Liaison To:	**TSG-S4 Codec Working Group**
From:	**RAN WG1**
cc:	**TSG-R2, TSG-R3, TSG-R4, TSG-SA, TSG-RAN**
Title:	**Liaison statement on Support of Speech Service in RAN**

TSG-S4 has asked TSG-R1, TSG-R2 and TSG-R3 in [1] to finalize the support of the speech service over the Radio Access Network in order for them to complete the AMR Speech Codec specifications in time for the approval of the 3GPP Release 99. Specifically, they have asked TSG-R1 to approve a representative set of operational conditions to be provided by S4, the corresponding error patterns to perform characterization testing being derived by S4 and provided for approval to RAN WG1.

RAN WG1 would like to inform SA WG4 that discussions are currently taking place inside TSG-R1 in order to complete the generic channel coding scheme definition. However, some indications can be already given to S4 regarding the available parameters and some mapping rules speech**. In the following only UTRA FDD is discussed**. For UTRA TDD the tool box concept is similar but the mapping rules differ. RAN WG1 will provide detailed information on UTRA TDD as discussion progresses on the support of speech and AMR in particular, for TDD.

Generally speaking, L1 can be seen as a toolbox providing some parameters among which RNC will, at the beginning of each connection, be able to choose from the tools which will be used to encode and transport each Radio Access Bearer. There is not therefore a single set of parameters defining the channel coding for the support of a given service. Thus WG1 will here list the available parameters, from which S4 can try and choose the ones they feel accurate for their tests. For the downlink, due to the way speech rate will be detected in L1, additional mapping rules will apply.

1.   Channel coding parameters and mapping rules for UTRA FDD

The most relevant reference for the channel coding and mapping rules are specification 25.212 and 25.211. The most important aspects are summarised as follows :

1.1 Channel coding parameter

Parameters for the definition of set of transport format set that is to say the channel coding/mapping of any transport channels in UTRA L1 :

- convolutional coding (for Release 99 at least),

- code rate ½, 1/3, no coding

- CRC of 0bits, 8bits, 12, 16bits

- Maximum puncturing rate, maximum repetition rate

1.2 Mapping rules

- For the downlink the transport format indication can be provided (TFCI) or not. In the later case, the transport format must be blindly detected. This is to be considered since it has an input on the available payload and also transport format detection. The amount of radio resource allocated (Spreading factor) depends on the use of TFCI/no TFCI and in the later case, whether fixed position rather than flexible positions are used.

- For the uplink, TFCI is included when there is more than one transport format combination, which will be typically the case with AMR. In addition to the TFCI aspects, the Channel coding/multiplexing chains are

different.

- The channel coding is defined in a generic way. Unequal error protection can be supported by using multiple transport channels for the speech information, a class of bit or equivalently a class of protection being mapped on at least one transport channel but possibly more if some channel coding parameters for a given class of bit need to be varied between AMR modes.

- The different transport format for a given transport channel contain static parameters (channel coding scheme, code rate of the mother code, CRC length)..

- The rate matching parameter setting implies that the relative protection ratio between different transport channels is unchanged for different transport format combinations, each corresponding to an AMR mode mapping.

- The spreading factor on the downlink remains unchanged unless the physical channels are reallocated..

WG1 recommends that when setting some test, S4 chooses different cases. Acknowledging the evaluation effort and cost for S4, WG1 recommends though that at least two cases are evaluated, one with and without TFCI as far as the downlink is concerned since the performance might be different. WG1 is currently carrying out simulation for both cases.

2. Questions to SA4

Beyond the indications given above, RAN WG1 would like to inform S4 of some issues currently discussed in WG1, where S4 might want to express some opinion. A list of current open issues concerning AMR operation is as follows :

- What is the aim of rate adaptation in the UTRA context ?
    - Improved quality for different C/I (GSM like)
    - Network adaptation (for example adaptation of capacity through a change of mode)
    - Other

- If adaptation is used, what kind of signaling ?
    - In-band signaling
    - Higher layer signaling.

        Other

- What type of transmission scenarios ?
    - Uplink / downlink / both links (adaptive) / tandem (UE to UE)

3. Work plan and procedures

RAN WG1 noted that SA4 is going to provide for approval by RAN WG1 a set of representative propagation conditions for which quality delivered by the AMR speech codec modes should be evaluated. The set of conditions being ready by the next meeting of SA4 in September, RAN WG1 will be in a position to review those at it next meeting in October. These conditions being agreed, error patterns will need to be produced.

RAN WG1 would like to verify whether such error patterns corresponds to the input or the output of the channel decoder. It is the understanding of RAN WG1 that error patterns will have to be produced for uplink, downlink, and different cases of mapping on the downlink (TFCI, i.e. explicit format indication and no TFCI, i.e. Blind format detection). If error patterns are given at the output of the channel decoder then WG1 understands that different error patterns have to be defined for each case of channel coding. On the other hand we understand that if the error patterns correspond to the input of the decoder, then the error patterns can be defined independently of the channel coding used, resulting in a lower number patterns to be defined.

RAN WG1 does not own a radio simulator capable of providing such error patterns. However RAN WG1 would like to encourage SA4 to check whether RAN WG4 could help them on this issue..

We think that these issues concern Working Groups TSG-R1, TSG-R2, TSG-R3 and TSG-S4. TSG-R1 would like to suggest to create a joint subgroup between TSG-RAN and TSG-S4 and possibly TSG-SA due to the service definition devoted to this task . This group would operate on a common reflector. It will aim at giving answers to the previous questions.

References :

[1]   LS to TSG-R1, TSG-R2 and TSG-R3, "Support of Speech Service in RAN", TSG-S4 Codec Working Group, TSGR1#6(99)803