3GPP TSG-SA

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Source: **Ericsson**[1]

Title: **Requirements and Objectives for Global Text Telephony**

Document for: **Discussion and Decision to start a new Work Item**

Agenda Item: **6.6**

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1. Summary and Recommendation

This document proposes Requirements, Objectives and Milestone Plan for a new Work Item in 3GPP/SA on "Global Text Telephony" in GSM and UMTS mobile networks.

The standardised solution for Global Text Telephony in 3GPP shall fulfil the thirteen TTY forum requirements that include the FCC requirements. These requirements and comments are reprinted in Annex A.

The solution shall fulfil further requirements brought forward by the TTY forum in September 1999, also reprinted in Annex A.

More requirements stem from users in other countries or the general requirement that the solution shall be useful in practically all countries world-wide.

The solution shall also allow interoperability world-wide, i.e. between users in different countries.

All these requirements are taken into account and ordered according to four categories:

- A: Transmission Performance Requirements
- B: Man Machine Interface Requirements (MMI)
- C: Compatibility Requirements
- D: Complexity of Implementation and Roll out

The Milestone Plan takes into account that the current transmission performance for the 5-Bit Baudot code, widely used in US, is not fully satisfying in PCS1900 networks without frequency hopping and that the FCC has required urgent solutions to this problem for E911 emergency calls.

A long term solution including general multimedia services is envisaged for global text telephony. The first, short term part of this solution should focus on satisfying the requirements of present text telephony users.

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2. Definitions and Abbreviations

EDT European Deaf Telephone
TTY Here used as the term for the text telephone type dominating in USA.
DTMF Here used as a term for the text telephone type used in Holland, using DTMF tones.
VCO Voice Carry Over: Alternating (or parallel) sending of Speech and receiving Text
HCO Hear Carry Over: Alternating (or parallel) receiving Speech and transmission of Text
FCC Federal Communications Commission (of United States of America)
PER Printable character Error Rate
MMI Man Machine Interface
SIM Subscriber Identification Module
ITU International Telecom Standardisation Union
GSM Global System for Mobile communication
UMTS Universal Mobile Telecommunication System
3GPP Third Generation Partnership Project
SA 3GPP System Architecture group
S4 3GPP System Architecure, working group 4

3. Background

3.1 Text Telephony

Text telephone systems are implemented mainly for distant conversation with deaf, hard-of-hearing, speech-impaired and deaf-blind users.

The general user needs are described in ETSI ETR 333.

In PSTN, seven different, openly specified systems for text telephony exist, and are used in different regions. Some proprietary modes are also used.

The open specifications are called Baudot, DTMF, EDT, V.21, Bell103, Minitel and V.18. They all use different modem technologies and character coding for the transmission of text. They are briefly defined in the annexes of ITU-T V.18.

ITU-T V.18 is an automoding mechanism that enables communication with all the legacy modes on the modem level. It also detects when both parties have V.18, and invokes an internationally useful character set, defined in ITU-T T.140, and optionally transmission of text and voice simultaneously. Native modulation for V.18 is V.21, while V.61 is used when simultaneous voice and text is wanted. Other modulations can be negotiated.

V.18 and T.140 are intended for use in new PSTN text telephones. They are also intended for use in gateways, bridging from the fragmented situation in the PSTN, into new services, designed according to the Total Conversation concept.

3.2 Total Conversation

Total Conversation adds text conversation to multimedia protocols in a standardised way, so that simultaneous communication in video, text and voice is accomplished. For the text part, the Unicode based text presentation protocol ITU-T T.140 is used. It is transmitted with a specific

standardised transport channel for each environment. Subsets can be used for example for text telephony enabled in the multimedia architectures.

Total Conversation is currently defined in the following environments:

1. Packet networks, where the procedures described in H.323 Annex G can be used for text conversation sessions, using TCP or RTP/T140 for the transport of T.140.

2. Packet networks, where the IETF Session Initiation Protocol SIP can be used for setting up and conducting text conversation sessions using RTP/T140 for the transport of T.140.

3. The H.324 multimedia environment in PSTN, ISDN and Mobile networks, where an AL1 channel connected by H.245 procedures is used for T.140.

4. The H.320 multimedia environment, where a H.224 channel with client ID=2 is specified for transport of T.140.

5. The T.120 data conferencing environment, that can be used alone or in conjunction with any of the environments above, where T.134 specifies the application entity and T.125 the data channel for T.140.

6. Text Telephony in the PSTN using the ITU-T V.18 modem and T.140 for the presentation without any further transport protocol.

3.3 Interworking

Interworking between these forms of Text Conversation can be achieved through the use of gateways or interworking functions. One gateway mechanism in the process of standardisation is ITU-T H.248, where Annex F describes additions for handling text telephony and text conversation.

3.4 Additional services

Apart from the basic user – to – user conversation, the following are examples of important additional services that can be offered text telephone users and Total Conversation users.

Emergency services

The ability to call to emergency services, announce an emergency situation and discuss the actions can be offered text telephone users and Total Conversation users.

Relay services

In order to have conversations with users of plain voice telephones, text relay services are established. Currently, manned relay services dominate, offering real time translation between written and spoken language. Automatic and semi-automatic versions are emerging. A through connection of the voice channel is usually offered as an option to satisfy users who can benefit from multiple modes.

With Total Conversation services, both traditional text relay services and other relay services are established. Examples are sign language relay services with text support during service establishment and speech-support relay services with visual enhancement.

4. Requirements and Objectives (R&O)

The Requirements, expressed in "shall" terms must be fulfilled or exceeded.
The Objectives, expressed in "should" terms are ultimate targets and may need to be balanced against cost and usability influence. Values in [square brackets] are subject for discussion.

Most requirements in this chapter are derived from the requirements expressed to be urgent urgent by the FCC and the CTIA TTY forum in USA. The relation with these requirements are documented for each requirement.

4.1 R&O on Transmission Performance

A1: The printable character error rate (PER) shall be less than [1%] for stationary calls under nominal radio conditions, i.e. where also speech calls show an acceptable quality (TTY/FCC 1).

A2: The printable character error rate (PER) shall be less than [1%] for calls with pedestrian speed or typical vehicle speed under nominal radio conditions (TTY/FCC 13, TTY Forum, extended).

A3: An output volume control should be provided in order to allow adaptation to existing Text Telephone equipment for optimal receiving quality (TTY/FCC 4).

A4: The input range shall be automatically adapted to the proper receiving level (new).

A5: The Text Telephone shall allow to transmit Speech and Text (VCO/HCO) in an automated way, without user interaction, either by alternating between speech and text mode or by transmitting speech and text in parallel (objective) (TTY/FCC 9, extended).

A6: The delay of the speech path shall not exceed that of a normal speech call in that situation by more than [40ms] in one way, if the text telephone functionality is activated. Otherwise [no] additional delay shall occur to the speech signal. The delay of the speech path should not vary during a speech phrase.

A7: The delay of the text path shall not exceed that of the speech path by more than [1000 ms] (one way) at typing speed of [7] characters per second. The delay of the text path may be variable.

A8: The time of switching between Text and Speech mode shall not exceed [1000ms] at typing speed.

A9: The printable character throughput shall not be smaller than [10] characters per second under nominal radio operating conditions (TTY/FCC 10, extended).

A10: Under impaired radio conditions the character throughput may be reduced in order to achieve the desired printable character error rate (TTY/FCC 10, modified).

A11: The signals used for transmission should pass existing fixed and wireless "analogue" speech channels with a printable character error rate below [1%] under nominal radio conditions, if two devices are connected "back to back".

A12: The data transmission bit rate should be as high as possible under the given radio conditions with the objective of [300] Bit/s with a bit error rate below [10^-3] and a residual bit error rate below [10^-5] (after removing detected bit errors).

A13: It shall be possible to transmit both, single characters, as well as long text or data strings (from file) efficiently.

A14: The transmission mechanism should provide data flow control to adapt the source data rate (when in file transfer mode) to the varying radio transmission conditions, in order not to loose data on the path.

A15: The character coding shall allow transmission of characters from any language in a consistent way.

4.2 R&O on Man Machine Interface (MMI)

These Requirements and Objectives are to some extend depending on implementation and not on the transmission standard. This list shall by non means restrict the innovation capabilities of vendors, but give guidelines and define a minimum set, against which the transmission standard needs to be checked.

B1: The Text Telephone user must be able to monitor all aspects of call progress (same or more information as provided to voice users) by tones and visualisation (TTY/FCC 2). The transmission standard shall provide the necessary monitor information to the MMI.

B2: There must be an indication, by tones and visualisation, when the call is connected or disconnected (TTY/FCC 3).

B3: Call information such as caller identification, where provided in mobile voice services, should also be provided for Text Telephony calls (TTY/FCC 11 adapted).

B4: The Text Telephone system must be able to send “Text Tones” to a normal telephone user, to indicate that he is using a text telephone, even if the other user has only a normal phone (TTY/FCC 6 adjusted).

B5: The Text Telephone user must have a means of tactile (vibrating) ring signal indication. (TTY/FCC 5), besides an acoustical and optical ring signal indication (new).

B6: Emergency calls (e.g. to 112 or 911 numbers) shall not require any further user interaction than for any normal voice call (except to connect the possible additional equipment) (new).

B7: Call back from Emergency Call Centres should not require any further user interaction than for any normal voice call (except to connect the possible additional equipment) (new).

B8: Call setup to and from other Text Telephone users of the same type according to the new standard should not require any further user interaction than for any normal voice call (new).

B9: Call setup to and from other Text Telephone users of an other kind (e.g. those defined in ITU V.18) may require some user activity, like

- sending a short additional precode (e.g. [2..3] digits) or
- typing a short digit sequence to invoke the service (e.g. like [#55*]) or
- (on user´s preference) the permanent subscription to such a service

- a capability signalling by the mobile

- activating a text telephone application

- others

B10: The new standard should allow the usage of ordinary unmodified mobile phones as already available to the user or on the mass market, in order to get the advantage of high volumes price level.

B10: The new standard shall allow to hide the intermediate (with existing phones) necessary user interaction, as described in the items before, in modern equipment (automatic service).

B11: The use of the Text Telephone for emergency calls with unregistered phones or without SIM card shall be possible as for normal voice calls.

B12: The interface to the possible adapters shall be exactly specified with

- mandatory interfaces (as to allow interaction to existing Text Telephones and the basic access to the mobile phone) and

- optional interfaces (as to connect microphone and loudspeaker, the control port of the mobile phones, …)

4.3 R&O on Compatibility

C1: The standard shall be compatible to equipment on the landline side as specified in ITU recommendation V.18 (TTY/FCC 12, extended), including all annexes of V.18 and V.18 with V.61 for voice and text simultaneously

C2: The landline party's Text Telephone equipment shall not need modifications or additions in order to be compatible and to achieve the desired error rate (TTY/FCC 7).

C3: It shall be possible to deploy the Text Telephone standard world wide in all GSM and UMTS networks (new).

C4: The wireless Text Telephone (i.e. on the Mobile user side) may require modifications or additions or the development of new equipment (TTY/FCC 8). The smaller the modifications or additions the better.

C5: Roaming between networks of different operators of the same kind of wireless technology shall be possible, provided the operators has installed the service.

C6: Is should be possible to connect equipment implementing the standard to any existing mobile phone of any existing wireless standard.

C7: Communication between Text Telephones in different kinds of wireless technologies shall be possible.

C8: Communication with text between mobile text telephones and multimedia devices with text shall be possible.

4.4 R&O on Complexity of Implementation and Roll Out

D1: The standard shall allow a fast first step implementation and roll out

D2: The standard shall allow a smart integration into the mobile phone or the Text Telephone terminal or an integration of everything together into a single device.

D3: The interaction between the new and existing standards may require a network based server, which may be deployed in different steps in different levels of integration as user demand grows over time.
Note: since at start up of the service no or only few users with this new Text Telephone standard will be online, a SW-based solution may be a reasonable, fast rolled out step, while high volume traffic (after some time) will possibly require more cost efficient solutions.

5. Draft Mile Stone Plan for Standardisation

March 2000: Approval of Work Item on Global Text Telephony by SA and S1

March 2000: Start of work in S1 and S4 (pre-assuming approval by SA)

June 2000: Examination of proposed solutions (short and long term)

Sep 2000: Review of intermediate results for GTT, Selection of proposal for short term part

Dec 2000: Recommendation for short term part ready for approval

Dec 2001: Recommendation for complete multimedia solution ready for approval

Annex A: (reformatted)

Committee

T1P1.5

Phoenix, AZ

November 17, 1999

TITLE: Industry TTY Forum Liaison Report

SOURCES: **Ed Hall, CTIA, TTY Forum Co-Chair**
Todd Lantor, PCIA, TTY Co-Chair

DISTRIBUTION: Committee T1P1.5 and appreciate working groups

CONTACT: **Ed Hall, CTIA**

ABSTRACT:

This contribution reflects comments and issues raised at the September 9, 1999 Industry TTY Forum. Most of the issues contained herein may have a significant impact on the selection of a GSM, TTY solution.

RECOMMENDATION:

CTIA recommends that this contribution be remanded to the appropriate working group for review and consideration. Questions and requests for clarification should be directed toward to Ed Hall or Todd Lantor.

During the Industry TTY Forum 12, September 9, 1999 Ericsson and Nokia provided presentations highlighting their technical contributions currently being considered by the TIA, TR45.3, TTY Working Group, (TR45.3.5).

Following both technical presentations, the consumer, FCC and emergency service representatives at the Forum responded with a myriad of questions that has resulted in additional *Issues* and *New Items of Concern*. Since these issues and concerns are significant, and may impact the TIA due process and bias the decision making of the engineering working group if not fully understood and kept within proper context, CTIA provided a liaison to insure all questions and concerns were addressed.

Although it is imperative that a technical solution for TTY over the GSM air interface be selected in the near future, it is likewise crucial that the decision process be based on a sound, technical analysis, while considering the consumer requirements as perceived, accepted and published by the FCC.

The issues and new items of concern that were voiced at the TTY Forum 12 are attached for your review and consideration.

Appendix: Consumer requirements with *comments* regarding proposed solutions

1. The character error rate should approximate that of AMPS, which has been demonstrated at <1% for stationary calls. More research on AMPS performance with TTY would be useful to assist in specifying a range of conditions.

Comment: All proposals presented to date appear to meet this criterion. Consumers are concerned that there be sufficient testing to validate this in the field.

2. The TTY caller must be able to visually monitor all aspects of call progress provided to voice users. Specifically, the ability to pass through sounds on the line to the TTY (so that the user can monitor ring, busy, answered-in-voice, etc.) should be provided.

Comment: All proposals claim to meet this criterion and we have no concerns. (IWF solutions may, however, not be able to meet this one.)

3. There must be a visual indication when the call has been disconnected.

Comment: This specific issue has not been addressed in presentations but is covered by most if not all systems by a message on the display of the phone.

4. A volume control should be provided.

Comment: This item is intended to allow the TTY user to adjust volume for better reception of TTY tones as necessary. Most if not all handsets include this feature anyway. It has not therefore been addressed in presentations on solutions.

5. The TTY user must have a means of tactile (vibrating) ring signal indication.

Comment: Again, this is an issue of general provisioning and not related to voice-channel solutions. (However, this will be an issue in IWF solutions.)

6. The caller must be able to transmit TTY tones independent of the condition of the receiving modem. (This is to permit Baudot signaling by pressing a key, to let a hearing person know that the incoming call is from a TTY.)

Comment: All voice-channel solutions to date appear to support this.

7. The landline party's TTY must not require retrofitting in order to achieve the desired error rate.

Comment: All solutions to date appear not to require retrofitting of the landline TTY.

8. The wireless party's TTY may require retrofitting, or a new model TTY to be developed, or the use of a portable data terminal such as a personal digital assistant.

Comment: Solutions that do not require retrofitting or special treatment are preferred by consumer representatives.

9. VCO and HCO should be supported where possible.

Comment: Voice-channel solutions presented to date appear to support this requirement. (IWF solutions may not, however.)

10. Reduction of throughput (partial rate) on Baudot is highly undesirable and should not be relied upon to achieve compliance (see #7). It may be useful as a user-selectable option to improve

accuracy on a given call.

Comment: No solution presented to date reduces throughput, as nearly as we can tell. This should be verified with the companies proposing solutions.

11. Call information such as ANI and ALI, where provided in wireless voice, should also be provided for TTY calls.

Comment: Voice channel solutions should not cause a problem with this.

12. On the landline side, the solution need not support little-used or obsolete TTY models, but in general should support the embedded base of TTYs sold over the past ten years. The landline equipment supported must not be limited to that used in Public Service Answering Points (911 centers).

Comment: This is of concern because of limited testing of solutions to date.

13. Drive conditions must be supported, again using AMPS as a benchmark.

Comment: This requirement has not been adequately addressed by testing.

September 14, 1999

To: TIA TR-45.3

Fr: Consumer Representatives, Wireless TTY Forum

Authors: Judy Harkins, Gallaudet University and Dick Brandt, dB Consulting as consultant to Gallaudet

David Baquis, Self Help for Hard of Hearing People, Inc.

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Re: Guidance to TR-45 on Proposals for Solutions to TTY over TDMA

Presentations on three of the proposals being considered by TR-45 for the TDMA TTY solution were made at the September 9, 1999 meeting of the Wireless TTY Forum. Given the timeframe TR-45 is operating under, and given that the FCC has directed industry to consider consumer issues in determining solutions, we offer this document as guidance to TR-45 as it considers the alternatives.

The information presented at the September 9 meeting was, in some cases, sufficiently sketchy that consumers were unable to ascertain the functional implications of the proposals. Some presentations were also done very late in the process, so there is not sufficient time for analysis.

We do not state a preference for any proposal but hope the following discussion will be helpful.

General Questions and Issues:

1. There is a concern among consumers about the implications of roaming among digital technologies in the future, if a variety of approaches for TTY access are used. Thus we believe consistency in approach across technologies is needed. One of the carriers also strongly expressed this view. This problem needs to be solved for the long term, not just for the current situation where roaming tends to go to the more-accessible analog network. Once these solutions are implemented, if problems arise, consumers will have great difficulty having them addressed because the solutions are within the network and customer service personnel will not be equipped to deal with them.

2. Has there been any analysis indicating that approaches which propose network changes in switches versus changes in base stations, would lead to earlier availability as claimed? Consumers are interested in seeing solid, lasting and effective solutions, and the speed of implementation, while important, should not override usability considerations.

3. All test results presented to date have been obtained using blocks of data sent out from a file stored either in a TTY or in a computer and sent via a TTY modem. It has been noted in tests run by Gallaudet that results obtained in an interactive mode (two people typing to each other) yielded poorer accuracy. Thus proposals that show errors in transmission should be scrutinized carefully. A full range of system impairments has either not been used in simulation testing or not reported on all of the solutions.

4. Non-activated phone support for 9-1-1 calls is required by the FCC. Has this been considered in the proposals? (See class mark discussion below.)

Appraisal of Specific Solutions:

Vocoder solution. From a consumer perspective, the Lucent "no gain" solution has been most thoroughly presented and appears to have the most transparent accessibility and the most support for consumer needs and requirements. The inclusion of error correction is a major benefit, given that the air interface presents new challenges to TTY transmission. Other, comparable proposals may also have merit (e.g., Nokia), but they have not been thoroughly explained so that consumers can compare them.

Code conversion. The Ericsson (and Nokia?) Code conversion ("tone") proposals appear to offer the possibility of earlier implementation (see 2 above) and the ability to use many existing handsets, but have the potential of putting the retrofit burden on the consumer. They raise the following concerns:

1. Smart Cable: Consumers are not opposed to the idea of including intelligence in the cable per se, however the following concerns exist:

    1.1. How would this intelligence be powered? (This question could not be answered at the Sept. 9 meeting.) There is opposition to the requirement for an additional battery for reasons of cost, bulk, and reliability.

    1.2. Who would make and provide the cable?

    1.3. Would this intelligence be built into the regular cable product line or would this be a primarily or exclusively "deaf" product? If the latter, experience shows that provisioning and cost may be serious problems. Customers often have to wait many weeks for "special" accessories. We realize standards bodies do not ordinarily address cost issues, but please consider the additional cost of a phone that vibrates (over a low-end phone), the cost of the TTY, and now the potentially high cost of a special-purpose cable with a small market.

    1.4. Would one cable fit all (thereby lowering the price and expanding the availability)?

2. Class Mark: Any system that relies on the phone having a class mark denoting that the user uses a TTY is not likely to be successful, because many deaf and hard of hearing people consider self-identification as a possible threat to their security. 9-1-1 operators have never been successful in having deaf and hard of hearing subscribers "sign up" as a TTY telephone number. The procedure is fraught with potential problems and snafus. When someone roamed into a carrier using this solution (not marked), what would happen? Hearing people who use TTYs may not realize they need to enroll their phones. People who have a phone and acquire a TTY later (e.g., after onset of hearing loss) would find the TTY does not work. TTY users could not use someone else's cell phone. One solution to this problem suggested at the forum was to mark all phones as TTY. Would carriers agree to this? In short, a system

that provides automatic detection of the TTY signal is preferable.

IWF. Although we recognize that IWF proposals are not a part of the present TR-45 TDMA TTY discussions we would also like to provide the following for your information, as they should be considered in development of proposals:

1. There is a strong desire for VCO/HCO capability, which appears to be difficult to implement in IWF solutions at the present time.

2. There is also a strong desire for provision of the line signal power indicator (flickering light) used to interpret call status.

3. Consumers are opposed to (and the DOJ has mandated against) requiring any form of special dialing (e.g., two-stage) or conditioning sequences (e.g., #NN) to reach 9-1-1.

4. It will be important that the delay between powering on a data device and dialing out not exceed the delay experienced with a voice call.