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*Technical Specification*

**3<sup>rd</sup> Generation Partnership Project (3GPP)  
TSG-SA Codec Working Group  
Architectural model for the 3G speech transcoders**

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## Reference

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## Keywords

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Adaptive Multi-Rate, Mandatory speech coder

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## Intellectual Property Rights

[tbc]

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## Foreword

This Technical Report has been produced by the 3<sup>rd</sup> Generation Partnership Project, Technical Specification Group Services and System Aspects, Working Group 4 (Codec).

The contents of this informal TR may be subject to continuing work within the 3GPP and may change following formal TSG-S4 approval. Should TSG-S4 modify the contents of this TR, it will be re-released with an identifying change of release date and an increase in version number as follows:

Version m.t.e

where:

m indicates [major version number]

- x the second digit is incremented for all changes of substance, i.e. technical enhancements, corrections, updates, etc.
- y the third digit is incremented when editorial only changes have been incorporated into the specification.

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## 1 Scope

The present document is a description of the transcoder in the UMTS networks. The initial aim of this document is to have a reference model for the standardization work carried out by the 3GPP Technical Specification Groups.

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## 2 Normative and Informative references

This TR incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this TR only when incorporated in it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

- [1] TS S3.01 : "RAN Overall Description"
- [2] TS S3.15 : "lu Interface RAN-CN User plane Protocols"
- [3] TS 26.010 : "Mandatory Speech Codec; AMR codec; speech processing functions; General description"
- [4] TS 26.011 : "Mandatory speech codec; AMR codec; Adaptive Multi-Rate speech transcoding".
- [5] TS 26.016 : "Mandatory speech codec; AMR codec; Source controlled rate operation for the Adaptive Multi-Rate speech traffic channels".
- [6] TS 26.017 : "Mandatory speech codec; AMR codec; Voice Activity Detection for Adaptive Multi-Rate speech traffic channels".
- [7] TS 26.014 : "Mandatory speech codec; AMR codec; Comfort noise aspects for Adaptive Multi-Rate speech traffic channels".
- [8] TS 26.015 : "Mandatory speech codec; AMR codec; Error concealment of lost frames"
- [9] TS 26.018 : "Mandatory speech codec; AMR codec, Frame structure for Adaptive Multi-Rate speech traffic channels".
- [10] TS 26.019 : "Mandatory speech codec; AMR codec; lu and Uu Interfaces to the RAN (lu) and UE (Uu)".
- [11] ITU-T G.711 "Pulse Coded Modulation"
- [12] ETSI GSM 08.62 "In-band Tandem Free Operation of speech codecs"
- [13] ITU-T X.YYY ATM AAL2 [tbc]

## 3 Definitions and abbreviations

### 3.1 Definitions

Definition of terms used in this TS can be found in TS 2x.xx, ... [T.B.A.].

### 3.2 Abbreviations

For the purposes of this TS, the following abbreviations apply:

AMR	Adaptive Multi-Rate
AS	Access Stratum
BFH	Bad Frame Handling
CN	Core Network
CDMA	Code Division Multiple Access
FDD	Frequency Duplex Division
GSM	Global System for Mobile communications
ITU-T	International Telecommunication Union – Telecommunication standardisation sector (former CCITT)
PCM	Pulse Code Modulation
PLMN	Public Land Mobile Network
PSTN	Public Switched Telephone Network
RAN	Radio Access Network
RF	Radio Frequency
RX	Receive
SCR	Source Controlled Rate
SPD	SPeech Decoder
SPE	SPeech Encoder
TC	Transcoder
TDD	Time Duplex Division
TFO	Tandem Free Operation
TX	Transmit
UE	User Equipment (terminal)

For abbreviations not given in this subclause, see TS [T.B.A].

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## 4 General

The TC is part of the Core Network at the opposite of the 2G systems for which is part of the RAN. It is considered for the time being that the Transcoder is under MSC control. I.e. TC in the IP gateway is not considered at the moment.

The only speech service under consideration is the mandatory narrow band speech service. Other speech services may be considered if felt necessary, e.g. wideband speech service.

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The TC is independent from the Radio Interface, i.e. it is exactly the same for both the FDD and TDD modes of the UTRA.

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## 5 Processing functions of the Speech Transcoder

The speech processing functions are carried out as described in [3].

The transcoder generates and receives the AAL2 packets to transmit and receives the coded speech. This is done according to [10]. The transmission management of the ATM connection is done by the TC. The QoS of this transmission is set up by the CN.

The Transcoder may be in charge of the DL Time Alignment if this function is required.

Tandem Free is done either by sending on the IU interface the received coded speech frames arriving on the IU interface or by and In-Band TFO on the PCM interface similar to [12].

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## 6 Location of the transcoder within the CN

[Editor's note

This specific aspect is being discussed within the TSG S2. This section will be updated when the decision is made in the mentioned WG of TSG SA.

For information several options are considered :

- At the Gateway MSC
- At the serving MSC
- Within the MSC
- At the Peripheral of the MSC]

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## 7 Transmission aspects of the TC

The figure 1 shows the data flows arriving and stemming from the TC. The content of the packets is described in [10].

The IU interface links the RNC (drift or serving) and the TC.

According to the decision made on the exact location of the transcoder the PSTN interface may actually be an IU interface.

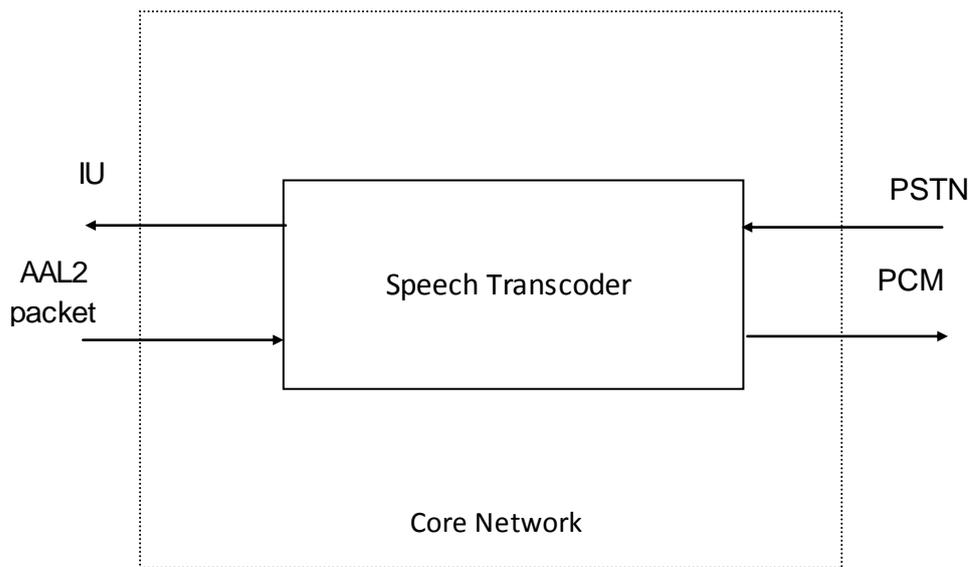


Fig. 1 : Data Flows and Interfaces of the Transcoder

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## 8 View of the TC from the USER plane

[Editor's note

The aim of this section is to represent the TC in the context of the UMTS architecture in which two planes are defined the USER plane and the CONTROL plane.

The USER plane represents the data stream, with the corresponding protocols, SAP, etc.]

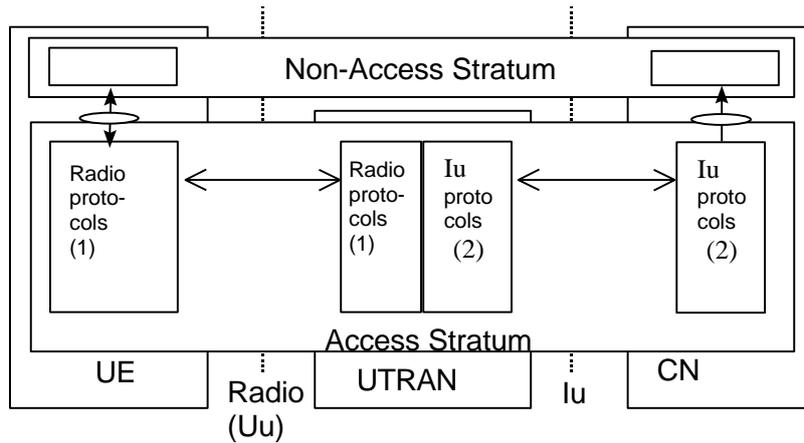
The transcoder is part of the NAS (Non Access Stratum) since it's part of the CN. The SAPs between the TC and the IU CN Edge node are the PDU, the RAB, [tbc].

[Editor's note

The role of the different SAP will be explained here in the next version of the TR.

A more precise description of the User Plane will also be provided.]

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**Figure 2 Iu and Uu User plane**

The figure 2 provides an high level view of the User-plane view. The Speech service is part of the non-access stratum which is established between the UE and the CN.

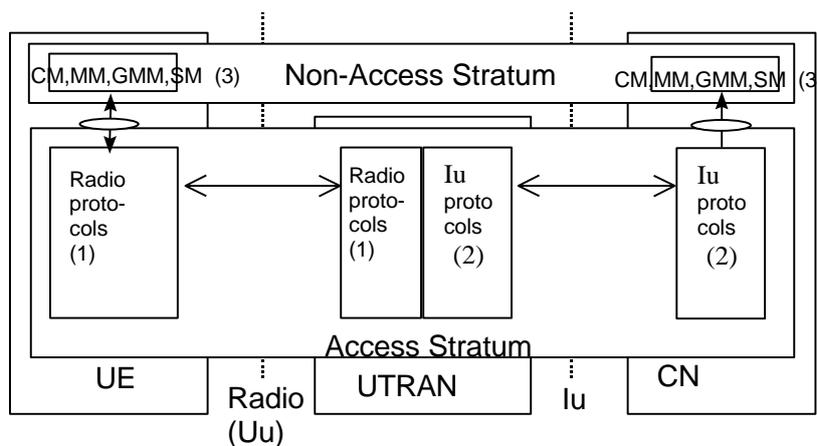
## 9 View of the TC from the CONTROL plane

[Editor's note

The aim of this section is to represent the TC in the context of the UMTS architecture in which two planes are defined the USER plane and the CONTROL plane.

The CONTROL plane represents the signalling required to manage a call and its attached services. Details will be provided with respect to the management of the TC by the CN]

The figure below shows the control plane (signalling) protocol stacks on Iu and Uu interfaces.



**Figure 3 Iu and Uu Control plane**

The figure 3 provides a high level view of the control plane for the Iu and Uu interfaces. The set-up of the RAB is part of this control plane.

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[ Editor's note:

The SAP related to the speech service and their role with respect to the TC will be detailed.]

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## 10 Tandem Free Operation & the TC

The Tandem Free is based on both In-Band signalling and out-of-band signalling according to the Mobile-to-Mobile communication scenario.

Out-of-band signalling is expected to be used when two mobiles in the served area of the MSC (either visited or gateway) are involved. The Transcoder is then acting as a mirror.

When the PSTN is the intermediate network between two PLMNs then a protocol similar to [12] will be used.

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## 11 Other aspects

### 11.1. TC assignment

[tbc]

### 11.2. TC start up

[tbc]

### 11.3. TC release

[tbc]

### 11.4. TC and handovers

[ffs]

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## History

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