TSG-SA Working Group 1 (Services) meeting #2 *Post-TSGS1#2(99)247*
Edinburgh, Scotland 9th-12th March 1999 Agenda: 06.01.05

3GPP TSG-SA Codec Working Group
TSG-S4#3: April 20-22, 1999, Munich, Germany

TSGS4#4(99) 138

TR 22.053 V0.1.1 (1999-04)

Technical Specification

3rd Generation Partnership Project (3GPP)
TSG-SA Codec Working Group
Tandem Free Operation of speech codecs;
Stage 1 service description

TSG-SA Working Group 1 (Services) meeting #2 *Post-TSGS1#2(99)247*
Edinburgh, Scotland 9th-12th March 1999 Agenda: 06.01.05

3GPP TSG-SA Codec Working Group
TSG-S4#3: April 20-22, 1999, Munich, Germany

TSGS4#4(99) 138

Reference
TSG-SA4-W1 (<Shortfilename>.PDF)

Keywords
Adaptive Multi-Rate, Mandatory speech coder

3GPP

Postal address

Office address

Internet
secretariat@3gpp.org
Individual copies of this deliverable
can be downloaded from
http://www.3gpp.org

Contents

Intellectual Property Rights

[tbc]

Foreword

This Technical Specification has been produced by the 3rd Generation Partnership Project, Technical Specification Group Services and System Aspects, Working Group 4 (Codec).
The contents of this mandatory TS 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 TS, 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.

1 Scope

This specification specifies the stage 1 description for the Tandem Free Operation (TFO) feature which provides the capability to avoid using two speech codecs in mobile to mobile speech calls involving a 3G system ~~together~~ with another 3G system or an interoperable 2 G system. The primary aim is to realise improvements in speech quality. The TFO mode of operation could also be used to reduce inter-Mobile services Switching Center (MSC) transmission bandwidth requirements depending on where is located the transcoder.
In analogy with CCITT Recommendations I.130 [1], Stage 1 is an overall service description, from the service subscriber's and user's standpoints, that views the network as a single entity which provides services to the user.

2 Normative references

References may be made to:

a) specific versions of publications (identified by date of publication, edition number, version number, etc.), in which case, subsequent revisions to the referenced document do not apply; or
b) all versions up to and including the identified version (identified by "up to and including" before the version identity); or
c) all versions subsequent to and including the identified version (identified by "onwards" following the version identity); or
d) publications without mention of a specific version, in which case the latest version applies.

A non-specific reference to an ETS shall also be taken to refer to later versions published as an EN with the same number.

[1] CCITT Recommendations I.130 (1988): "General modelling methods - Method for the characterisation of telecommunications services supported by an ISDN and network capabilities of an ISDN".
[2] 3GPP TS 2X.XX : "Abbreviations and acronyms".
[3] ETSI TS GSM 08.62 : "Tandem Free Operation of Speech codec"

3 Definitions and abbreviations

3GPP TS 2X.XX [2] provides a list of abbreviations and acronyms used in 3GPP specifications. For the purposes of this specification the following definitions and abbreviations also apply:

3.1 Definitions

Tandem Free Operation (TFO): the avoidance of using two AMR speech codecs or an AMR and an interoperable speech codec in mobile to mobile speech calls
TFO call: a mobile to mobile call where TFO has been applied
Normal call or operation: a call where TFO has not been applied
Negotiation phase: phase during which the applicability of TFO is assessed through the exchange of information such as the capabilities of the respective UE-RAN-CN ~~transcoders~~ and the types of speech codecs being used.
A party: user originating the call
B party: user receiving the call (unless the call is forwarded).

3.2 Abbreviations

ASCI Avanced Speech Call Items
MSC Mobile services Switching Centre
PLMN Public Land Mobile Network

4 Description

The TFO feature avoids the use of two speech codecs that occurs in mobile to mobile speech calls.

4.1 Applicability of TFO to Basic Services.

TFO shall be applicable to all mobile to mobile speech calls where both parties use ~~the~~ an interoperable speech coding standard. TFO shall be supported for the AMR speech codec.
Therefore the TFO shall be applicable between two 3G mobiles independently of their location, between a 3G mobile and a GSM mobile which uses either GSM AMR or GSM EFR speech codecs.

TFO of 3G mobiles with GSM mobiles shall be based on the GSM TFO standard [3].

[Editor's note

Other 2G systems than GSM could be added, e.g. PDC or IS136 provided that they include both interoperable speech codecs and a TFO standard which can interwork.]

4.2 Support in Mobile Stations (MS)

TFO shall not require any modifications to existing or future mobile stations. There shall be no additional user intervention required to enable or invoke the feature. Correspondingly, it shall not be possible for a user to disable the feature.

4.3 Parameters to be indicated and negotiated

The speech codec standards used on each party shall be indicated and negotiated, if applicable.

[Editor's note

The 3G mobile may include more than one standard in the future. It is future proof to include this aspect from day one.]

4.4 Provision of Service

4.4.1 Location Independence

TFO shall be capable of being applied for mobile to mobile calls regardless of the serving networks of the A or B parties. Thus, the A and B parties may be registered on different PLMNs or on the same network. One of these two network could be a 2G network.

4.4.2 Provision of service within and between networks

Provision of the TFO feature shall be determined by the network operator on a network (or sub-network) wide basis, where equipment to support the feature has been deployed. It shall not be necessary for the service capability to be rolled out throughout an entire network before being made operational.

TFO between networks shall be applied if appropriate between supporting (sub) networks.

In the case where a TFO call is handed over between two parts of a network, but the new part is not provisioned with TFO, the call shall revert to normal operation.

In the case where a normal call is handed over between two parts of a network, and the new part is provisioned with TFO, the call will switch to TFO if appropriate.

NOTE: TFO operation will normally require that the coded speech is transmitted transparently (i.e. without errors) between the relevant transcoders (e.g. by bit-stealing or by AAL2 packets).

4.4.3 Subscription and Billing Information

This feature shall not be provisioned on a per-subscriber basis and no record of the application of TFO is necessary for billing purposes.

4.5 Quality of Service (QoS)

4.5.1 Impact on Speech Quality

The speech quality and timing requirements depend on the phase of the call and are defined in table 1. In all cases the duration and degradation should be minimised.

The timing requirements for the application and removal of TFO are derived from the typical user's perception of the feature in the context of typical call set-up times together with handover operation. There is a much stricter requirement on the time taken to revert to normal operation than to apply TFO because when TFO is enabled only on one side of a call, the speech will be unintelligible. Likewise, failures in the transmission of the coded speech without (significant) errors (e.g. due to routing via an ADPCM link) should be detected rapidly as the speech quality may also be seriously degraded.

Table 1: TFO speech quality and timing requirements.

Call phase	Reference condition (note 1)	Maximum degradation	Speed of operation
TFO negotiation following call set-up	normal transcoding stages	"no perceptible degradation"	2 sec (note 2) 7 sec (note 3)
TFO negotiation following TFO interruption or handover	normal transcoding stages	"no perceptible degradation"	7 sec (notes 4 and 5)
transition from normal operation to TFO	normal transcoding stages	"no annoying artefacts"	
return from TFO to normal operation	TFO transcoding stages	"no annoying artefacts"	160 ms
continuous TFO	TFO transcoding stages	"no degradation"	
continuous normal operation	normal transcoding stages	"no degradation"	

NOTE 1: All reference conditions are defined as error free with no bit-stealing and with no transmission delay between the TCs. 'normal transcoding stages' refers to the speech codec(s) selected prior to TFO.
NOTE 2: Objective for time taken to establish TFO after call set-up.
NOTE 3: Maximum time allowed for TFO negotiation after call set-up.
NOTE 4: Objective for time taken to establish TFO after re-establishment of transparent PCM link.
NOTE 5: Once TFO has been successfully established during a call, an unlimited number of negotiation attempts may be made after any subsequent interruptions of TFO.
[Editor's note : this table should be updated for the 3G systems, but this is a good starting point]

NOTE: The timing limits and the quality degradations specified in table 1 are to some extent inter-dependent.

5 Interaction with supplementary services

5.1 General

This clause defines the interactions between supplementary services and TFO.

[Editor's note :
The notion of supplementary services may not exist in the UMTS. This is ffs]

Neither TFO nor attempted TFO establishment shall interfere with the provision or invocation of any supplementary services

5.2 Explicit Call Transfer (ECT)

Following call transfer, the new call route is evaluated and TFO applied if possible, otherwise normal operation applies.

5.3 Call wait/Call hold.

Following the establishment of another call, the new call route shall be evaluated and TFO applied if possible, otherwise normal operation applies.

5.4 Multiparty

Where more than two parties are involved in a call, TFO may not be applicable. As a result, when a two-party TFO call is extended to multi-party, all the links shall revert to normal operation.

5.5 Service Announcements

TFO shall not disrupt the provision of call progress or similar speech announcements to the user which originate in any of the networks routing a call.

6 Interaction with Alternate and Followed by services

There shall be no impact on data transmission due to TFO or attempted TFO establishment.

7 Interaction with other speech services

There is no requirement for TFO in ASCI services.

[Editor's note:
It is very likely that ASCI services are not known under this name in 3 GPP, this must be investigated.]

8 Interaction with DTMF

DTMF transmission performance during TFO shall be not worse than during normal operation.

[Editor's note :
The management of the DTMF is not known at the moment for 3G systems, especially in DL. It may be an issue if as currently assumed the TC acts as a reflector in case of TFO of 3G mobiles of the same served area. This is ffs.]

9 Interaction with Lawful Intercept

In the case where lawful intercept is required in a TFO call, the intercept shall not cause any degradation in the speech quality received by the A and B parties.

History

Document history		
V. 0.1.0	April 1999	First Draft
V. 0.1.1	April 1999	Editorial corrections

Rapporteur for 3GPP TS 22.053 is:

William Navarro
Nortel Networks
Tel. : +33 1 39 44 57 56
Fax : +33 1 39 44 50 12
Email : mailto:navarro@nortelnetworks.com

This document is written in Microsoft Word version 97