

Joint TSG-S4#10 - SMG11#15 Meeting *Tdoc S4/SMG11 (00)0107*
February 28-March 3, 2000, Helsinki, Finland

3GPP TSG CN Working Group 2 SWG B
Milan, Italy
14-16 February, 2000

Tdoc N2B000387

Liaison Statement

TO: R3
CC: S4, S2, and N1
Source: N2¹

Subject: Stage 2 description for TrFO break

N2 thank R3 for their liaison statement (Tdoc R3-000402).

N2 recognized from the LS that R3 is studying the procedure for TrFO break, and there are two possible solutions, which are RANAP solution and User Plane solution. In addition, N2 find another problem to be solved that is related to a potential source for fraud, and also find two possible solutions. However, N2 could not decide the solution, since the problem is related to the solution for the TrFO break procedure. Attachment 1 of this LS includes the problem and the possible solutions.

N2 ask R3 to study the solution for the problem as well.

N2 has the work of completion of TS 23.153, Out of Band Transcoder Control (OoBTC) Stage 2, which should include the stage 2 procedures for TrFO break. In order to finalize our work on OoBTC stage 2, we describe the stage 2 procedure for TrFO break as Attachment 2 of this LS. The descriptions include two possible solutions for TrFO break and two possible solutions for fraud problem with editor's notes such as "Either Alternative 1 or Alternative 2 will remain, which is adopted by R3." Moreover, N2 will send the TS 23.153 that includes the descriptions to CN#7 at least for information and possibly for approval.

N2 asks R3 to contribute to development of TS 23.153 to add the detail stage 2 description for the TrFO break procedure and the solution for the fraud problem.

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Attachment 1

Problem to be solved that is related to a potential source for fraud

During the last RAN3 meetings, the procedures in TS 25.415, UTRAN Iu Interface User Plane Protocols, have been adapted to allow an end-to-end establishment of the Iu user plane protocol between the RNCs. However, there are still some open issues with regard to the timing relationship of the RAB assignment, the establishment of the Iu user plane protocol, and the CN related signalling.

Several documents presented at the last N2B meeting indicate that the Iu UP protocol will be initialized as soon as a bearer has been established end-to-end between the two RNCs. As the initialization procedure uses in-band signalling this means that the bearer has to be connected through by both MSCs, in both directions. Additionally, the RNC also establishes the radio bearer and connects radio and radio access bearer as soon as the Iu UP protocol has been initialized. (After the Iu UP initialization there is no further trigger event for the RNC.) In sum, the user plane is established end-to-end from MS to MS without any consideration that the call has not yet been answered on call control level.

A good example is the following message flow taken from Tdoc N2B-000140 (fig. 1): in this case the ring back tone is transmitted in-band to MS-a, and only this part of the bearer (from MS-a to the RBT generator) is shown as connected through, but actually, the bearer was connected through end-to-end from MS-a to MS-b as soon as the "DHO to DHO connection without transcoder is established".

This is in contradiction to the following requirement from TS 24.008, section 5.5.1, In-band tones and announcements:

Under certain conditions the MS will have to attach the user connection before the CONNECT message. **It is up to the network to ensure that no undesired end-to-end through connection takes place during the establishment of a MT call.**

NOTE: This allows the use of *progress indicator* IEs independently from the channel modes appropriate for the call.

Furthermore, such an end-to-end connection creates a potential source for fraud. As long as MS-b has not sent an Alert message and the timer T310 is running in MSC-b, the RBT generator will not be inserted, and the connection can be used for user traffic. (Note: T310 is started with receipt of Call Confirmed and stopped with receipt of Alert. Its length is operator dependent, but typical values are of the order of 30 seconds.) For this reason it has been a strict requirement by some operators in the past, that such an end-to-end through connection is prevented by the network.

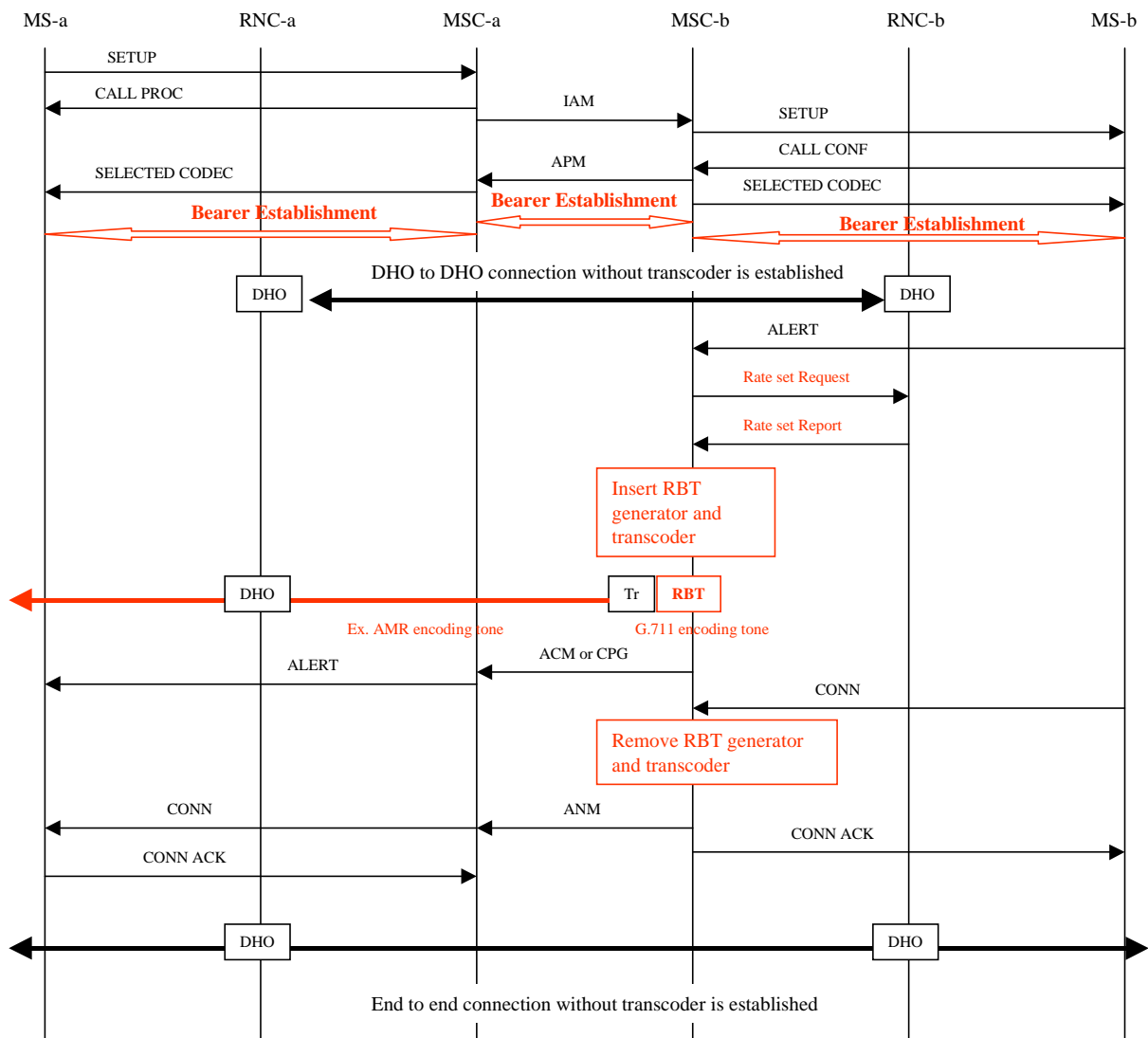


Figure 1 (from the annex of Tdoc N2B-000140): The procedure for sending RBT (alerting indication)

Possible solution 1

A possible way out might be to perform the through connection in MSC-b only after MS-b has sent the Connect message (see fig.2). In this case, the RNCs start sending the lu UP initialization message as soon as the RAB assignment has been performed. However, the initialization will not be answered by the opposite RNC until the connection has been established.

Note that in this case charging will be started before the lu UP protocol has been established. This means, even if the lu UP protocol cannot be established successfully, the subscriber will have to pay for the call. If this is acceptable to the operators, then at least care should be taken that the possible maximum time for which the RNC tries to

establish the lu UP protocol **after receipt of Connect** is limited effectively by some timer.

If the RAB assignment is performed before receipt of Alert, such an effective limitation is probably not possible without introducing a new message between MSC and RNC. Currently, the RNC does not know when the MS has sent Connect, as the DTAP signalling is transferred transparently. Therefore, the minimum time for which the RNC should retry the lu UP protocol initialization is given by the call control timer T301 which is started in the MSC with receipt of Alert and stopped with receipt of Connect. Its length is operator dependent; typical values are of the order of 1-3 minutes. This would also be the time for which the RNC would try to initialize the lu UP protocol **after receipt of Connect**, if the subscriber B answered the call immediately after the alerting has started.

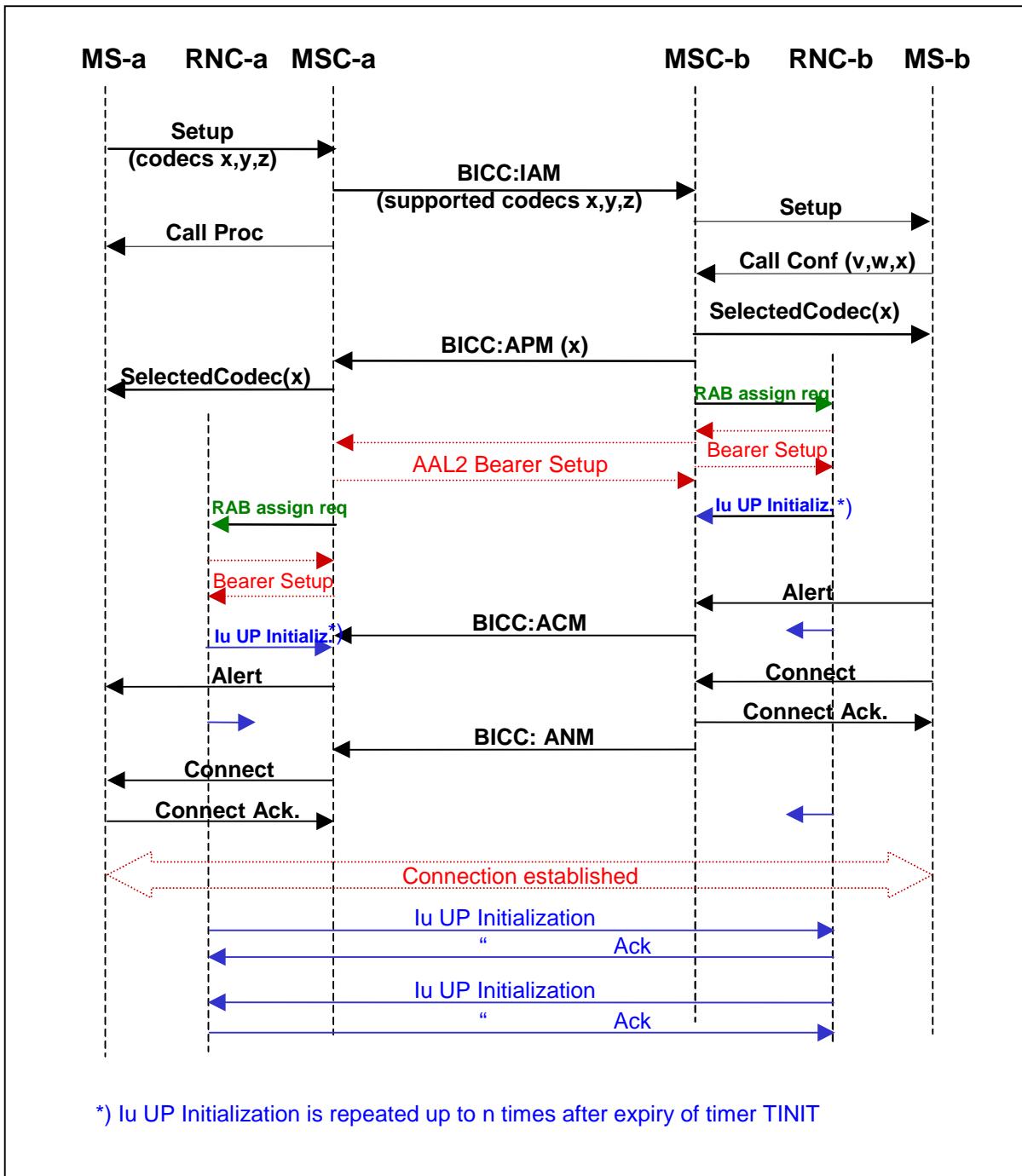
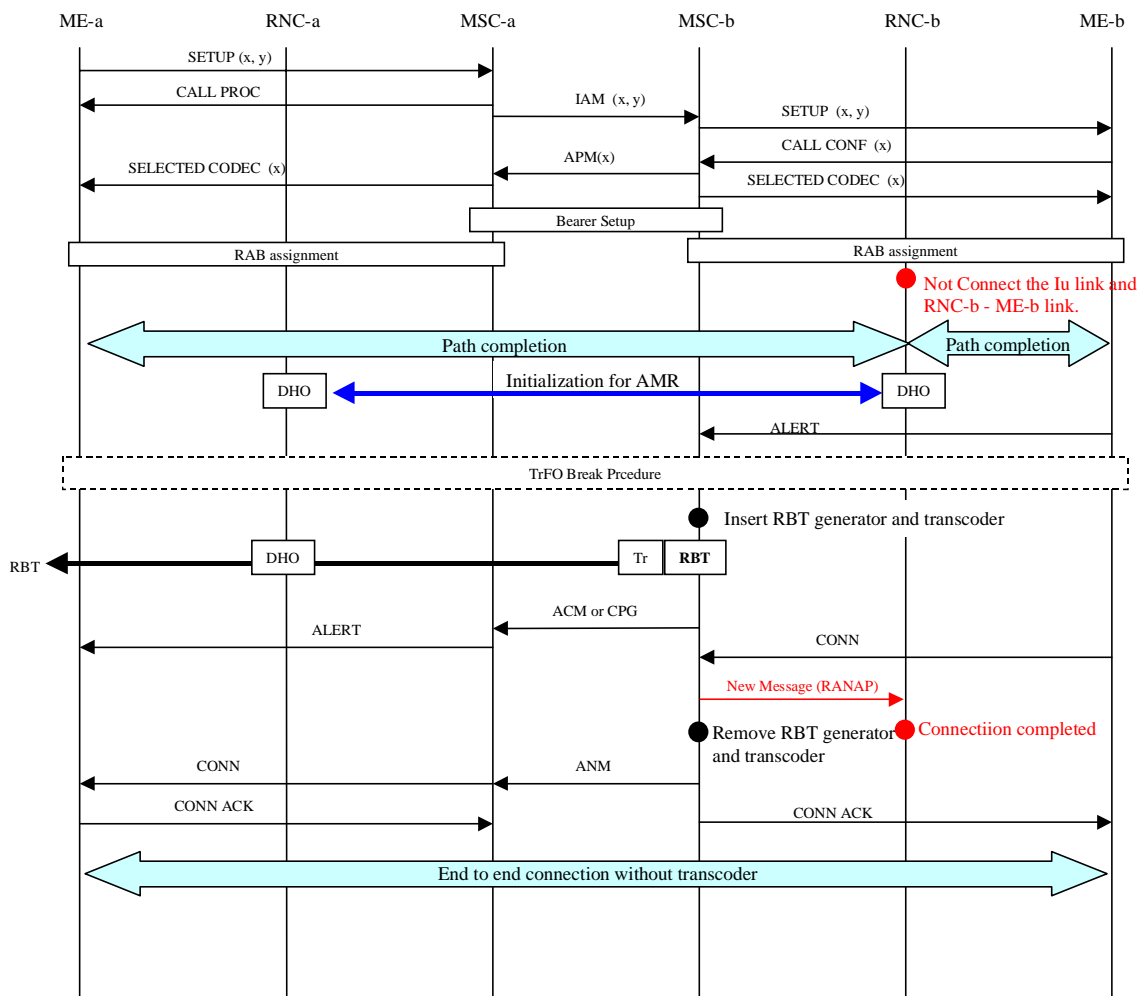


Figure 2: Iu UP protocol initialization with late through connection

Possible Solution 2

Only DHO-DHO path is needed for the Iu UP initialization. It is not necessary to complete the path to UE at destination side when Iu UP initialization is performed. It is possible to inform RNC that the called user send back the answer message, "CONNECT", with new message so that RNC can connect RAB and Radio Bearer.

1. After the CC level negotiation, the bearer establishment for RAB and RB is performed. However RAB and RB at the destination side are not connected in RNC at this point.
2. When the called party answers, the destination MSC sends new message to RNC to indicate the answer from the called user.
3. On the receipt of the indication from MSC, RNC connects through the transmission path.
4. An answer message toward the originating MSC is sent, and then the charging may begin at the MSC controlling charging.



Attachment 2

6.4 Information flow for interaction with Multiparty SS

[Note: Either Alternative 1 or Alternative 2 will remain, which is adopted by R3.]

[Alternative 1: Using C-plane for TrFO break]

After having established a call (using codec x), the subscriber sets up another call (using codec y). When joining these calls to a multiparty call, the negotiated codecs remain active for the call leg from a subscriber to the CCD. Before the allocation of the transcoder, RFCI set report procedure is invoked. MSC A obtains the used RFCI set from RNC with the procedure. See TS 25.413 that defines it in detail.

When the procedure ends successfully, MSC A inserts the transcoders for A-party and B-party in which the permitted rate is set. Also, MSC A inserts the transcoder for C-party.

When the procedure ends unsuccessfully, the C-party addition fails.

At the CCD, the encoded speech signal is transcoded to PCM. After joining the input signals, the joint speech signal is fed back to the participants of the Multiparty call by transcoding it to the previously negotiated encoding scheme of that particular subscriber.

After drop(s) of the leaf-party and only two parties remain in the call, MSC-A may remove the transcoders, then the call may come back to TrFO condition.

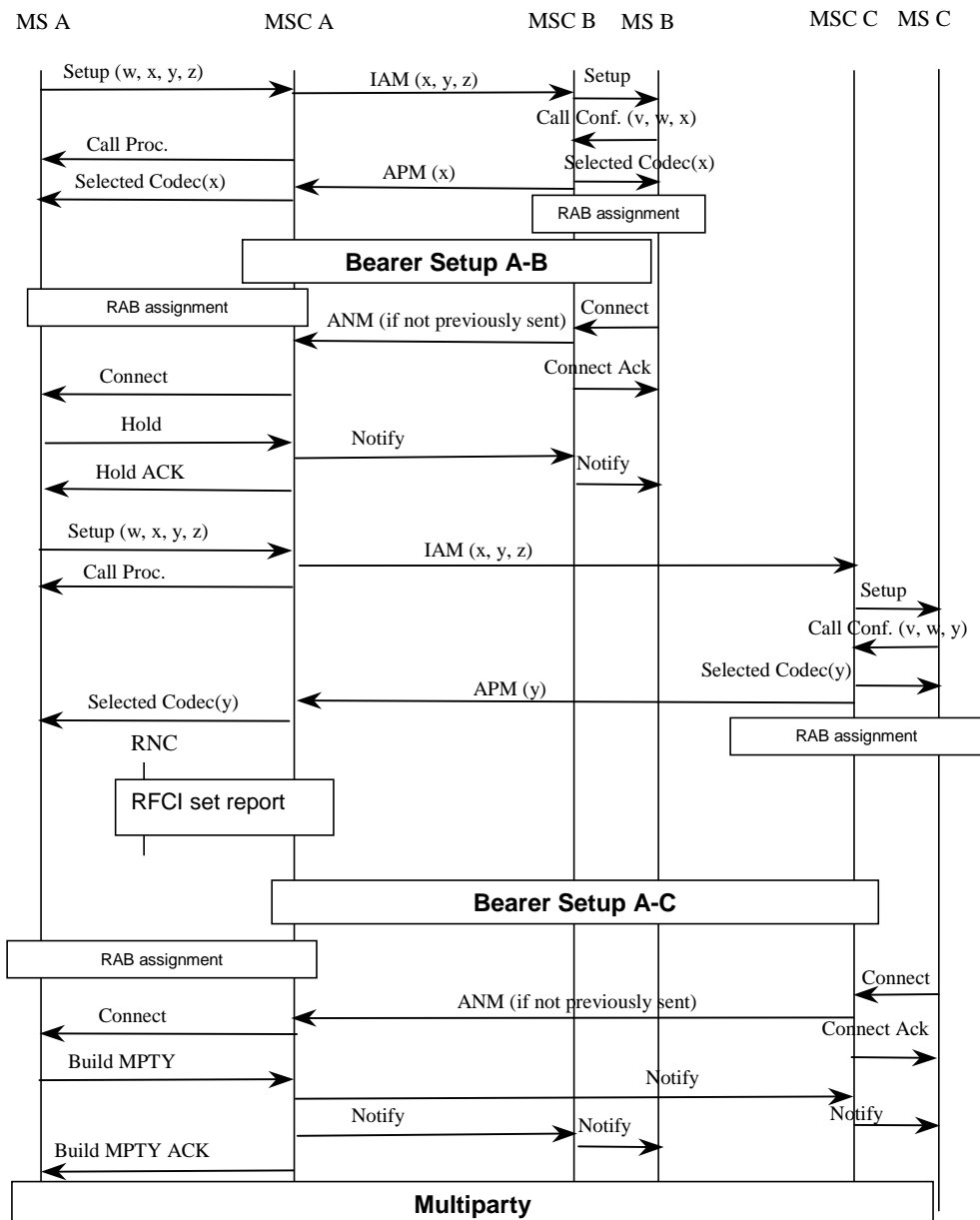


Figure 6.4/1 Interactions with Multiparty SS

[Alternative 2: Using U-plane for TrFO break]

After having established a call (using codec x), the subscriber sets up another call (using codec y). When joining these calls to a multiparty call, the negotiated codecs remain active for the call leg from a subscriber to the CCD. MSC-A inserts the transcoders for A-party and B-party. After the insertion of the transcoders, the procedure for TrFO break is invoked. See TS 25.415 that defines it in detail. The procedure doesn't interact with any call/bearer control entity in MSCs.

At the CCD, the encoded speech signal is transcoded to PCM. After joining the input signals, the joint speech signal is fed back to the participants of the Multiparty call by transcoding it to the previously negotiated encoding scheme of that particular subscriber.

After drop(s) of the leaf-party and only two parties remain in the call, MSC-A may remove the transcoders, then the call may come back to TrFO condition.

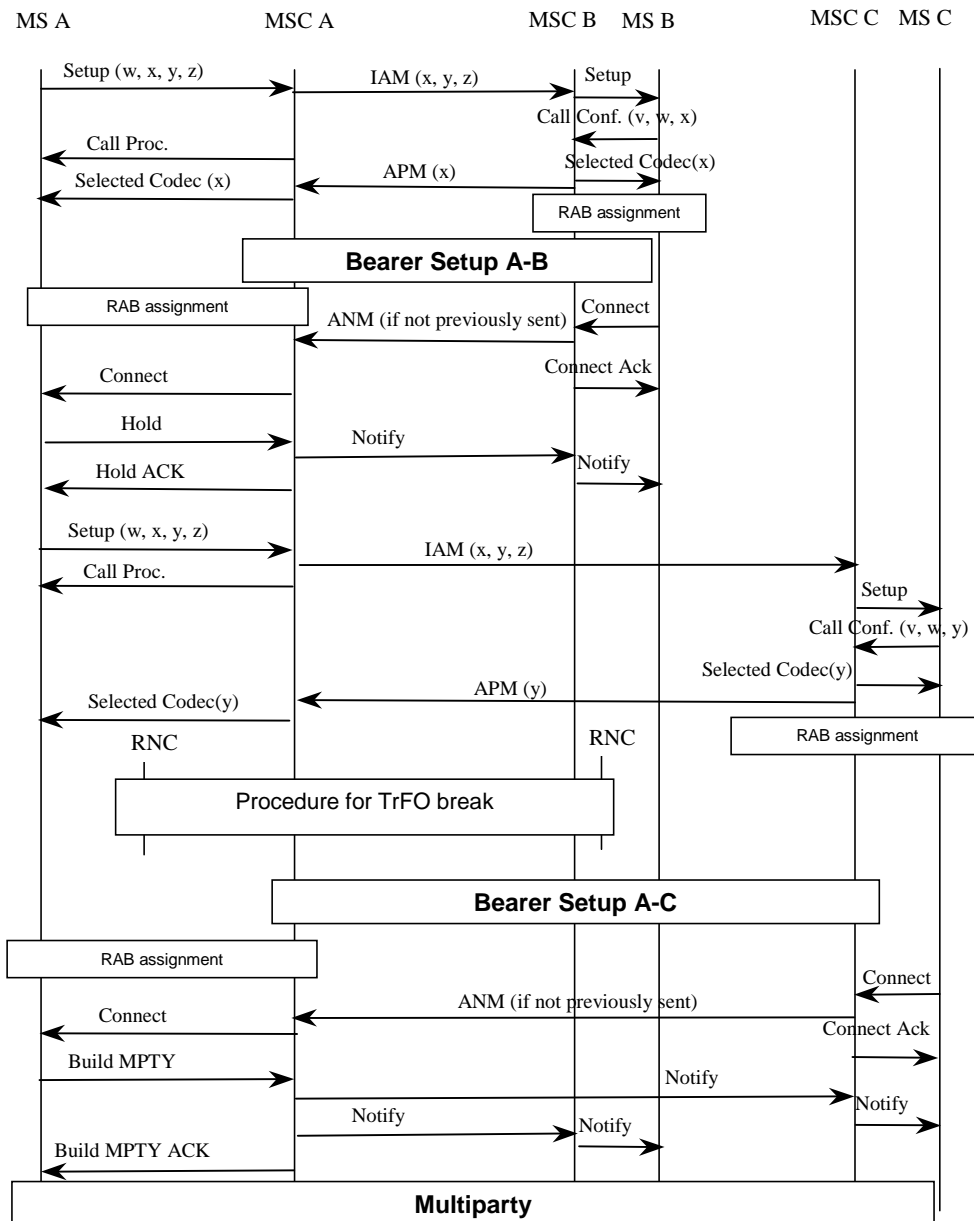


Figure 6.4/1 Interactions with Multiparty SS

**** Next modification ****

6.5 Information flow for handover from UMTS to GSM after TrFO establishment

[Note: Either Alternative 1 or Alternative 2 will remain, which is adopted by R3.]

[Alternative 1: Using C-plane for TrFO break]

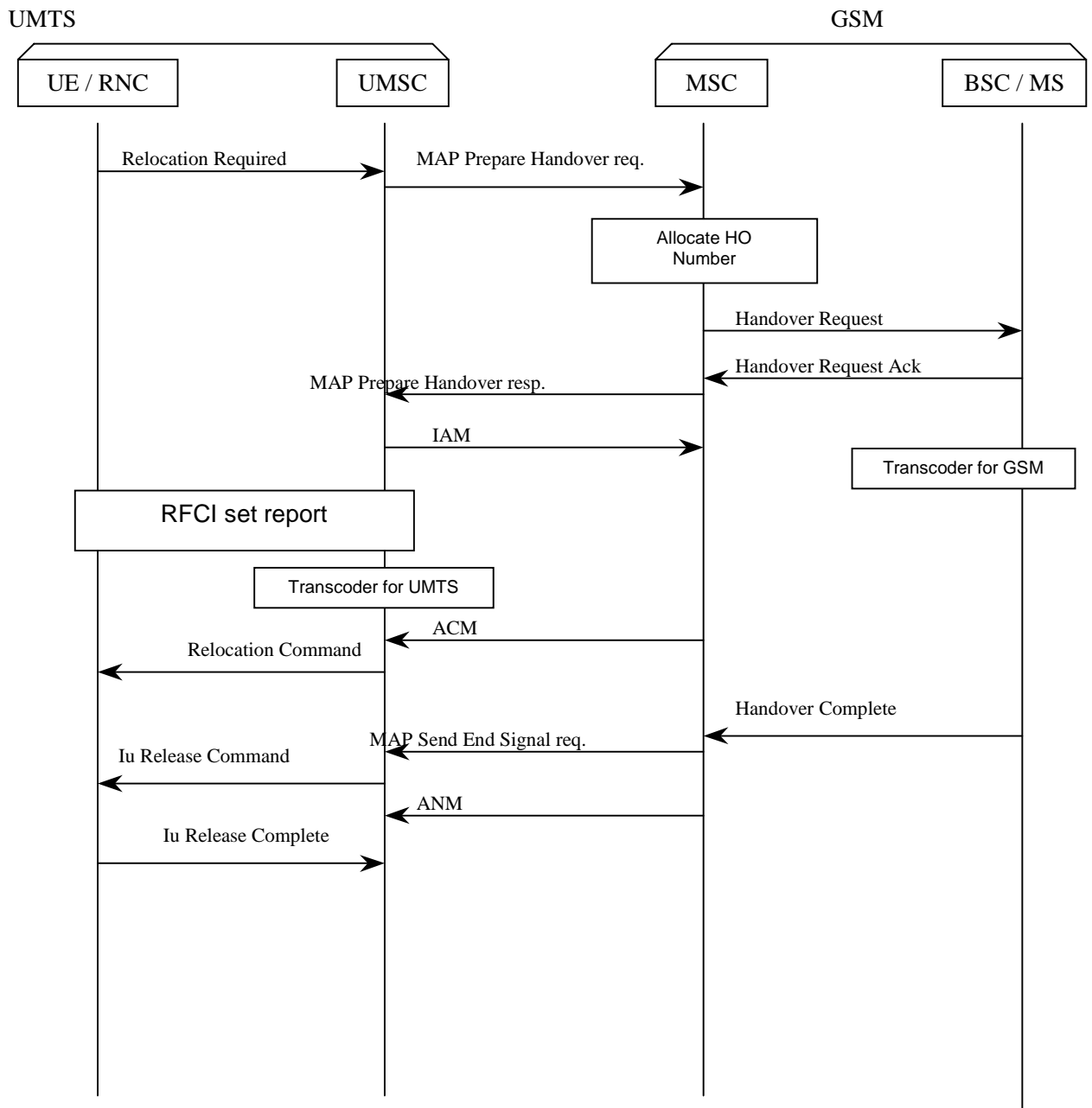


Figure 6.5/1 UMTS to GSM Handover after TrFO establishment

Figure 6.5/1 illustrates the way that transcoding will be handled for inter MSC Handover from UMTS to GSM. If the transport link between the UMSC and the MSC is TDM, then the UMSC invokes the RFCI set report procedure to obtain the used RFCI set from RNC. See TS 25.413 that defines it in detail.

When the procedure ends successfully, the UMSC inserts the transcoder for the peer UE, in which the permitted rate is set.

When the procedure ends unsuccessfully, the handover fails.

The GSM BSC will perform transcoding in the same manner, which currently used in GSM.

If the transport link between the UMSC and MSC is not TDM (e.g. AAL2 is

supported), then the codec negotiation between the UMSC and MSC will be performed using the procedures shown in subclause 6.1.1 and subclause 6.2.1. In this case, the MSC will transcode from low bit rate speech to PCM across the GSM A-interface. The BSC will order the transcoding according to normal operation.

[Alternative 2: Using U-plane for TrFO break]

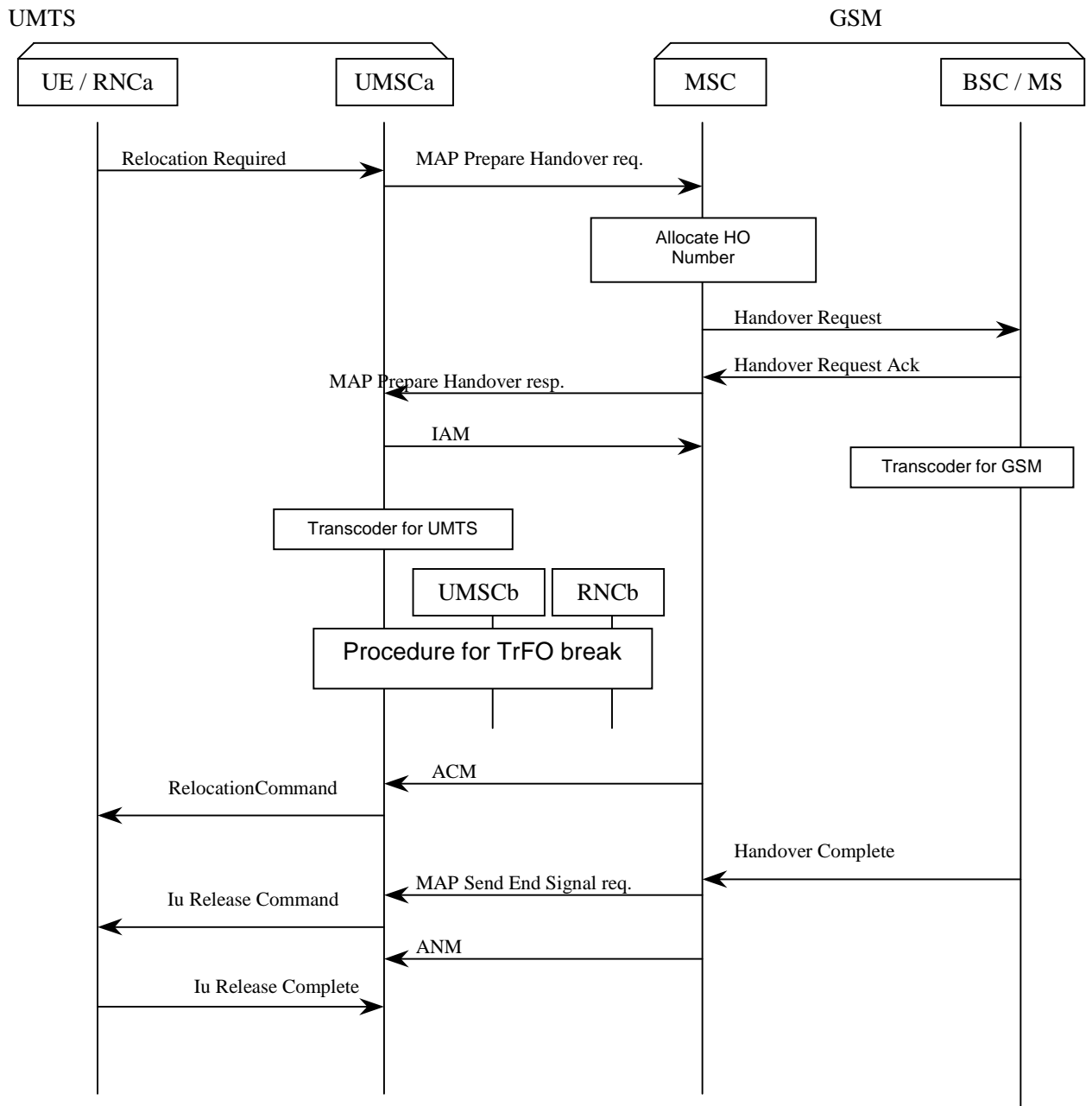


Figure 6.5/1 UMTS to GSM Handover after TrFO establishment

Figure 6.5/1 illustrates the way that transcoding will be handled for inter MSC Handover from UMTS to GSM. If the transport link between the UMSC and the MSC is TDM, then the UMSCa inserts the transcoder and the procedure for TrFO break is invoked between the transcoder and RNCb. See TS 25.415 that defines it in detail. The procedure doesn't interact with any call/bearer control entity in MSCs.

The GSM BSC will perform transcoding in the same manner, which currently used in GSM.

If the transport link between the UMSC and MSC is not TDM (e.g. AAL2 is supported), then the codec negotiation between the UMSC and MSC will be performed using the procedures shown in subclause 6.1.1 and subclause 6.2.1. In this case, the MSC will transcode from low bit rate speech to PCM across the GSM A-interface. The BSC will order the transcoding according to normal operation.

**** Next modification ****

6.6 Information flow for sending a tone or an announcement

[Note: Either Alternative 1 or Alternative 2 will remain, which is adopted by R3.]

[Alternative 1: Using C-plane for TrFO break]

In the case where TrFO is applied, the connection for the selected codec is established between the calling MSC(MSC-a) and the called MSC(MSC-b). Therefore, G.711 encoding tones and announcements can not transmit through the connection for the selected codec. The MSC-b must use the transcoder corresponding the selected codec in order to transmit the tone or the announcement to the calling MS (MS-a). After MSC-b receives the CONNECT message that is sent from the called MS (MS-b), MSC-b removes the transcoder and tone/announcement generator.

For example, figure 6.6/1 shows the case sending Ring Back Tone for alerting indication. After the codec negotiation and the bearer establishment, initialization for AMR is invoked between RNC-a and RNC-b. Then MSC-b receives the alert message and invokes RFCI set report to obtain the used RFCI set from RNC-b. See TS 25.413 that defines it in detail.

When the procedure ends successfully, the MSC-b inserts the transcoder, in which the permitted rate is set, and RBT generator.

When the procedure ends unsuccessfully, the call establishment may fail.

When MSC-b receives the connect message, it removes the transcoder and the tone generator.

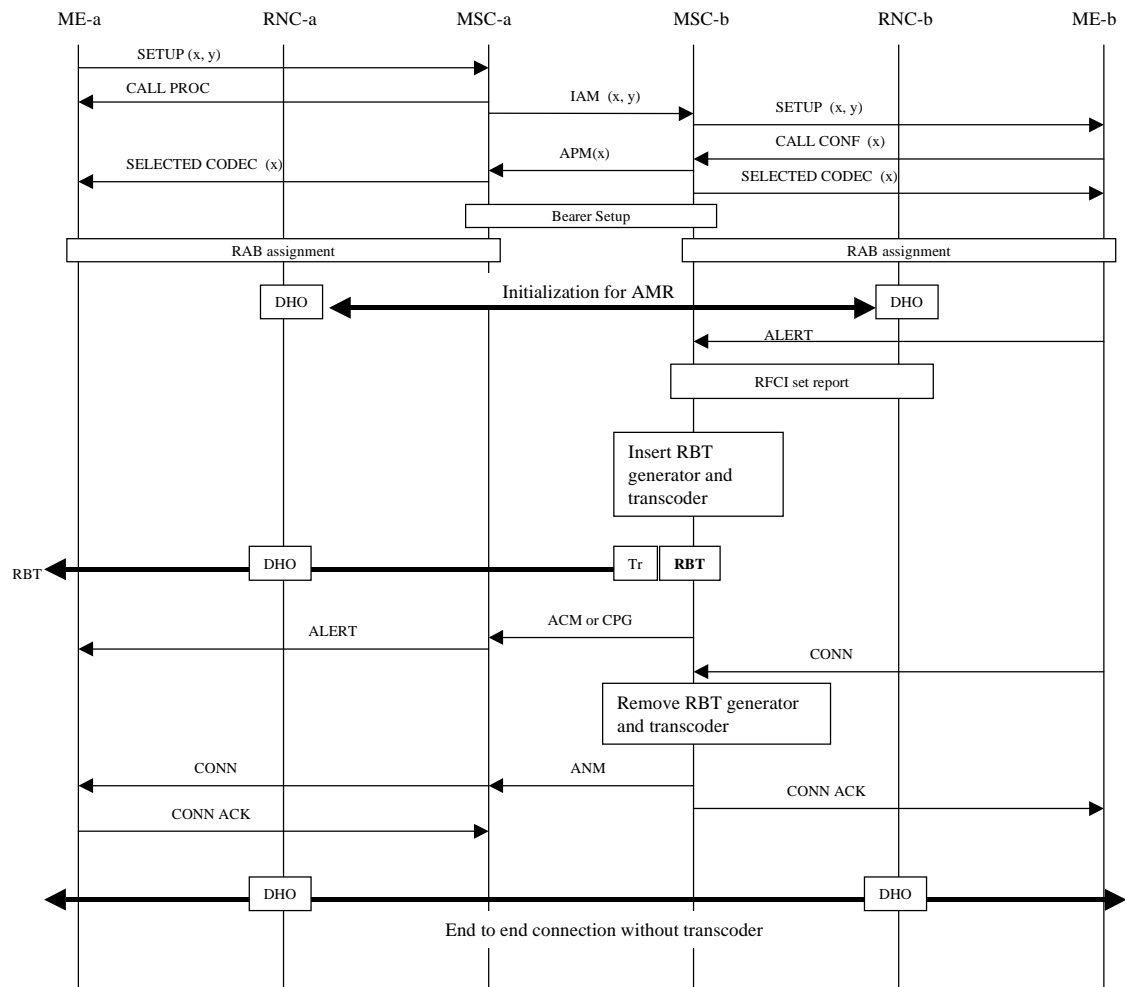


Figure 6.6/1 The procedure for sending RBT (alerting indication)

[Alternative 2: Using U-plane for TrFO break]

In the case where TrFO is applied, the connection for the selected codec is established between the calling MSC(MSC-a) and the called MSC(MSC-b). Therefore, G.711 encoding tones and announcements can not transmit through the connection for the selected codec. The MSC-b must use the transcoder corresponding the selected codec in order to transmit the tone or the announcement to the calling MS (MS-a). After MSC-b receives the CONNECT message that is sent from the called MS (MS-b), MSC-b removes the transcoder and tone/announcement generator.

For example, figure 6.6/1 shows the case sending Ring Back Tone for alerting indication. After the codec negotiation and the bearer establishment, initialization for AMR is invoked between RNC-a and RNC-b. Then MSC-b inserts the transcoder and RBT generator. Then, the procedure for TrFO break is invoked between RNC-a and the transcoder. See TS 25.415 that defines it in detail. The procedure doesn't interact with any call/bearer control entity in MSCs.

When MSC-b receives the connect message, it removes the transcoder and the tone generator.

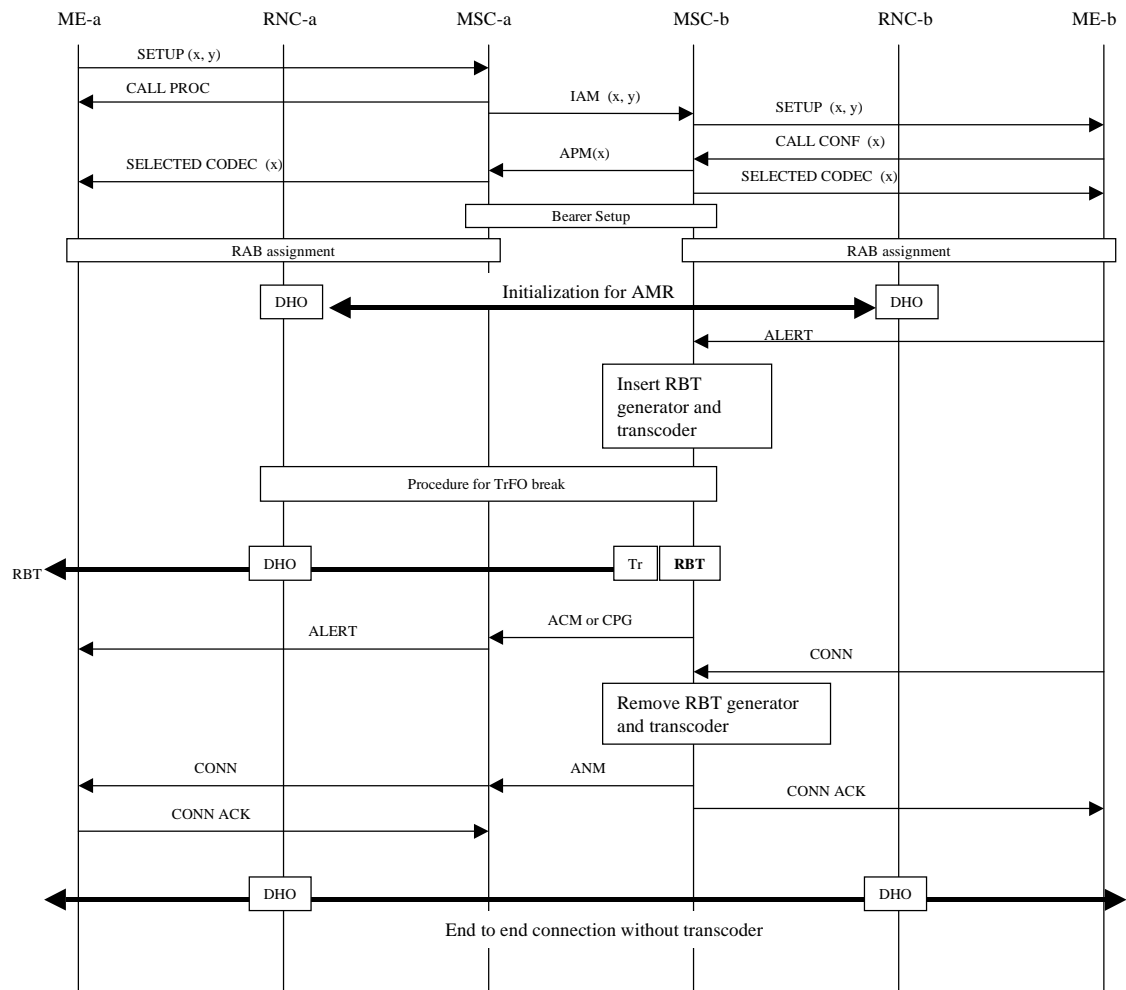


Figure 6.6/1 The procedure for sending RBT (alerting indication)