Technical Specification Group Services and System Aspects
Global Text Telephony Workshop, Dusseldorf, Germany, 18-19 April 2001

**GTT(01)0006**

**Source:** **Nokia, Nortel Networks**

**Title:** **Transcoder based CTM implementation**

**Document for:** **Discussion**

**Agenda Item:**

This document describes the implementation of CTM (Cellular Text telephone Modem) function together with speech transcoding. CTM is needed for PSTN text telephony (TTY) interworking with mobile networks. In this document the term GTT (Global Text Telephony) is used instead of PSTN text telephony or TTY.

It has also been proposed to place CTM in a separate node. Based on subscription, GTT calls would be then routed through this node.

## Introduction

GTT stage 1 general requirements are defined in 3GPP TS 22.226. It also defines different protocol environments for GTT: Packet and circuit switched multimedia, circuit switched voice telephony, a separate data path with a combined voice session.

CTM is needed only in circuit switched voice telephony where text conversation is carried inband in the voice channel. This means that text conversation must transparently pass the speech codecs and other speech processing functions (and devices) in the wireless networks. It also requires that CTM is placed before the speech codec in the transmission path.

Packet and circuit switched multimedia are end to end services and don’t require any text conversion functions in the network.

If text is transmitted in a separate data path, CTM conversion is not required either. This can be the case in a GSM/GPRS DTM (Dual Transfer Mode) call.

The term "transcoder based" is somewhat misleading. This solution does not require CTM adaptor to be placed inside the transcoder. It can also be an external box placed in front of the transcoder in the same transmission line. Although placing the function inside the transcoder has some benefits.

## Functionality

General CTM based text telephony functionality is well presented in 3GPP TS 26.226. This document considers only the network part.

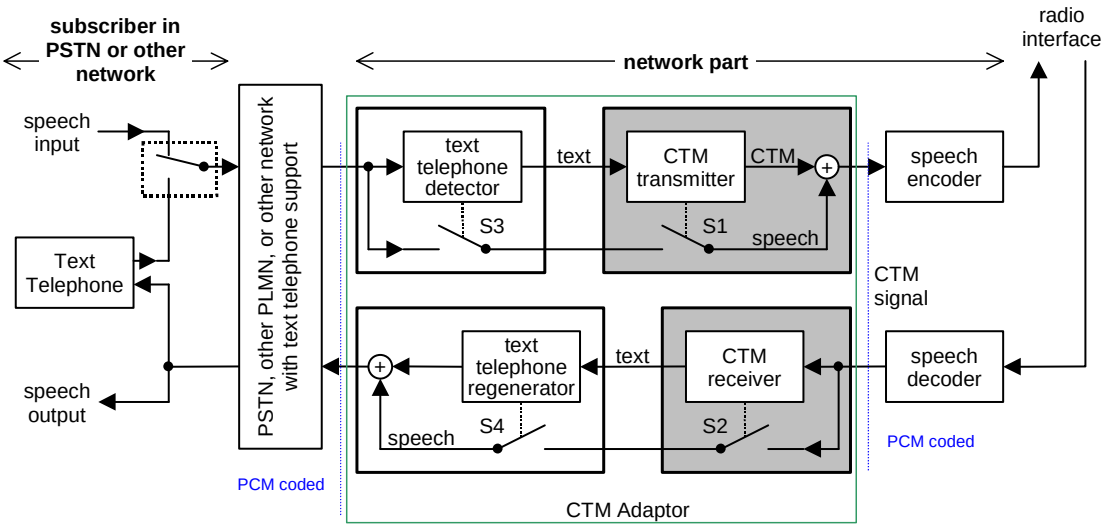


Figure 1. CTM adaptor block diagram.

In GERAN A/Gb interface case, the CTM adaptor presented in the figure 1 can be placed in the BSS transcoder or A-interface circuits. In Iu interface case, it can be placed in MGW or PSTN interface circuits in the core network.

## Mobile subscriber issues

GTT service is mainly targeted for hearing impaired people. In circuit switched voice environment it allows them to communicate over a normal PSTN voice connection. It also allows the users to transmit speech and text alternately (Voice Carry Over/Hearing Carry Over).

If the CTM function is placed in speech transcoders, text communication can be supported in all calls. GTT can be activated and deactivated from any GTT capable mobile also during a call. This solution does not require GTT user identification in the subscriber data. One of the GTT stage 1 requirements is to allow GTT use without subscription.

Subscription based GTT call handling leads to the identification of a GTT user. This is something that hearing impaired people may not want. In general they should be treated equally with normal voice subscribers.

Transcoder based solution does not preclude GTT subscription. This way the solution can be further enhanced e.g. with new text protocols. Operators can offer basic text telephony to everybody and more advanced service to GTT subscribers.

## Implementation and interworking issues

CTM has been standardized to pass standard speech codecs. However there are also many other kinds of speech processing functions in the networks e.g. noise and echo cancellers. These algorithms have not been standardized and it can't be known without extensive testing if CTM signal passes them.

Typically these functions are implemented in the transcoder. If the CTM adaptor is also in the transcoder, they can be disconnected when CTM signal is detected and there is not any danger of corrupting the text conversation.

Speech coder sample buffering can be utilized also for the CTM adaptor. This way additional delay is not introduced in the voice path.

Implementing the CTM adaptor inside the transcoder requires only software upgrade in the existing network.

## TFO and TrFO

TFO uses bit stealing and inband protocol to send coded speech over a PCM connection between two transcoders. In the transcoders, speech coding is then bypassed and coded speech is transmitted between mobile terminals. If the CTM adaptor is in the transcoder, CTM coding can also be bypassed when TFO connection is established i.e. CTM coded text signal is not decoded in the network in MS-MS calls.

TrFO uses outband signalling for codec negotiation to send coded speech between mobile terminals. User plane protocol is transparently passed between transcoders. CTM coded text signal is not decoded in MS-MS calls. CTM adaptor is inserted in the same place where speech coding (Transcoder at the edge).

Transcoder based CTM solution is compatible with TFO and TrFO.

## Emergency calls

There has been regulatory requirements to support text telephony in emergency calls. In the transcoder based solution emergency text calls can be handled the same way as emergency speech calls assuming that emergency centers have text telephony capable equipment.

## Supplementary services

Call hold, call wait, mid-call announcements etc. work as for normal circuit switched voice calls. This may lead to special cases where text communication is not working properly. These situations may be very difficult, if not impossible, to solve on the network side and they apply also to the CTM service node solution.

- Even if GTT subscription is detected it can not be known if the particular call is a voice or a text call. GTT capable terminals can be used also for voice calls (and in HCO/VCO cases).

- Even if the call is a text call text signal is not transmitted continuously.

- E.g. multi party service can not be provided for text calls.

## Summary

In this document it is proposed to implement CTM adaptor in the speech transcoder. However this solution allows it also to be placed in an external box in the same circuits as transcoder.

The main benefit of the solution is the possibility to use GTT without subscription. This will allow hearing impaired people to be treated equally with voice users and does not require any modifications to emergency call handling procedures and routing.

The solution can be further improved with GTT subscription in order to save transcoding resources and to reduce network upgrade costs.