Technical Specification Group Services and System Aspects *TSGS#25(04)0535*
Meeting #25, Palm Springs, USA

Presentation of Specification to TSG or WG

Presentation to:	**TSG SA Meeting #25**
Document for presentation:	**TR 23.903, Version 1.0.0**
Presented for:	**Information**

Abstract of document:

TR 23.903, ìRedial Solution for Voice-Video Switchingî, describes the idle mode redial mechanism which 3GPP based systems can use to enhance switching between circuit switched voice and video services.

Changes since last presentation to TSG SA:

This is the first time that this TR is presented to TSG SA.

TSG SA 2 believes that this version of TR 23.903 is more than 50% complete.

Outstanding Issues:

Within this version of the TR, the open issues are clearly listed. The more significant ones include:

1) how can the UE detect that ìvideo coverageî is available during a UTRAN and/or GERAN voice call?
2) how to reliably transfer the ìcause for releaseî information between MSCs?
3) how should the video call handovers from 3G to 2G be curtailed?
4) how to reliably handle fallback from UTRAN to GSM when the 3G and 2G cells are in different Routeing/Location areas?

It is anticipated that the open issues can be resolved before TSG SA #26.

Contentious Issues:

None are currently identified.

3GPP TR 23.903 V1.0.0 (2004-09)

Technical Report

3rd Generation Partnership Project; Technical Specification Group Services and System Aspects ; Redial Solution for Voice-Video Switching; Release 6

Select keywords from list provided in specs database.

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Contents

Foreword

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

The contents of the present document are subject to continuing work within the TSG and may change following formal TSG approval. Should the TSG modify the contents of the present document, it will be re-released by the TSG with an identifying change of release date and an increase in version number as follows:

Version x.y.z

where:

- x the first digit:
  - 1 presented to TSG for information;
  - 2 presented to TSG for approval;
  - 3 or greater indicates TSG approved document under change control.
- y the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- z the third digit is incremented when editorial only changes have been incorporated in the document.

Introduction

Many 3GPP operators regard circuit switched video services as a key part of UMTS. However there is a strong desire to have an effective and user friendly method of switching between voice and video services when the user desires and/or when radio conditions change and video mode is no longer available.

Following a study of alternative mechanisms, this Technical Report describes the idle mode redial mechanism which 3GPP based systems can use to enhance switching between voice and video services.

1 Scope

The present document describes the idle mode redial mechanism which 3GPP based systems can use to enhance switching between circuit switched voice and video services.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non-specific.
- For a specific reference, subsequent revisions do not apply.
- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

3 Definitions, symbols and abbreviations

Delete from the above heading those words which are not applicable.

Subclause numbering depends on applicability and should be renumbered accordingly.

3.1 Definitions

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

A party: the calling party.

B party: the called party.

Editorís note: the following definitions are FFS:

VA party: the party that transmits the video call request. (The VA party may be the A party or the B party of any preceding voice call. It is the B party if, for example, the B party pushes the ì switch to videoî button during a voice call initiated by the A party.)

VB party: the party that receives the video call request.

3.2 Symbols

For the purposes of the present document, the following symbols apply:

Symbol format

<symbol> <Explanation>

3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

Abbreviation format

<ACRONYM> <Explanation>

4 Description of idle mode redial switching between voice and video

4.1 General Description

This ìIdle-Mode Redialî mechanism is a combination of existing Voice call and Video call standards and services. It is a ìterminal-centricî solution that requires only minimal additional support from the UTRAN, GERAN and Core Network. There are 3 main components to the solution:

a) Switching between voice and video during an established call is achieved by one UE releasing the voice (or video) call and then that UE establishing a video (or voice) call with the same destination UE.

b) During a video call, the radio coverage at one end may degrade such that the video call cannot be maintained. In this case the video call will be released, and, the UE that initiated the video call can then automatically attempt to establish a voice call with the other party.

c) The initial establishment of a video call may be unsuccessful, in which case the A party can automatically establish a voice call.

For all these 3 cases, optimisation of the Man Machine Interface in the UE is possible and desirable.

Note: there may be tradeoffs between ëspeed of redialí and interactions with content servers that only support video calls. In particular, the use of the term ìautomaticî does not prevent the UE requesting confirmation from the user.

It is not the intention of this TR to specify the MMI of UEs, however, this TR does describe some MMI actions solely for the purpose of easing the description of the procedures.

4.2 User initiated switching during an established call

4.2.1 Signalling flows and procedures

The successful case of the "B party initiated switch to video" for UMTS is illustrated in Figure 1.

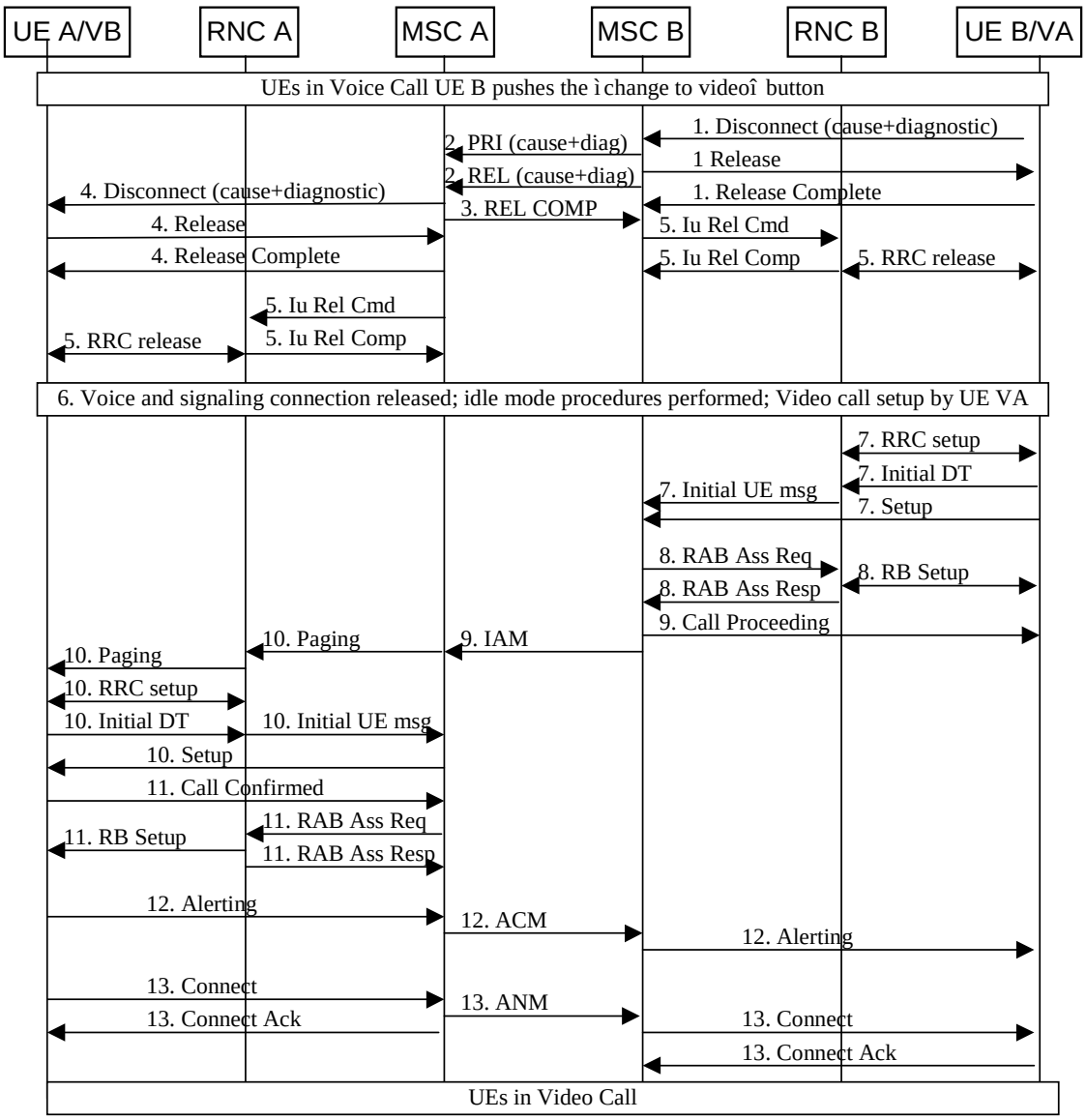

Figure 1: B party initiated switch to video

0) The UEs are in a voice call initiated by UE A. Following verbal dialogue between User A and User B, they agree that a switch to video is likely to be successful (e.g. because both User A and User B have video capable handsets, and, they both have "using 3G" indications visible on their screens). The User of UE B pushes the "switch to video" button (or uses other MMI that provides the same functionality) and stores the CLI of UE A for use in step 7.

Note: if UE A (instead of UE B) initiated the ìswitch to videoî, then UE A stores the previously dialled number for use in step 7.

1) UE B releases the voice call. The Disconnect message carries a specific cause value and a specific diagnostic information that indicates that UE B intends to establish a video call to UE A.

2) MSC B sends a Pre-release Information (PRI) message to MSC A with a release cause and the diagnostic information, e.g. "re-establishment with new Bearer capability expected". This is followed by a RELEASE message with the same release cause and diagnostic information. The cause value and diagnostic information in the mandatory RELEASE message might be changed by transit networks prior to arrival at MSC A.

   MSC B and MSC A record the release cause and diagnostic information on the CDRs.

3) MSC A sends a RELEASE COMPLETE message to MSC B.

4) MSC A releases the voice call with UE A. The Cause value and diagnostic is copied from the PRI message (if it was received), or copied from the REL message (if no PRI message was received). UE A stores the previously dialled number of UE B for use in step 13.

5) MSC B and MSC A locally release the Iu connections to RNC B and RNC A (assuming that there are no other CM connections active). RNC B and RNC A then release the RRC connections (assuming that their mobiles are not in PMM connected state).

   If either (or both) UE A or UE B were using GERAN access, and, their RR/RRC connection had started on UMTS, and, the Routeing Area of the local GERAN and UTRAN cells are different, then the BSS should include the ìCell selection indicator after release of all TCH and SDCCHî IE in the Channel Release message encoded such that the UE camps first on the local UMTS cell.

6) UE B and UE A camp on suitable cells and perform the required idle mode tasks.

7) UE VA (formerly UE B) initiates RRC connection setup and sends the Setup message for the video call to MSC B. The Called Party number is the one stored in step 0.

8) MSC B requests the allocation of radio resources.

   If UE VA established its RR connection using GERAN, then a handover to UTRAN will be needed to support the 64 kbit/s bearer. In this case, MSC-B shall send an A interface Assignment Request message to the BSC with the Channel Type IE set to ìtransparent data, 64 kbit/sî and including the Service Handover IE set to "Handover to UTRAN or cdma2000 should be performed". The BSC shall then gather measurements of neighbouring cells and shall either send an appropriate Handover Required message (with a UTRAN target cell) or shall send an Assignment Failure message to the MSC.

9) If radio resource allocation was successful, the IAM message is sent to MSC A and the Call Proceeding message is sent to UE VA.

10) MSC A pages UE VB (formerly UE A). UE A responds by establishing an RRC connection and sending the Paging Response message to MSC A within the RRC-Initial Direct Transfer and RANAP-Initial UE messages. MSC A then sends the Setup message for the video call to UE VB. The Setup message carries the CLI of UE VA.

11) UE VB confirms its capability to handle the video call in the Call Confirmed message and MSC A requests the allocation of radio resources.

    If UE VB responded to paging by establishing an RR connection on a GERAN cell, then MSC A initiates handover to UTRAN as described in step 8.

12) If the radio resource allocation was successful, UE VB sends an Alerting message to MSC A. MSC A sends the ACM message to MSC B and MSC B sends the Alerting message to UE VA.

13) User VB answers the video call. For privacy reasons, this ëswitch to videoí answer function should not be automated. (For switching *from video* to voice, the answer should not be automated if the CLI does not ìmatchî the number stored in step 4.)

    The duration for which UE VB looks for a matching CLI is for further study.

14) The video call is established.

With obvious small differences, some of which are described above, the above procedure is also used for switching from a video call to a voice call.

4.2.2 Open issues

4.2.2.1 Detection of video calling capability during a voice call

As a minimum, it will be useful if mobiles can indicate whether they are using UMTS for their ongoing voice call.

However additional functionality would be useful, specifically:

- when using UTRAN, an indication of whether 64 kbit/s video can be supported in the mobileís current location;

- when using GERAN, an indication of whether UMTS coverage is available, and, ideally whether the UMTS coverage can support 64 kbit/s video.

4.2.2.2 Indication of likely redial attempt

It will be useful if the ëdisconnectingí UE can indicate to the core network, and potentially to the other UE that its user wishes to immediately re-establish communication with another media type. Within the core network, the main usage is anticipated to be associated with O+M and statistical purposes: this requires extra diagnostic information to be written onto the CDR.

While within the disconnect message there are several possibilities for the UE to signal to its MSC, the working assumption is to use a specific diagnostic field within the cause value.

Further study is needed to identify the best cause value to use. Ideally a cause value can be identified that avoids the need to send the PRI message.

4.3 Automatic fallback to voice during an established video call

4.3.1 Signalling flows and procedures

4.3.1.1 Fallback from UTRAN Video to UTRAN Voice call

The successful case of the ì VB party radio degradation leading to fallback to voiceî for UMTS is illustrated in Figure 2.

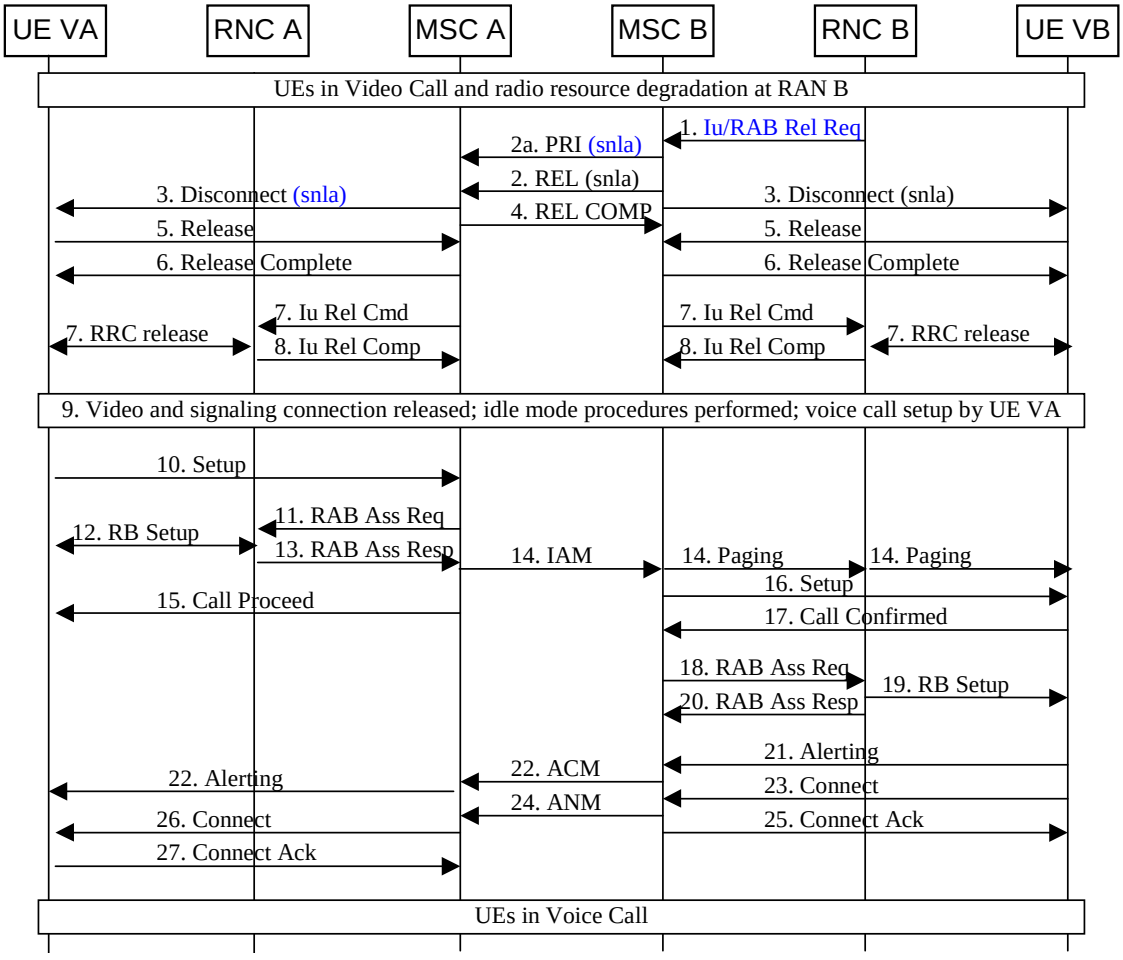

Figure 2: VB party radio degradation leading to fallback to voice

Editorís note: compared to figure 1, many RRC/Iu connection establishment messages are missing from figure 2.

1. [RNC B is configured such that it knows that the local GERAN does not (or does) support video calls (ie does not support 64 kbit/s conversational QoS on the CS domain).] [or, RNC B received the Service Handover IE set to ëHandover to GSM shall not be performedí in the RAB Assignment Request message]

Editorís note: the above method(s) of operation needs to be verified by implementors.

When RNC B detects that the 64kbit/s bearer cannot be maintained any longer, RNC B sends either an Iu RELEASE REQUEST message or a RAB Release Request message to MSC B, indicating that the Iu connection should be released.

2. MSC B sends the PRI message to MSC A with a release cause, e.g. ìservice not longer availableî. This is followed by a REL message with the same release cause value. This cause value in the mandatory REL message might be changed by transit networks prior to arrival at MSC A.

Editorís note: further study is needed to identify the best cause value to use. Ideally a cause value can be identified that avoids the need to send the PRI message.

3. The MSCs send Disconnect messages to the UEs with an error cause indicating ìservice not longer availableî. If this cause code is not received or not understood by UE VA, then UE VA cannot decide whether to Redial or not. In that case UE VA should first confirm the Redial attempt (not shown here) with its user. UE VB stores the CLI of UE VA for later use in step 23.

4. MSC A sends a Release Complete message to MSC B.

5. The UEs release the Video Call.

6. The MSCs confirm the release of the Video Call.

7. The MSCs request the release of all resources and the RNCs release the RRC connections (unless their UE is in PMM connected state).

8. The RNCs confirm the release of all resources.

9. When the signalling connections with the UEs are released, UE VB and UE VA camp on suitable cells and perform the required idle mode tasks.

10. UE VA, which received the Video call release with cause ìservice no longer availableî, sends a SETUP message to MSC A to setup a Voice call, possibly after some delay to permit interaction with user A.

11. A RAB Assignment Request message is sent from the MSC A to the RNC A, requesting the setup of a RAB for a Voice call.

12. The radio bearer is established between RNC A and UE VA.

13. RNC A responds to MSC A with an RAB Assignment Response message.

14. MSC A sends an IAM message to MSC B to establish a Voice Call with UE VB. MSC B pages RNC B and RNC B pages UE VB.

15. MSC A sends a Call Proceeding message to UE VA.

16. The MSC B sends a Setup message to UE VB indicating the establishment of a Voice Call.

17. UE VB sends Call Confirmed to MSC B.

18. The RAB Assignment Request message is sent from MSC B to the RNC B, requesting the establishment of a RAB for a Voice Call.

19. The radio bearer is established between the RNC B and UE VB.

20. RNC B responds to MSC B with a RAB Assignment Response message.

21. UE VB sends Alerting message to MSB B.

22. MSC B sends ACM message to MSC A. MSC A sends Alerting to UE VA.

23. User B or, automatically, UE VB accepts the Voice Call and UE VB sends Connect message to MSC B. Automatic acceptance of the voice call should not be performed unless the CLI matches that stored in step 3.
24. MSC B sends ANM message to MSC A.
25. MSC B sends Connect Ack message to UE VB.
26. MSC A sends Connect message to UE VA.
27. UE VA acknowledges with a Connect Ack message to MSC A and the Voice call is established.

4.3.1.2 Fallback from UTRAN Video to GERAN Voice call

The procedure in 4.3.1.1 can also be used if UE VB drops out of UTRAN coverage into GERAN coverage, but with some modifications.

a) If the UTRAN and GERAN cells are attached to different MSCs then problems are likely to occur due to the time required for the UE VB to perform Location Area and Routeing Area updating. To overcome this, UE VA [should] implement a mechanism to perform one single retry. If UE VB does not respond to MSC Bís paging, then this will only become known to UE VA when MSC Bís ìno response to pagingî timer expires. Typically, an operator configures this time with values in the range of [8 to 25] seconds. This time period is probably sufficient for the HSS to be pointing at the correct MSC for UE VB and hence UE VA can retry immediately the first voice call attempt fails.

   However, it is quite likely that UE VB will have ìcall forward on not reachableî set and so UE VAís first call will be diverted to a voice mail server.

b) In order to avoid useless handover attempts, the RNCs are frequently configured so that no GERAN neighbour cells are given to the mobile during a video call. This will slow down re-selection from 3G to 2G in the case of total loss of 3G coverage. Conversely, in many other scenarios the lack of 2G neighbour cells might force UE VB to camp on the 3G cell for long enough for it to receive the paging for the voice call.

   Overall, the operator may need to adapt the neighbour cell lists provided in video calls on cell by cell basis and/or dependent upon whether or not combined 2G/3G MSCs AND combined SGSNs are in use.

4.3.2 Open issues

4.3.2.1 How is handover to 2G curtailed?

In step 1, above, it needs to be verified that the RNC does not attempt handover to GERAN. If this is not the case, then, it is necessary to ascertain whether the anchor MSC, or, relay MSC, or, target BSC cause the handover to fail, or, whether the UE is successfully handed over to a GSM signalling channel, or, does the anchor MSC set the Service Handover IE in the RAB assignment message to ìhandover to GSM shall not be performedî?

4.3.2.2 Neighbour cells for video calls

The operator needs to have independent control of the neighbour cells sent during CS domain video calls compared to the neighbour cells sent during CS domain voice calls and PS domain connections.

4.3.2.3 RRC behaviour following degradation of the Video RAB

Further study is required on how to ësynchroniseí the release of the RRC connection in the RNC and in the mobile when the radio connection is degraded or lost. If synchronisation cannot be guaranteed then timers may be needed to delay the redial attempt by the A party.

4.3.2.4 Reduction in idle mode tasks

If UE VB loses video coverage and then falls back onto GERAN coverage, UE-VB will need to perform LA and RA updating unless combined 2G/3G MSCs and combined 2G/3G SGSNs are used. In this situation, UE VA is very likely to initiate the redial attempt prior to UE VB having completed the mobility management tasks.

Further study is needed on this problem.

4.3.2.5 Interaction with voice mail servers

If a redial attempt is unsuccessful, is there any practical manner to avoid being forwarded to a voice mail server?

4.4 Automatic fallback to voice during video call establishment

4.4.1 Signalling flows and procedures

Editorís note: a signalling diagram and the message description still need to be added.

4.4.2 Open issues

4.4.2.1 How to detect that a voice call might be successful?

There are many reasons (User Determined User Busy, Barring of all incoming calls, an existing active video call) why a video call and a re-dialled voice call might both be unsuccessful. It would be useful if the rejection for the video call carried information that helped UE A to determine whether or not a subsequent voice call might succeed.

Note: for UDUB, the A party will have received the Alerting message prior to the release message.

4.4.2.2 How to avoid video mail boxes?

Users of video phones can be provided with a full suite of supplementary services, e.g. automatic forwarding to a video mail box when not in UMTS coverage. How does the A party know whether the B party is available for voice communication?

4.5 Automatic upgrade to video following fallback to voice

This appears difficult to achieve in an automatic manner. However, given the privacy issues associated with automatic switching from voice to video, this does not appear to be a serious deficiency.

For manual switching, good indications of UTRAN coverage, and, its ability (or not) to handle 64 kbit/s video would be useful. This is the same requirement as described in section 4.2.2.1.

5 Interaction with Supplementary Services and other 3GPP Features

Editorís note: this section is not complete.

5.1 Calling Line Identity

To make this feature work smoothly, CLIs should not be restricted by the user, and, CLIs should be transferred by the networks. In addition, single numbering schemes should be used (i.e. the userís videophone and telephone numbers need to be the same).

When detecting that a redialled call is the same as the original, UE VB should be aware that the number format might change from, for example, national to international format. This could be because the networks route the voice and video calls differently, or, because UE VB was the original A party.

The impacts of Camel based number translation services, e.g. for office VPNs are for further study.

5.2 Camel based services triggered by call release

Release of the call can trigger other services, for example, voice mail delivery attempts and/or Call Completion to a Busy Subscriber. These services should have been designed to permit customers to make ëone call followed by anotherí, however, increased usage of closely coupled calls might mean that these other services need re-tuning.

5.3 Provision of Multi-Media ìRing Backî tones to the VA party

The impacts of this are for further study.

6 O+M, charging and inter-operator and roaming accounting

6.1 Call Detail Records and Statistics

With this redial mechanism, the voice and video calls are totally separate. Hence each should be able to use the existing CDR and billing machinery without modification.

However, it is worth noting that the billing system will probably not be able to provide any correlation between video and voice components of the same call.

The easy ability to switch between voice and video calls may have an impact on, for example, calculations of ëmean call holding timeí if this is calculated from CDRs. As a consequence there may be a need to add extra information onto the CDRs to indicate the reason for release/reason for establishment of a call.

In particular, it would be valuable to know the proportion of redial attempts that were successful.

The addition of ìreason for establishmentî might require extra 24.008 signalling from the mobile. It is FFS whether such a change to the 24.008 signalling should be made in this release of the specification.

6.2 Online charging

With this redial mechanism, the voice and video calls are totally separate. Hence each should be able to use the existing pre-pay mechanisms without modification.

6.3 Tariffing

With this redial mechanism, each call will be subject to its own tariffs. If ëper secondí charging is in operation this should not matter. However if ìper minuteî billing is used, a customer might be slightly disappointed with the charge raised following 20 seconds of voice communication and 40 seconds of video communication.

6.4 Inter-operator accounting

With this redial mechanism, the voice and video calls are totally separate. Hence there should be no impact on existing inter-operator agreements for either voice or for video calls.

6.5 Roaming accounting

With this redial mechanism, the voice and video calls are totally separate. Hence there should be no impact on existing roaming agreements for either voice or for video calls.

Annex A: (informative)
List of CRs needed to other TSs

Editorís note: This annex is intended to list the CRs that are needed to other specifications.

Annex B:
Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
2004-08	SA 2 #41				TR Skeleton	-	0.0.1
2004-08	SA 2 #41				Updated TR Skeleton	0.0.1	0.0.2
2004-08	SA 2 #41				S2-042623 is produced from TR skeleton in S2-042615 plus tdocs S2-042616, S2-042621, S2-042622, S2-042619 and S2-042620.	0.0.2	0.1.0
2004-08	SA 2 #41				S2-042939 is produced from S2-042623 with the removal of ëcommentsí.	0.1.0	1.0.0
2004-09	SA#25	SP-040535			Presented for information to SA#25	1.0.0	1.0.0