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ETSI SMG3 Plenary Meeting #6,
Nice, France
13th – 15th December 1999

Agenda item: **5.1.3**

Source: **TSG_N WG1**

Title: **TR on Work Item Multimedia**

Introduction:

This document contains TR agreed by **TSG_N WG1** and forwarded to **TSG_N Plenary** meeting **#6** for Information.

2 Documents are attached:

- Presentation of TR 23.972 to TSG
- TR 23.972 v.0.0.3

Presentation of Specification to TSG or WG

Presentation to: **TSG CN Meeting #6**

Document for presentation: **TR 23.972, Version 0.0.3**

Presented for: **Information**

Abstract of document:

This document collects the requirements and working assumptions for multimedia for release 99. The description is at a level of detail which is required in the detailed procedure design in N1 and N3, which is realized as CRs to 24.008 and 29.007.

Changes since last presentation to <TSG><WG> Meeting #<N>:

New document in TSG.

Outstanding Issues:

The target release of the fallback and swap between speech and multimedia functionalities is to be decided (see section 4.1 in the TR).

Contentious Issues:

See the outstanding issues.

3G TR 23.972 V0.0.3 (99-12)

Technical Report

3rd Generation Partnership Project; Technical Specification Group CN; Multimedia Telephony (3G TR 23.972 version 0.0.3)

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Contents

1 Introduction, Scope

This document collects the requirements and working assumptions for multimedia for release 99. The description is at a level of detail which is required in the detailed procedure design in N1 and N3.

The document covers the CS as well as the PS multimedia services; however, with focus on CS.

The target release for the Multimedia specifications is (in general) R99, and the specifications apply to UMTS as well as GSM.

2 References

[1] ITU-T Recommendation H.324: “Terminal for low bit-rate multimedia communication”

[2] ITU-T Recommendation H.223: “Multiplexing protocol for low bit rate multimedia communication”

[3] ITU-T Recommendation H.245: “Control protocol for multimedia communication”

[4] ITU-T Recommendation V.8: “Procedures for starting sessions of data transmission over the public switched telephone network”.

[5] ITU-T Recommendation V.8bis: “Procedures for the identification and selection of common modes of operation between data circuit-terminating equipment (DCEs) and between data terminal equipment (DTEs) over the general public switched telephone network and on leased point-to-point telephone-type circuits”.

[6] ITU-T Recommendation V.140: “Procedures for establishing communication between two multiprotocol audio-visual terminals using digital channels at a multiple of 64 or 56 kbit/s”.

[7] ITU-T Recommendation Q.931: “Digital subscriber signalling system no. 1 (DSS1) – ISDN user-network interface layer 3 specification for basic call control”.

[8] 3GPP 24.008: : "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification”.

[9] 3GPP 22.002: "Digital cellular telecommunications system (Phase 2+); Bearer Services (BS) supported by a GSM Public Land Mobile Network (PLMN)"

[10] 3GPP 22.972 "Real Time Multimedia" (Stage 1 description) – obsolete

[11] 3GPP 23.960 " Framework of Network Functions to support multimedia services in UMTS " ('guide-lines for the production of standards')

[12] 3GPP 26.111 " Codec for Circuit Switched Multimedia Telephony Service; Modifications to H.324"

[13] 3GPP 26.112 " Codec for Circuit Switched Multimedia Telephony Service; Call Setup Requirements" – created in S4 Codec adhoc, to be incorporated in various N1 and N3 specifications (and terminated).

[14] 3GPP 26.911 "Codec for Circuit Switched Multimedia Telephony Service"

[15] N1-99748 "Call Setup Procedure for interworking with H.320"

[16] N1-99749 "Indication for multimedia telephony in UMTS"

[17] N1-99750 "Rate Negotiation Procedure for Multimedia Telephony"

[18] N1-99971"Low rate 3G-H324M"

[19] N1-99973 "Proposal for additional point codes in UMTS Bearer Capability Information Element"

[20] N1-99A30 "CODEC Negotiation Procedure"

[21] N1-99A98 "LS – Joint N1/N3 to S1,S2,S4,N2: Liaison Statement on 3G-H.324M "

[22] N1-99B72 "LS – S2 to N1: Multimedia Call Control for UMTS R 99"

3 Multimedia call setup

3.1 Requirements

The following basic working assumptions are agreed or adopted in N1 and/or N3 to be supported in R99 or R00 (The target release is indicated for each issue):

- Circuit Switched (CS) multimedia will be based on H324 terminal, more specifically a mobile specific subset H.324/M and even more specifically a 3G-variant called 3G-324M [12]. (R99)
- Packet Switched (PS) multimedia will be based on H.323 [21]. (R99)
- All call scenarios shall be supported, i.e. Mobile Originating and Mobile Terminating call against Mobile (including 2G), ISDN and PSTN call party. (R99)
- CS Multimedia telephony is a Bearer Service, which utilizes Synchronous Transparent Data service (BS30) [9]. However, it bears some Teleservice-like characteristics, as the application (H.324 information) must be signalled to the network (for invoking appropriate Interworking equipment) and to the peer end terminal (R99)
- Single and multiple numbering. (R99)
- Speech fallback, i.e. if setup of the multimedia call fails the call will be set up as a speech call. The specific fallback cases are fallback from UDI to speech and fallback from 3.1kHz to speech (R99+ [1] or R00).
- Fallback from UDI call setup attempt to 3.1 kHz call setup would increase user friendliness of multimedia call. (see section 6.2). As an alternative to MSC-engineered fallback, call retry, performed either by MSC or MS (which seems to be preferred) by MS has been proposed. [13] (R99+ or R00)
- In-call modification:
  - Modification of call type from speech call to multimedia call (and vice versa) during call – outband approach (see 6.1.1.1). (R99+ or R00)
  - Modification of call type from speech call to multimedia call (and vice versa) during call – inband approach (see 6.1.1.2). (R00)
  - Service degradation and upgrading (see section 6.1.2) (R00)
- End-to-end user rate negotiation. (R00)
- H.324 - H.323 interworking. (R00 or later)
- H.324 - H.320 interworking. [15] (R00)

3.2 Indication and Coding of 3G-324M during Setup

3.2.1 Call Type

Call type indication during 3G-324M call setup is a necessity, no matter what is the agreed required service for this type of call in mobile environment. Both network and the remote-end need to know it to better coordinate the process, invoke interworking unit required in the connecting nodes and also to invoke the application at the remote-end. H.223 & H.245

[1] R99+ = Features which are approved (by TSGN plenary) to be added to R99 after December 99

are low layer requirements for 3G-324M and this is considered to reflect 3G-324M uniquely and thus should/could be used for call type indication for 3G-324M call.

It has been agreed in N1 to indicate ‘H.223 & H.245’ as ‘Other Rate Adaptation’ in the UMTS BC (N1-99973). This shall be mapped into ‘H.223 & H.245’ as user information layer 1 protocol in the ISDN BC. This is following the existing principles in 24.008.

3.2.2 Data Rates

3G-324M call is to be supported by different bitrates in different networks and, more specifically, different bitrates could be available within the considered networks. On the other hand, the application itself has the flexibility to operate within a range of bitrates sacrificing performance upto certain extent. This gives the scope of indicating supporting rates by the originating terminal at setup and enhances the possibility of advanced fallback (UDI/RDI to 3.1 kHz, as mentioned in section 3.6) during setup. This might help in providing sophisticated in-call upgrade or downgrade feature, depending on the resource availability and end users' intention. Thus, situation like Handover could be better taken care of and end-users might find it feasible to have it at different charging rates.

However, current standards do not allow indication of H.324 call and rate adaptation at the same time.
It does not make sense to indicate a user rate for ‘H.223 & H.245’ in ISUP, since H.223 rate adaptation is always up to 28.8/33.6 kbps for modem call and 56/64 kbps for RDI/UDI calls. Since this is a mobile specific requirement, it should be handled within the mobile network as for other bearer services (in the IWF), not impacting the fixed network signalling.
The current working assumptions in 3GPP does not contain any solution to this problem.

The following list contains the required bitrate options for internetwork 3G-324M call within the range of application requirement:

- 64, 56, 33.6, 32 and 28.8 kbps for Mobile to Mobile call
- 64 and 56 kbps for Mobile to/from N-ISDN call
- 33.6 and 28.8 kbps for Mobile to/from PSTN call
- 32 kbps for Mobile to/from PHS call [16]

Possibility of multiple 64/56 kbps channels for a single call to enhance performance is FFS.

3.2.3 User rate renegotiation.

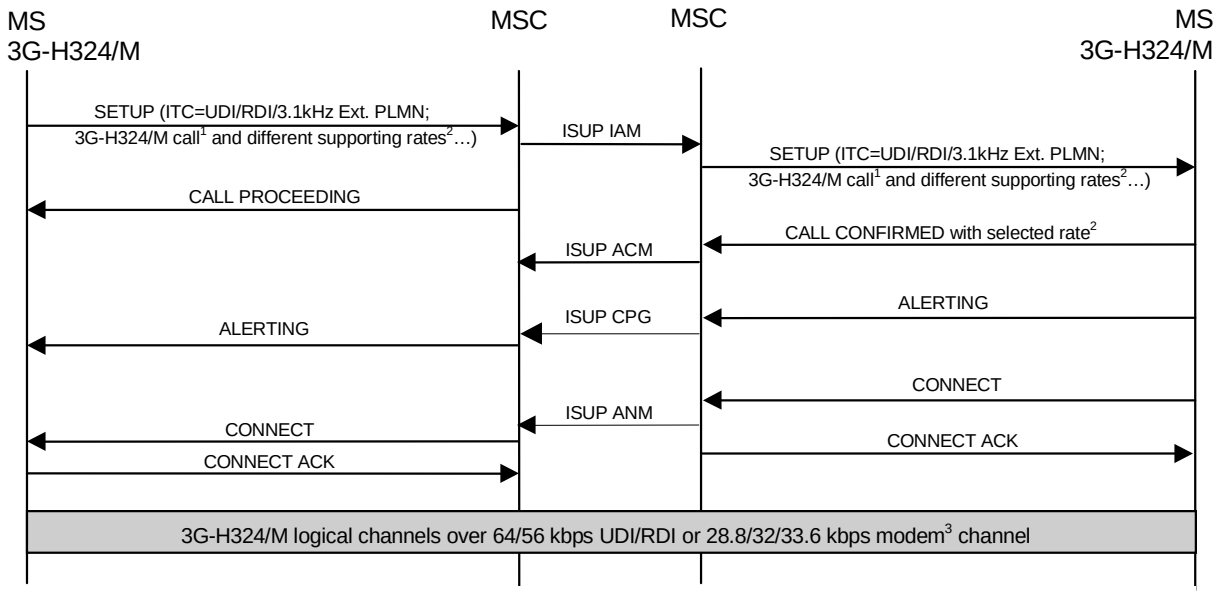
There does not exist a feasible end-to-end signalling solution for user rate negotiation. However, it can be handled in a similar way as the user rate indication by providing H.223 rate adapation in the IWF. Change of user rate can be requested by the subscriber by invoking an 24.008 MODIFY procedure (with a new user rate). See item 0 in section 6.1.

3.2.4 Versions

In the future, need to indicate supported 3G-324M versions might arise. The feature and actual coding it is FFS.

3.3 Mobile to Mobile Call

Mobile to mobile 3G-324M call is a basic feature required in R99. Figure 1 shows a general view of call setup in this regard.



[1]coded as 'OTH_RA (Other Rate Adaption)= H.223 & H.245'
[2]FFS
[3] for 3.1 kHz Ext. PLMN case modem in MSC/IWF will be included and according channel will be activated after V.34 (V.8/V.8*bis*) negotiation

Figure 1: General Mobile to Mobile 3G-324M call setup procedure

ITC in SETUP message will be either UDI/RDI or 3.1 kHz Ext. PLMN depending on the supporting ability of both the ends. Inclusion of 3.1 kHz mode will provide flexibility of providing multimedia call support even if any intermediate network part does not support desired UDI/RDI mode, but the originating end must know about it before hand and needs V.140/V.34 negotiation and thus V.8/V.8*bis* support in MSC/IWF. The SETUP message shall also include call type indication for 3G-324M call (and possibly supporting rates). CALL CONFIRMED message at the end-leg will indicate the selected rate. Proper field and coding of call type and different supporting rates are still FFS and some of the proposals in this regard are mentioned in section 6.1.

Fallback to speech due to 3G-324M call handshaking failure, in any case of ITC, is considered to be integral service to be provided to the end-user**2**.

3.4 Mobile to/from PSTN call

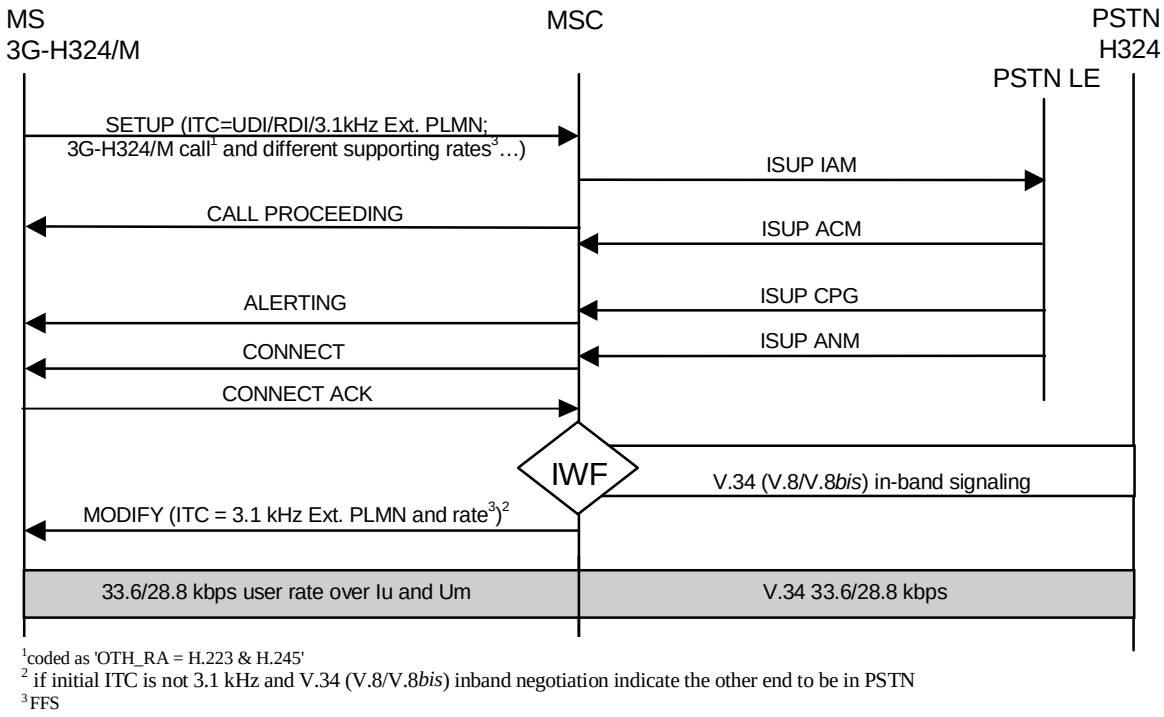
Mobile to/from PSTN 3G-324M (H324) call is also considered as basic requirement for R99. Modem in MSC/IWF needs to conform corresponding V.8 [4], and optionally V.8*bis* [5], signalling for this case involving PSTN. The scenario can be separated into Mobile Originated (MO) and Mobile Terminated (MT) cases and fallback to speech**2**, in any case of call origination, due to 3G-324M call modem handshaking failure is considered to be integral service to be provided to the end-user.

3.4.1 MO case

The general signalling situation for this case is shown in Figure 2. This case indicates the necessity of including IWF in MSC, as soon as it receives a SETUP message from an MS with the indication of a 3G-324M call, no matter what is the ITC there. So that, having no connection to the remote terminal after the outband approach, as the other end is in PSTN, the IWF start modem (V.34) handshaking and thus comes to know about the fact. Then, with the help of MODIFY message to the MS the MSC/IWF initiates the change of the connection to 3.1 kHz Ext. PLMN, if this was not originally requested. This fallback from attempted UDI call to 3.1kHz is currently FFS (see section 6.2).

2 The target release for fallback to speech is still open.

This approach does not solve the case in which the transit networks are only 3.1 kHz capable. In that case a UDI/RDI call setup would still fail. However, this case is believed to be quite rare, and a user/terminal in such a network would probably configure the terminal to attempt ITC=3.1kHz. A more common scenario is that setup of a digital connection (also over PSTN) succeeds, but the peer end turns out to be an analogue device.



[1]coded as 'OTH_RA = H.223 & H.245'
[2] if initial ITC is not 3.1 kHz and V.34 (V.8/V.8*bis*) inband negotiation indicate the other end to be in PSTN
[3]FFS

Figure 2: General Mobile to PSTN 3G-324M (H324) call setup procedure

3.4.2 MT Case

The case can be separated as Multi-numbering and Single-numbering scheme, as described below:

3.4.2.1 Multi-numbering Scheme

In this scheme separate MSISDN (E.164) is assigned for different applications within one terminal and service required for different applications and corresponding MSISDN is stored in VLR. So, when a call is coming from PSTN end, the terminating MSC knows about it from VLR and send SETUP message to the terminating MS indicating the 3.1 kHz Ext. PLMN as ITC, 3G-324M as call type and other required corresponding parameters. The general signalling sequence for call setup in this case is shown in Figure 3.

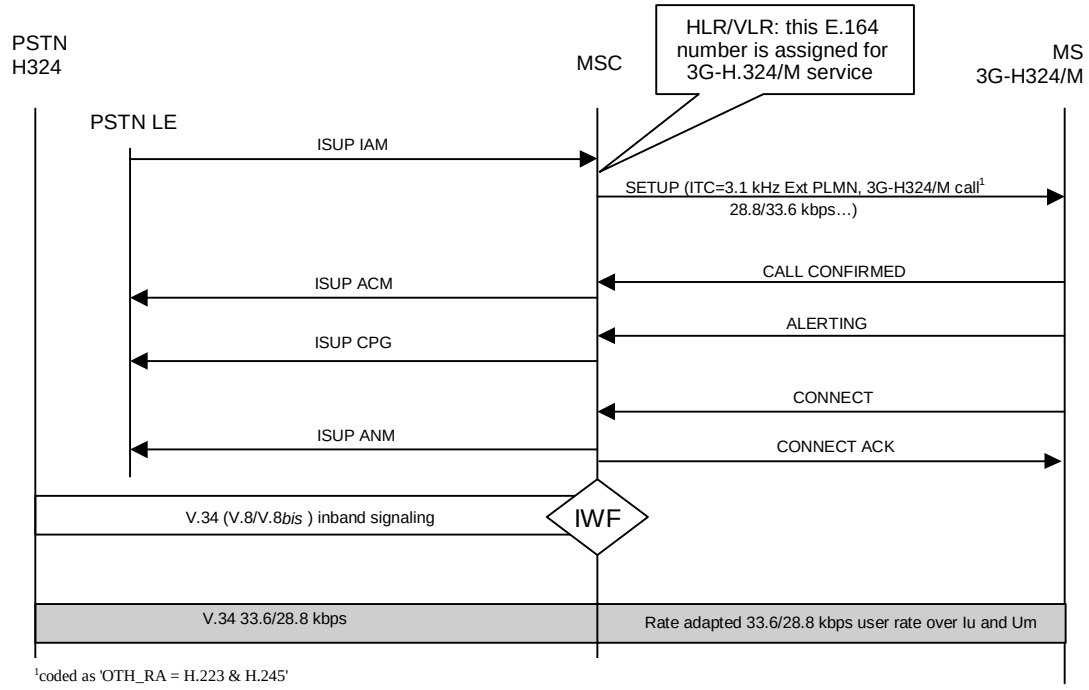


Figure 3: General PSTN to Mobile 3G-324M (H324) call setup procedure for Multi-numbering scheme

3.4.2.2 Single-numbering Scheme

The terminating MSC does not get any BC information from the ISUP IAM and thus sends the SETUP to terminating MS with empty BC IE. This will allow the terminating MS to acknowledge by sending CALL CONFIRMED message back with BC IE which indicates supported/desired type of call. The probability of a successful call setup could be enhanced if the terminating MS were allowed to include several BC_IE-elements in the CALL CONFIRMED message, thus enabling a call type negotiation. This functionality is currently FFS. With current specification it is recommended to put 3.1 kHz Ext. PLMN as ITC in the only allowed BC IE. After this IWF is invoked by MSC and inband modem handshaking leads to setting the connection according to the inband modem negotiation. The signalling scenario for the case is shown in Figure 4.

A problem with this scenario is, that an incoming speech call coming without BC IE, which is responded with multimedia BCIE (i.e. ITC=3.1 kHz Ext. PLMN and Other Rate Adaption=H.223/H.245),will have to wait for modem negotiation, before the fallback to speech, even if the call does not need modem connection, requiring some extra time. A plain speech call, i.e. the called MS responds with only speech BCIE, will however not be affected, as the modem is not invoked in this case.

An alternative to the multiple BC_IEs is to rely on in-call modification, when that is available.

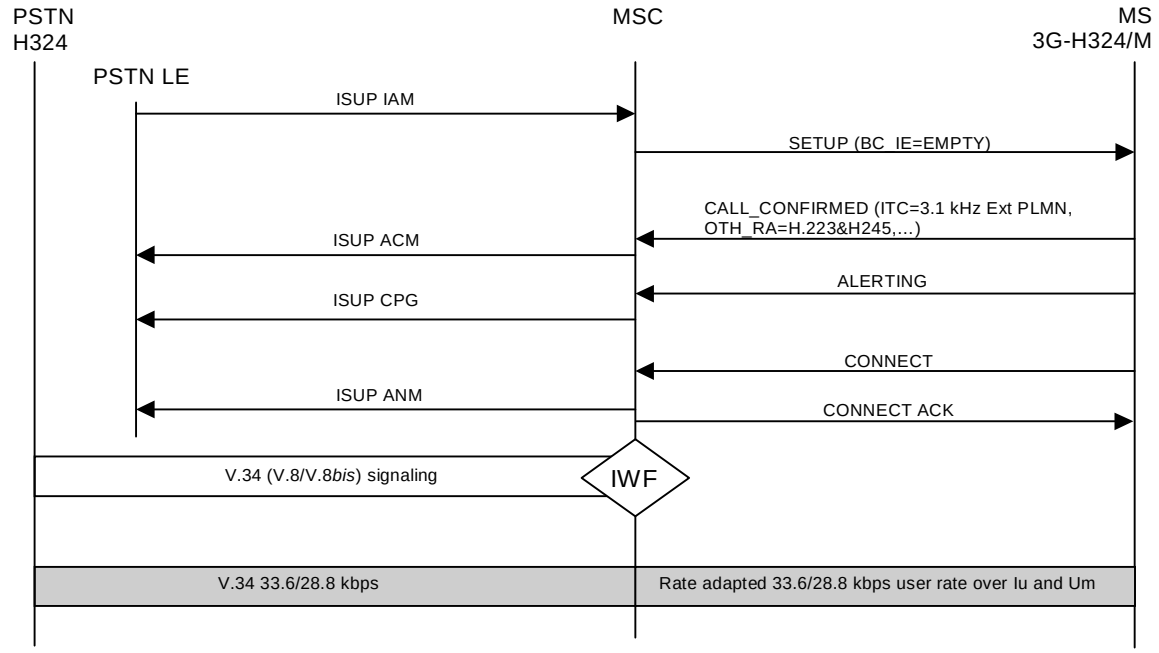


Figure 4: General PSTN to Mobile 3G-324M (H324) call setup procedure for single-numbering scheme

3.5 Mobile to/from ISDN call

3G-324M call from/to N-ISDN to/from Mobile end is another basic requirement for R99. The application in N-ISDN side should conform to H.324 Annex D – H.324/I. The other assumption in this regard is within digital PLMN-ISDN domain the 24.008 [8] call control signalling should be interworking with corresponding Q.931 [7] call control signalling. It is expected that H.324/I terminals will always use whole B channel – 64/56 kbps, for the purpose.

3.5.1 MO case

Figure 5 shows the Mobile to N-ISDN 3G-324M (H324/I) call setup signalling procedure. In this case, the originating MS needs to know about the ITC (UDI/RDI) capability of the called end beforehand.

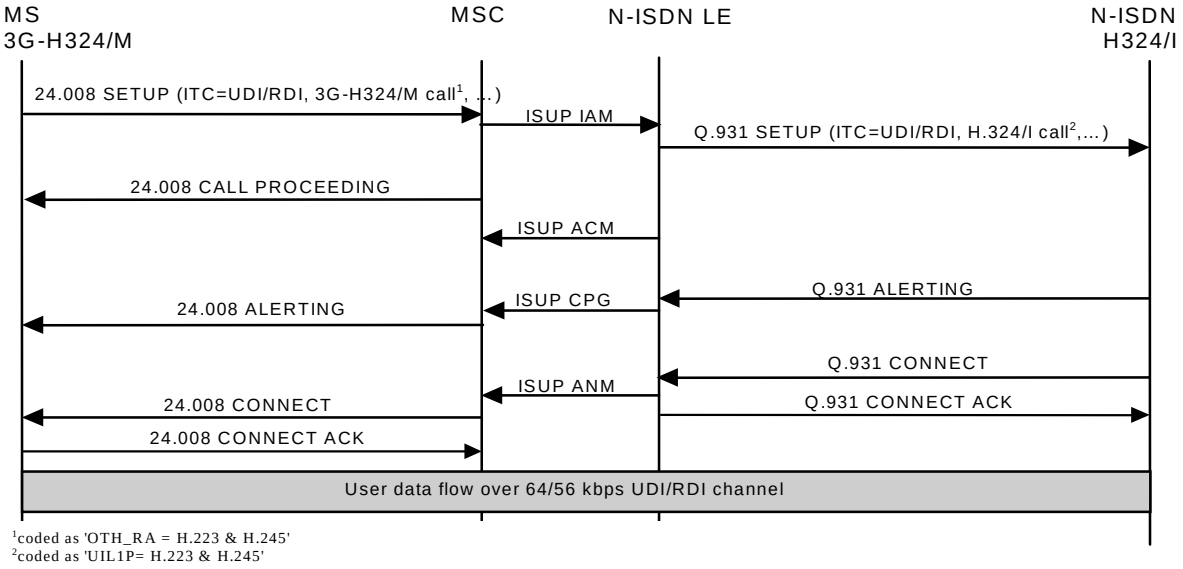


Figure 5: Mobile to N-ISDN general 3G-324M (H.324/I) call setup procedure

3.5.2 MT case

N-ISDN to Mobile 3G-324M (H.324/I) call setup signalling procedure is shown in Figure 6 and scope for further study as mentioned in MO case just above is equally applicable for this case as well.

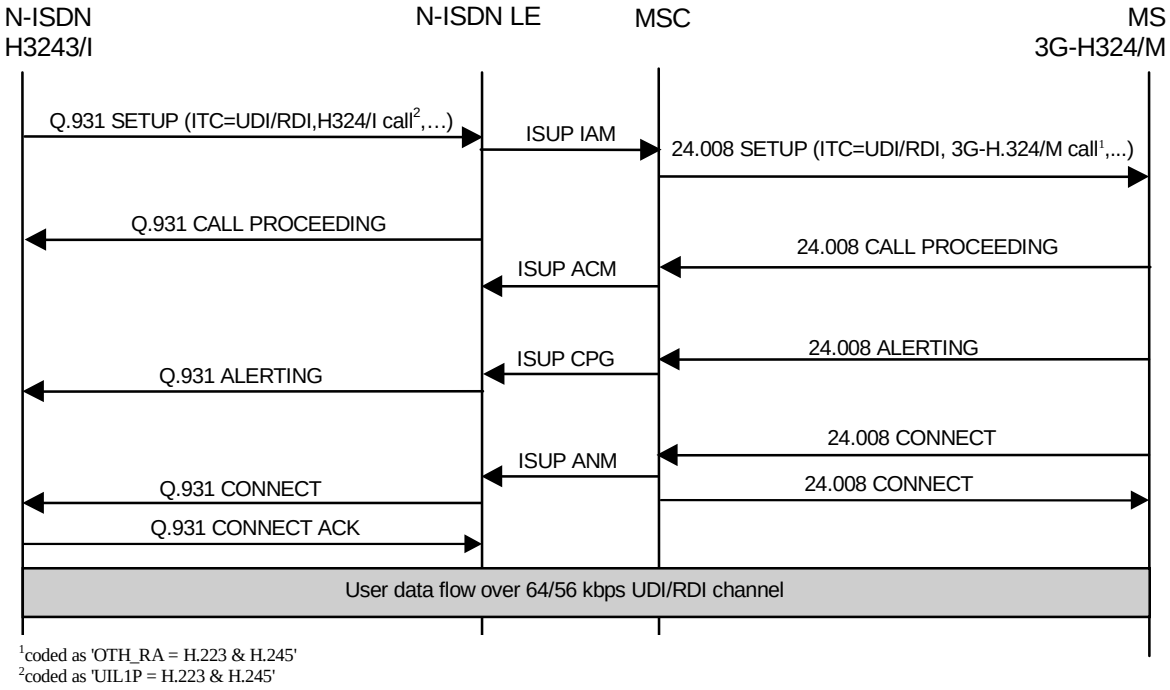


Figure 6: N-ISDN to Mobile general H.324/I-3G-324M call setup procedure

4 Supplementary services

As CS multimedia telephony utilizes general bearer service (BS30), by default SSs apply according to [24.004 Annex A]. The following points regarding applicability of SSs for BS30, may be noted.

- Call Hold does not apply to data calls. H.324 does not cope with a held/suspended transmission path.
- Multiparty does not apply to data calls. Corresponding functionality can be provided by external conference devices (MCU, Multipoint Communication Unit). Alternatively multimedia/video conference call could be implemented in the terminal through multicall.
- Explicit Call Transfer does not apply to data calls. Now as data calls are used for human communication there may be a need to be able to transfer the call to a third party. But as H.324 does not tolerate a broken data connection this issues if FFS.
- Calling NAme Presentation does not apply to data call. The need is equal to that of speech call -> FFS.
- There may be need for multimedia call specific Call Barring. FFS

5 Multimedia work plan, Specification changes

This section summarizes the required specification changes required for support of multimedia call in R99 (and later releases) in detail.

Item	Tdoc/CR	Specification	Change	Status
Coding of 3G-324M-indication in BC_IE	N1-99E88	24.008	- Add code point 'H.223 & H.245' to Other Rate Adaptation	Agreed (?)
Rev. CR TO 29.007 v3.2.0-INTERWORKING WITH H.324/I.	N3-99508	29.007		Agreed
REV CR to 27.001 for INTRODUCTION OF MULTIMEDIA	N3-99502	27.001		Agreed
Multimedia CR	N1-99D84 / 070	24.008	Add description of multimedia call handling	Not approved
Multimedia CR	N3-99393	29.007	Add description of multimedia call handling	Not approved

6 Open issues

The following list contains features, which are proposed, but not yet agreed in N1/N3. The items should be evaluated in order to determine the target release for the feature – whether it is important enough, and possible to realize in R99, or if it will be postponed to R00 or later:

- Subscription issues – need to be clarified for R99.
- Multiple 56/64 kbps channels for one call.
- In the future, it may be possible to have an end-to-end signalling solution for user rate negotiations., based on BICC.
- Indication of 3G-324M version information.
- Call type negotiation of terminating call by allowing several BC-elements in the CALL CONFIRMED message. The BC-elements could be in priority order[3]. See section 3.4.2.2.

The following sections contain descriptions of various open issues.

6.1 In-call modification

6.1.1 Modification of call type - Speech first, swap to H.324

Option of starting 3G-324M call with speech mode first and then switching to H.324 mode depending on end-users' intention is a requirement in R99 or R00 (which one is to be decided). The feature could be achieved both through outband and inband approach and are discussed under separate sections below.

6.1.1.1 Outband Approach

The call would start as a normal speech call with speech indicated in BC IE, with no pre-indication about H.324 call. When user wants to switch to H.324 call an In-Call-Modification message from originating terminal, indicating BS requirement for 3G-324M call in BC IE, would change the mode of the call from speech to 3G-324M call. This approach would support the opposite case as well – H.324 first, swap to speech and thus toggling between the two modes of the call.Existing Recommendations do not support of switching to a mode not pre-notified and thus the

[3] The multiple BC_IEs indicate the desired type of call, set by the user in order of preference, e.g. primarily multimedia call, secondarily speech etc.

approach needs further change in existing Recommendation. End-to-end UDI/RDI connection (most mobile and N-ISDN cases) should be working fine with the approach, provided mentioned changes are ratified and implemented. But connection involving modem (PSTN and some mobile/N-ISDN cases) seems to need additional attention from users' side - both the users must invoke the modem within a certain time window (2 seconds) in relation to each other, otherwise the modem handshake would fail, resulting in failure of the call.

Furthermore signalling of the modification procedure over ISDN/PSTN networks, required for and end-to-end solution, is a problem to be solved. BICC may provide the solution.

Consequently a full solution can not be expected before R00, however, a partial solution (i.e. intra-PLMN call) is targetted for R99+ or R00.

6.1.1.2 Inband Approach

On the other hand, V.8*bis* support should be accomplished in IWF to provide inband speech-call-first feature. Again, this is something which is not present in existing implementation and the H.324 [1] Recommendation also mentions the support to be optional. There are many ways to have inter-modem V.8*bis* [5] transactions and the Recommendation mentions about 13 different ways. Some of those do not support speech-call-first feature, while some provide some additional features. Transaction number 2 could/should be a good candidate for providing the feature with less complexity. But, still further study is required for selecting best possible V.8*bis* transaction.

The target release of the inband approach is R00.

6.1.2 NW initiated call modification

6.1.2.1 Service degradation

When during a multimedia call the available bandwidth decreases (e.g. due to Handover to a congested area) there may be a need for modification of call type.

H.324 can cope with change of transmission speed, but if available data rate is below 28,8 kbps, the network should initiate a modification downgrading the call to speech. (It should be noted that the fallback to speech only could be within the multimedia call. That would be a much simpler approach in which only the bandwidth needs to be adapted (see option 10) in section 6.3). It would then also be easier to add a video stream once enough bandwidth is available again.) - FFS

6.1.2.2 Upgrading service

If at call setup the requested resources can not be granted (e.g. a requested H.324 call is set up (through fallback) as a speech call), and later during the call requested resources become available (H.324 call would be possible in the example), it must be determined if this upgrading should be done. This NW functionality must be optional. The issue is FFS.

6.2 UDI/RDI fallback to 3.1 kHz

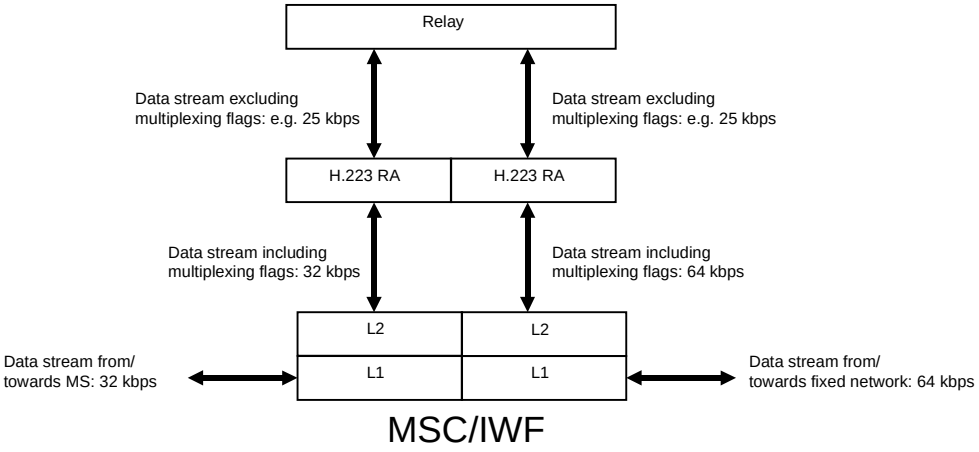
One more important fallback aspect, which is not mentioned before in any of the intra and internetwork 3G-324M (H324, H324/I) call cases, is fallback from UDI/RDI to 3.1 kHz and would be nice to have it in R99. The subjected application is expected to work in different internetwork cases and, more importantly, there are considerable variations in providing services within different networks depending on implementation. This fallback issue will help to provide bridges among some of these variations. On the other hand, vulnerable mobile atmosphere could still support the birate-hungry application during worse situation by implementing this fallback feature.

The main advantage of this type of fallback is the originating end does not necessarily need to know the ITC capabilities of terminating terminals. In this case failure in UDI/RDI handshaking will include IWF and initiates modem handshaking, resulting 3.1 kHz modem connection, provided the terminating end also support 3.1 kHz mode of the application. Lower bitrate indication in outband signalling during call setup will definitely help this type of fallback, as

mentioned in section 3.2.2.3, and would need to include IWF in MSC even if ITC is UDI/RDI with 3G-324M indication, as mentioned in section 3.4.1.

6.3 H.223 Rate Adaption

An alternative to support low data rate multimedia has been presented in N1-99971. It proposes terminating H.223M in the MSC/IWF and then using HDLC flags for rate adaptation. The alternative described is rather straightforward. Furthermore, it provides a solution to all the requirements on supporting user rates for 3G.324M (low user rates and also change of user rate during the call). It bases on the technique that the IWF removes all stuffing flags on the receiving side and inserts stuffing flags on the sending side (thereby allowing different rates on either side):



A drawback with this solution may be that the approach needs gateway sort of thing in MSC/IWF to handle H.223M flags making the scenario very complex and requiring much to do. On the other hand, rate negotiation is not that way taken care of in the approach - it is rather more rate adaptation.

7 History

Document history		
0.0.1	1999-10-21	First draft for publication in N1#8
0.0.2	1999-10-29	Revised version for approval in N1#8
0.0.3	1999-12-09	Revised after N1#9, for presentation in TSG#6