

**Source:** TSG-S4 (Codec Working Group)  
**Title:** Proposed Work Items  
**Document for:** Approval  
**Agenda Item:** 9.4

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This document contains the Work Item Description documents presented by TSG-SA4 (Codec WG) for approval at TSG-SA#2

List of Work Items:

- WI S4-1: Mandatory Speech Codec for Narrow band Speech Telephony Service
- WI S4-2: Codec for Low bit rate Multimedia Telephony Service
- WI S4-3: QoS for Speech and Multimedia Codec
- WI S4-5: Codec(s) for Wideband Telephony Services
- WI S4-6: Tandem free aspects for 3G and between 3G and 2G systems

**Work Item Title:** Mandatory Speech Codec for Narrowband Telephony Service  
Work Item S4-1 Description

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**x.1 TSG SA Work Area**

	WG1: Services
	WG2: Architecture
	WG3: Security
X	WG4: Codec
	WG5: Network Management

**x.2 Justification**

The provision of the narrowband telephony service in 3G systems requires to first select and then fully specify the operation on a Mandatory Speech Codec to be implemented by all 3G terminals and network equipment. The Mandatory Speech Codec will be the default speech codec in all W-CDMA and TD-CDMA 3G systems.

**x.3 Intended Output of the Work Item**

Selection [Report] of the mandatory speech codec

Technical specifications of the mandatory speech codec for the provision of the Narrowband Telephony Service in 3G systems (provisional list):

- General Description
- Interface with the Radio Access Network (RAN)
- Transcoding functions
- Substitution and muting of lost frames
- ANSI-C Code
- Comfort Noise aspects
- Speech Activity Rate Control
- Voice Activity Detection
- (Other specifications could be required especially regarding the definition of the mode signaling)

Technical reports on the evaluation of the mandatory speech codec for the provision of the Narrowband Telephony Service in 3G systems (Provisional list):

- Report on the Characterization tests of the mandatory speech codec in 3G radio channels

**x.4 Impact on other Technical Specifications and Technical Reports**

Affects:	USIM	ME	NW	Others
Yes		X	X	
No	X			
Don't know				

**x.5 Technical Scope, including the field of application of the intended output**

The selection and specification of the mandatory speech codec must take advantage of the corresponding activities already completed or still ongoing within the Partner Organizations, especially in ARIB and ETSI.

ARIB will complete the evaluation of mandatory speech codec candidates by February 1999.

ETSI has been working under the assumption that the newly approved AMR should be the best candidate for the mandatory speech codec. AMR provides the high quality and flexibility expected from a default 3G speech codec.

As part of the work item, AMR and other existing speech codec should be evaluated with the objective to select the best possible solution for the mandatory speech codec. The selected candidate should fulfill the following minimum set of requirements:

- Equivalent to wireline speech codec (ADPCM - G.726) in No Errors conditions
- Limited degradation under normal operational conditions (with channel errors, in tandeming)
- Based on a proven technology
- Good trade off complexity/performance for low cost implementation in 3G systems

After the selection of the speech codec, it will be necessary to define the complete operation of the codec in FDD W-CDMA and TDD TD-CDMA channels, including the discontinuous transmission operation and/or variable rate operation.

The definition of the best channel coding for the support of the mandatory speech codec (based on existing bearers vs dedicated bearer with unequal protection) should be defined in relation with the TSG-RAN WG1.

Finally, the operation of the mandatory speech codec should be fully characterized in multiple 3G operational environment.

#### **x.6 Impact on and Linked 3GPP Work Items**

TSG-S4: Work Items on Codec for low bit rate Multimedia telephony service, 3G audio-visual terminal characteristics, Tandem free aspects for 3G and between 2G and 3G systems

Corresponding activities in TSG-SA WG2 (Architecture) and TSG-RAN WG1 (Layer 1)

Other working groups as required

#### **x.7 Schedule of tasks to be performed**

Detailed work program to be defined during the 3GPP TSG-SA WG4#2 meeting

Work Item to be approved in TSG-SA#2 (March 1999, in Fort Lauderdale, US)

Selection of Mandatory Speech codec completed by: April 1999

Baseline Specification of Mandatory Speech codec completed by: April 1999

Mandatory speech Codec Characterization in 3G radio channels (W-CDMA FDD and TD/CDMA TDD) completed by: December 1999

Final Specification completed by: December 1999

New Specifications & Technical Reports (Provisional Number)						
Spec. No.	Title	Prime resp. TSG(s)	2ndary resp. TSG(s)	Presented for information at TSG#	Approved at TSG#	Comments
XX.YY.01	Mandatory Speech Codec General Description	SA		TSG SA#x	TSG-SA#y	Editor: tbd
XX.YY.02	Mandatory Speech Codec ANSI C-Code	SA		TSG SA#x	TSG-SA#y	Editor: tbd
XX.YY.03	Mandatory Speech Codec Test Sequences	SA		TSG SA#x	TSG-SA#y	Editor: tbd
XX.YY.04	Mandatory Speech Codec Speech Transcoding Functions	SA		TSG SA#x	TSG-SA#y	Editor: tbd
XX.YY.05	Mandatory Speech Codec Error Concealment of lost frames	SA		TSG SA#x	TSG-SA#y	Editor: tbd
XX.YY.06	Mandatory Speech Codec Source Controlled Bit-Rate Operation	SA		TSG SA#x	TSG-SA#y	Editor: tbd
XX.YY.07	Mandatory Speech Codec Voice Activity Detector	SA		TSG SA#x	TSG-SA#y	Editor: tbd
XX.YY.08	Mandatory Speech Codec Frame Structure	SA		TSG SA#x	TSG-SA#y	Editor: tbd
XX.YY.09	Mandatory Speech Codec Interface to the RAN	SA		TSG SA#x	TSG-SA#y	Editor: tbd
XX.YY.10	Mandatory Speech Codec Performances Characterization	SA		TSG SA#x	TSG-SA#y	Editor: tbd
Affected existing specifications						
Spec. No.	CR	Subject			Approved at TSG#	Comments

## x.8 Supporting Members

Individual Member Organization	Representing Partner
Ericsson	ETSI
GSM North America	T1
Matsushita Communication Ind. Co. Ltd.	ARIB
NEC	ARIB
Nokia	ETSI
Nortel Networks	ETSI
NTT DoCoMo	ARIB
Siemens	ETSI

## x.9 Work item Rapporteur

Erik Ekudden (Ericsson)

Contact Information:

Email:erik.ekudden@era-t.ericsson.se

Tel: +46 8 757 2168

Fax: +46 8 757 5550

Address: Torshamnsgatan 23, S-164 80 Stockholm, Sweden

## x.10 Responsible TSGs

TSG SA WG4 (Codec)

**Work Item Title:** Codec for Low bit rate Multimedia Telephony Service  
Work Item S4-2 Description

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**x.1 TSG SA Work Area**

	WG1: Services
	WG2: Architecture
	WG3: Security
X	WG4: Codec
	WG5: Network Management

**x.2 Justification**

Whereas 3G networks will provide sufficient bandwidth and QoS to support multimedia<sup>1</sup> telephony, the specification of a multimedia telephony codec will enable terminals capable of low-cost, high-quality, real-time, two-way multimedia communications. Additionally, a public specification of such a service will allow interoperability of different manufacturers' equipment, thus broadening the potential market for such devices.

**x.3 Intended Output of the Work Item**

Technical specification of the low bitrate, multimedia telephony codec in 3G systems:

- General description
- Required and optional video codecs
- Required and optional speech codecs
- Mux level error correction

Technical reports on the low bitrate, multimedia telephony codec in 3G systems:

- Call setup requirements
- Call control requirements
- Bearer capabilities recommendation

Areas of consideration for which output may occur at some time in the future:

- Multipoint calling
- Supplemental services
- Interworking with ITU-T H.324, H.320 and H.323 systems
- Interoperability testing

**x.4 Impact on other Technical Specifications and Technical Reports**

<b>Affects:</b>	<b>USIM</b>	<b>ME</b>	<b>NW</b>	<b>Others</b>
<b>Yes</b>		X	X	
<b>No</b>	X			
<b>Don't know</b>				

**x.5 Technical Scope, including the field of application of the intended output**

A 3G multimedia telephony service should first address low bitrate, circuit switched connections. Such a service should also make efficient use of the available bandwidth. Additionally, special attention must be made to the error prone nature of radio based networks.

All these requirements are best addressed with ITU-T H.324/ANNEX C (Multimedia Telephone Terminals Over Error Prone Channels).<sup>2</sup> Where H.324/ANNEX C falls short,

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<sup>1</sup> Multimedia telephony is telephony combining video, speech, and/or data streams.

<sup>2</sup> Note that H.324/ANNEX C is an integral part of H.324 and specifically includes H.223 Level 0,

other relevant standards will be used. These shortcomings may include speech and/or video codecs. Additionally, call setup and termination are not defined in H.324/ANNEX C.

H.323 could also be used to satisfy the above requirements for packet switched connections. However, there are additional issues, relative to H.324 (such as IP over wireless network), that need to be addressed within 3GPP that would preclude consideration of H.323 for the April 1999 deadline. However, WI2 will address those H.323 issues within its mandate after this deadline.

Finally, since the system as a whole must function efficiently, liaisons to other 3GPP groups will be used to develop the overall system aspects of IMT 2000 hosted H.324/ANNEX C.

#### **x.6 Impact on and Linked 3GPP Work Items**

TSG-SA WG4 WI1 (Mandatory Speech Codec for Narrowband Telephony Service)

TSG-SA WG4 WI3 (QoS for speech and multimedia codec)

Related activities in TSG-SA WG1, TSG-SA WG2, TSG-SA WG5, TSG-CN WG1

#### **x.7 Schedule of tasks to be performed**

Detailed work program to be defined during the 3GPP TSG-SA WG4#3 meeting	March 1999
Work item to be approved in TSG-SA#2	March 1999
Baseline technical specification for H.324/Annex C based multimedia telephony service	April 1999
Baseline technical specification for H.323 based multimedia telephony service	December 1999
Final H.324/Annex C technical specification	December 1999

#### **x.8 Supporting Members**

<b>Individual Member Organization</b>	<b>Representing Partner</b>
Siemens	ETSI
Nokia	ETSI
Toshiba	ARIB
NTT DoCoMo	ARIB
NEC	ARIB
Motorola	ETSI
Ericsson	ETSI
Sony	ARIB

#### **x.9 Work Item Rapporteur**

Barry Aronson (Toshiba)

Contact Information: E-mail: [baronson@acm.org](mailto:baronson@acm.org)  
Tel.: +1 978 232 3994  
Fax.: +1 978 232 9220  
Address: 131 Dodge St., Beverly, MA, USA

#### **x.10 Responsible TSGs**

TSG SA WG4 (Codec)

#### **x.11 Existing Reference Documentation**

See 3GPP/TSGS4#2(99)015.

**Work Item Title:** QoS for Speech and Multimedia Codec  
Work Item S4-3 Description

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**x.1 TSG SA Work Area**

	Services
	Architecture
	Security
X	Codec
	Network Management

**x.2 Justification**

Successful provision of speech and multimedia services within the IMT-2000 network requires knowledge of the requirements that intended applications and codecs set for the PLMN network (bearers, network architecture, etc.). This Work Item results will target in assisting other 3GPP WGs to produce such requirements in 3GPP technical specifications where seen appropriate.

**x.3 Intended Output of the Work Item**

Technical Reports discussing the end-to-end QoS requirement issues and proposed solutions to provide adequate quality of service (QoS) for circuit switched and packet switched multimedia services within third generation mobile networks.

A Technical Specification for transmission planning aspects of speech (and multimedia) services on third generation mobile network.

Changes to developing 3GPP specifications may result depending upon the output of the study.

**x.4 Impact on other Technical Specifications and Technical Reports**

<b>Affects:</b>	<b>USIM</b>	<b>ME</b>	<b>NW</b>	<b>Others</b>
<b>Yes</b>		X	X	
<b>No</b>	X			
<b>Don't know</b>				

**x.5 Technical Scope, including the field of application of the intended output**

Evaluation of requirements on quality, bitrates, bit error rates, frame erasure rate, delay etc. for speech and multimedia services. The output of the work item should be utilised by other 3GPP groups as guidance for setting requirements for satisfactory user-to-user service.

The technical requirements of speech and multimedia codecs found out in Technical Reports of this Work Item should be satisfied by the related QoS parameters and other system implications, and by the speech and/or multimedia codec implementations in mobile terminals. The scope includes speech and multimedia services both in circuit switched and packet switched environments.

**x.6 Linked 3GPP Work Items**

TSG-S4 Codec for Low-bitrate Video Telephony Service, TSG-S4 3G Audio-visual Terminal Characteristics, TSG-S1 Quality of Service Requirements

**x.7 Schedule of Tasks to be Performed**

Work Item to be approved in: TSG SA #2 (March 99)

**Technical Reports**

*Quantitative performance evaluation of H.324 Annex C over 3G:*

Start of Report March 99  
 Approval of deliverable by WG4 April 99  
 Approval of deliverable by TSG TSG SA #1 (June 99)

*Quantitative performance evaluation of real-time packet switched multimedia services over 3G:*

Start of Report March 99  
 Approval of deliverable by WG4 November 99  
 Approval of deliverable by TSG TSG SA #xx (December 99)

**Technical Specifications**

*Transmission planning aspects of the speech service in 3G PLMN System*

Start of Specification March 99  
 Approval of deliverable by WG4 November 99  
 Approval of deliverable by TSG TSG SA #xx (December 99)

New specifications						
Spec No.	Title	Prime rsp. TSG	2ndary rsp. TSG(s)	Presented for information at TSG#	approved at TSG#	Comments
XX	Quantitative performance evaluation of H.324 Annex C over 3G	TSG SA			TSG xx (June 99)	Editor: xx
XX	Quantitative performance evaluation of real-time packet switched multimedia services over 3G	TSG SA			TSG xx (December 99)	Editor: xx
XX	Transmission planning aspects of the speech service in 3G PLMN System	TSG SA			TSG xx (December 99)	Editor: xx
Affected existing specifications						
Spec No.	CR	Subject		Approved at TSG#		Comments

**x.8 Supporting Members**

Individual Member Organization	Representing Partner
Cellnet	ETSI
Ericsson	ETSI
NEC	ARIB
Nokia	ETSI
Nortel Networks	ETSI
NTT-DoCoMo	ARIB
Siemens	ETSI
Sony	ARIB
Toshiba	ARIB

**x.9 Work Item Rapporteur(s)**

Harri Honko (Nokia)

Contact Information: E-mail: harri.honko@nokia.com  
 Tel. +358 3 272 5650  
 Fax. +358 3 272 5241  
 GSM +358 40 533 1437  
 Address: Nokia Research Center, P.O. Box 100, FIN-33721  
 Tampere

**x.10 Responsible TSGs**

TSG SA4 (Codec) in conjunction with the relevant TSG-SA1 (Services), TSG-SA2 (Architecture) and TSG-CN1 (CC/SS/MM) experts plus 3GPP TSG-T2 (Terminal Services & Capabilities)



## **x.11 Existing Reference Documentation**

[1] GSM 03.50 5.2.0, ETSI

[2] UMTS 22.05 3.2.0 Chapter 5.4, ETSI SMG1

[3] Volume 1 v.0.5, ARIB

### Candidates for baseline documents:

*For TS* Transmission planning aspects of the speech service in UMTS/IMT-2000 PLMN System:

[1] GSM 03.50 5.2.0, ETSI

**Work Item Title:** Codec(s) for Wideband Telephony Services  
Work Item S4-5 Description

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### TSG Work Area

	Services
	Architecture
	Security
X	Codec
	Network Management

### Linked 3GPP Work Items

TSG-SA WG4 Work Item 2: Codec for Low-bitrate Video Telephony Service;

TSG-SA WG4 Work Item 3: QoS for speech and multimedia codec.

### Justification

The selection and specification of wideband codec(s) targets end-to-end 3G high-quality mobile telephony services. All of the mobile phone users, network operators and manufacturers of mobile terminals and of mobile network infrastructure will have a benefit from an enhanced quality telephony service. Users will be able to make calls with improved speech quality. The quality difference between narrowband and wideband telephony is quite evident for a user who ever had compared them. Regarding that wideband service is presently not common in fixed networks, its availability in 3G networks might further catalyse the increase of mobile phone usage which is a benefit for both mobile network operators and manufacturers. In addition, wideband telephony capability represents a feature in mobile telephony, a fact which supports both network providers and manufacturers to broaden their range of products.

The specification of wideband codec(s) will enable, for example, to perform high-quality telephone calls (point-to-point), audioconferencing (multipoint) and high-quality audio for videoconferencing (point-to-point and multipoint) but its application may not be limited to these example scenarios. Service providers will be able to deliver e.g. multimedia and value added services, while maximising interoperability, including tandem free connections, both within the 3G system and between 3G terminals and other systems.

### Intended Output of the Work Item

Technical scope of the Working Item 5 is:

Specification of codec(s) for wideband telephony services.

Proposed output of the Work Item 5 is:

Technical Specification of codec(s) for wideband telephony services.

### Impact on other Technical Specifications and Technical Reports

Affects:	USIM	ME	NW	Others
Yes		X	X	
No	X			
Don't know				

### Technical Scope, including the field of application of the intended output

Existing standard codec(s), results of on-going standardization work in other standardization bodies and new wideband codec(s) should be considered with the objective to select the best possible solution for the wideband telephony services within the 3G mobile telephony framework. Especially, the results of wideband speech codec standardization work in ITU-T, ISO-MPEG, ETSI SMG11 and ARIB should be considered.

The selection and specification of the wideband codec(s) should take advantage of the corresponding activities on going within the Partner Organisations. For information, ARIB will complete the evaluation of available other speech and audio codecs with the simulated IMT-2000 channel conditions for WCDMA in mid March 1999. Also for information, ETSI SMG11 has scheduled to complete the feasibility phase on wideband AMR in June 1999. ITU-T is studying wideband speech and audio coding under Q20 of Study Group 16.

After the selection of the codec(s), the complete operation of the codec in FDD W-CDMA and TDCDMA channels should be defined.

#### **Schedule of Tasks to be Performed (to be updated at each TSG-SA plenary)**

Approval of WI:	TSG SA #2 (March 99)
First draft of requirements:	June 99
Final definition of requirements:	October 99
Selection of codecs:	April 00
Baseline Specifications:	(TBD)
Codec characterization in 3G radio channels:	(TBD)
Final specification:	(TBD)

#### **Supporting Individual Members**

BT, Deutsche Telekom AG, France Telecom, Matsushita Communication Industrial Co.,Ltd., NEC Corporation, Siemens, Nortel Networks, Ericsson, Nokia, Sony Corp., Mannesmann Mobilfunk

#### **The identity of the Work Item Rapporteur(s)**

Siemens AG (Imre Varga)

Contact information: Address: Imre Varga, Siemens AG, ICP CD MP T3, Grillparzer Strasse 10-18, D-81675 Muenchen  
E-mail: Imre.Varga@mch.siemens.de  
Tel.: +49 89 722 47537  
Fax: +49 89 722 46489

#### **Responsible TSGs**

TSG SA WG4 (Codec)

**Work Item Title:** Tandem free aspects for 3G and between 3G and 2G systems  
Work Item S4-6 Description

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**x.1 TSG SA Work Area**

	WG1: Services
	WG2: Architecture
	WG3: Security
<b>X</b>	WG4: Codec
	WG5: Network Management

**x.2 Justification**

Mobile to mobile communications are increasing together with the penetration of mobile communication. If no care is taken this results in an increasing number of tandeming of the speech codecs which is well known to decrease the speech quality.

It is expected that when 3G networks are deployed the 2G systems be widely used all over the world. Consequently mobile to mobile communications are very likely to involve one 2G MS. Therefore TF must work within 3G systems and between 3G and 2G systems.

Tandem Free allows transmission saving within the PLMNs and possibly between them. This therefore reduces the operation costs for the mobile network operators.

TFO solutions (e.g. [1]) have been or are being developed for the 2G systems such as GSM, PDC and IS136. The TF solution for 3G shall be able to interwork with the 2G solutions.

A prerequisite to establish Tandem Free is that same speech codecs are used in the 3G and the 2G systems. The mandatory and optional speech codecs of the 3G systems should enable Tandem Free.

**x.3 Intended Output of the Work Item**

Technical Reports and Technical Specifications enabling the implementation of the Tandem Free feature :

General Description

TFO specifications for the Transcoders

Contribution to the out-of-band solution

It is expected that the layer 3 signaling required for the Tandem Free will be standardized by other TSG Working Groups.

**x.4 Impact on other Technical Specifications and Technical Reports**

Affects:	USIM	ME	NW	Others
<b>Yes</b>			<b>X</b>	
<b>No</b>	<b>X</b>			
<b>Don't know</b>		<b>X</b>		

**x.5 Technical Scope, including the field of application of the intended output**

The technical specifications under the responsibility of the TSG SA WG4 are related to the 3G transcoders and restricted to the speech services.

There has already been activities on the TF subject for the 2G systems. The TSG-SA intends to use this work and to carry out the adaptation required for the 3G systems.

The GSM TFO is mainly based on in-band signaling due to the lack of proper layer 3 signaling to ensure TFO between and within GSM networks.

It has been recently agreed upon that the transcoders will be part of the Core Network, this should allow out-of-band solutions or a better coordination between out-of-band and in-band signaling. This also facilitates the transmission saving. The TSG SA WG4 intends to collaborate with the proper TSG WGs to elaborate such a solution.

The interface with the RAN for the speech services has not been standardized yet and will impact the TF standard.

#### **x.6 Impact on and Linked 3GPP Work Items**

The TSG-SA4 WI1 "Mandatory speech codecs for Narrowband Telephony Service".

The corresponding activities TSG-SA WG2 (Architecture), TSG-CN WG1 (MM/CC/SM (Iu)) and TSG-CN WG3 (Interworking with external networks).

#### **x.7 Schedule of tasks to be performed**

Technical Report "Architectural Model for the 3G Transcoders" (in collaboration with TSG SA WG2)	April 1999
Identification of the 2G systems with which to interwork	June 1999
Requirement for TF	June 1999
Technical Specification for TF within 3G networks	December 1999
Technical Specification for TF between 3G networks	December 1999
Technical Specification for TF between 3G and 2G networks	December 1999

The Technical Specifications will be drafted in collaboration with the TSG Working Groups having activities related with the TF feature.

#### **x.8 Supporting Members**

<b>Individual Member Organization</b>	<b>Representing Partner</b>
Ericsson	ETSI
Nokia	ETSI
Nortel Networks	ETSI
NTT DoCoMo	ARIB
Siemens	ETSI

#### **x.9 Work Item Rapporteur**

William Navarro (Nortel Networks, ETSI)

Nortel Networks 19 Avenue du Centre – MS CT111  
Montigny-le-Bretonneux  
78928 Yvelines Cedex 9  
France

Tel: +33 1 39 44 57 56

Fax : +33 1 39 44 50 12

E-mail : navarro@nortelnetworks.com

#### **x.10 Responsible TSGs**

TSG SA and TSG CN

#### **x.11 Existing Reference Documentation**

- [1] ETSI GSM 08.62 Digital cellular telecommunications system (Phase 2+); Inband Tandem Free Operation (TFO) of Speech Codecs