3GPP TSG CN Plenary Meeting #15 **NP-020095**
6th – 8th March 2002. Jeju, Korea.

Source: **ERICSSON L.M.**

Title: **Status summary for service change and UDI fallback**

Agenda item: **SCUDIF**

Document for: **INFORMATION**

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1 Introduction

The present discussion paper aims to provide a summary of the status of the work item "service change and UDI fallback", describe the changes since the last CN plenary, and present clarifications to the concerns expressed by some delegations in CN1.
There are two attachments provided to this document:

- A slide presentation providing an overview of the status (NP-020095b);
- A document (NP-020095c) that can be used as a reference during the discussion. This document includes suggestions for how clarifying text may be incorporated into TR 23.972.

2 Summary and changes since CN#14

2.1 Summary of last CN WGs meetings in Sophia

In order to complete the CN3 work item "Service change and UDI fallback" (N3-010586), a set of CRs have been submitted and agreed in their respective working groups:

- N3-020090, CR to TS 27.001;
- N3-020091, CR to TS 29.007;
- N1-020439, CR to TR 23.972;
- N1-020440, CR to TS 24.008;

Additionally, a LS (N1-020455) has been sent from CN1 to SA1 (as well as CN), proposing SA1 to cover the relevant service requirements, if SA1 considers them needed:

- N1-020455, LS from CN1 to SA1 and CN;

2.2 Summary of the discussion in SA1#15 in Saalfelden

SA1 has added the requirements regarding service change and fallback to TS 22.101, including privacy aspects. The result has been sent to CN in a LS carbon-copied to CN1, CN3, CN4, and is including the copy of the CR to 22.101 and a proposed revised work item description:

- S1-020610, LS from SA1 to CN;
- S1-020609, CR to TS 22.101;
- S1-020611, proposed revised WID for "Service change and UDI fallback".

SA1 considered in the LS that it is important that the work item covers interworking with ISUP networks, echoing the concerns that were raised in CN4#12 in Sophia.

2.3 Resolution on concerns expressed in the LS from CN1

In the LS sent from CN1 to CN (N1-020455), CN1 describes the concerns that some delegations have shown regarding the functionality:

"*A few technical issues pointed out by some delegations are listed below:*

1. *The functionality is applicable to BICC. Interworking with ISUP networks if required should be added in the scope of the WI. Service Aspects in the WI currently reads, "When transit networks outside PLMNs are involved the provisioning of service change and fallback can not be guaranteed."*
2. *The new value for Repeat Indicator raised concern in terms of backward compatibility with release 98 terminals.*"

The explanations given in the following chapters are considered sufficiently covered by the existing specifications. However, a document proposing changes to the agreed CR to 3GPP TR 23.972 (N1-020439) covering these clarifications is attached.

2.3.1 Interworking with ISUP networks

The first item is reflecting the concern exposed by SA1. In non-BICC networks, it is not possible to request for service change and fallback, so the call set up has to be mapped to a single service and the gateway MSC terminates the OoBTC procedure.

If the 3G.324M codec is the first codec in the list, the network decides by configuration whether the call setup continues as a UDI multimedia-only call or as a speech call. If the codec is not the first one in the list, then the call is set up as a speech call.

If fallback to multimedia occurs, the call control parameters towards the external network are set according to the setting for UDI/RDI multimedia calls, and the 3G-324.M codec is returned as the selected codec and the only member of the available codec list. If fallback to speech occurs, the call control parameters are set according to the setting for speech calls, and the 3G-324.M codec is not included in the list of available codecs.

2.3.2 Backwards compatibility with release 98 terminals

The second item from the LS is described in chapter 3 of this paper, where it will be shown that the existing specifications already cover this situation.

2.3.3 Choice of multimedia codec

In the LS from CN1 to CN (N1-020455), CN1 asks CN to take the following action:

" *To CN#15*
***ACTION**: Based upon the conditional approval of this CR package, CN should proceed with approval of these CRs based upon feedback (or lack thereof) received from SA1.*
CN should also note that there are currently two possibilities to signal the request for multimedia in the network (N1-020439):

- *3G.324M is a 3GPP codec agreed by SA4 for inclusion in TS 26.103 (N3-020081).*
- *A preferred approach with dependency to ITU-T is to use Clearmode Codec currently being standardized in SG11 for inclusion in Q.765.5."*

Although the preferred approach would be to use the codec agreed by ITU-T for inclusion in Q.765.5 in order to have a single means of signalling both in BICC and 3GPP networks, a 3GPP codec has been approved by SA4 for inclusion in TS 26.103:

- S4-020123, CR to 26.103;
- S4-020194, LS response to CN3, confirming the inclusion of the codec, as was previously agreed.

If CN considers that it is not proper to have a reference to the revised version of Q.765.5 in the main body of TR 23.972, no changes are needed to the CR to TR-23.972 (N1-020439).

2.4 Conclusion

As explained earlier, all outstanding issues have been covered by the different CRs presented in CN1, CN3, SA1 and SA4. It is thus considered that the work item is complete and covers the service requirement described in TS 22.101 (S1-020609), and that all concerns expressed by the different delegations have been answered. If the CN plenary considers that it is necessary to include these clarifications in 3GPP TR 23.972, proposed changes to the approved text are included as an attachment.

Also, in order to bring the TR 23.972 in accordance with Release 5 drafting rules, a CR proposing editorial corrections has been provided in a separate contribution (NP-020096), as has been agreed earlier.

3 Support of R98 MS and MSC

When a MS requests a UDI/RDI multimedia or speech call with service change, it indicates this by including a BC Repeat Indicator with the value "service change and fallback" as well as the two BCs. The proposed value for the repeat indicator was reserved in 04.08 (R98), leading a call control entity from R98 to consider this situation as a "Conditional IE error" as described in ch. 8.7.2.

According to this, the CC entity shall either ignore the SETUP message and send back a STATUS message, or may try to process the message anyway (in which case the MSC ignores the repeat indicator, and only considers the first BC, as repeated elements are ignored according to TS 24.008 ch.8.6.3, and the MSC answers then with as single BC which is considered by the originating MS as a normal fallback to speech).

When the MS receives the STATUS message stating #100 "conditional IE error", it may send a new SETUP message, as is explicitly allowed in TS 24.008 ch. 5.5.3.2.2. The choice of the BC to include in the new SETUP message should be left to implementation of the terminal.

At the terminating side, when the terminating MSC receives a request for service change, and if the both subscription and access network allow a UDI multimedia call to be set up, the MSC sends a SETUP message with a BC repeat indicator "Service change and fallback" and two BCs. If the SETUP message is rejected for the same reason as above (described in TS 24.008 ch.8.7.2), the MS shall send a STATUS message back to the MSC, which may then send again a SETUP message, with only a single BC (and of course no repeat indicator), as is allowed by TS 24.008, ch. 5.5.3.2.2.

The BC to be sent should be either the preferred BC or the speech BC. The preferred behaviour should be left as an operator's configuration.

By sending the preferred BC, the operator is choosing to select the preferred service (be it multimedia or speech) even in non-optimal situations, at the risk of the call being rejected if the mobile doesn't support UDI/RDI multimedia (this service was introduced in R99).

By sending instead the speech BC, the operator is choosing to perform a fallback to speech, thus securing the call in non-optimal configuration, at the risk of offering a degraded service to users, even if the mobile were supporting the R99 UDI multimedia service.

If the (single mode) call is accepted, the MS will send back the same BC in the CALL CONFIRMED message, and the core network proceeds as described in TR 23.972 3.8.3.3.

Ericsson believes that the existing text in 3GPP TS 24.008 already covers the situation. However, some proposed changes are included as an attachment, if the CN plenary considers that an explicit clarification should be included in 3GPP TR 23.972.

3GPP TSG CN Plenary Meeting #14 NP-020095c
6th – 8th March 2002. Jeju, Korea.

Source: **ERICSSON L.M.**

Title: **Proposed changes to TR 23.972 (Annex to NP-020095)**

Agenda item: **SCUDIF**

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This document is proposing changes to TR 23.972 (including the CR N1-020439) which are covering the clarifications regarding interworking with ISUP networks (ch. 3.8.3.6) and backwards compatibility with R98 networks and terminals, as discussed in the discussion paper NP-020095. Additionally, a better referencing of the 3G-324.M codec is proposed.

*** First modified section ***

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.764: “Signalling System No. 7 – ISDN User Part Signalling Procedures”.

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

[9] 3GPP 24.008: : "Digital cellular telecommunications system (Phase 2+); Mobile radio interface layer 3 specification”.

[10] 3GPP 22.002: "Digital cellular telecommunications system (Phase 2+); Bearer Services (BS) supported by a GSM Public Land Mobile Network (PLMN)"

[11] 3GPP 22.972 "Real Time Multimedia" (Stage 1 description) – obsolete

[12] 3GPP 23.960 " Framework of Network Functions to support multimedia services in UMTS " ('guide-lines for the production of standards')

[13] 3GPP 26.111 " Codec for Circuit Switched Multimedia Telephony Service; Modifications to H.324"

[14] 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).

[15] 3GPP 26.911 "Codec for Circuit Switched Multimedia Telephony Service"

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

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

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

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

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

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

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

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

[24] N3-99314 "Multimedia call Inter-working with H.320 and H.324/I"

[25] 3GPP 26.103 "Speech Codec List for GSM and UMTS"

[26] 3GPP TS 23.153 "Out of Band Transcoder Control – Stage 2"

[27] 3GPP TS 27.001 "General on Terminal Adaptation Functions (TAF) for Mobile Stations (MS)"

[28] 3GPP TS 29.007 "General requirements on interworking between the Public Land Mobile Network (PLMN) and the Integrated Services Digital Network (ISDN) or Public Switched Telephone Network (PSTN)"

*** Next new section ***

3.8 Service change and fallback for UDI/RDI multimedia

3.8.1 Scope

Service change and fallback is a function available to UDI/RDI multimedia calls. The functionality shall support the following:

a) Fallback to speech: allow a user to set up a multimedia call to a terminal with the assurance that a speech connection is set up as the minimum, if allowed by subscription. The call will not be rejected due to the lack of terminating end's terminal capability, subscription, or transit network support;

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

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

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

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

To fulfil:

- Service request signalling between the MS and the MSC;
- Service request signalling across the Core Network.

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

3.8.2 Call Control Signalling

Using a new repeat indicator value, "support of service change and fallback", as described in 3GPP TS 24.008, ch. 5.3.6 "Support of multimedia calls" (N1-020244), together with two BC-IEs, a UDI/RDI multimedia and a speech, it is possible to request a service change and fallback functionality, while still maintaining the backwards compatibility with non-supporting terminals.

3.8.2.1 Mobile originating side

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

In the case a R98 or older MSC ignores the SETUP message due to the presence of a reserved value for the Repeat Indicator, it sends a STATUS message back to the MS, with the Cause Value set to #100, "Conditional IE error" (see 3GPP TS 24.008 [9], ch. 8.7.2 "Conditional IE errors"). As described in clause 3.7 "Call retry", the MS may then resend a new SETUP message with a single BC (no Repeat Indicator is included). This procedure is described in 3GPP TS 24.008 [9], ch. 5.5.3.2.2, "STATUS message with compatible state", as an optional behaviour.

After checking the provisioning, and verifying that the functionality is supported, the MSC replies in the CALL PROCEEDING message with either the two BCs in the same order, or with a single BC (multimedia or speech).

The originating MSC transmits the request to the terminating MSC. In case a transit node or the terminating MSC does not support multimedia, a fallback to speech shall occur. The fallback is reported to the originating MSC, and the call is set up as a normal speech call – see 3.8.2.3.

3.8.2.2 Mobile terminating side

When the terminating MSC receives a request for a multimedia call, it shall check the provisioning.

Both BC-IEs are sent in the same preference order received together with a Repeat Indicator set to "service change and fallback" to the terminating MS in the SETUP message.

The terminating MS, based on its capabilities and internal settings, may return the two BCs in the same order, reversed order, or just one BC (either speech or multimedia) to the terminating MSC in the CALL CONFIRMED message.

In the case a R98 or older MS ignores the SETUP message due to the presence of a reserved value for the Repeat Indicator, it sends a STATUS message back to the terminating MSC, with the Cause Value set to #100, "Conditional IE error" (see 3GPP TS 24.008 [9], ch. 8.7.2 "Conditional IE errors"). The terminating MSC shall then resend a new SETUP message, with the BC of the preferred service or the speech BC (fallback to speech) as the only BC (no Repeat Indicator is included). The preferred behaviour is configurable by the operator. The handling of the STATUS message is described in 3GPP TS 24.008 [9], ch. 5.5.3.2.2, "STATUS message with compatible state".

The terminating MSC returns this information to the originating MSC.

3.8.2.3 Mobile originating side – completion of call setup

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

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

3.8.2.4 Service change in the active state

At any given time, if either of call parties wants to change from the current active mode to the other mode via MMI, the terminal activates an In-Call Modification procedure. Using this procedure, described in 3GPP TS 24.008 [9], ch. 5.3.4.3 "Changing the call mode", the MS sends a MODIFY message containing the BC-IE to change to. This BC-IE shall be one of those already negotiated at call setup.

The network then initiates the procedure for service change. If the procedure succeeds, the originating MS receives a MODIFY COMPLETE message including the BC of the mode to switch to. On the contrary, if the procedure fails, the MS receives a MODIFY REJECT message from the MSC including the BC from the current active mode.

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

On the remote side, the MSC will initiate an In-Call Modification procedure towards the terminal using the MODIFY message. Under its default settings, the terminal shall request confirmation from the user. If the change is agreed, the MS replies to the MSC with a MODIFY COMPLETE message, whereas a MODIFY REJECT message is sent if the change is declined.

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

3.8.3 Core Network procedures

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

3.8.3.1 Multimedia codec

The codec negotiation procedures are transmitting an ordered list of preferred codecs from the originating to the terminating MSC. Each node may optionally remove the codecs it does not support, and the terminating MSC selects the codec to use ("selected codec") and the list of available codecs for the call, based on the incoming list of codecs, and on the information given by the terminating MS in the CALL CONFIRMED message.

~~The~~For service change and fallback, a dummy codec indicates~~used for service change and fallback to carry the information~~ that a multimedia call is requested either as the preferred mode or as a second mode. It is referred in this TR as the 3G-324.M codec. The dummy codec is defined in 3GPP TS 26.103 [25] (N3-020081).

This codec is only used in the Core Network, and is not sent from the terminal in the Supported Codec List IE. The use of the Repeat Indicator and the two BCs as described in 3.8.2 is sufficient to request the service from the MS.

~~ITU-T is currently defining a new means of signalling a UDI n x 64 kbit/s channel through BICC networks, which is described in Annex B.~~

3.8.3.2 Originating side

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

If the SETUP message received from the MS contains a Repeat Indicator with a value of "service change and fallback", as well as a UDI/RDI multimedia BC and a speech BC, the MSC shall include a 3G-324.M codec in the list of supported codec types using the following rule:

- If the multimedia BC-IE is the first BC, then the 3G-324.M codec is the first codec in the list,
- If the speech BC-IE is the first BC, then the 3G-324.M codec is the last codec in the list. In the rare case that the maximum number of codecs is already reached before insertion of the 3G-324M codec, the optional speech codec with the least preference shall be discarded.

The list is then sent according to the Out-of-Band Transcoder Control codec negotiation procedure. The TMR field is set to "64 kbit/s UDI". If a transit node does not support one of the codec types, it may remove it from the list. If the 3G-324.M codec is unsupported and removed, the call is turned to a normal speech call (fallback to speech), and the procedure continues normally.

3.8.3.3 Terminating side

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

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

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

- If no Repeat Indicator is included, and only a speech BC is received, the MSC chooses a speech codec as the Selected Codec according to the normal mechanism, and no 3G-324.M codec is inserted in the list of available codecs;
- If no Repeat Indicator is included, and only a multimedia BC is received, the MSC chooses the 3G-324.M codec as the Selected Codec, and only the 3G-324.M codec is inserted in the list of available codecs;
- If the Repeat Indicator is included, and the speech BC is the first BC and the multimedia BC is the second BC, the MSC chooses a speech codec as the Selected Codec according to the normal mechanism, and both the 3G-324.M codec and speech codecs are inserted in the list of available codecs;
- If the Repeat Indicator is included, and the multimedia BC is the first BC and the speech BC is the second BC, the Selected Codec is the 3G-324.M codec, and both the 3G-324.M codec and speech codecs are inserted in the list of available codecs.

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

3.8.3.4 Originating side – completion of call setup

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

The call was set up with a multimedia BC first:

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

The call was set up with a speech BC first:

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

3.8.3.5 Service change during the active state

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

- If the current mode is the speech mode and the MODIFY message contains a multimedia BC, the normal Out-of-Band Transcoder Control procedures take place to change the Selected Codec to the 3G-324.M codec;
- If the current mode is the multimedia mode and the MODIFY message contains a speech BC, the normal Out-of-Band Transcoder Control procedures take place to change the Selected Codec to the preferred speech codec.

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

3.8.3.6 Interworking with external networks

If the 3G-324.M codec is included in the list of supported codec types and the external network does not support BICC or codec negotiation, the Gateway MSC shall terminate the codec negotiation and fallback to a single service. In the case where the 3G-324.M codec is the first on the list, the network decides by configuration to fallback either to a UDI multimedia-only call or to speech. In the case where the 3G-324.M codec is not the first on the list, the call shall fallback to speech only.

If fallback to multimedia occurs, the call control parameters sent towards the external network are set according to the setting for UDI/RDI multimedia calls (see 3GPP TS 27.001 [27], Annex B and 3GPP TS 29.007 [28], table 7A), and the 3G-324.M codec is returned to the originating MSC server as the selected codec and the only member of the available codec list. If fallback to speech occurs, the call control parameters are set according to the setting for speech calls, and the 3G-324.M codec is removed from the available codec list returned to the originating MSC server.

*** Next new section ***

~~Annex B:~~

~~Multimedia codec~~

~~There is an ongoing work in ITU-T SG11 to add a "clear mode" codec to Q.765.5 (described in N1-020245), which could be used to signal the request for multimedia through BICC networks.~~

*** End of new section ***