

**27 February - 02 March, 2001**

**Gothenburg, Sweden**

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**3GPP TSG SA2#16**

**S2-010383**

**Los Angeles, California, US, January 22<sup>nd</sup> – 26<sup>th</sup>, 2001**

**Source:** TSG SA WG2  
**Title:** Response to: LS on some issues related to optimised IP speech support in GERAN

**From:** TSG-SA WG2  
**To:** TSG-GERAN, TSG-RAN WG2, TSG-SA WG3, TSG-RAN WG3, TSG-CN WG1, TSG-CN WG3

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**Attachment S2-010292 included in zip file**

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## **Introduction**

TSG-SA WG2 thanks TSG-GERAN for their questions in S2-010292 regarding issues related to optimised IP speech support in GERAN. TSG SA WG2 has looked at the questions and encloses its responses below. TSG SA WG2 also wishes to inform TSG GERAN that the following S2 meeting will be held jointly with the S3 meeting to which IPsec issues will be raised

## **Choice of Header adaptation mechanism**

SA2 is of the opinion that the study should continue on the basis that all identified header adaptation mechanisms (header removal, header compression, no header adaptation) are supported in the GERAN. Furthermore, for both header compression and header removal, information on the media structure (if applicable e.g. for AMR) shall be made available in the GERAN BSC. In addition, for header removal, the applied codec shall be made available in the GERAN BSS. The SIP application in the UE is involved in the SIP level codec negotiation, and, therefore, is the entity to know the type of service offered to the end user (e.g., a voice-only session or a part of a multimedia service).

SA2 view is that the UE is aware of which header adaptation mechanism shall apply. The bearer structure and codec information is transported from the SIP layer in the UE down to the lower layers, and further to the GERAN BSS. This information is used by the BSS to select the appropriate RAB according to the header adaptation method identified by the UE. It is understood that header removal is to be used for a voice-only session.

- TSG GERAN would kindly ask SA2 to provide an example of parameters and their values in the RAB assignment that would represent the RAB for an exemplary VoIP-only stream using the AMR speech codec.

S2 is of the view that the UTRAN does not require header removal, and views that the information transported in the PDP context is the same for both the GERAN and UTRAN (e.g. QoS parameters and media structure if applicable). As the GERAN will require extra information (e.g. the codec used), SA2 views that this could be sent either from the UE to the

BSS or via the SGSN. SA2 views that the information sent to the RAN via the SGSN should be common to both the UTRAN and GERAN, and the information specific to the GERAN could be sent directly between the UE and BSS

S2 is interested in TSG-GERANs and TSG RAN WG3 view on this approach, and whether the above proposal is feasible.

- TSG GERAN would further appreciate any advice from SA2 on how the GERAN BSS, based on these RAB parameters, can determine that header removal can be used for this RAB, and that the optimised speech configuration (channel coding etc) to be selected is the one designed for AMR.

The information delivered to the GERAN BSS should indicate that the application is a voice application for which header removal is to be used. Codec information is available after the SIP level session establishment and made available to the GERAN BSS.

### **Header regeneration in the MS**

- TSG GERAN would like to ask SA2 experts whether they see any problems with omitting the transmission of RTCP packets over the air interface.

SA2 does not see any problems with omitting RTCP packets over the air interface in the stream using the AMR speech codec with header removal.

- TSG GERAN understands that IPsec cannot be used with optimised speech (i.e. the header removal case). Does SA2 see any problems with this assumption?

SA 2 has the same view as TSG GERAN that the use of IPsec limits the options at the radio interface. SA2 proposes to address this issue at the next SA2/SA3 joint session (26 February – 3 March) in particular raising the question as to are IPSEC and header removal/compression mutually exclusive?

SA2 welcomes input on this matter from RAN2 for both header removal and header compression.

- Additionally to the protocols identified above TSG GERAN kindly asks, if other protocols have to be taken into the account to be transported over the air interface.

SA2 is not aware of any other protocols that need to be taken into account in the use of AMR with optimised bearers.

### **Multiple parallel codecs with SIP**

- TSG GERAN would appreciate the support of SA2 experts in providing solutions to the above mentioned problem, i.e., how SIP codec signalling relates to RAB signalling. Specifically, TSG GERAN would appreciate a description of the current SA2 assumption regarding how the GERAN 'single-codec' limitation discussed above is considered in the SIP codec negotiation signalling.

SA2 agrees with TSG GERAN's assumption that codec negotiation occurs in the SIP level, SA2 believes that SIP negotiation procedures fulfil the TSG GERAN requirements on the matter. For the optimised bearer case this would identify the single codec for the stream using the AMR speech codec.

A work item to identify a subset of mandatory codecs is currently being discussed in SA2

- In addition, TSG GERAN would like an indication from SA2 and RAN3 on whether the above mentioned issue is expected to lead to changes in the RAB signalling (for example inclusion of multiple codec formats in the same RAB request message).

SA2 does not see that the above mentioned issues will lead to changes in the RAB signalling. It is expected that multiple media streams will lead to multiple RABs being established.

### **Handovers causing codec change**

- TSG GERAN suspects that this will cause severe speech performance impact in mid-call, and would like to have an indication from SA2 about the amount of SIP signalling traffic after compression during codec changes and whether or not there are alternatives to this SIP signalling during codec changes.

SA2 also expresses concern on the speech performance and the end user experience which will occur when handing over from a BTS with different capabilities causing a change in the speech codec. SA2 believes that this issue is removed if this functionality is only provided for AMR coding. SA2 asks the GERAN group if they can accept this network deployment. Otherwise, this issue and the related performance impacts require more study.

### **Handover GERAN - UTRAN**

- In handover between radio access networks where GERAN uses header removal and UTRAN uses header compression, which header adaptation-related information (e.g. RTP field information) needs to be transferred between GERAN and UTRAN, if any?

SA2 believes it is not in a position to address this issue. In particular SA2 believes that an analysis has to be carried out on the difference in information sent from the UE to the BSC and the UE to the RNC, and whether this information is sufficient for unequal header compression to be possible.

- How long time can this type of GERAN-UTRAN handover be expected to take, considering all involved signalling?

SA2 has not conducted any study on this and is thus not in a position to answer this question. SA2 is looking to its RAN experts to provide guidance on this topic.

- In handover from GERAN (header removal) to UTRAN (header compression), what is the service/architecture impact for the user equipment, given that it needs to start sending uplink headers? (The headers include RTP time stamps and sequence numbers that need to be aligned with those previously generated by the BSS.)

The SA2 opinion is that the initial SIP negotiation supplies the IP address and other information necessary to generate the headers for header compression. The time stamp and sequence number generation in the user equipment in the uplink headers needs more study. It is SA2's opinion that this information may have to be maintained within the terminal throughout the communication and hence would be available for use in the compression case.

- In addition, TSG GERAN would like to ask SA2 whether the PDP context remains intact during this handover scenario.

SA2's opinion is that, if the above assumptions are correct, then PDP context information is untouched in this handover scenario.

**3GPP TSG SA2#16**  
Los Angeles, California, US, January 22<sup>nd</sup> – 26<sup>th</sup>, 2001

**S2-010292**

**TSG GERAN #3**  
Boston, Massachusetts  
15<sup>th</sup> – 19<sup>th</sup> of January 2001

**GP-010392**  
**Agenda item 6.3**

**Source:** TSG GERAN  
**Title:** LS on some issues related to optimised IP speech support in GERAN

**From:** TSG-GERAN  
**To:** TSG-SA WG2, TSG-RAN WG3

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## **Introduction**

The optimised speech bearers are being designed for GERAN to support IP based speech only streams. The issues that are under development in TSG GERAN include support for header removal as well as support for multiplexing of speech and SIP signalling. However, there are issues that need to be resolved. Some of these are also of concern to other 3GPP TSGs. This LS is an attempt to list those issues in order to progress the work with respect to this item.

## **Choice of Header adaptation mechanism**

There are different header adaptation mechanisms that may be used by the GERAN. Header adaptation mechanisms are part of PDCP functionality and they are defined as follows:

- Header compression. Transport and network level headers (e.g. RTP/UDP/IP) are compressed in such a way that the decompressed headers are semantically identical to the original uncompressed headers. The IETF ROHC WG is responsible for standardising header compression schemes. Header compression is suited for standard internet applications that are not designed to work only with GERAN and especially for multimedia applications therefore the scheme will be used with generic real-time multimedia bearers.
- Header removal. Transport and network level headers (e.g. RTP/UDP/IP) are completely removed. Based on information submitted at call setup and based on information derived from lower layer (link & physical), the receiving entity can regenerate the headers. The primary application of header removal is the optimised speech bearer, and the regenerated header may not always be semantically identical to the original header.
- No header adaptation. Transport and network-level headers (e.g. RTP/UDP/IP) are forwarded.

The choice of header adaptation mechanism will depend on the type of application that is used. Header removal will only be used if the application is IP based speech using a codec for which header removal functionality is designed in GERAN (GSM FR, HR, EFR, AMR).

An unambiguous indication (using parameters in the RAB assignment) that would help GERAN RRC in deciding which header adaptation mechanism to use is required. This indication is expected to be part of the RAB assignment procedure over the Lu interface. Further, in case of header removal, GERAN must be able to deduce from the RAB

parameters in a RAB assignment/re-assignment the exact format of the PDCP SDUs in the speech flow, since this in turn determines which optimised speech configuration (channel coding etc) to use.

- TSG GERAN would kindly ask SA2 to provide an example of parameters and their values in the RAB assignment that would represent the RAB for an exemplary VoIP-only stream using the AMR speech codec.

- TSG GERAN would further appreciate any advice from SA2 on how the GERAN BSS, based on these RAB parameters, can determine that header removal can be used for this RAB, and that the optimised speech configuration (channel coding etc) to be selected is the one designed for AMR.

### **Header regeneration in the MS**

In case of header removal there is a choice to regenerate or not RTP/UDP/IP headers. Even if regeneration is performed, end to end transparency of network and transport headers can not be guaranteed. Some of the varying fields in the RTP header have to be regenerated using local information only (i.e. without explicitly sending information over the radio interface). Also, the current assumption in TSG GERAN is that RTCP packets need not to be transmitted over the air interface

- TSG GERAN would like to ask SA2 experts whether they see any problems with omitting the transmission of RTCP packets over the air interface.

- TSG GERAN understands that IPsec cannot be used with optimised speech (i.e. the header removal case). Does SA2 see any problems with this assumption?

- Additionally to the protocols identified above TSG GERAN kindly asks, if other protocols have to be taken into the account to be transported over the air interface.

### **Multiple parallel codecs with SIP**

In SIP the caller may send a set of supported codecs to the recipient, and vice versa. After the call setup, when sending VoIP packets, the caller uses one of the codecs supported by the called party and the called party uses one of the codecs supported by the caller. The sender may dynamically select the codec from the set of supported codecs and the codec may differ in different directions.

A GERAN optimised speech RAB supports only a single codec type and it must be the same in uplink and downlink directions. Consequently, the result of a RAB negotiation must only include one single codec.

- TSG GERAN would appreciate the support of SA2 experts in providing solutions to the above mentioned problem, i.e., how SIP codec signalling relates to RAB signalling. Specifically, TSG GERAN would appreciate a description of the current SA2 assumption regarding how the GERAN 'single-codec' limitation discussed above is considered in the SIP codec negotiation signalling.

- In addition, TSG GERAN would like an indication from SA2 and RAN3 on whether the above mentioned issue is expected to lead to changes in the RAB signalling (for example inclusion of multiple codec formats in the same RAB request message).

### **Handovers causing codec change**

GERAN is required to support legacy TRXs, which in case of optimised speech means that it is required for the CN to support in addition to AMR (and WB-AMR) all other GSM speech codecs, GSM FR, GSM HR and GSM EFR. Handover between cells supporting optimised

speech for different codec sets, or radio resource management decisions in GERAN may require changing the speech codec or in case of AMR modifying the active set. TSG GERAN believes that SIP message exchanges are required for codec re-negotiation where supported codec/channel coding scheme changes.

- TSG GERAN suspects that this will cause severe speech performance impact in mid-call, and would like to have an indication from SA2 about the amount of SIP signalling traffic after compression during codec changes and whether or not there are alternatives to this SIP signalling during codec changes.

### **Handover GERAN - UTRAN**

TSG GERAN understands that UTRAN will not support header removal. If this is the case, TSG GERAN would like to know whether there are any issues with handover between GERAN and UTRAN in case when different header adaptation mechanisms are applied to the VoIP stream. For example considering the case where there is a need to handover from GERAN (header removal) to UTRAN (header compression).

Potential issues include the following, and indications from SA2 and RAN3 are appreciated:

- In handover between radio access networks where GERAN uses header removal and UTRAN uses header compression, which header adaptation-related information (e.g. RTP field information) needs to be transferred between GERAN and UTRAN, if any?
- How long time can this type of GERAN-UTRAN handover be expected to take, considering all involved signalling?
- In handover from GERAN (header removal) to UTRAN (header compression), what is the service/architecture impact for the user equipment, given that it needs to start sending uplink headers? (The headers include RTP time stamps and sequence numbers that need to be aligned with those previously generated by the BSS.)
- In addition, TSG GERAN would like to ask SA2 whether the PDP context remains intact during this handover scenario.

### **Conclusion**

Most of the issues above are required to be solved in order to proceed with the work in GERAN efficiently.

TSG GERAN would also like to ask TSG SA2 how the issues above, once decided are going to be documented.

TSG GERAN kindly ask SA2 and RAN3 to indicate when they will be able to conclude on the issues above. TSG GERAN will have an Adhoc during February (12th to 16th) followed by a TSG GERAN meeting in April (2nd-6th) and would appreciate answer by then.