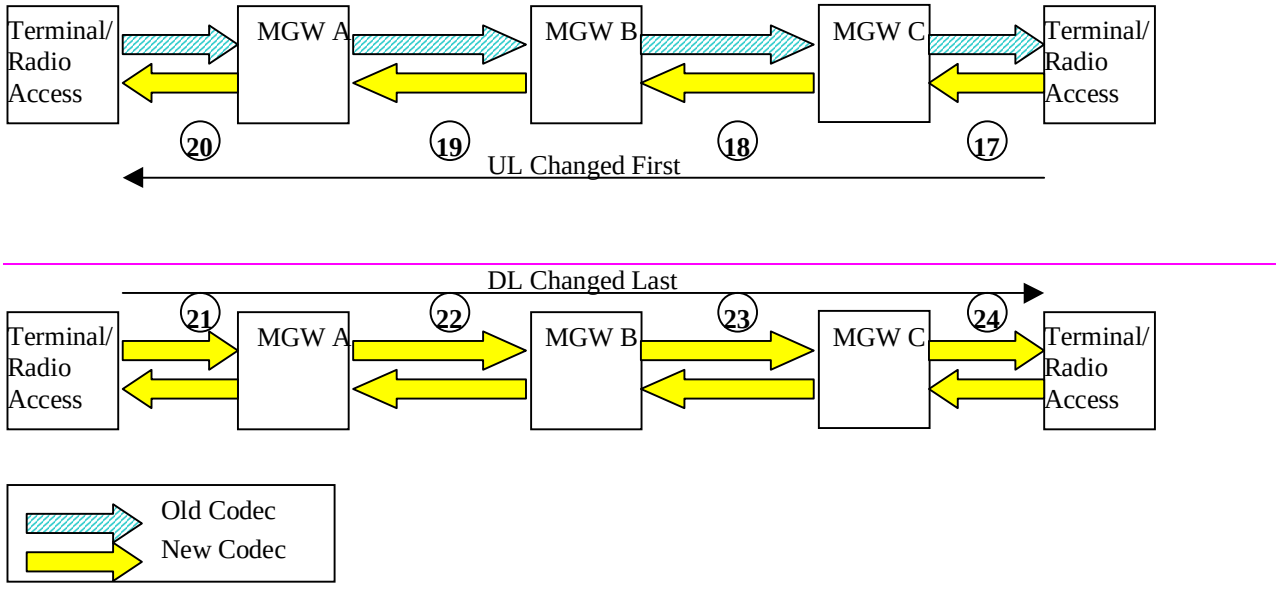


Figure 5.8.1/1: Codec Modification Control Procedures

When the node terminating the Codec Modification ~~initiating node~~ receives the Modify request it requests the bearer modification and the codec modification. ~~ication Acknowledge, then it may order the change to the source codec.~~ The MGWs are at this stage only monitoring for new codec type. As shown in Figure 5.8.1/2 the modification of the codec is performed as separate operation for Uplink and Downlink, this ensures that both the codec modification and bearer modification are synchronised.



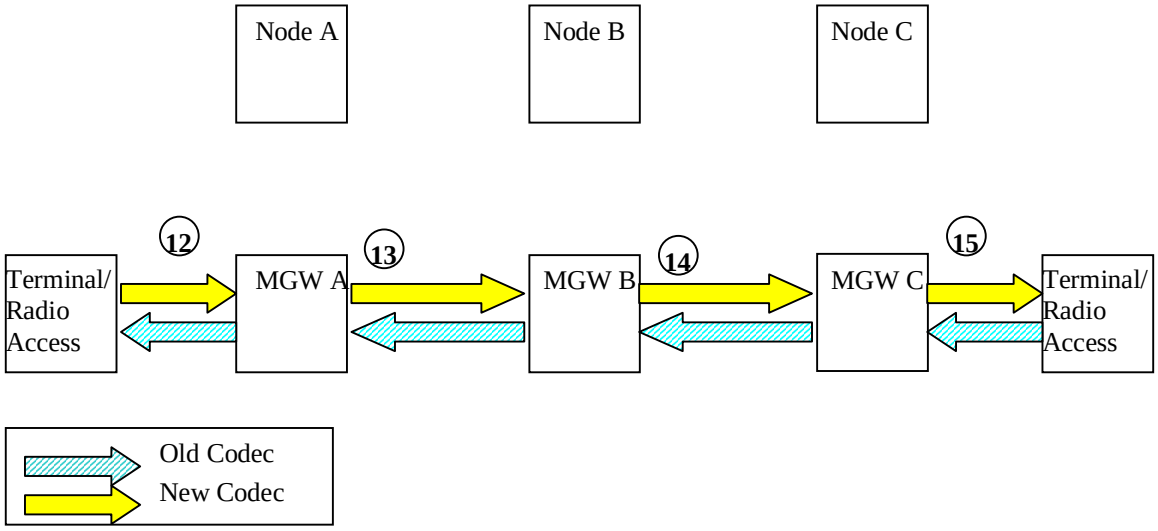


Figure 5.8.1/2: Codec Modification inband procedure

Once the modifcation of the codec is complete the terminating end replies to the preceding nodes with Modify Ack and indicates to the MGW that the procedure is complete with Conf Char.

If the procedure was unsucessful then Modfiy Fail is return to the preceding nodes which then indicate to the MGWs to return to the previous codec selection.

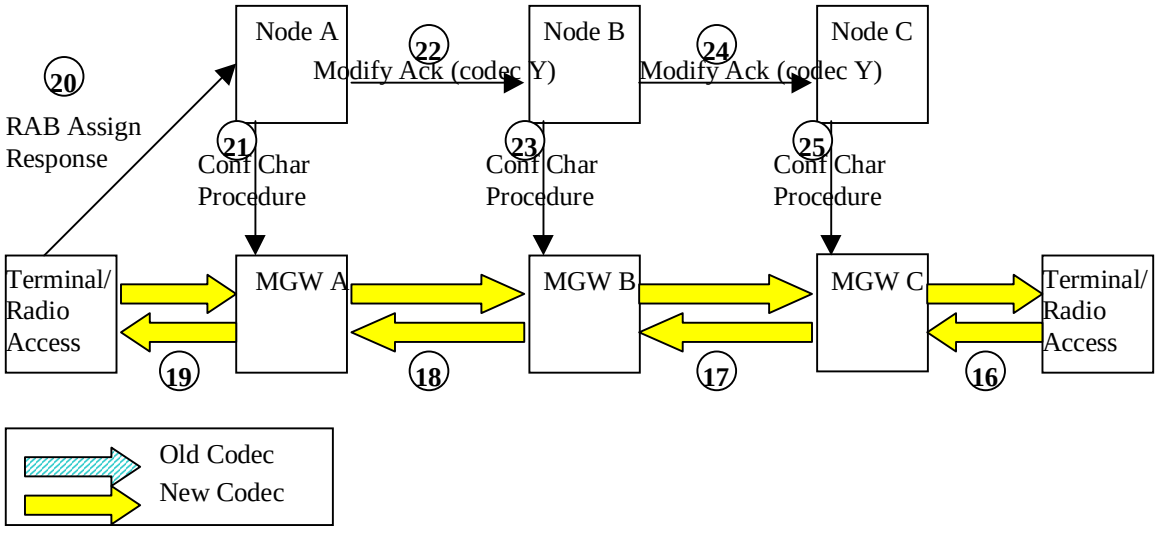


Figure 5.8.1/3: Codec Modification inband procedure and acknowledgement

5.8.2 Modification of Available Codec List

Codec List modification may occur by “puncturing” of codec types or modes from the current Available Codec List. Note this shall not include puncturing of modes from the selected codec, as this would require Selected Codec modification. If a node performs a procedure (e.g. call forwarding) which results in a reduction to the list of Available Codecs then it shall send the new Available Codecs List to all preceding nodes indicating Codec List Modification.

5.8.3 Mid-call Codec negotiation

TBoth the selected codec and available codec list can be re-negotiatedion during the call, mid-call when necessary. The node initiating the procedure sends a Supported Codecs List which may contain new codecs and also may not contain previous codecs from the Available Codecs List. If the list no longer contains the Selected Codec then a new codec must be selected. If the current selected codec exists then it should be kept as the preferred codec. The codec negotiation procedure is performed as for set-up, each node may reduce the codec list and pass on the "punctured" list. The last node in the negotiation selects the preferred codec that is left in the remaining SupportedAvailable Codecs List.

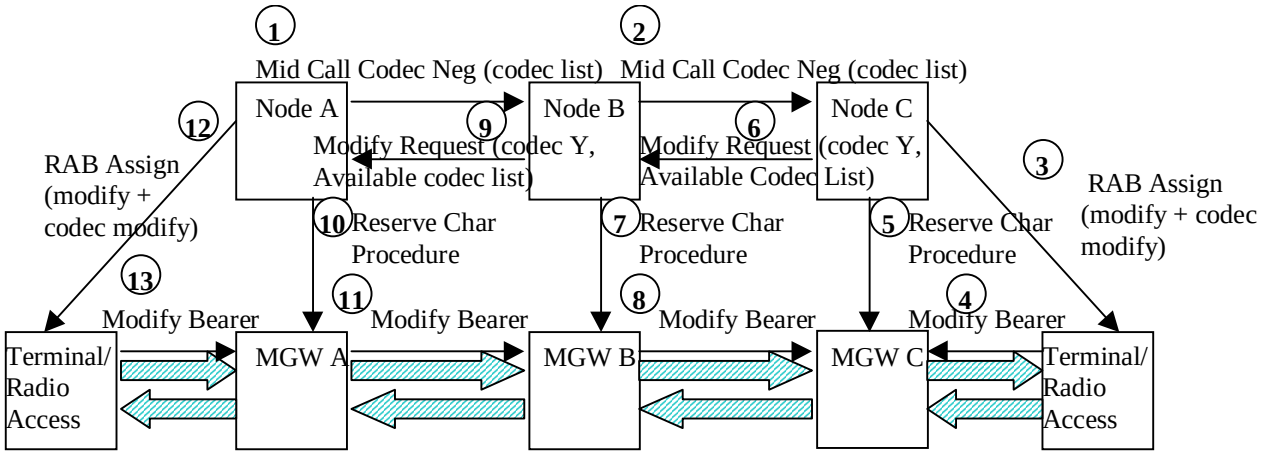


Figure 5.8.3/1: Mid Call Codec Negotiation

The modification to a new Available Codecs List and Selected Codec then follows the procedures described in chapter 5.8.1/-1 & 5.8.1/-2,and 5.8.1/3 initiated by the last node receiving the Mid Call -Codec Negotiation procedure.

3GPP TSG-CN4 Rel-4 Ad Hoc Meeting **Tdoc N4-010233**
Madrid, SPAIN from 13th to 15th February 2001

CR-Form-v3

CHANGE REQUEST

⌘ **23.153** **CR** **015** ⌘ rev **-** ⌘ Current version: **4.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Alignment of SRNS Relocation with 3G TS 23.205
Source:	⌘	CN4
Work item code:	⌘	OoBTC
Date:	⌘	2001-02-06
Category:	⌘	**F**
Release:	⌘	REL-4

Use one of the following categories:
- ***F*** *(essential correction)*
- ***A*** *(corresponds to a correction in an earlier release)*
- ***B*** *(Addition of feature),*
- ***C*** *(Functional modification of feature)*
- ***D*** *(Editorial modification)*

Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	Align 'SRNS Relocation during TrFO' sequence with 3G TS 23.205
Summary of change:	⌘	H.248 messages 'ModifyReq' and 'SubtractReq' are aligned in the figures 6.2/2 and 6.2/3 with 3G TS 23.205 clause 8.1 'Intra-MSC SRNS Relocation'. That is, 'ModifyReq' is moved after 'Relocation Detect' message and 'SubtractReq' is moved after 'Iu Release complete' message.
Consequences if not approved:	⌘	This TS would not be aligned with 3G TS 23.205

Clauses affected:	⌘	6.2		
Other specs affected:	⌘	☐ Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	
Other comments:	⌘			

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

"*First Modified Section ******

6.2 SRNS Relocation during TrFO

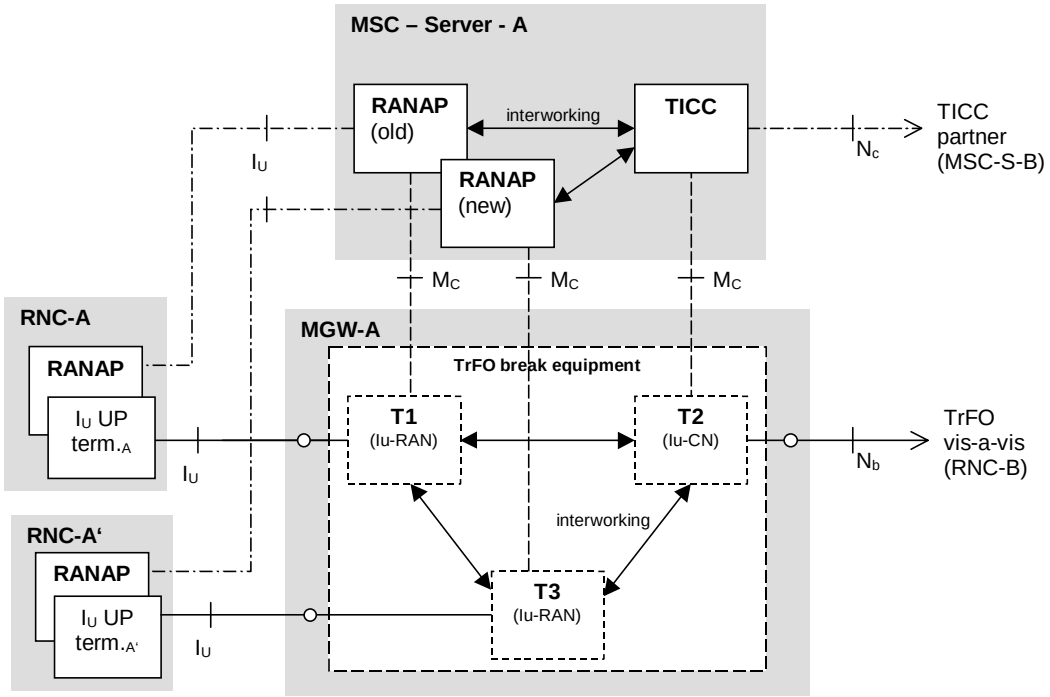


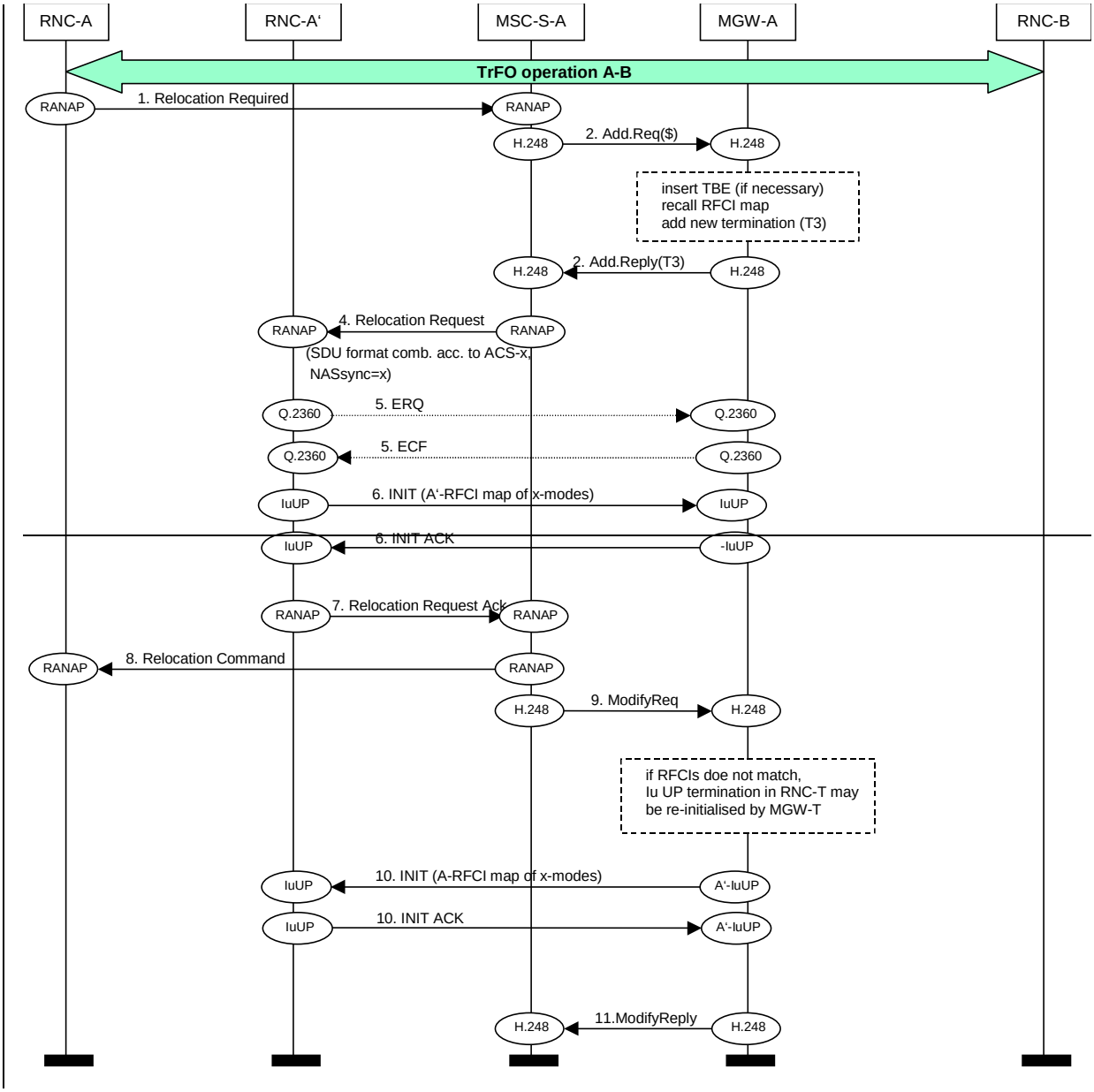
Figure 6.2/1: Configuration during SRNS Relocation

Figure 6.1/1 shows the configuration during relocation. After setting up the new I_U interface (towards RNC-A') until releasing the old one, the original TrFO relation (A⇔B) and the target TrFO relation (A'⇔B) exist in parallel. Within the respective context (TBE) interworking between T1, T2 and T3 is necessary:

T3 will perform initialisation towards RNC-A'.

T2 will hide initialisation performed on $I_{U,A'}$ from RNC-B.

If the option to remove the TBE was applied after call setup, the whole context (TBE) needs to be inserted prior to performing SRNS Relocation. Initialisation data need to be available within MGW-A. After Relocation, the context (TBE) may be removed again, i.e. the MGW-A again acts as a pure AAL2 switch.


RNC-A
RNC-A'
MSC-S-A
MGW-A
RNC-B
TrFO operation A-B
RANAP
1. Relocation Required
H.248
2. Add.Req($)
insert TBE (if necessary)
recall RFCI map
add new termination (T3)
2. Add.Reply(T3)
4. Relocation Request
(SDU format comb. acc. to ACS-x,
NASsync=x)
Q.2360
5. ERQ
5. ECF
IuUP
6. INIT (A'-RFCI map of x-modes)
6. INIT ACK
-IuUP
7. Relocation Request Ack
8. Relocation Command
9. ModifyReq
if RFCIs doe not match,
Iu UP termination in RNC-T may
be re-initialised by MGW-T
10. INIT (A-RFCI map of x-modes)
A'-IuUP
10. INIT ACK
11.ModifyReply

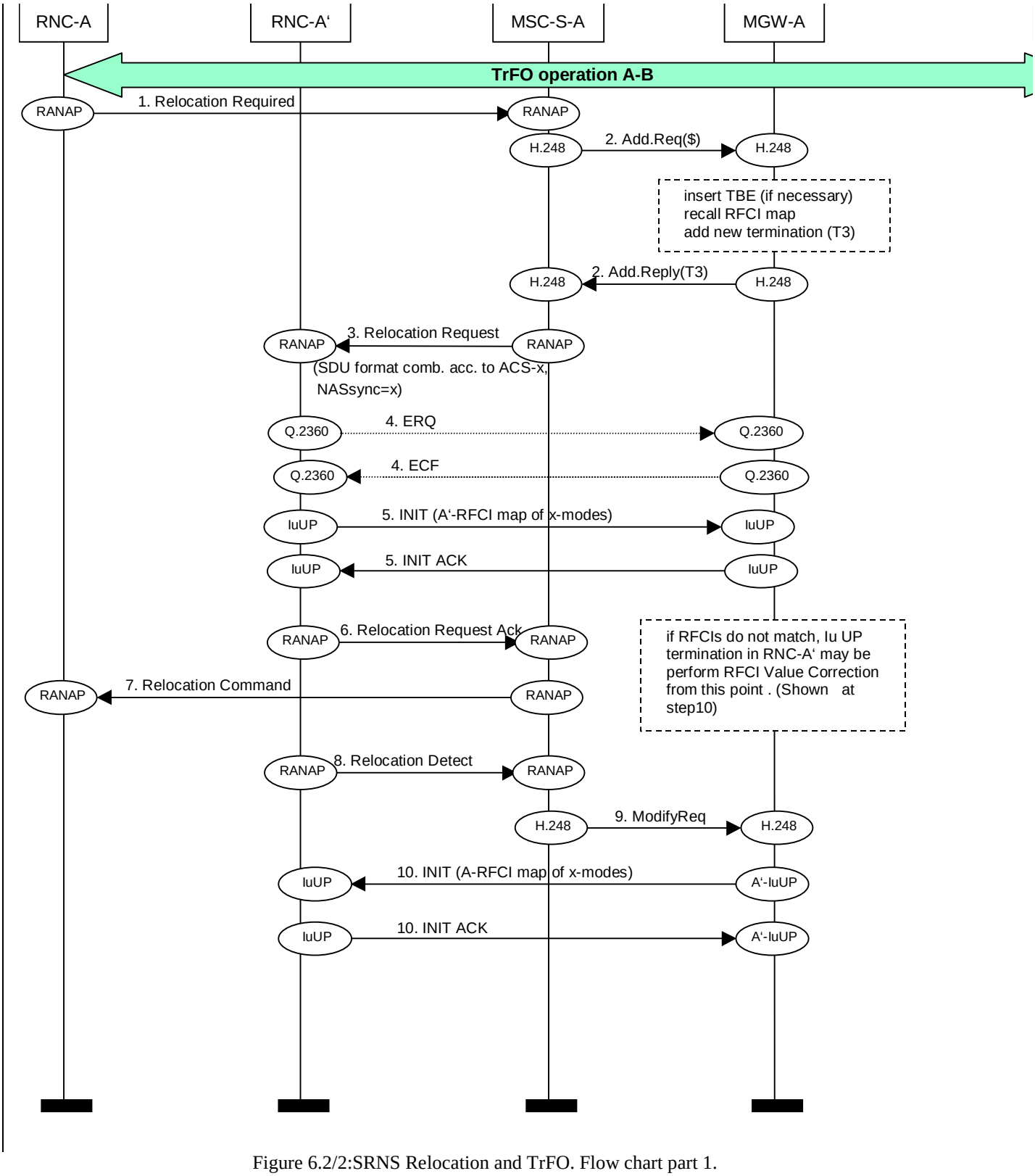
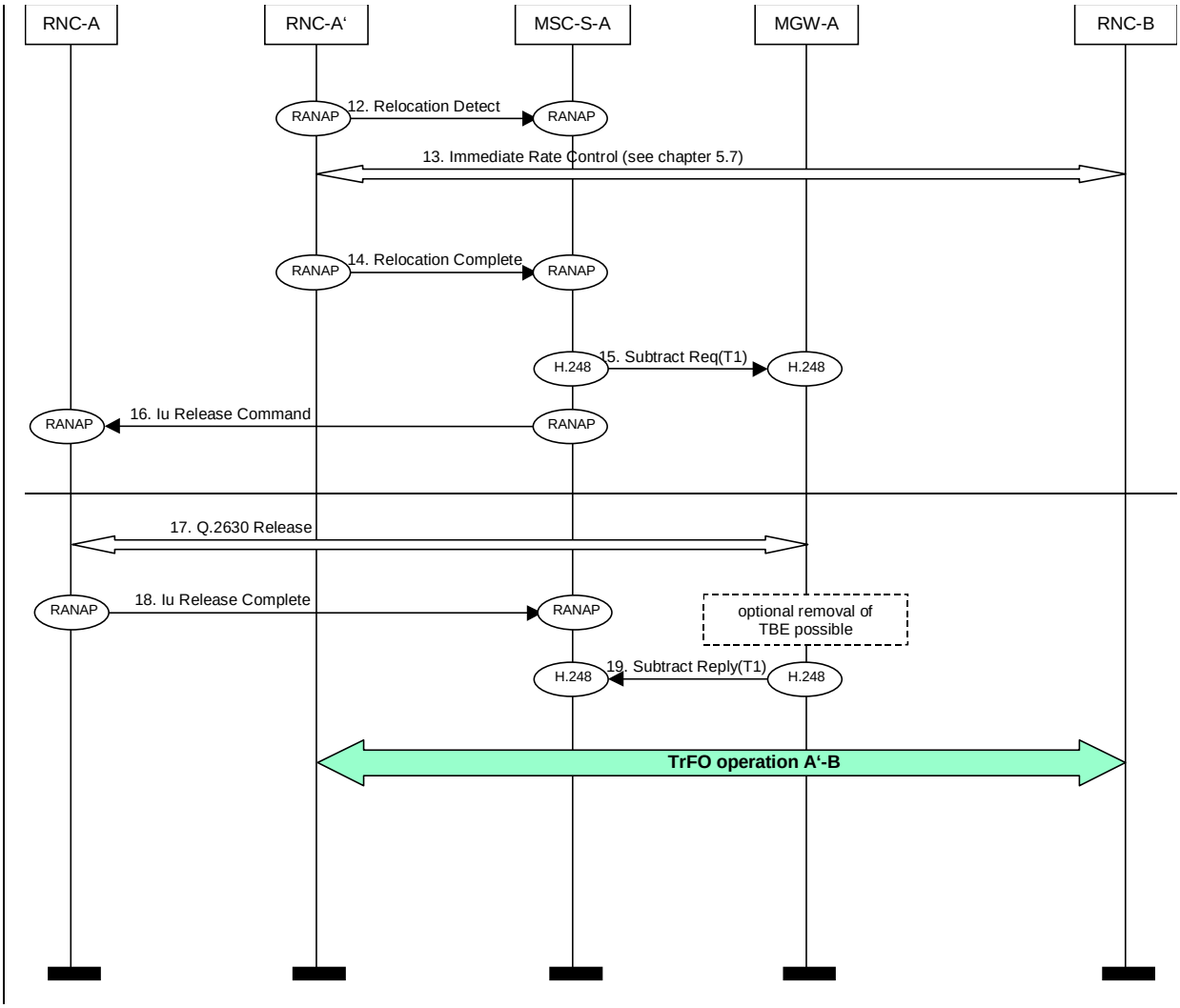


Figure 6.2/2:SRNS Relocation and TrFO. Flow chart part 1.


RNC-A
RNC-A‘
MSC-S-A
MGW-A
RNC-B
RANAP
12. Relocation Detect
RANAP
13. Immediate Rate Control (see chapter 5.7)
RANAP
14. Relocation Complete
RANAP
H.248
15. Subtract Req(T1)
H.248
RANAP
16. Iu Release Command
RANAP
17. Q.2630 Release
RANAP
18. Iu Release Complete
RANAP
optional removal of TBE possible
H.248
19. Subtract Reply(T1)
H.248
TrFO operation A‘-B

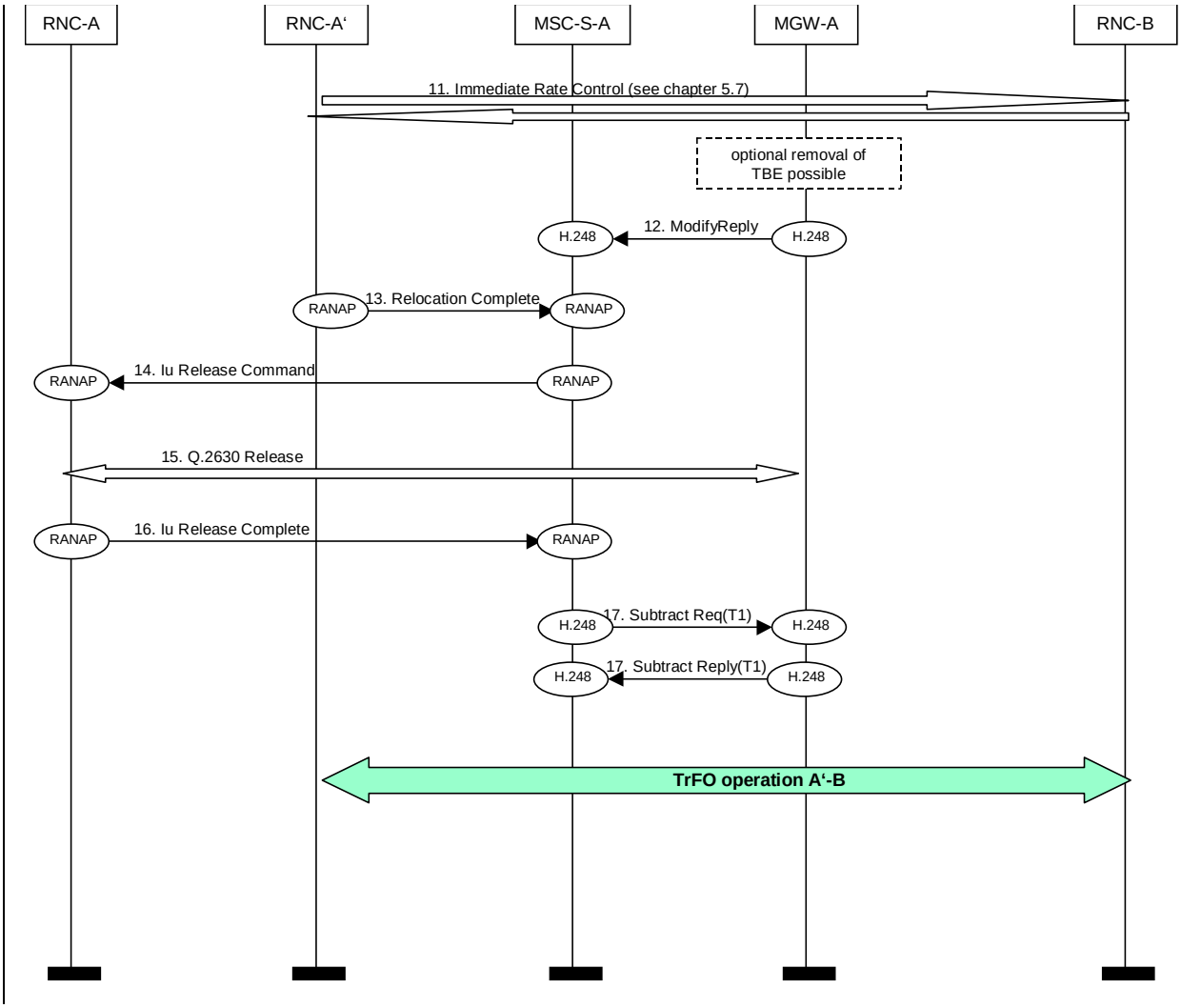


Figure 6.2/3 SRNS Relocation and TrFO. Flow chart part 2.

RAB Assignment on the new Iu leg:

A RAN side terminations with IuUP property (T3) has to be added to the already seized call context (step 2.) before sending Relocation Request (4.), that contains all the RAB parameters already applied on the Iu leg towards RNC-A.

UP initialisation

RNC-A' shall accept the requested set of codec modes and is not allowed to puncture out any negotiated mode. The INIT frames shall be according to the RAB parameters received.

At reception of an INIT frame from the new RNC, the termination at MGW-A shall not perform forwarding of the IuUP initialisation. The MGW shall check whether the received RFCI allocations match the stored RFCI allocation. If it does not match, it may re-initialise the IuUP towards RNC-A' at this point in time.

Removal of TrFO Break Equipment (TBE)

If the MGW supports the removal of TBEs, it shall insert the TBE before seizing the additional termination. It may again remove the TBE after performing RFCI matching and through-connection of the new termination and the termination to the far end party.

3GPP TSG-CN4 Rel-4 Ad Hoc Meeting **Tdoc N4-010234**
Madrid, SPAIN from 13th to 15th February 2001

CR-Form-v3

CHANGE REQUEST

⌘ **23.153** **CR** **016** ⌘ rev **-** ⌘ Current version: **4.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Inter-MSC Serving Area SRNS Relocation
Source:	⌘	CN4
Work item code:	⌘	OoBTC
Date:	⌘	2001-02-06
Category:	⌘	**D**
Release:	⌘	REL-4

Use one of the following categories:
- ***F*** *(essential correction)*
- ***A*** *(corresponds to a correction in an earlier release)*
- ***B*** *(Addition of feature),*
- ***C*** *(Functional modification of feature)*
- ***D*** *(Editorial modification)*

Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	The CR 022 for 3G TS 23.009 (Rel-4) introduces Intra-3G_MSC relocation procedure based on SCCP GT addressing.
Summary of change:	⌘	It is stated in the 3G TS 23.153 that TrFO can be maintained only for Intra-MSC SRNS Relocation. That is, for RNC's connected to different MSC's, SCCP GT addressing must be used to continue with TrFO.
Consequences if not approved:	⌘	It is not stated that TrFO can be maintained only in case of Intra-3G_MSC relocation procedure.

Clauses affected:	⌘	6.2
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

"*First Modified Section ******

6.2 SRNS Relocation during TrFO

In order to maintain TrFO connection in SRNS Relocation, procedures specified in [8] and [11] for 'Intra-MSC SRNS Relocation' shall be followed. Note that the 'Intra-MSC SRNS Relocation' procedure can also be used for relocation between RNC's connected to different 3G MSC's. In this case SCCP Global Title addressing shall~~may~~ be used to signal directly from the Anchor MSC to the drift RNC.~~.~~

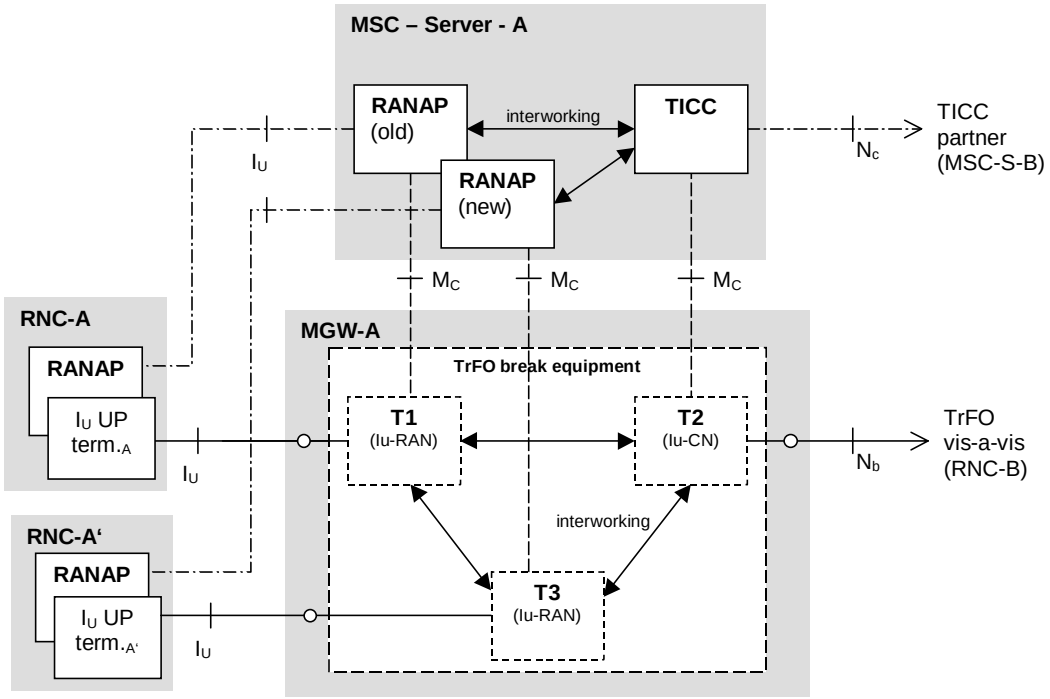

Figure 6.2/1: Configuration during SRNS Relocation

Figure 6.1/1 shows the configuration during relocation. After setting up the new I_U interface (towards RNC-A') until releasing the old one, the original TrFO relation (A⇔B) and the target TrFO relation (A'⇔B) exist in parallel. Within the respective context (TBE) interworking between T1, T2 and T3 is necessary:

T3 will perform initialisation towards RNC-A'.

T2 will hide initialisation performed on $I_{U,A'}$ from RNC-B.

If the option to remove the TBE was applied after call setup, the whole context (TBE) needs to be inserted prior to performing SRNS Relocation. Initialisation data need to be available within MGW-A. After Relocation, the context (TBE) may be removed again, i.e. the MGW-A again acts as a pure AAL2 switch.

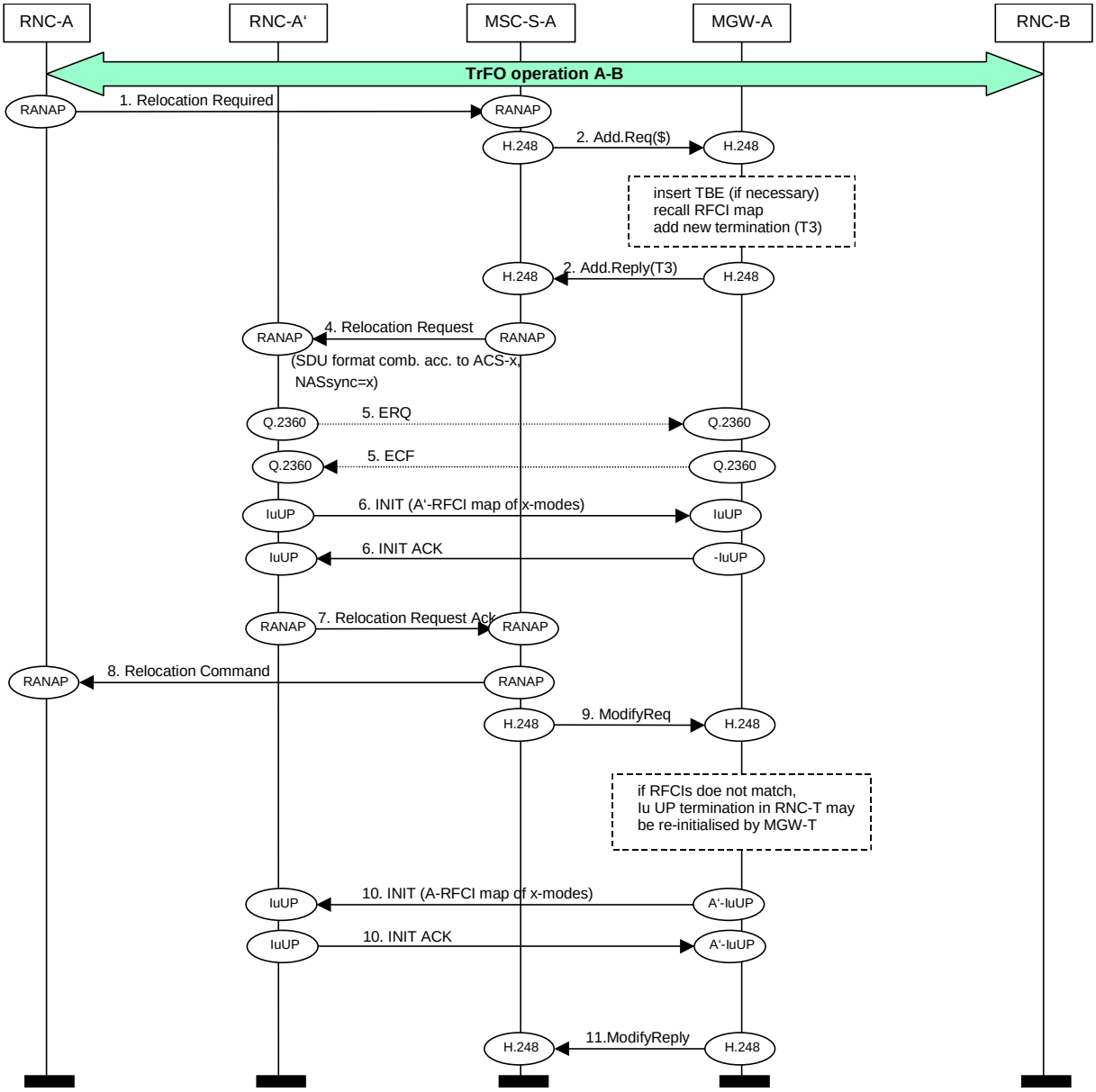

Figure 6.2/2:SRNS Relocation and TrFO. Flow chart part 1.

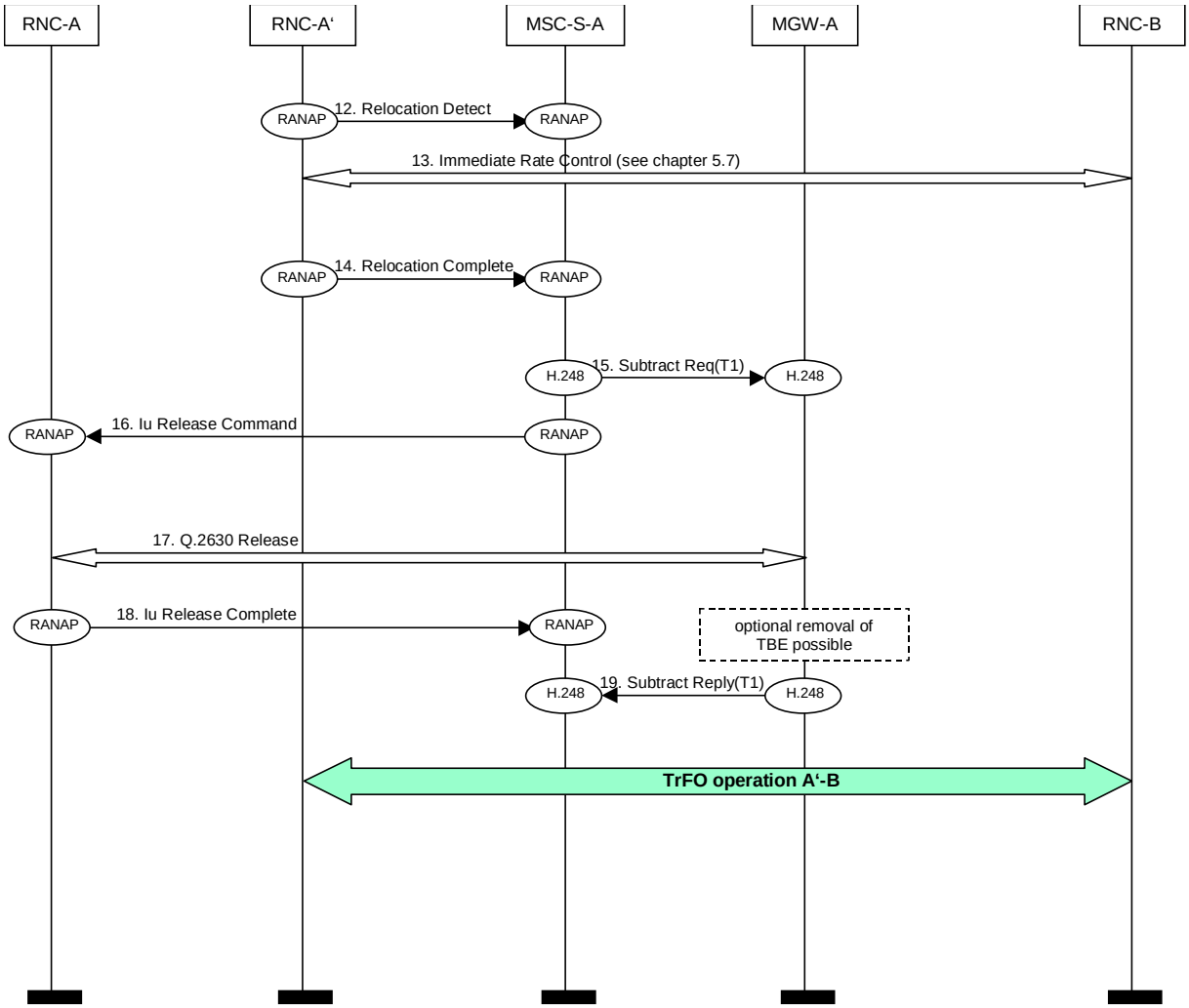

Figure 6.2/3 SRNS Relocation and TrFO. Flow chart part 2.

RAB Assignment on the new Iu leg:

A RAN side terminations with IuUP property (T3) has to be added to the already seized call context (step 2.) before sending Relocation Request (4.), that contains all the RAB parameters already applied on the Iu leg towards RNC-A.

UP initialisation

RNC-A' shall accept the requested set of codec modes and is not allowed to puncture out any negotiated mode. The INIT frames shall be according to the RAB parameters received.

At reception of an INIT frame from the new RNC, the termination at MGW-A shall not perform forwarding of the IuUP initialisation. The MGW shall check whether the received RFCI allocations match the stored RFCI allocation. If it does not match, it may re-initialise the IuUP towards RNC-A' at this point in time.

Removal of TrFO Break Equipment (TBE)

If the MGW supports the removal of TBEs, it shall insert the TBE before seizing the additional termination. It may again remove the TBE after performing RFCI matching and through-connection of the new termination and the termination to the far end party.

3GPP TSG-CN4 Rel-4 Ad Hoc Meeting **Tdoc N4-010295**
Madrid, SPAIN from 13th to 15th February 2001

CR-Form-v3

CHANGE REQUEST

⌘ **23.153** **CR** **017** ⌘ rev **1** ⌘ Current version: **4.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	General Improvements
Source:	⌘	CN4
Work item code:	⌘	OoBTC
Date:	⌘	2001-02-07
Category:	⌘	**D**
Release:	⌘	REL-4

Use one of the following categories:
- ***F*** *(essential correction)*
- ***A*** *(corresponds to a correction in an earlier release)*
- ***B*** *(Addition of feature),*
- ***C*** *(Functional modification of feature)*
- ***D*** *(Editorial modification)*

Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	General updates and corrections to improve the specification.
Summary of change:	⌘	
Consequences if not approved:	⌘	

Clauses affected:	⌘	2, 4.1, 5.1, 5.3, 5.4.2, 5.6, 6.6, 6.7
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

"***First Modified Section ****

2 References

The following documents contain provisions that, 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.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] —3G TS 23.107: "QoS Concept and Architecture"

[2] 3G TS 24.008: "Mobile radio interface layer 3 specification Core Network Protocols –Stage 3"

[3] 3G TS 25.413: "UTRAN Iu Interface RANAP Signalling"

[4] 3G TS 25.415: "UTRAN Iu Interface User Plane Protocols"

[5] 3G TS 26.103: "Speech codec list for GSM and UMTS"

[6] Q.1902.4~~x~~: "Bearer Independent Call Control, CS2, procedures"

[7] Q.765.5:" Application Transport Mechanism for Bearer Independent Call Control"

[8] 3G TS 23.205, Bearer-independent CS Core Network.

[9] 3G TS 33.106, Lawful Interception Requirements

[10] 3G TS 28.062, Inband Tandem Free Operation (TFO) of Speech Codecs.

[11] 3G TS 23.009, Handover Procedures.

[13] ITU-T H.248: “Media Gateway Control Protocol”

"*Next Modified Section ****

4 Out-of-Band Transcoder control functionality

4.1 OoBTC Requirements

The OoBTC mechanism shall support the following:

- The capability to negotiate the preferred codec type to be used between two end nodes and to avoid the use of transcoders in the network at call set-up.

  The originating UE indicates the list of its supported codec types for codec negotiation. This list shall be conveyed to the terminating MSC. The terminating UE indicates its list of supported codec types to the

terminating MSC. The terminating MSC shall convey the selected codec to the originating MSC, which then indicates the selected codec to the originating UE.

Where no compatible codec type can be selected between the UEs then the default PCM coding shall be selected. The originating MSC shall insert a transcoder in the path from the originating UE. Codec selection for the terminating UE is then performed within the terminating MSC, independently of the originating MSC.

Note: For a codec type supporting various modes, the described functionality shall also be applicable to negotiate the set of codec modes common to originating and terminating UEs. Other negotiations such as Initialisation and Rate control are performed at a later point in time by the Iu UP protocol.

- The capability to control the presence of transcoders in the network after call set-up.

  Where a change to the call state of a transcoder free connection occurs, such that compressed speech cannot be maintained, it shall be possible to insert a transcoder or pair of transcoders where needed in the path. If this results in change to the encoding of the speech in other nodes then it shall be possible to inform the end points of this segment that the speech coding is changed. Such examples where this could occur are:

  - SS interruptions (e.g. A to B call connection becomes to multiparty call connection.)
  - Handover to an incompatible partner.
  - Synchronisation loss

  Where a change in call state as described above is temporary then it shall be possible to return to a transcoder free connection by removing the inserted transcoders and informing the endpoints that the connection has resumed to compressed speech encoding.

- The codec types comprise codecs for speech in the first phase of the specification. The transcoder control should have enough expandability to support future enhancements of codec types.
- The transcoder control procedure shall not cause a perceivable time lag in the cases of establishing transcoder free connection and reverting to normal (double transcoded) call connection in the cases described above for control of the presence of transcoders.
- The capability to insert transcoder (in cases where a TrFO connection is not possible) at the most appropriate location, i.e. to save bandwidth it should be located at the CN edge between an ATM or IP transport network and a STM network.
  - When a transport network cannot maintain compressed voice then reversion to the default PCM coding shall occur. A transcoder shall be inserted at that point and OoBTC procedures terminated. TrFO link is then possible between that point and the preceding nodes.
  - When a Non-TrFO call reaches the UMTS CN then OoBTC procedures are initiated from that point and after codec negotiation has been performed, if compressed voice can be supported through the CN then a transcoder is inserted at the edge of the CN.
- The OoBTC signalling procedures shall be supported by the call control protocol on the Nc interface, for example codec negotiation, codec modification, codec list modification, codec renegotiation, and codec list re-negotiation. BICC CS2 [6] supports such a mechanism, through the APM procedures defined by [7].
- The OoBTC signalling procedures shall be supported by the bearer control protocol on the Iu and Nb interfaces, for example to increase the bandwidth of the bearer (if needed) in the procedures for the codec modification.

"*Next Modified Section ******

5 General Principles

5.1 Network Model

The codec negotiation mechanism (OoBTC) is designed to work in the general situation where more than two call control (CC) nodes need to participate in the codec negotiation. The codec negotiation mechanism works as follows:

- Originating CC node: sends its list of supported codec types and options, listed in order of preference.
- Transit CC nodes: if needed, analyse the received list of options, delete unsupported options from the list and forward the list. No modification is done to the preference levels of any of the listed codecs.
- Terminating CC node: analyse the received list of options with their associated priorities and selects the supported option with highest indicated priority.

Figure 5.1/1 illustrates the architecture for Rel-~~400~~ for UMTS to UMTS TrFO connection. The transit network may exist for calls between PLMNs or between islands of mobile CNs separated by transit networks. This figure is a basic illustration, OoBTC shall apply to other access technologies where the OoBTC procedures are supported, i.e. not limited to this figure. The negotiation occurs at call set-up phase, and possibly later on in the call due to other changes such as handover or relocation. However, as described in the next section, it shall be possible to modify the selected codec at any moment during the active phase of the call.

Further detail of the Call & Bearer Separation for 3GPP is described in [8].

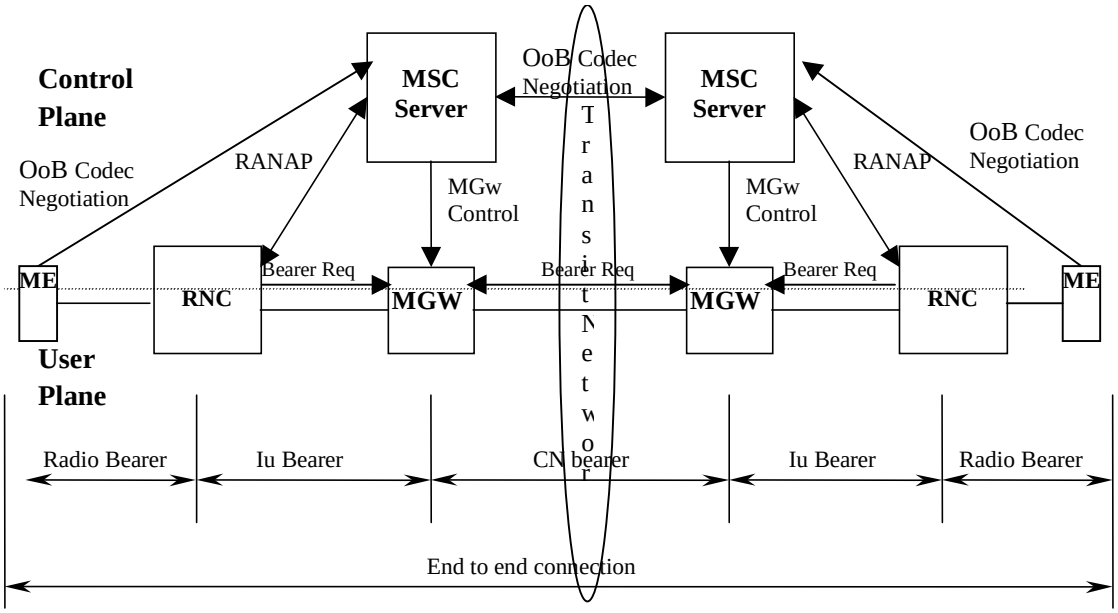


Figure 5.1/1. Basic Architecture for UMTS to UMTS TrFO Connection

The following sections describe successful call establishment scenarios using the codec negotiation mechanism.

"*Next Modified Section ******

5.3 Media Gateway Control for Codec Handling

The general handling of MGW control procedures are detailed in [8]. Specific handling related to the control of the speech encoding is detailed in Figure~~.~~ 5.3/1. The terms context, termination, streams and stream properties are described in the ITU-T H.248 "Media Gateway Control Protocol" [13].

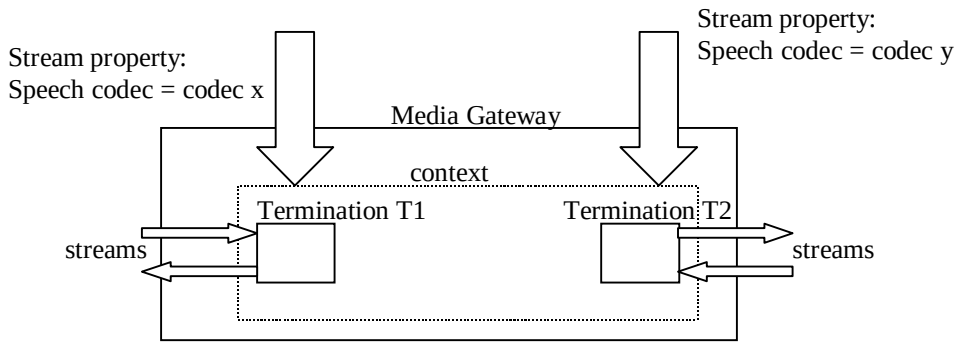


Figure 5.3/1. MGW control for speech codec

The handling of transcoding between one codec type (media stream property applied at one termination) and the another codec type (media stream property at other termination) is a function of the MGW. The media stream property for Audio Codec Type is defined in Annex C of the ITU-T MGW control protocol, H.248 (see [12] Annex C)~~.~~

"*Next Modified Section ******

5.4.2 RFCI Storage

The RNC shall allocate RAB Subflow Combination Indicators~~Identifiers are allocated~~ to the SDU formats (SDU formats sent to the RNC by the MSC in the RAB Assignment). This allocation is then sent in the Iu UP Initialisation PDU by the RNC in the User Plane. For further details see [3] and [4].

During the TrFO call establishment each MGW linked into the call shall store the RFCIs received from Iu UP PDU Type 14.

After the out of band codec negotiation has been performed, if the originating side is a UTRAN, then on request from the MSC for a RAB Assignment, it shall initiate the Iu user plane. If the originating side is a network that does not support Iu UP then the Iu UP initialisation is initiated by the GMSC, as described in detail in Chapter 6.7. An Initialisation Protocol Data Unit (PDU) shall be sent to the first MGW in the call connection. Each initialisation leg is acknowledged per TrFO Link, i.e. per MGW-MGW interface. The subsequent initialisation is performed using the same RFCI set as received from the preceding node, independently of the Stream mode directions (i.e. if the terminations are not through connected).

This is shown figure 5.4.2/1.

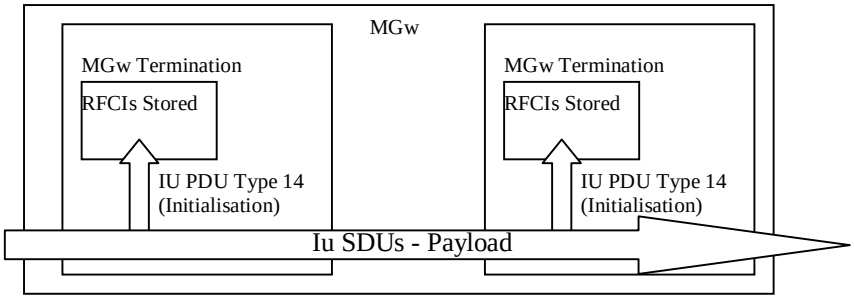


Figure 5.4.2/1: RFCI Storage and subsequent initialisation in MGW

When the MGW terminations are through-connected and the RFCIs at both terminations are matching, then the MGW may revert to transparent mode; the RNCs shall not perform any subsequent Iu UP initialisations without explicit request by the serving MSCs.

All succeeding MGWs in the path shall behave in a similar way as described above.

"*Next Modified Section ******

5.6 CN Node handling of Codec Types & Codec Modes

The supported codec list received by the MSC in DTAP protocol [2] has no priority, whereas the list sent in the OoBTC procedures is sent with a level of preference. In order to support interworking with 2G systems it is recommended that MGWs support 2G EFR codecs and for GSM the FR AMR codec. In order to avoid modifications during handover between 2G and 3G systems the MSC nodes may give preference to a suitable 2G codec.

The originating CN node, while performing speech service negotiation with a terminating CN node, shall indicate the maximum number of modes that shall be selected during speech codec negotiation. This maximum number of supported modes may depend on optimisation strategies applied by the originating CN node.

The terminating CN node receiving this information compares the maximum number of modes received by the originating CN with its own one and shall decide on the minimum of both numbers to be applied as result of the negotiation.

The decision about the actual modes to be selected shall be left to the terminating CN node. In order to provide harmonisation of out of band codec negotiation (TrFO) and inband codec negotiation (TFO) the same codec selection mechanisms being defined for TFO shall be applied for TrFO. These rules shall be taken into account when forwarding a codec list from the originating node to proceeding node, both for TrFO and TFO.

When the MSC node requests a RAB assignment the Subflow Combinations provided shall either all be initialised by the RNC or all rejected with appropriate cause code.

The MSC shall always define "Discontinuos Transmission (DTX)" and "No Data" SDUs in addition to the negotiated speech modes. This is because for TrFO the RAB requested by one RNC must match that requested by the peer RNC – they are effectively the same RAB. If one MSC requires DTX support then the RAB requested by the far end MSC must also support DTX (even if it is not desired by that MSC). As no Out Of Band negotiation for DTX is supported nor DTX control to the UE, DTX shall be mandatory for TrFO connections.

"*Next Modified Section ******

6.6 Call Hold/Call Wait

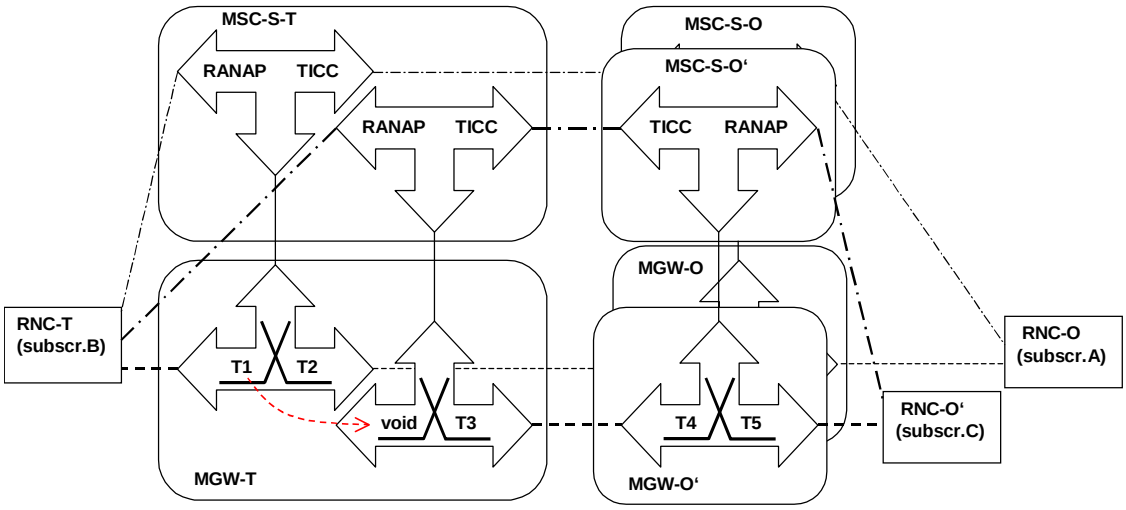


Figure 6.6/1: Configuration during Call Hold / Call Wait scenario

This scenario assumes subscriber C (served by RNC-O') calls subscriber B (served by RNC-T), currently in communication with subscriber A. Subscriber C receives a tone/announcement, applied by terminating side. Then subscriber B puts subscriber A on Hold and A receives an announcement (applied again by terminating side.)

MGW-O has to establish an originating side call context (T4, T5), MGW-T the respective terminating one (T3 only, T1 from subscriber will be moved to it during the scenario), the B party context has to be inserted into path again (if TBE was removed).

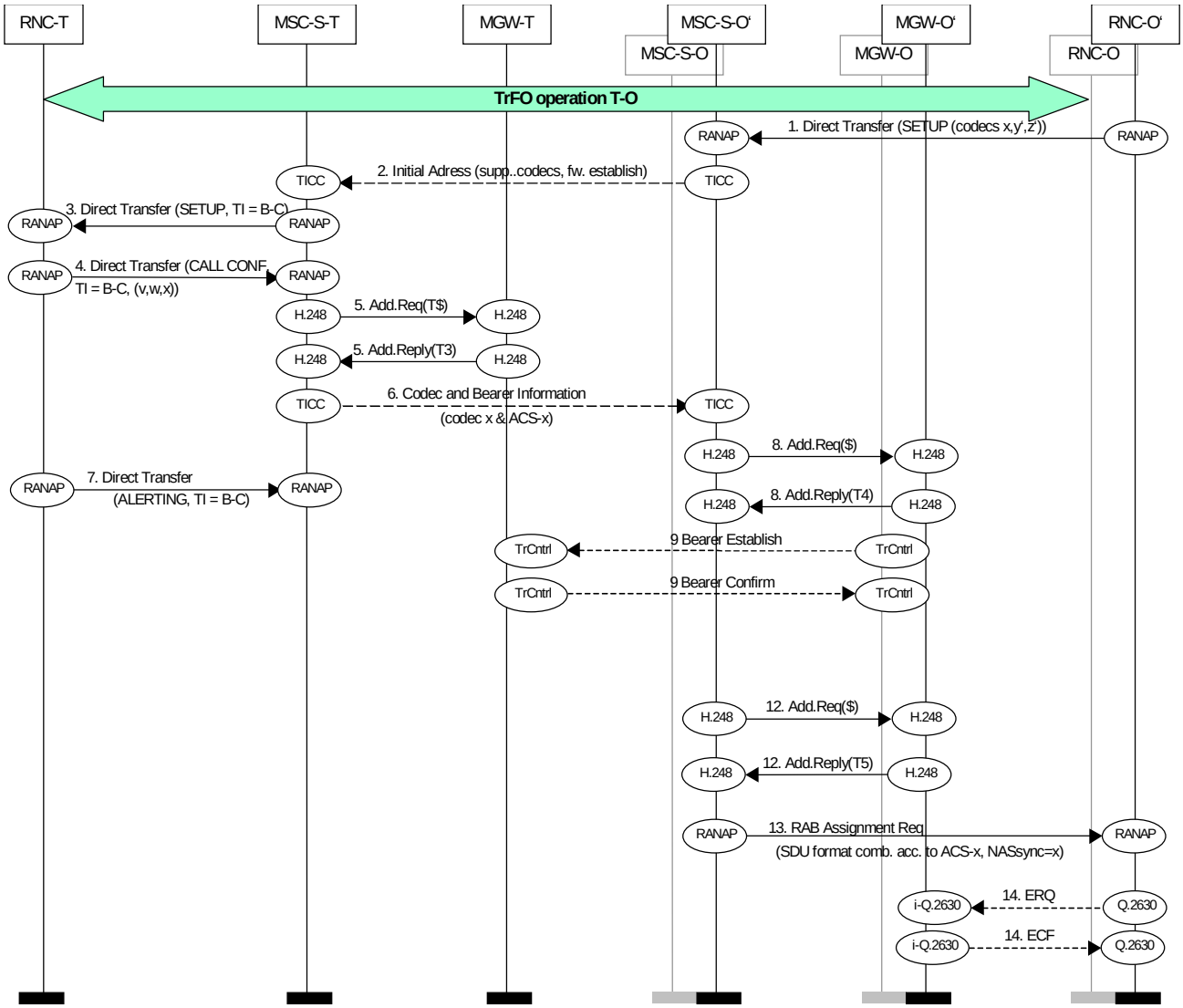
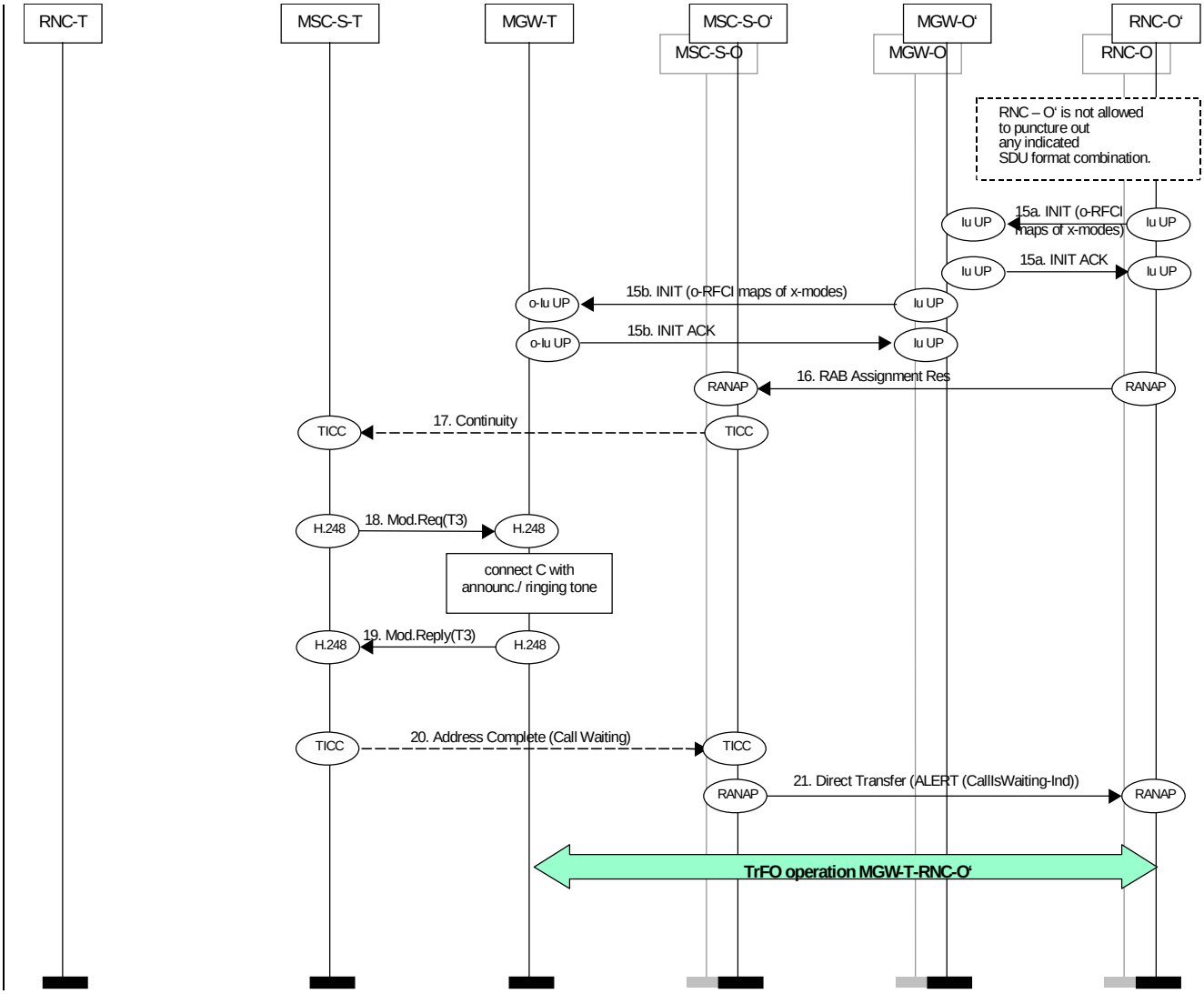


Figure 6.6/2: Call Hold/Call Wait and TrFO. Message flow part 1.


RNC-T
MSC-S-T
MGW-T
MSC-S-O'
MSC-S-O
MGW-O'
MGW-O
RNC-O'
RNC-O
RNC – O' is not allowed to puncture out any indicated SDU format combination.
Iu UP
15a. INIT (o-RFCI maps of x-modes)
15a. INIT ACK
o-Iu UP
15b. INIT (o-RFCI maps of x-modes)
15b. INIT ACK
RANAP
16. RAB Assignment Res
TICC
17. Continuity
H.248
18. Mod.Req(T3)
connect C with announc./ ringing tone
19. Mod.Reply(T3)
20. Address Complete (Call Waiting)
21. Direct Transfer (ALERT (CallIsWaiting-Ind))
TrFO operation MGW-T-RNC-O'

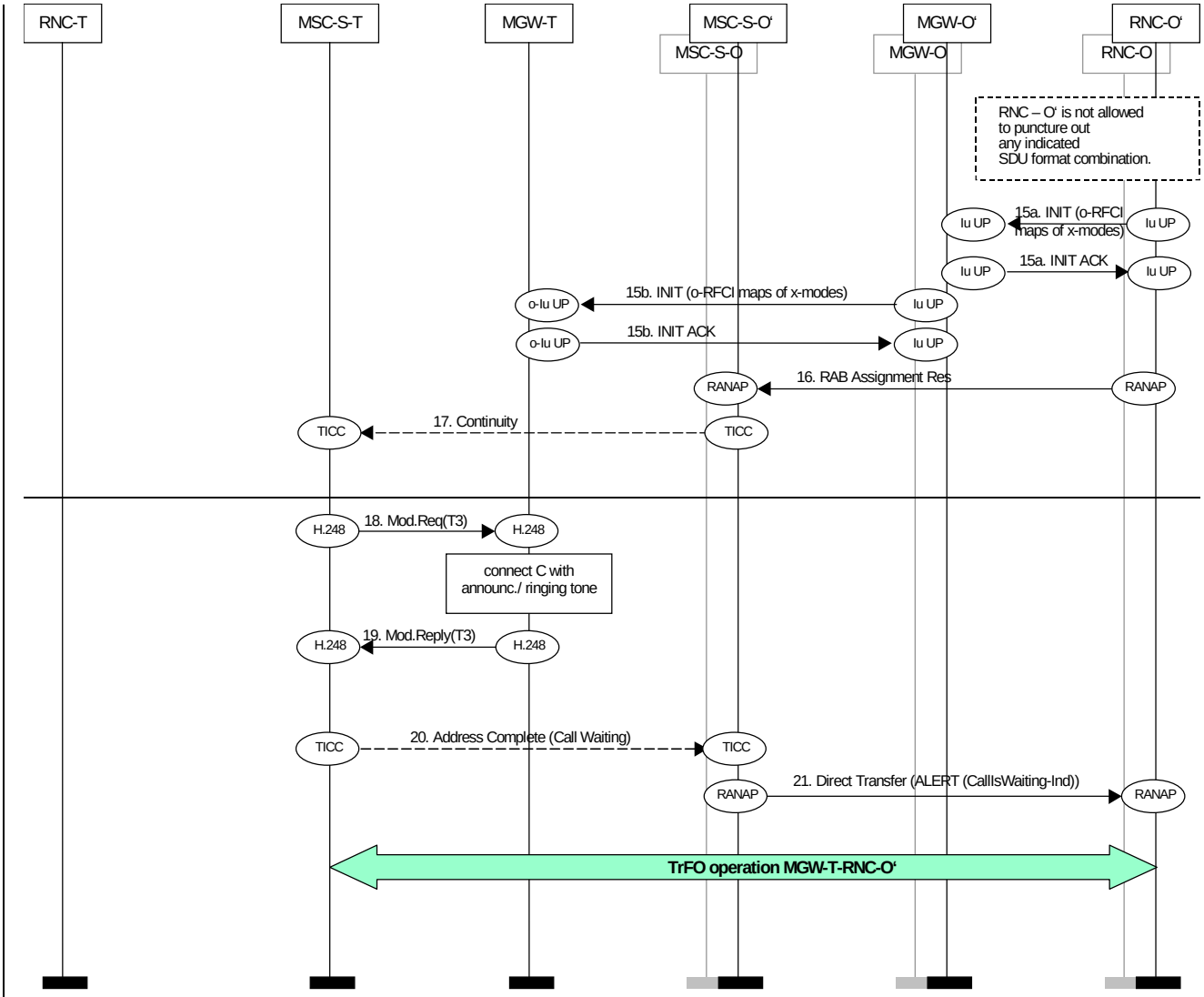


Figure 6.6/3: Call Hold/Call Wait and TrFO. Message flow part 2.

"*Next Modified Section ******

6.7 External Network to Mobile TrFO Call Establishment

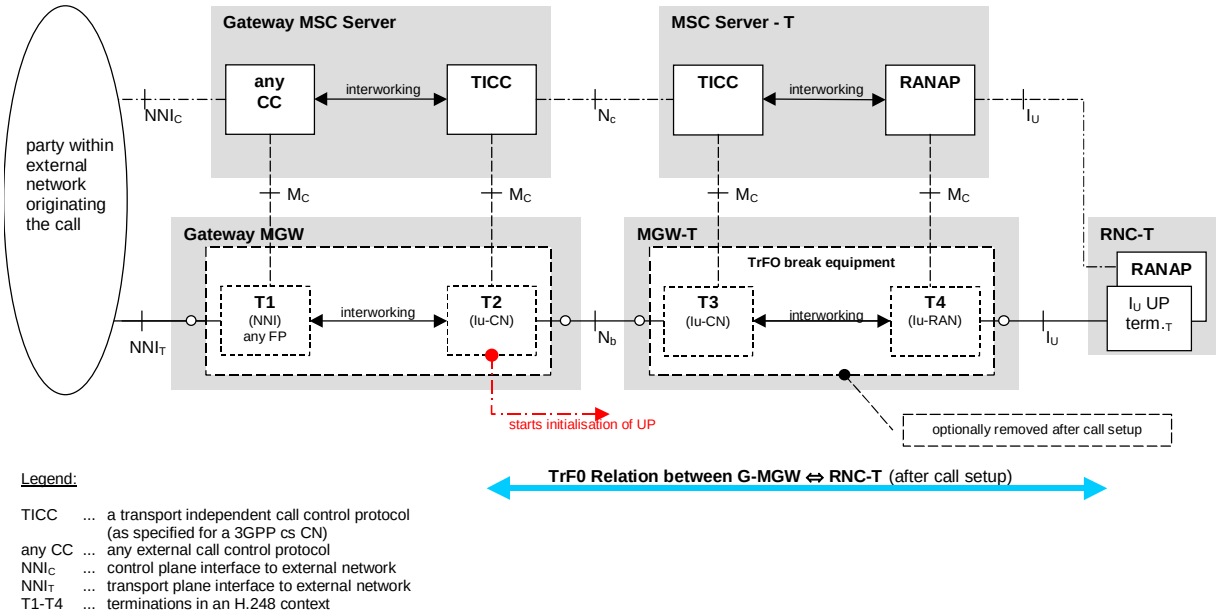


Figure 6.7/1. Configuration during Call Setup of a External Network to Mobile Call.

The description of Figure 6.1/1 (Configuration during Call Setup of a Mobile to Mobile Call) within chapter 6.1 applies for the network and protocol entities involved in the External Network to Mobile Call scenario with following modifications:

No RNC-O is present – a party served by an external network originates the call instead

The originating CN nodes are Gateway nodes (Gateway MSC Server / Gateway MGW)

The Gateway MGW call context is no TrFO break equipment in general, i.e. T1 in general do not support the IuUP framing protocol. Appropriate interworking (in some cases transcoding) has to be performed between T1 and T2.

Therefore Figures 6.1/2 to 6.1/4. (the respective message flows for mobile to mobile call setup) apply in principle as well with appropriate modifications outlined below:

Codec negotiation

Step 1. Until 6., that give the codec negotiation phase in Figure 6.1/2, shall be applied with following modifications:

There is no originating UE involved in this negotiation phase

If the preceding node of the Gateway MSC-Server doesn't support OoBTC procedures for compressed voice types, the Gateway MSC-Server shall initiate OoBTC procedures in order to enable transcoders placement at the edge gateway node.

The edge gateway node shall always send the complete list of the codec types and modes it supports for this type of call setup.

UP initialisation

The main difference compared to the Mobile to Mobile call setup is, that the CN side termination of the Gateway MGW (T2 in figure 6.7/1) shall start the initialisation of the IuUP according to the result of the codec negotiation. The forward initialisation principle shall be followed in any setup scenario.

3GPP TSG-CN4 Rel-4 Ad Hoc Meeting **Tdoc N4-010266**
Madrid, SPAIN from 13th to 15th February 2001

CR-Form-v3

CHANGE REQUEST

⌘ **23.153** **CR** **020** ⌘ rev **-** ⌘ Current version: **4.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network ☐

Title:	⌘	Reference to Q.2630 in certain diagrams should be bearer independent
Source:	⌘	CN4
Work item code:	⌘	OoBTC
Date:	⌘	2001-02-08
Category:	⌘	**D**
Release:	⌘	

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	There should no bearer dependent transport control protocol mentioned within TS 23.153
Summary of change:	⌘	remove reference to Q.2630
Consequences if not approved:	⌘	The description of TrFO scenarios would not be bearer independent

Clauses affected:	⌘	6.1, 6.2, 6.6
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

6 Detailed Call Procedures

6.1 Mobile to Mobile TrFO Call Establishment

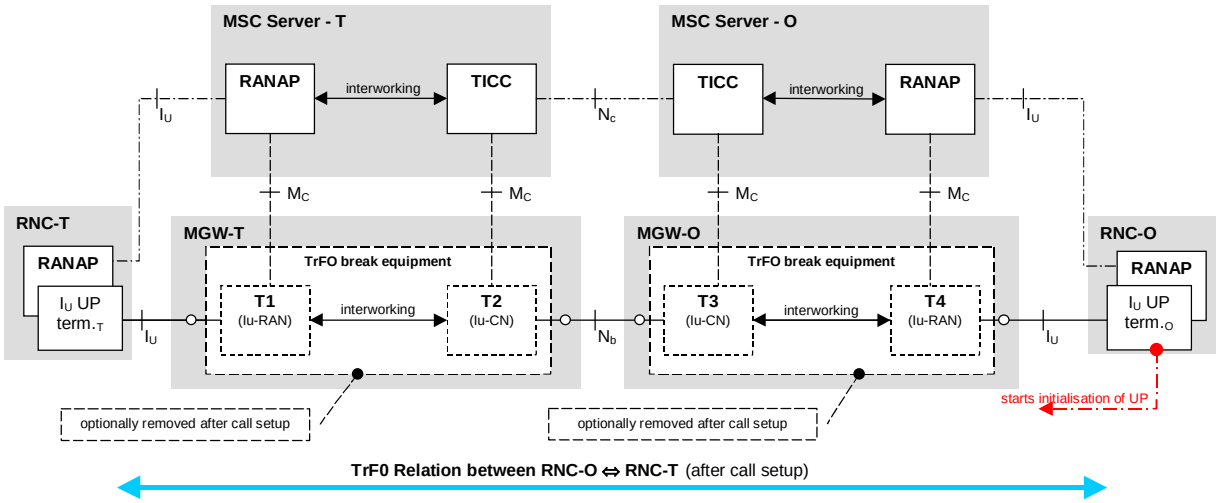


Figure 6.1/1: Configuration during Call Setup of a Mobile to Mobile Call.

Following network and protocol entities are involved in the scenario, outlined in Figure 6.1/1:

RNC-T, **RNC-O**: terminating/originating RNCs

MSC Server-T, MSC Server-O: MSC Servers, performing service, i.e. codec negotiation

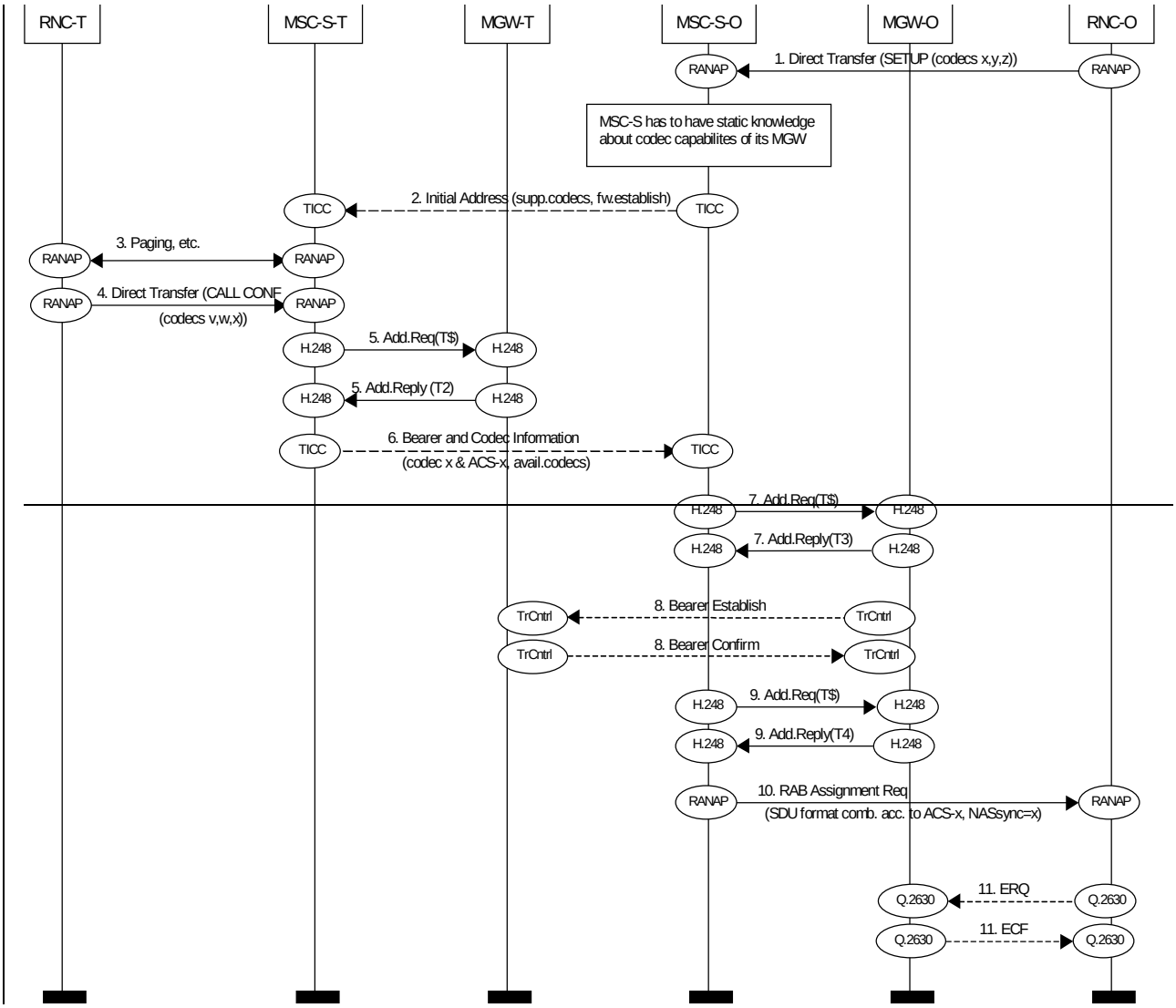
MGW-T, **MGW-O:** terminating/originating MGWs with the optional capability to insert/remove so called

TrFO break equipment: (**TBE**s), i.e. contexts containing an UTRAN- and a CN side I_U UP termination (**T1** – **T4**), inter-working in a distinct manner on control level. [Note: *context* is meant to be the H.248 specific throughout the document]. It is aimed to design protocols for TrFO in a way, that these pieces of HW can be removed after call setup phase to allow to revert to "simple" AAL2 switching in case of ATM transport.

I_U UP term.$_T$, **I_U UP term.$_O$**: Terminating- and originating-side TrFO peers (I_U UP terminations in RNC's in Figure 6.1/1)

RANAP, **TICC**:C-plane protocol incarnations, responsible for codec negotiation, controlling the respective interfaces (I_U, N_C), creating, modifying, removing etc. terminations and contexts.

The final configuration is (at least logically) an end to end TrFO relation between RNC-T and RNC-O with the option to remove the TBEs from the user data path, i.e. to revert to pure AAL2 switching in case of ATM Transport.


RNC-T
MSC-S-T
MGW-T
MSC-S-O
MGW-O
RNC-O
RANAP
1. Direct Transfer (SETUP (codecs x,y,z))
MSC-S has to have static knowledge about codec capabilites of its MGW
TICC
2. Initial Address (supp.codecs, fw.establish)
3. Paging, etc.
4. Direct Transfer (CALL CONF (codecs v,w,x))
H.248
5. Add.Req(T$)
5. Add.Reply (T2)
6. Bearer and Codec Information (codec x & ACS-x, avail.codecs)
7. Add.Req(T$)
7. Add.Reply(T3)
TrCntrl
8. Bearer Establish
8. Bearer Confirm
9. Add.Req(T$)
9. Add.Reply(T4)
10. RAB Assignment Req (SDU format comb. acc. to ACS-x, NASsync=x)
Q.2630
11. ERQ
11. ECF

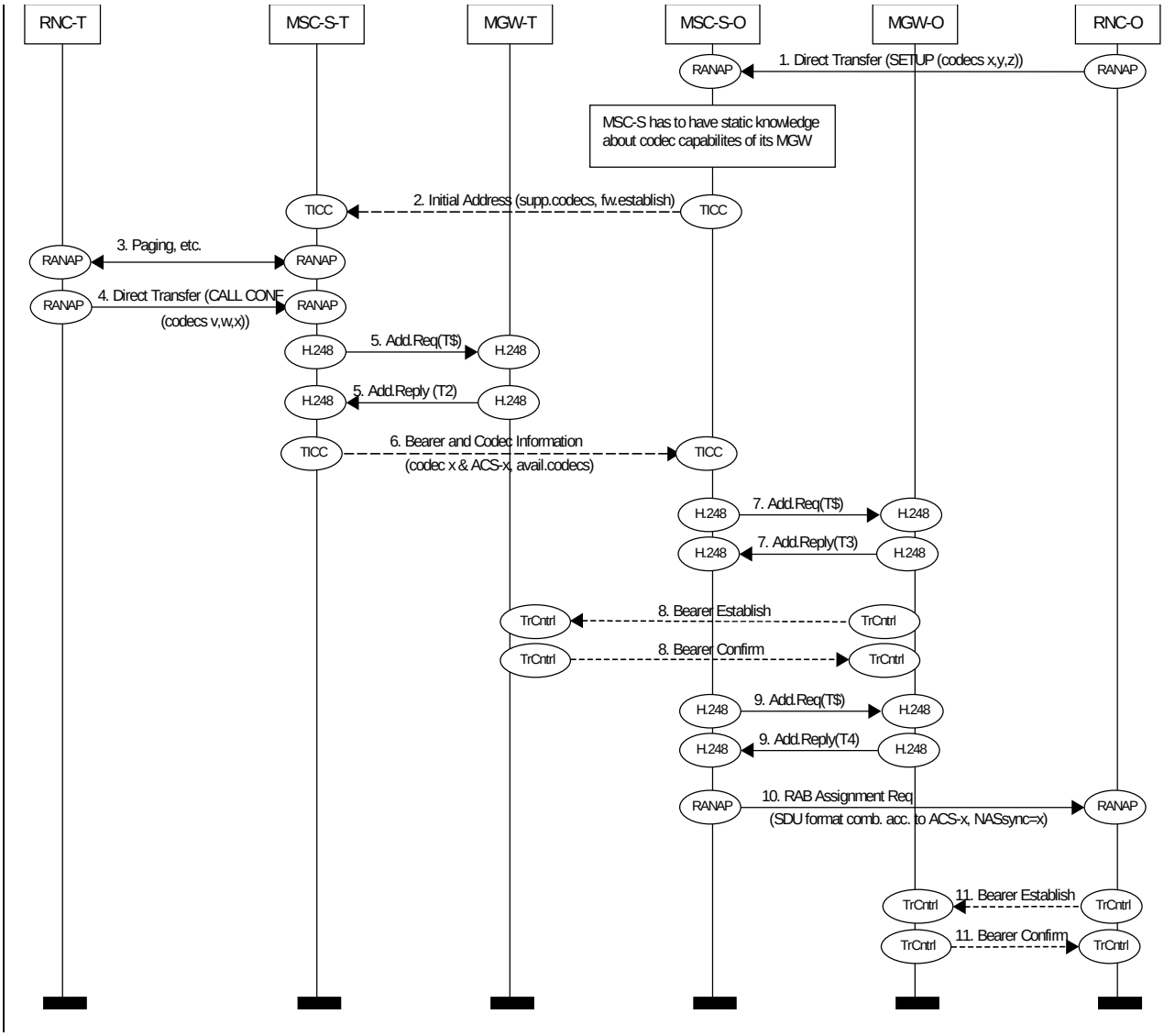
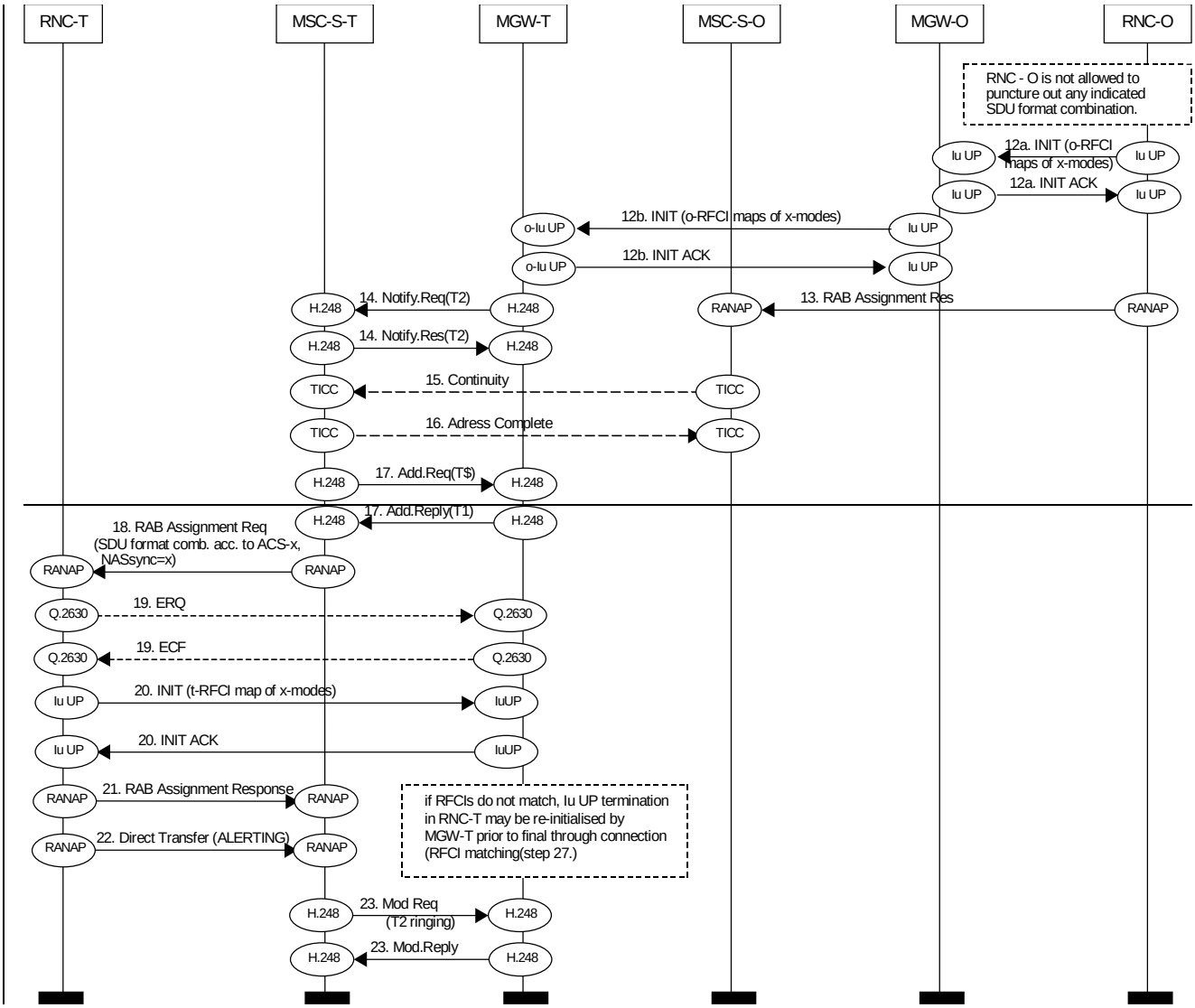


Figure 6.1/2: Call Setup. Mobile to Mobile Call. Message Flow part 1.


RNC-T
MSC-S-T
MGW-T
MSC-S-O
MGW-O
RNC-O
RNC - O is not allowed to puncture out any indicated SDU format combination.
Iu UP
12a. INIT (o-RFCI maps of x-modes)
12a. INIT ACK
o-Iu UP
12b. INIT (o-RFCI maps of x-modes)
12b. INIT ACK
H.248
14. Notify.Req(T2)
14. Notify.Res(T2)
RANAP
13. RAB Assignment Res
TICC
15. Continuity
16. Adress Complete
17. Add.Req(T$)
17. Add.Reply(T1)
18. RAB Assignment Req (SDU format comb. acc. to ACS-x, NASsync=x)
Q.2630
19. ERQ
19. ECF
20. INIT (t-RFCI map of x-modes)
20. INIT ACK
IuUP
21. RAB Assignment Response
22. Direct Transfer (ALERTING)
if RFCIs do not match, Iu UP termination in RNC-T may be re-initialised by MGW-T prior to final through connection (RFCI matching(step 27.)
23. Mod Req (T2 ringing)
23. Mod.Reply

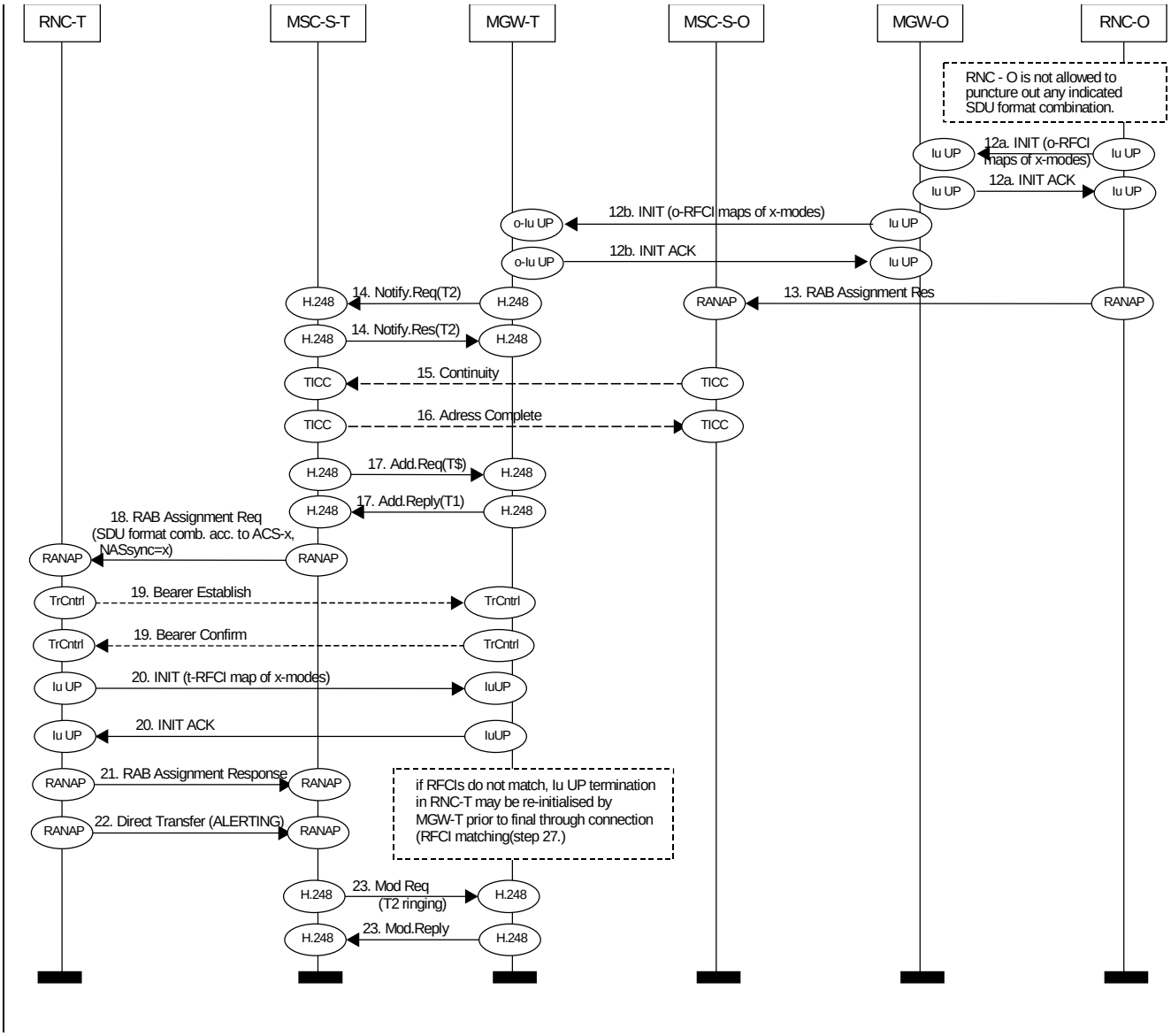


Figure 6.1/3: Call Setup. Mobile to Mobile Call. Message Flow part 2.

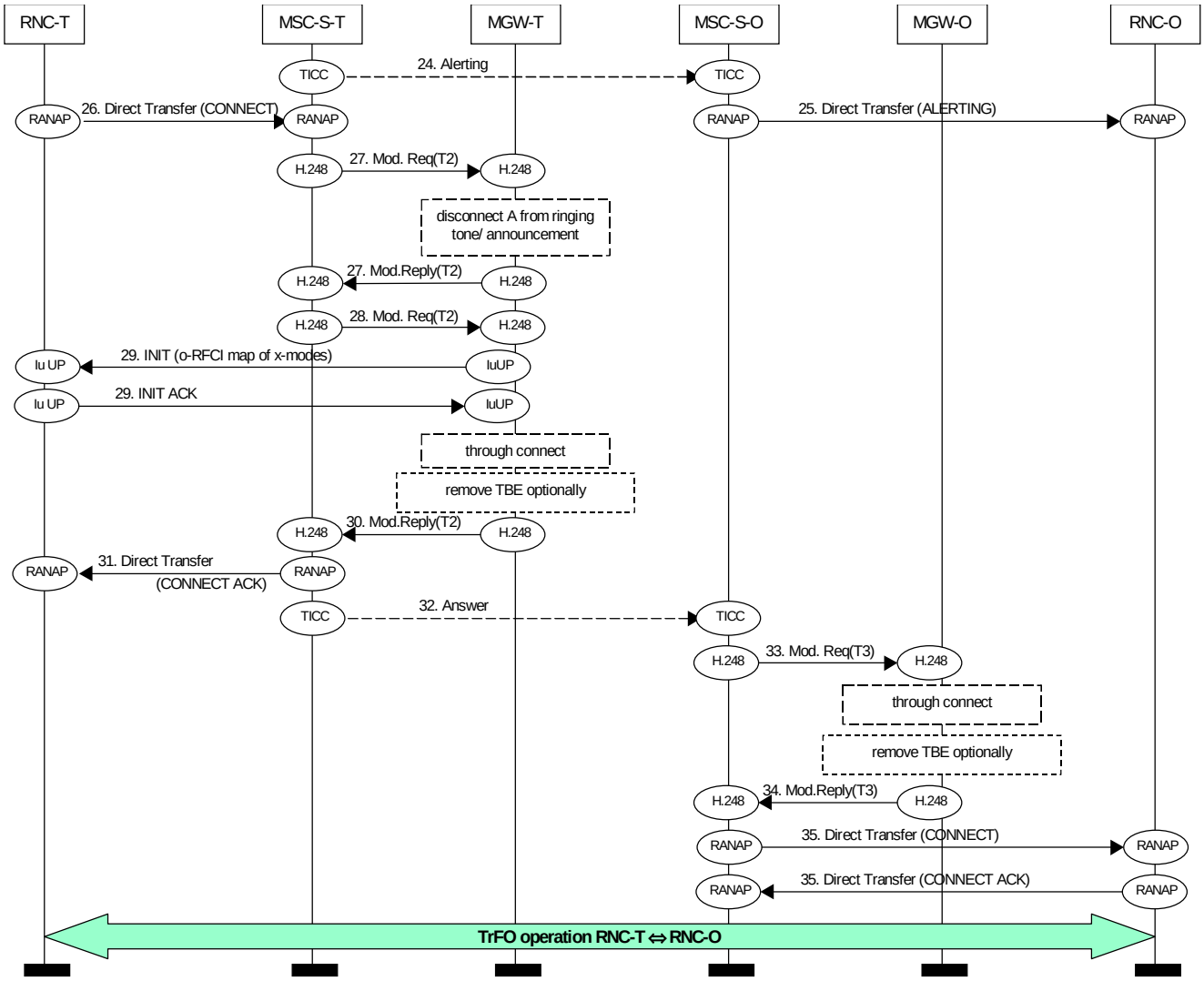


Figure 6.1/4: Call Setup. Mobile to Mobile Call. Message Flow part 3.

Codec negotiation

Step 1. to 6. gives the codec negotiation phase. The mobiles inform the network about their capabilities (1. and 4.). Afterwards the MSC-Server performs codec negotiation according to chapter 5.6.

Network side bearer establishment

MSC-T/MSC-O shall request seizure of network side bearer terminations with IuUP properties (see steps 5. and 7.). Intermediate CN nodes that may perform certain service interactions (e.g. IN nodes) have to seize terminations with IuUP properties as well.

RAB Assignment

RAN side terminations with IuUP property have to be seized (9. and 17.) before sending RAB Assignment (steps 10. and 18.), that contains RAB parameters according to the selected codec and the negotiated ACS. In addition, the respective NAS synchronisation indicator shall be included.

6.2 SRNS Relocation during TrFO

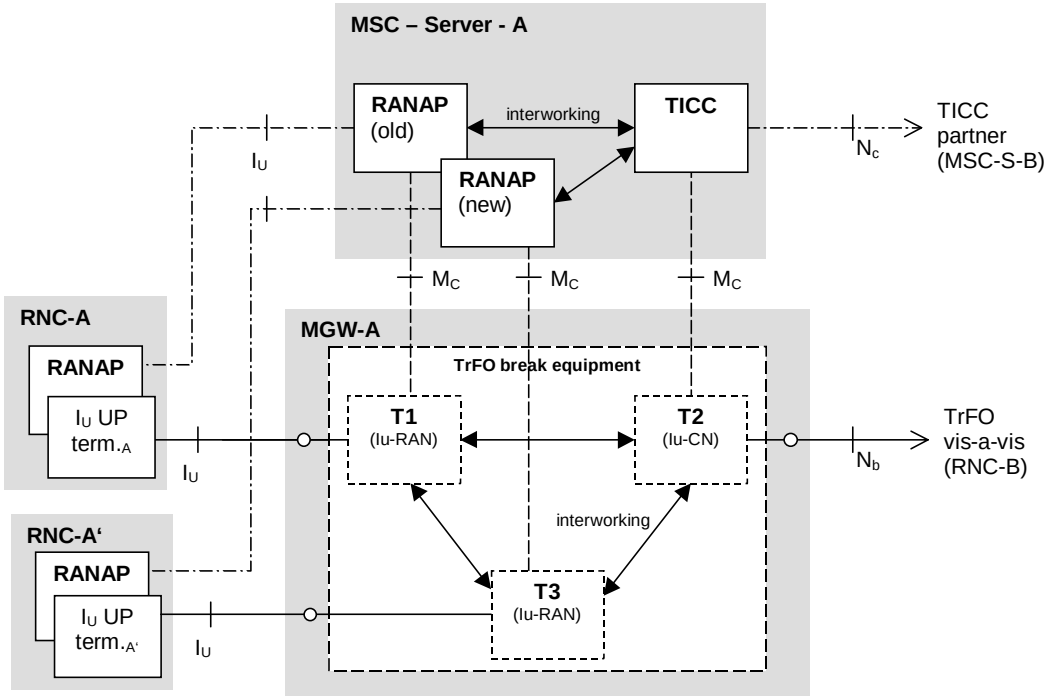


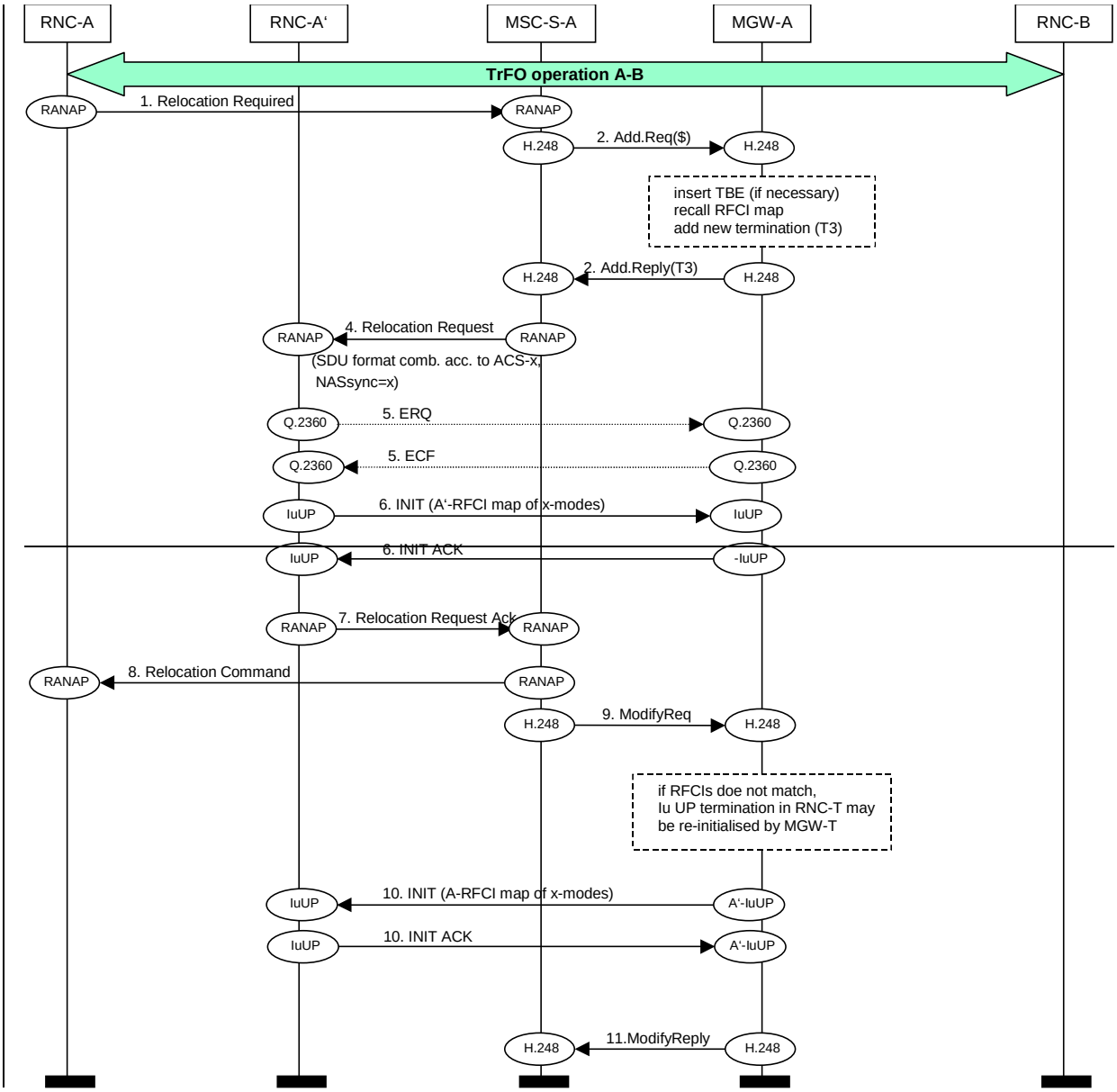
Figure 6.2/1: Configuration during SRNS Relocation

Figure 6.1/1 shows the configuration during relocation. After setting up the new I_U interface (towards RNC-A') until releasing the old one, the original TrFO relation (A⇔B) and the target TrFO relation (A'⇔B) exist in parallel. Within the respective context (TBE) interworking between T1, T2 and T3 is necessary:

T3 will perform initialisation towards RNC-A'.

T2 will hide initialisation performed on $I_{U,A'}$ from RNC-B.

If the option to remove the TBE was applied after call setup, the whole context (TBE) needs to be inserted prior to performing SRNS Relocation. Initialisation data need to be available within MGW-A. After Relocation, the context (TBE) may be removed again, i.e. the MGW-A again acts as a pure AAL2 switch.


RNC-A
RNC-A'
MSC-S-A
MGW-A
RNC-B
TrFO operation A-B
RANAP
1. Relocation Required
RANAP
H.248
2. Add.Req($)
H.248
insert TBE (if necessary)
recall RFCI map
add new termination (T3)
H.248
2. Add.Reply(T3)
H.248
RANAP
4. Relocation Request
RANAP
(SDU format comb. acc. to ACS-x,
NASsync=x)
Q.2360
5. ERQ
Q.2360
Q.2360
5. ECF
Q.2360
IuUP
6. INIT (A'-RFCI map of x-modes)
IuUP
IuUP
6. INIT ACK
-IuUP
RANAP
7. Relocation Request Ack
RANAP
RANAP
8. Relocation Command
RANAP
H.248
9. ModifyReq
H.248
if RFCIs doe not match,
Iu UP termination in RNC-T may
be re-initialised by MGW-T
IuUP
10. INIT (A-RFCI map of x-modes)
A'-IuUP
IuUP
10. INIT ACK
A'-IuUP
H.248
11.ModifyReply
H.248

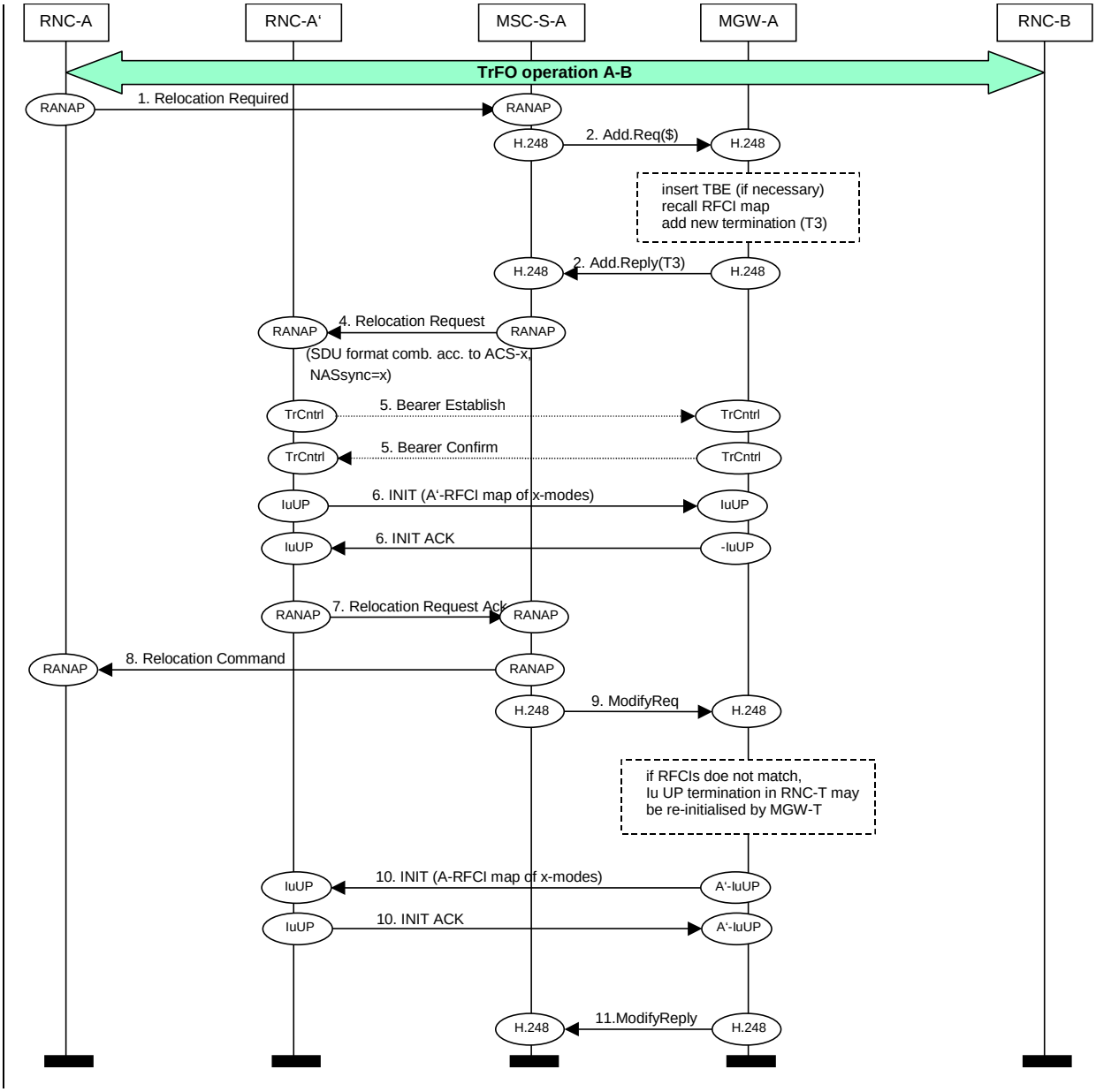
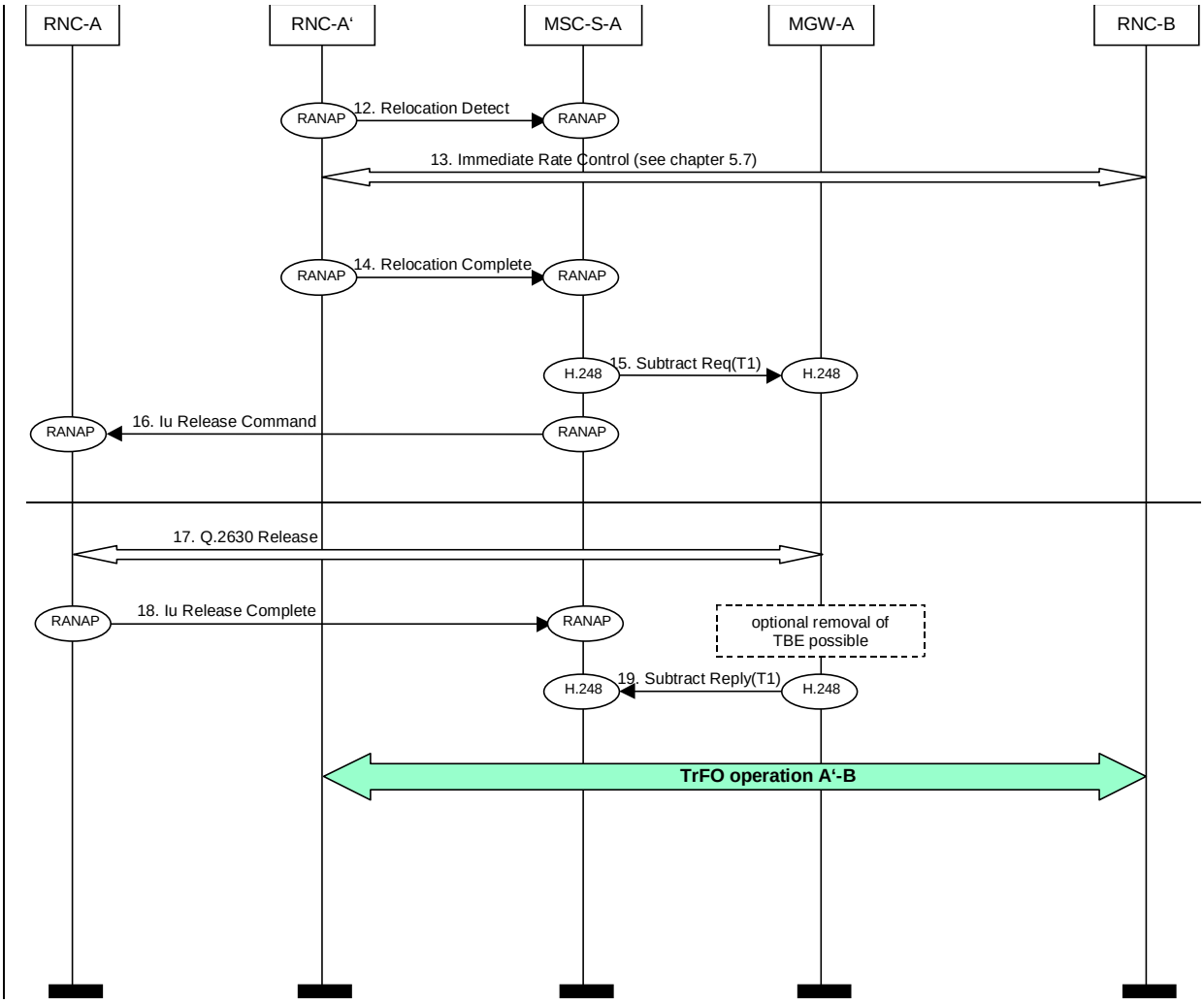


Figure 6.2/2:SRNS Relocation and TrFO. Flow chart part 1.


RNC-A
RNC-A‘
MSC-S-A
MGW-A
RNC-B
RANAP
12. Relocation Detect
RANAP
13. Immediate Rate Control (see chapter 5.7)
RANAP
14. Relocation Complete
RANAP
H.248
15. Subtract Req(T1)
H.248
RANAP
16. Iu Release Command
RANAP
17. Q.2630 Release
RANAP
18. Iu Release Complete
RANAP
optional removal of TBE possible
H.248
19. Subtract Reply(T1)
H.248
TrFO operation A‘-B

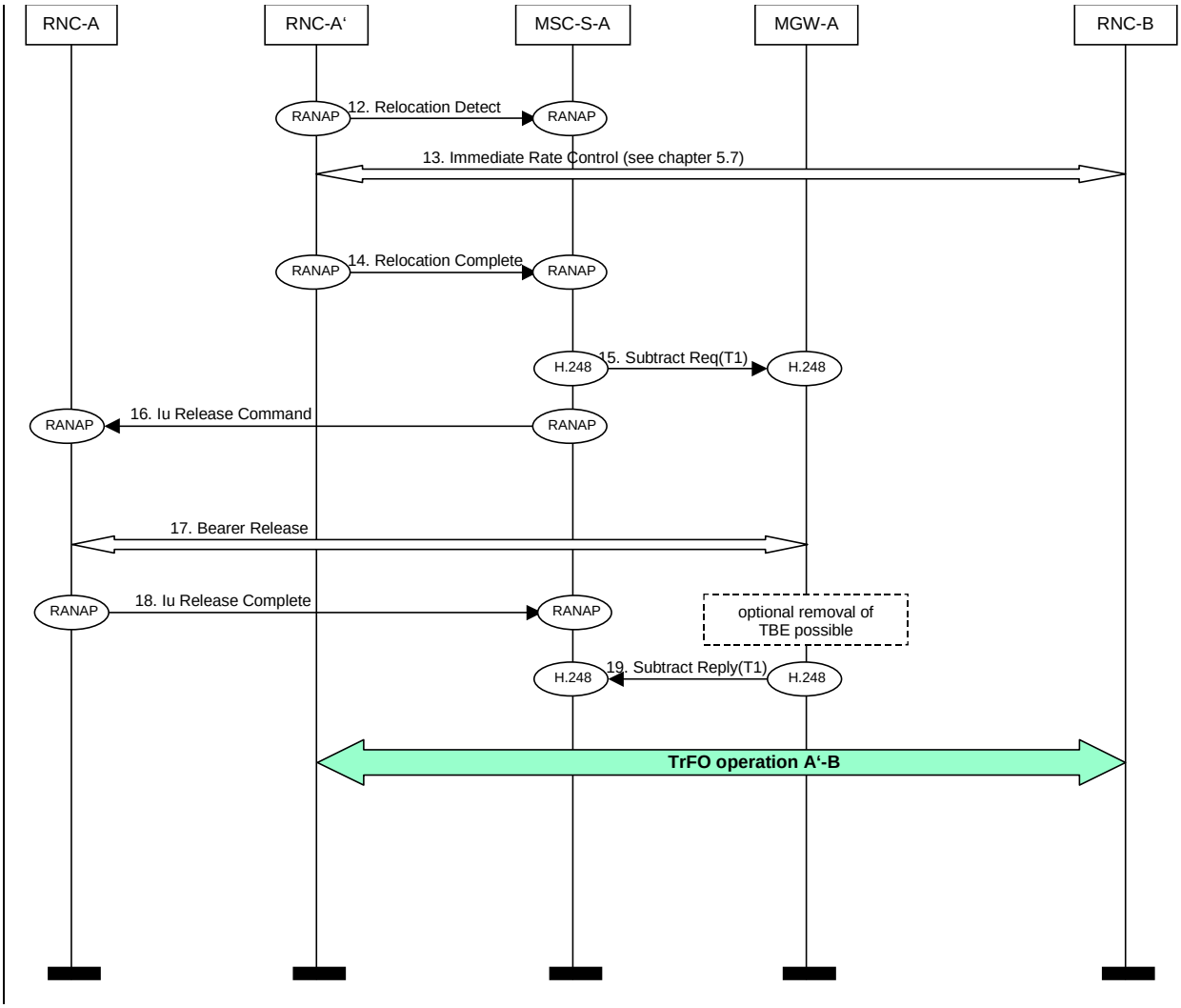


Figure 6.2/3 SRNS Relocation and TrFO. Flow chart part 2.

RAB Assignment on the new Iu leg:

A RAN side terminations with IuUP property (T3) has to be added to the already seized call context (step 2.) before sending Relocation Request (4.), that contains all the RAB parameters already applied on the Iu leg towards RNC-A.

UP initialisation

RNC-A' shall accept the requested set of codec modes and is not allowed to puncture out any negotiated mode. The INIT frames shall be according to the RAB parameters received.

At reception of an INIT frame from the new RNC, the termination at MGW-A shall not perform forwarding of the IuUP initialisation. The MGW shall check whether the received RFCI allocations match the stored RFCI allocation. If it does not match, it may re-initialise the IuUP towards RNC-A' at this point in time.

Removal of TrFO Break Equipment (TBE)

If the MGW supports the removal of TBEs, it shall insert the TBE before seizing the additional termination. It may again remove the TBE after performing RFCI matching and through-connection of the new termination and the termination to the far end party.

****** next modified section ******

6.6 Call Hold/Call Wait

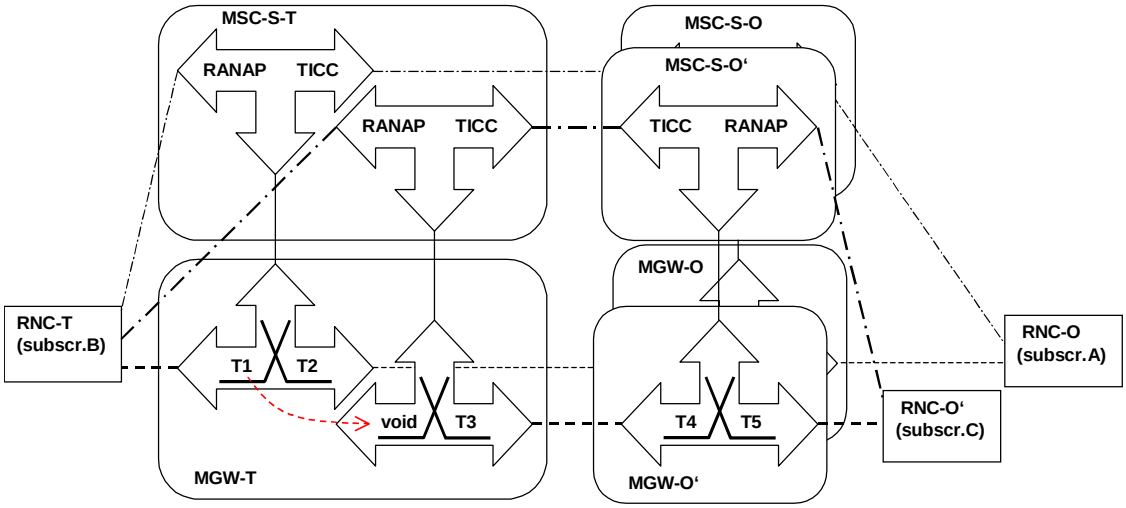
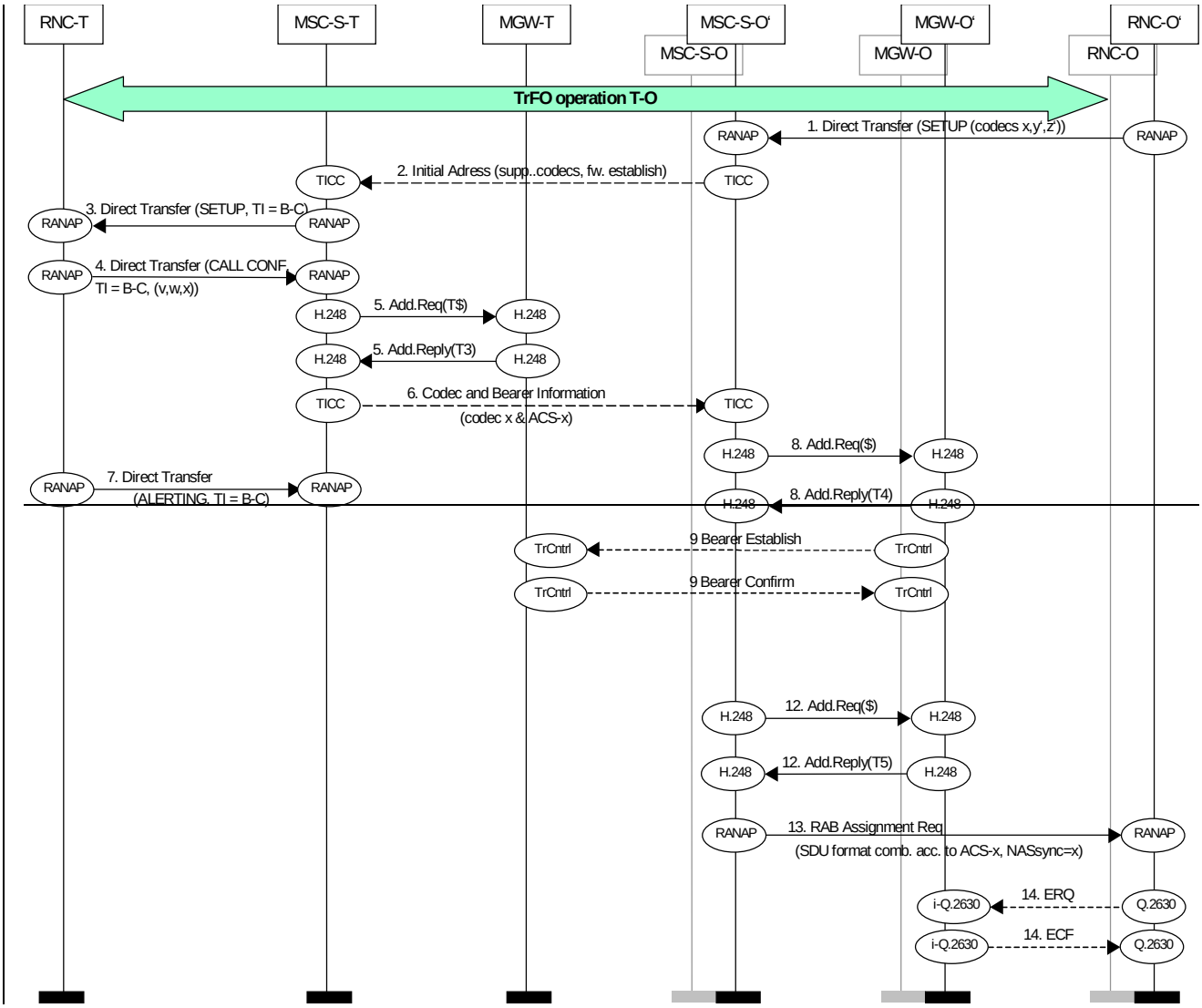


Figure 6.6/1: Configuration during Call Hold / Call Wait scenario

This scenario assumes subscriber C (served by RNC-O') calls subscriber B (served by RNC-T), currently in communication with subscriber A. Subscriber C receives a tone/announcement, applied by terminating side. Then subscriber B puts subscriber A on Hold and A receives an announcement (applied again by terminating side.)

MGW-O has to establish an originating side call context (T4, T5), MGW-T the respective terminating one (T3 only, T1 from subscriber will be moved to it during the scenario), the B party context has to be inserted into path again (if TBE was removed).


RNC-T
MSC-S-T
MGW-T
MSC-S-O'
MSC-S-O
MGW-O'
MGW-O
RNC-O'
RNC-O
TrFO operation T-O
RANAP
1. Direct Transfer (SETUP (codecs x,y',z'))
TICC
2. Initial Adress (supp..codecs, fw. establish)
3. Direct Transfer (SETUP, TI = B-C)
4. Direct Transfer (CALL CONF
TI = B-C, (v,w,x))
H.248
5. Add.Req(T$)
5. Add.Reply(T3)
6. Codec and Bearer Information
(codec x & ACS-x)
8. Add.Req($)
7. Direct Transfer
(ALERTING, TI = B-C)
8. Add.Reply(T4)
TrCntrl
9 Bearer Establish
9 Bearer Confirm
12. Add.Req($)
12. Add.Reply(T5)
13. RAB Assignment Req
(SDU format comb. acc. to ACS-x, NASsync=x)
i-Q.2630
Q.2630
14. ERQ
14. ECF

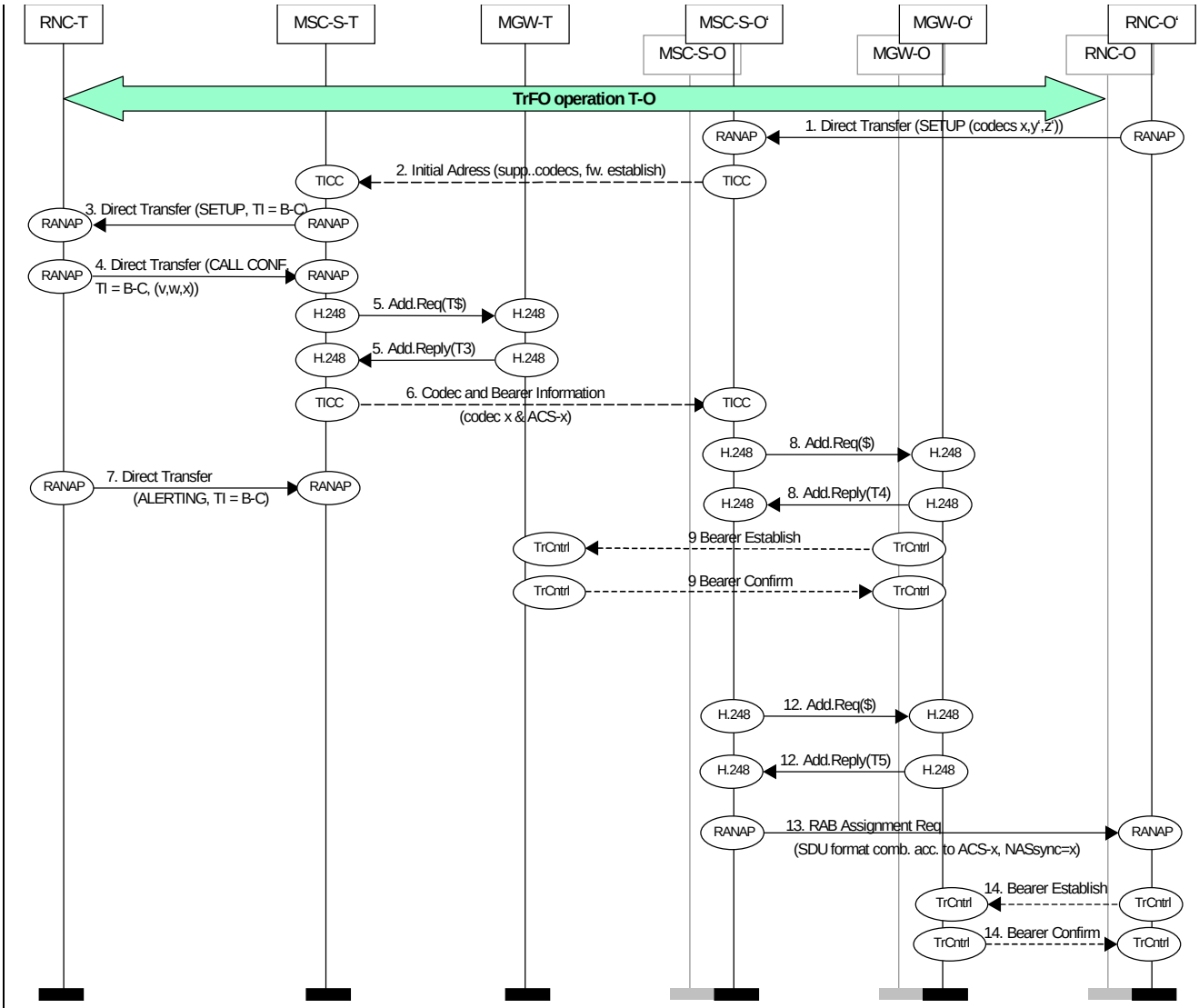


Figure 6.6/2: Call Hold/Call Wait and TrFO. Message flow part 1.

3GPP TSG-CN4 Rel-4 Ad Hoc Meeting **Tdoc N4-010299**
Madrid, SPAIN from 13th to 15th February 2001

CR-Form-v3

CHANGE REQUEST

⌘ **23.153** **CR** **021** ⌘ rev **1** ⌘ Current version: **4.0.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network **X**

Title:	⌘	Initialisation Issues
Source:	⌘	CN4
Work item code:	⌘	OoBTC
Date:	⌘	2001-02-09
Category:	⌘	**C**
Release:	⌘	Rel 4

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	In case of certain SS and IN interworking cases it should be explained, how a CN node, that is neither the originating RNC nor a border MGW shall perform UP initialisation. Message Names in figure 6.3.1/2 have been modified.
Summary of change:	⌘	Additional initialisation issues
Consequences if not approved:	⌘	Incomplete standard

Clauses affected:	⌘	6.3.1, 6.3.2
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.
2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

6.3.1 TrFO interworking with SS (VMSC = service interworking node)

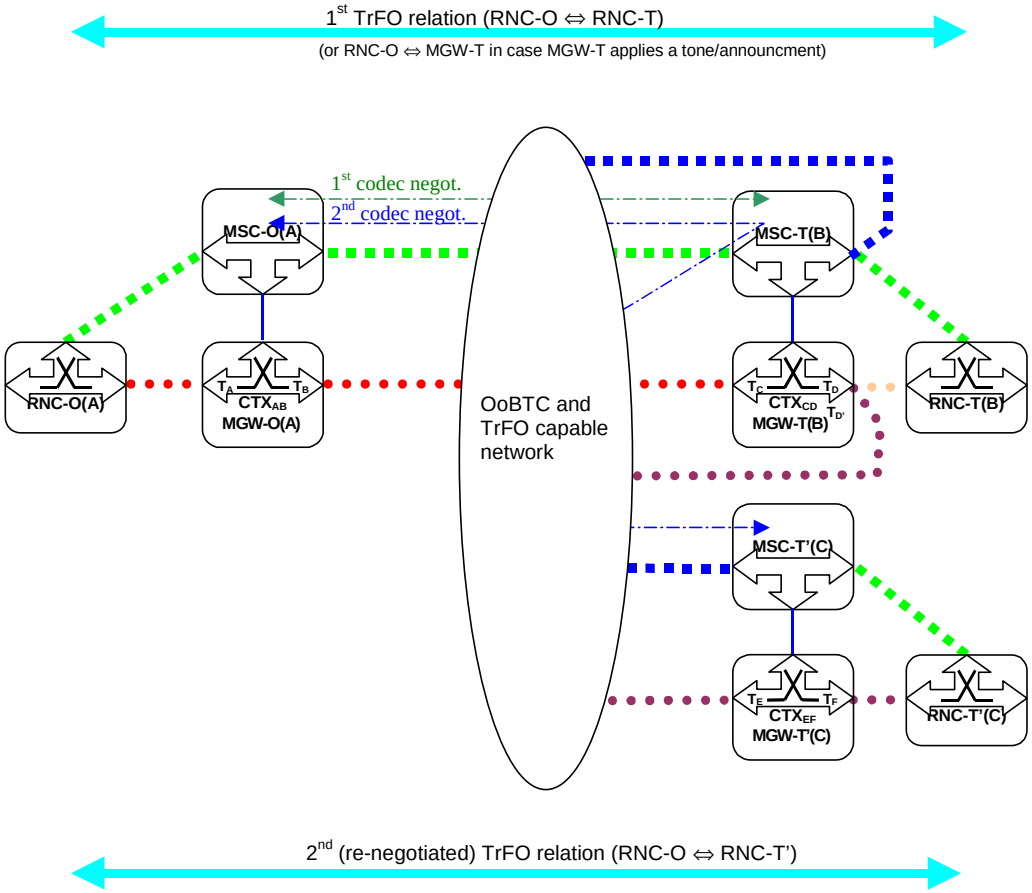


Figure 6.3.1/1. Codec Modification in case of SS interworking

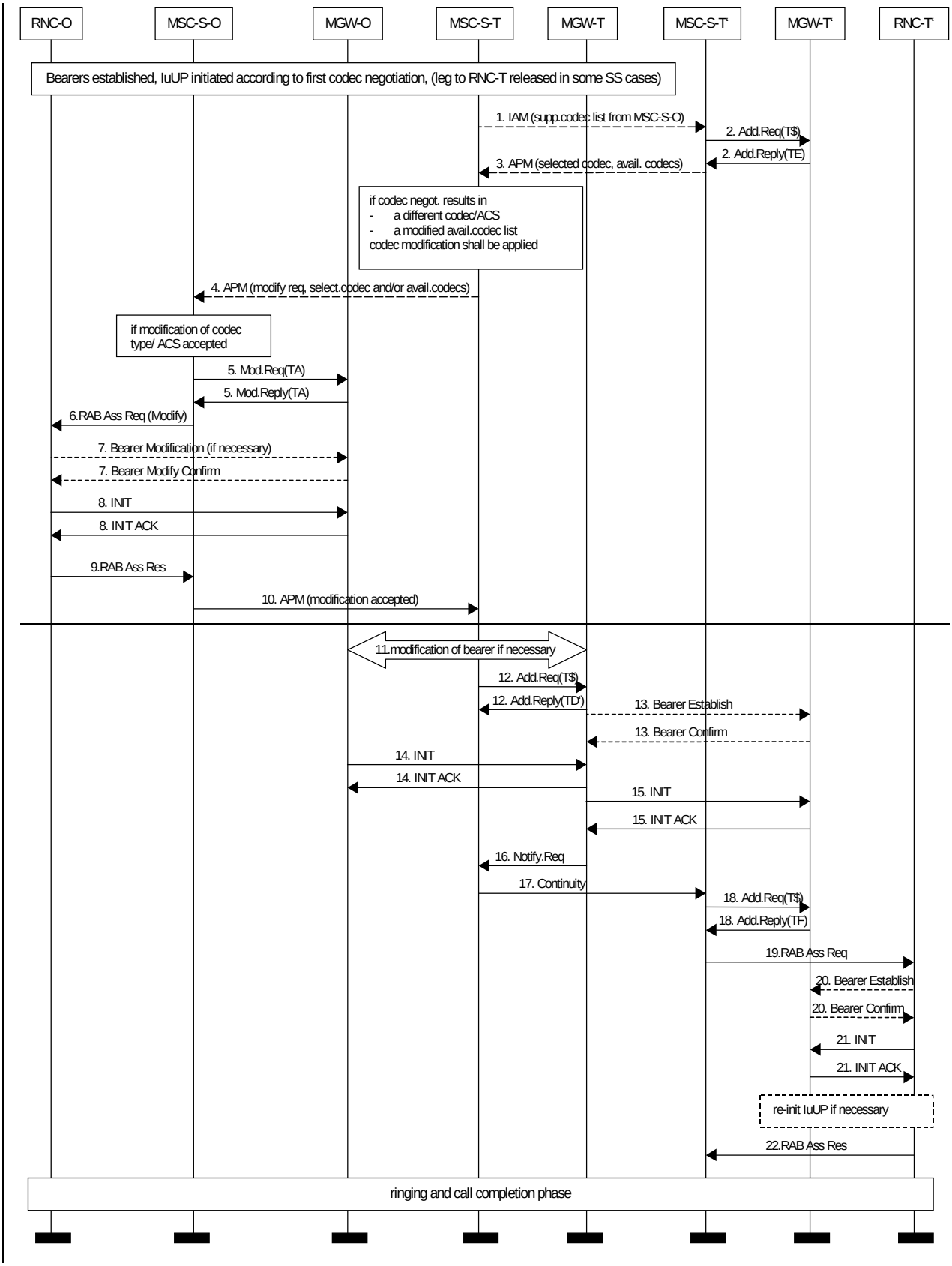
In case of supplementary service interworking, it may become necessary to apply codec modification out of band. Figure 6.3.1/1 shows the network model, that may apply for a certain set of SS's (call deflection (CD), call forwarding on no reply (CFNRy), CF on user determined busy (CFUB), etc.). Common to these scenarios is:

- the service interworking is controlled by the VMSC (this is common to all SSs).
- MSC-T extends the call towards MSC-T' according to the forwarded-/deflected-to-number.

An intermediate TrFO relation will in general already exist between two RNC's (RNC-O and RNC-T in figure 6.3.1/1) before the call is diverted to another node, as the ringing tone was applied in backward direction.

In order to perform codec negotiation with the third node (MSC-T') as well it is necessary to forward the supported codec list from MSC-O. MSC-T' signals back the codec it selected and the available codec list. If the codec negotiation result is different from the previously performed codec negotiation between MSC-O and MSC-T, MSC-O shall be informed. MSC-O shall be~~is~~ able to ~~detect~~ decide based on the received modified codec type whether UP re-initialisation and bearer modification is required. This scenario is depicted in Figure 6.3.1/2 below. If no codec modification has to be applied, MSC-T-(B) shall extend the UP initialisation towards MSC-T'(C), i.e. MSC-T(B) shall initialise a termination (TC) with the property Initialisation Procedure = ~~Outgo~~incoming. MSC-T' (C) shall also initialise a termination TC with the property Initialisation Procedure = incoming.

Further call handling follows the mobile to mobile call establishment (see section 6.1).


RNC-O
MSC-S-O
MGW-O
MSC-S-T
MGW-T
MSC-S-T'
MGW-T'
RNC-T'
Bearers established, IuUP initiated according to first codec negotiation, (leg to RNC-T released in some SS cases)
1. IAM (supp.codec list from MSC-S-O)
2. Add.Req(T$)
2. Add.Reply(TE)
3. APM (selected codec, avail. codecs)
if codec negot. results in
- a different codec/ACS
- a modified avail.codec list
codec modification shall be applied
4. APM (modify req, select.codec and/or avail.codecs)
if modification of codec type/ ACS accepted
5. Mod.Req(TA)
5. Mod.Reply(TA)
6.RAB Ass Req (Modify)
7. Bearer Modification (if necessary)
7. Bearer Modify Confirm
8. INIT
8. INIT ACK
9.RAB Ass Res
10. APM (modification accepted)
11.modification of bearer if necessary
12. Add.Req(T$)
12. Add.Reply(TD')
13. Bearer Establish
13. Bearer Confirm
14. INIT
14. INIT ACK
15. INIT
15. INIT ACK
16. Notify.Req
17. Continuity
18. Add.Req(T$)
18. Add.Reply(TF)
19.RAB Ass Req
20. Bearer Establish
20. Bearer Confirm
21. INIT
21. INIT ACK
re-init IuUP if necessary
22.RAB Ass Res
ringing and call completion phase

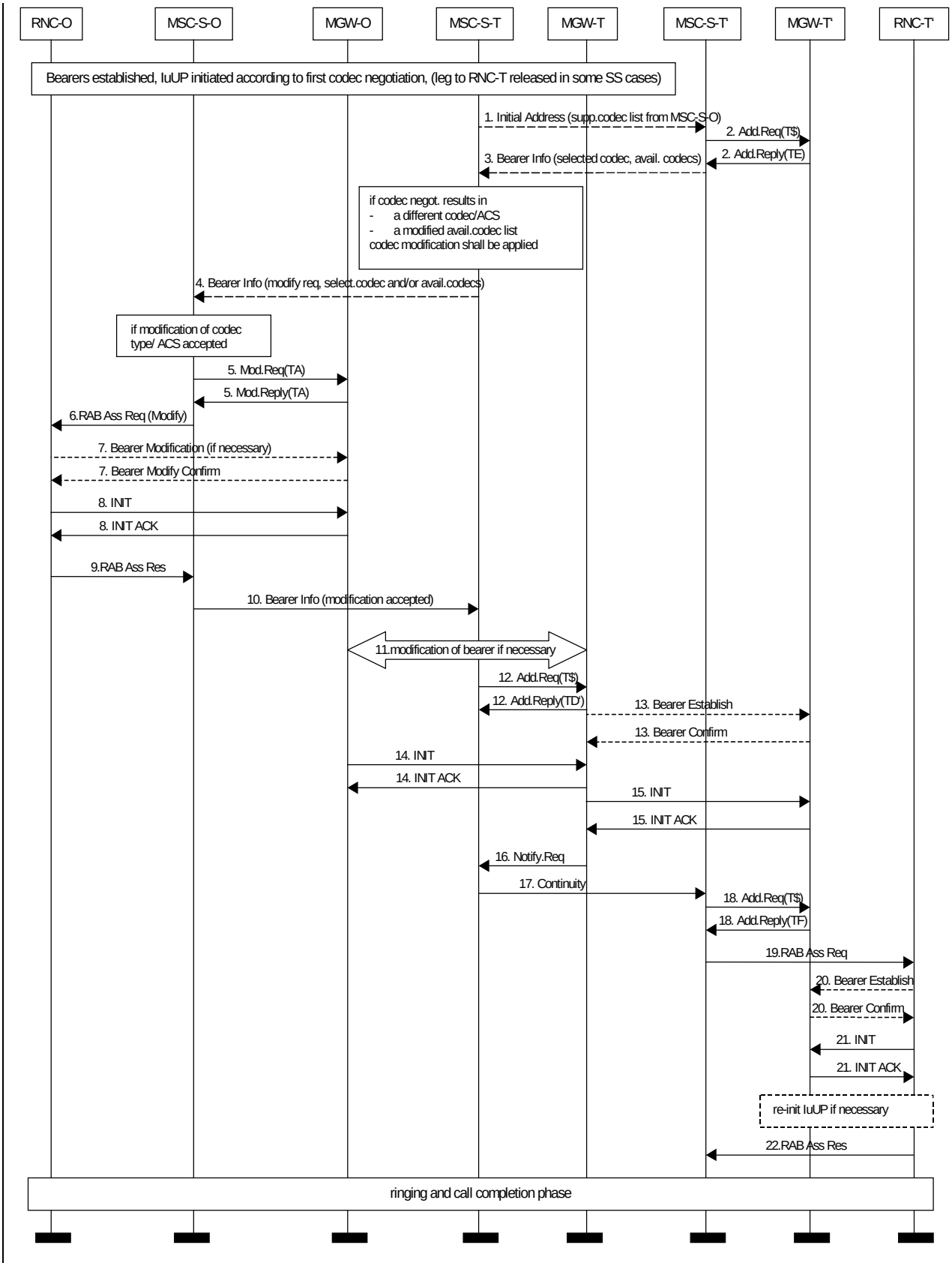


Figure 6.3.1/2: Codec Modification for SS-interworking & UP re-initialisation.

3GPP TSG-CN4 Rel-4 Ad Hoc Meeting **Tdoc N4-010306**
Madrid, SPAIN from 13th to 15th February 2001

CR-Form-v3

CHANGE REQUEST

⌘ **23.153** **CR** **022** ⌘ rev **2** ⌘ Current version: **4.0.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network **x**

Title:	⌘	Avoiding double description of Iu framing package procedure
Source:	⌘	CN4
Work item code:	⌘	OoBTC
Date:	⌘	2001-02-08
Category:	⌘	**F**
Release:	⌘	Rel4

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	The procedures for Iu framing package procedures are described in TS 23.153 as well as in TS 29.232. It is proposed to delete the detailed description in 23.153.
Summary of change:	⌘	Deletion of Procedure description in chapter 5.4.5
Consequences if not approved:	⌘	Double description may lead to contradictory standards

Clauses affected:	⌘	2, 5.4.5
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	This CR might imply to merge certain CRs against chapter 5.4.5 of TS 23.153 into a update proposal for 29.232.

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2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://www.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2000-09 contains the specifications resulting from the September 2000 TSG meetings.
3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

2 References

The following documents contain provisions that, 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.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] 3G TS 23.107: "QoS Concept and Architecture"

[2] 3G TS 24.008: "Mobile radio interface layer 3 specification Core Network Protocols –Stage 3"

[3] 3G TS 25.413: "UTRAN Iu Interface RANAP Signalling"

[4] 3G TS 25.415: "UTRAN Iu Interface User Plane Protocols"

[5] 3G TS 26.103: "Speech codec list for GSM and UMTS"

[6] Q.1902.x: "Bearer Independent Call Control, CS2"

[7] Q.765.5:" Application Transport Mechanism for Bearer Independent Call Control"

[8] 3G TS 23.205, Bearer-independent CS Core Network.

[9] 3G TS 33.106, Lawful Interception Requirements

[10] 3G TS 28.062, Inband Tandem Free Operation (TFO) of Speech Codecs.

[11] 3G TS 23.009, Handover Procedures.

[12] 3G TS 29.232: "Media Gateway Controller (MGC) – Media Gateway (MGW) interface; Stage 3".

5.4.5 MGW Control Protocol Iu UP Package properties

The following is a summary of the Iu UP H.248 requirements; the procedures are described in [12] and are valid for Iu UP in Support Mode:

Additional Package Properties:

Iu UP Termination Type: Values - Iu-RAN (Iu Framing Protocol on Iu Interface)

- Iu-CN (Iu Framing Protocol on Nb Interface)

Iu UP Initialisation Procedure: Values – Incoming (For Iu-CN: the Iu Framing Protocol initialisation is received by the media gateway and used for subsequent initialisation from this MGW. For Iu-RAN this indicates the originating RNC interface).

- Outgoing (For Iu-CN the Iu Framing Protocol is generated by the core network MGW, i.e. initialised on the Nb Interface. For the Iu-RAN interface this specifies the terminating RNC Interface)

~~**Procedures:**~~

~~Iu UP Initialisation procedure is always acknowledged between MGW peers. If a request for a Notification for the bearer establishment is requested then this shall not be sent until the acknowledgement for the Iu UP initialisation has also be returned.~~

~~The RFCI parameters are always stored against the MGW termination that received the Iu UP initialisation.~~

~~If a MGW has Iu UP termination property Initialisation Procedure = Incoming then it expects to received an Initialisation (either internally or externally).~~

~~If a MGW has Iu UP termination property Initialisation Procedure = Outgoing then it generates a network originated Initialisation PDU.~~

~~If a MGW has two terminations in the same context defined as supporting Iu UP package, then on receipt of an Iu Initialisation procedure from one side it shall forward the Iu UP initialisation procedure on to the peer MGW. This procedure shall be performed independently of the through-connection of the terminations in the context, but is dependent on the bearer connection from the other termination to its peer MGW being established.~~

~~If a MGW has one termination with Type = Iu-RAN and one with type Iu-CN in the same context then no forwarding of Iu UP initialisation out from the Iu-RAN termination shall be performed until an Iu UP initialisation has been received at the Iu-RAN side. If the RFCI values stored at the Iu-CN termination do not match the RFCI values stored at the Iu-RAN side then "RFCI Matching" may be performed to the Iu-RAN side – Iu UP initialisation is sent with the RFCI values from the Iu-CN side. No "RFCI Matching" is permitted at the Iu-CN side.~~

~~"RFCI Matching" may be delayed if terminations are not through-connected, triggered by connection modification otherwise it shall be performed immediately, this is implementation option~~

~~If "RFCI Matching" is not performed the MGW shall map the indexes for Iu frames from one side to the RFCI indexes from the other side.~~

~~If a MGW has two Iu-RAN terminations connected to the same context then the "RFCI Matching" is performed to the termination latest defined.~~

~~If a MGW has two terminations with Iu UP package connected to the same context and both RFCI sets match then the MGW may switch into Iu UP transparent mode – no monitoring of the Iu frames is performed, provided that the terminations are through-connected.~~

~~If a H.248 procedure is received when a MGW is in transparent mode (but Iu UP is defined as support mode) that requires interpretation or interaction with the Iu UP then the MGW shall switch back to support mode, i.e. perform monitoring or termination of the Iu UP protocol.~~