2.4 Evolution of text telephony

2.4.1 The recommendations of the Nordic countries regarding functionality for text telephony

Robert Hecht

Foreword

The following recommendations about the future functionality of text telephony were compiled by the Nordic Forum for Telecommunication and Disability (NFTH)[1] by mandate of the NFTH meeting held in Reykjavik in May 2005 [NFTH, 2005].

Introduction

The next generation of text telephony in the Nordic countries and Europe is under development. The next generation of text telephony means telephony that is Internet (IP) based, and also various mobile terminals. The objective is to clarify the Nordic standpoints, in order to in this way contribute to increased harmonisation within the area.

The Nordic standpoints concerning traditional text telephony and text telephony for everybody

Mobility

Text telephony should be operator-neutral and independent of terminal manufacturer. Mobile text calls should function in 3G, GSM and future terminals. The terminals that are also in common use now should also be able to cope with mobile text, i.e. 'smartphones' should not be a basic requirement. A smartphone combines the functionality of a mobile telephone and a laptop computer in one and the same terminal. It is desirable that terminal manufacturers facilitate the use of both voice and text channels simultaneously during a call.

[1] The Nordic Forum for Telecommunication and Disability (NFTH) is a collaborative body established in 1987 by The Nordic Cooperation on Disability (NSH) under the Nordic Council of Ministers. NFTH is financed by The Nordic Development Centre for Rehabilitation Technology (NUH), which is a subsidiary of the NSH. The purpose of NFTH is to discuss relevant topics in the field of telecommunications that concern disabled persons and to support the Nordic countries' endeavours to integrate disabled persons into the information society. NFTH does this by making recommendations and guidelines dealing with the current and future problems of the new information society. http://www.nuh.fi/NFTH_eng.htm

Internet

Text telephony should be possible through downloaded software or via the Internet, on computers with the most common operative systems (Windows, Macintosh, Linux, etc.). Text telephony should be possible from various computers with Internet access, including Internet cafés. Between computers, it should be possible to speak and hear simultaneously as text is being used.

Service interoperability

Within the Nordic countries text telephony between computers, common kinds of mobile terminals and the analogue text telephones that are used within the Nordic countries, including Speak directly-functionality, should function. Text telephony should, if possible, also offer interoperability with common 'Instant Messaging' (IM) services, such as MSN Messenger and Yahoo, among others.

Service interoperability can be achieved in various ways. It may, for example, relate to a central 'gateway' solution, or the production of a common technical solution. It should be possible for text telephony to be used through the various networks that are common and available in various contexts.

Continuous transmission of text

During a text call it should be possible to transmit continuously so that the conversation is fluent. A text call should be perceived as occurring in real time and correspond with a voice conversation, where it is possible to interrupt each other at any time.

When text is sent at approximately one second intervals, the party conversing senses the fluency mentioned above. Sending text as blocks ('chat') is a supplement, but it does not completely satisfy the need for a text conversation corresponding to a conversation that speaking persons experience.

Interoperability for text telephony across IP

With analogue text telephony, several different standards have emerged. Interoperability for text telephony via IP should apply within the EU area, and preferably globally. The ongoing work to achieve interoperability for text telephony over IP is of great importance.

Relay services for text telephony

Relay services facilitate calls between persons with hearing, persons who have speech impairment, deaf persons and deaf-blind persons. These are crucial services that assist in creating communication between persons with disability and persons with hearing. Relay services may be either manual or automatic.

It should be possible to connect relay services the easiest way possible. It is appropriate that the person calling up should not need to know that, for example, a certain telephone number leads to a hearing or a deaf person and that the call is automatically diverted via a relay service when this is necessary.

It is also important that relay services for text telephony and relay services for video telephony use voice/audio and text in the same way, so that interoperability is achieved to the highest possible degree between text telephones, video telephones and total conversation units.

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NFTH, (2005). The recommendations of the Nordic countries regarding functionality for text telephony. http://www.nuh.fi/NFTH_2-2005.doc

2.4.2 Mobile and IP–based text telephony Flexible text communication services in Sweden

Robert Hecht

Rationale

It is estimated that there are around 6 000 – 8 000 sign language users in Sweden today who use mobile phones for either SMS or video calls. This project opens a possibility of using the mobile phone for text calls with other mobile telephones, with Internet users and traditional text telephones.

There are in addition a large number of users in Sweden today who are classified as post language deafened, who cannot use sign language and who use speech for outgoing communication. These users cannot at present use the Internet efficiently, i.e. say what they want to say and receive text instead of speech.

The emergency number 112 and the Text telephone Relay Service in Sweden are examples of services that can be reached using a mobile text client or a web-based client.

Mobile IP Technology

This service addresses a clearly emerging need to communicate using text communication through the mobile, for example when 3G coverage is lacking or it is impossible to interface in real time with other text telephones or services which are compatible with legacy text telephones (V.21, EDT, DTMF, Baudot, V.18, etc.) on the PSTN network, such as emergency services, text relay services, etc.

To complement the mobile communication, a web-based client is used. Both clients can be downloaded and used from anywhere, such as Internet cafés, office environment, etc.

The service supplements existing investments in text and image communication, e.g. for users who do not use 3G telephones or when coverage for image communication by 3G does not exist or for deaf adults who do not use sign language.

The service is also operator independent, which is a big advantage with regard to the user preferences.

Call traffic

The following calls can be made using the service.

- *Mobile text clients to: legacy text telephones, other mobile text clients and/or web-based clients that use the open standard specified below*
- *Web clients to: legacy text telephones, other mobile text clients and/or web-based clients that use the open standard specified below*
- *Text telephones: to mobile text clients and/or web-based clients that use the open standard specified below.*

Open standard

The mobile data network puts several constraints that make it almost impossible for P2P communication between mobile devices. That is the reason for that in the service it was decided to generate a communication model using standard, existing and allowed protocols.

The solution adopted in the service is to use an application server that relays the dataflow between mobile terminals, web interfaces and legacy text telephone.

One of the goals of the service is to allow any software or terminal to connect to the application server and get the possibilities to communicate with mobile terminals, web interfaces and legacy text telephone.

The protocol used in the mobile terminals is http(s) and XML-RPC schemas[1] that fulfil the recommendation of the ITU-T T-140[2]. The web interfaces are using the http(s) protocol and SOAP-XML web protocol[3] that enables the service to use the protocol and thereby avoid the annoying "firewall" problem, as described in SOAP-XML[4].

[1] It's a specification and a set of implementations that allow software running on disparate operating systems, running in different environments to make procedure calls over the Internet.

[2] Mobile text telephone: XML mobile text protocol.

[3] SOAP is the Simple Object Access Protocol, a way to create widely distributed, complex computing environments that run over the Internet using existing internet infrastructure. SOAP is about applications communicating directly with each other over the Internet in a very rich way.

[4] Web text telephone: SOAP XML web protocol.

Features

Users who utilize text primarily for remote communication will have good and equal facilities for effectively contacting each other, authorities or relatives and alarm services which have a text telephone interface.

A number of important features in the service are discussed below.

Client downloaded to mobile phones and/or PCs

To download the software to be used in the mobile phones:

- *The mobile client is downloaded from a specific URL Customers that have downloaded the software can use it from their mobile phones.*

Text client for PC:

- *The text client is a Java application accessible via a web page.*

Communication with text telephones:

- *The service or platform has a so called gateway for communication between text telephony between mobiles, the Internet and text telephones*
- *The following gateways are in use today: Sweden (V.21), Denmark (V.21), Germany (V.18 with EDT text telephones).*

Mobile users

The mobile test pilots will send and receive text calls with their mobile phones which support Java functionality as per MIDP 2.0. For incoming calls it is assumed that the phone vibrates and depending on whether the user is registered in the system the call will be initiated by two different user procedures. It is possible to apply existing T9/dictionary functions in the mobile phone when texting.

The service is also operator-independent, which is a big advantage as far as the users' preferences are concerned.

Due to limits in the ergonomics of standard mobile phones available in the market today, a communication block wise ("chat") has been chosen.

Voice carry over (VCO) feature cannot be used from the mobile phone because today's mobile phones cannot use the data channel and the Internet connection at the same time.

Internet users

A web-based client is used by users, relatives, authorities and others to send and receive text calls from PCs connected to the Internet. The user has to be logged into the platform in order to be reached.

The web-based client is built as an applet and downloaded directly on the PC. This means that the users always download the latest version of the client.

The Voice carry over (VCO)/Hear carry over (HCO) features will be implemented during autumn 2006. The text function in the web client is "character by character".

In order for it to be possible to be reached by a web-based client the user or the relative must register in the service.

Text telephone access

Calls from a traditional text telephone to an Internet client and web/mobile client:

- *users who have a traditional V.21 phone (the text telephone user) dial a fixed-line phone number. The call is automatically answered by the service*
- *the service answers with the following text, e.g. welcome to web service for text communication. Which phone number do you want to call?*
- *the text telephone user then writes the phone number (or name) of the person sought*
- *the call will then be connected to the Internet client (web or mobile)*
- *If the Internet client does not answer the call, the text phone user can leave a message*
- *the text telephone user pays the current call charge to the service.*

During autumn 2006 the service had approximately 100 registered users using the service on a daily bases. The field trials with users are continuously evaluated. Conclusions in the final phase of the project will be vital in the decision making process within the National Post and Telecom Agency (Post- och telestyrelsen, PTS) of launching this functionality as a public service in Sweden during 2007.

References and further information

www.flexitext.net

2.4.3 Mobile text telephony based on GPRS Communications

Santiago Aguilera

Rationale

Text telephones allow deaf people to communicate remotely. However, even if the advent of text telephony has brought great improvements in remote communication for deaf people, current text telephony still has some limitations:

- *The need for specific terminals with small production volumes, increasing production costs in comparison to more widely used terminals*
- *The fact that deaf people have to pay higher telephone bills. This is due to the fact that to exchange the same amount of information, text communications require more time than voice conversations. Since the cost of a call is charged according to its duration, the cost of text calls is higher than for voice calls*
- *Text telephones used in many of the different countries are incompatible, making it very difficult to establish international text telephone calls.*

As previously mentioned, deaf people can be economically discriminated against due to the higher cost of telephone calls. This is due to the fact that the rates to be paid depend on the connection time and not on the transmitted data. Therefore, the objective of this project was to create a text telephony system based on GPRS[1] (2.5 G) data mobile communications, because GPRS considers for billing purposes, only the transmitted information. Since the amount of data is very low in text conversations (and is independent of the duration) the cost of calls will be much lower.

For the sake of mobility, the terminals used were Personal Digital Assistants (PDA) with Pocket PC or Palm operative system. The system was designed using Internet technology (TCP/IP protocol), allowing communication with any kind of terminals with the TCP/IP protocol, such as mobile telephones or PCs. For PCs a client text telephone program was implemented. On the other hand, a WAP text telephone client, able to communicate with the PDA text telephone client, was developed by the Spanish Vodafone Foundation.

[1]GPRS (General Packet Radio Service) run over GSM networks and offer the possibility of charging according to the amount of data sent rather than connection time.

Previous experience

In order to provide deaf people with the advantages of mobile telephony, in 1998 a commercial terminal, the Nokia 9110 (see figure 2.34), was adapted to text telephony. This programmable terminal was provided with specific compilers and its own operating system. The developed programs were therefore not portable [Roe, 2001].

Figure 2.34 Nokia Communicator working as text telephone.

This text telephone was widely accepted among the deaf community. More than 5 000 terminals are currently being used in Spain. It is worth mentioning that this project was nominated by European Union as an example of good practice in eliminating communication barriers and of "Design for All".

Nevertheless, this terminal was not able to solve two specific problems:

- *Text conversations take much more time than voice communications. Since GSM[2] telephony billed users according to the length of the call, deaf people paid much higher bills*
- *The software designed for text communication was not portable to new terminals coming on to the market.*

Text Telephone Based on GPRS Mobile Communications

The objective was to apply the new technological solutions that have appeared over the last few years to solve the previously mentioned problems: high cost of the calls and dependence on the terminal (no portability).

To solve the first issue, an application based on 2.5 mobile generation (2.5 G) was designed with the possibility of also using GPRS data communication [Andersson, 2001] [Heine & Sagkob, 2003]. This application allows the customer to be billed

[2]GSM (Global System for Mobile Communications) is the second generation of mobile phone systems. Invoices are based on connection time.

only for the amount of information transmitted, which is very low in the case of text telephony, in comparison to traditional billing based on call duration.

To solve the problem of the dependence on the terminal the application was programmed in C/C++ for the three different mobile terminal families, which cover almost 100 % of programmable terminals currently used by the vast majority of people:

- *PDA with Pocket PC [Makofsky, 2003] [Krell, 2002]*
- *Palm OS [Foster, 2002] [Bachmann, 2002] and*
- *PC with Windows OS.*

Client software

The system has a client/server architecture. The client terminal can be a PDA (Personal Digital Assistant) or a PC. The software for the client terminal was designed to allow the user to swap languages. Three languages, Spanish, English and Portuguese are currently supported. Its main functions are:

- *To access GPRS network for connection and obtaining a single IP address for identification a san IP client on the Internet. This IP address is dynamically provided by the GPRS network to the different devices connected to it (figure 2.35)*
- *To register itself (as a client terminal) in the text telephone server, communicating the obtained IP address (figure 2.36)*
- *To allow the user to make a call to other registered terminal*
- *To inform the user of the calls in the process of being received from other terminals. For people with hearing difficulties, the indication (event signal) is visual (blanking the screen terminal) and tactile (activating the vibrator included in the terminal)*
- *To register in the user terminal all non answered calls (lost calls)*
- *The last and most important function is to offer the possibility of real-time telephone conversation between two users.*

Figure 2.35 PDA connection with GPRS network. Dynamic IP assignation by the GPRS network. IP is fixed while connection is on.

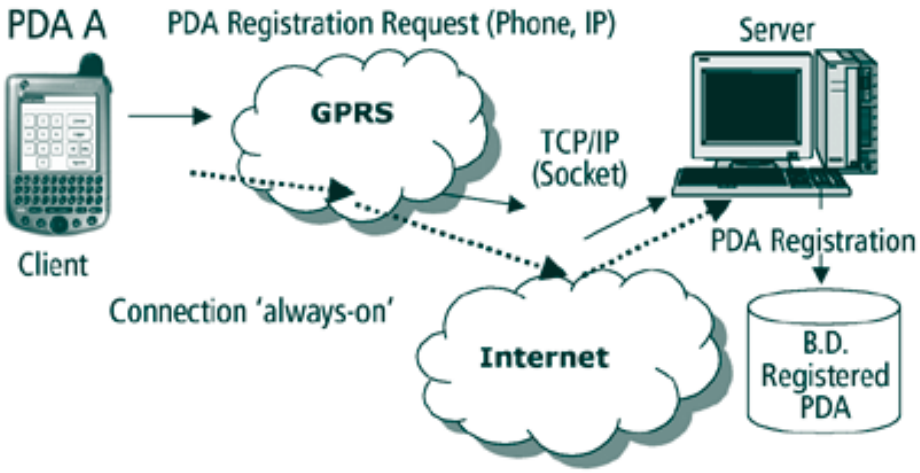

Figure 2.36 Registration process into the server by a PDA A. This PDA is connected to the server through the GPRS and Internet networks on a permanent basis ("always-on") to be able to access the service at any time.

Server Software

The server software, running in a remote computer connected to the Internet, carries out the following functions:

- *To allow the registration of the client terminals to be able to communicate among themselves. This process assumes information is stored in a database to identify each user: telephone number and IP address assigned by the GPRS network (figure 2.37)*
- *To detect the communication request from a caller trying to communicate with another user. If the called terminal is not registered in the server, the caller will be warned that no conversation is possible. If the called user is registered and not busy, he/she will be informed of the caller's intention to establish a text conversation with him/her (figure 2.38)*
- *When a called user accepts an incoming call, and the communication channel is on, the server drives the information traffic between them (figure 2.39).*

Figure 2.37 Call request to the server from a registered PDA A.

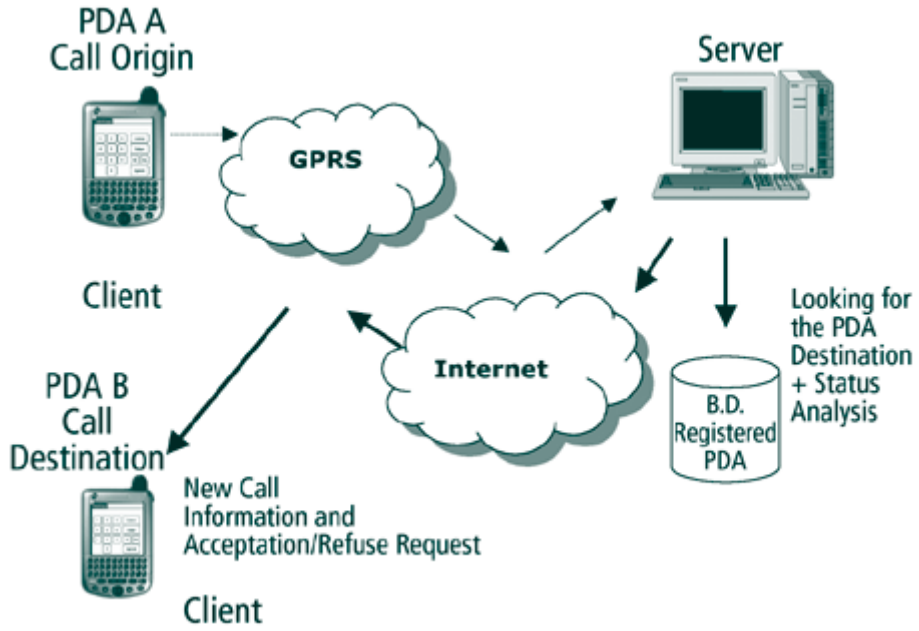

Figure 2.38 Localization of PDA B (call destination) and analysis of its status (no connected / busy / free) by the PDA A (call origin), through the server.

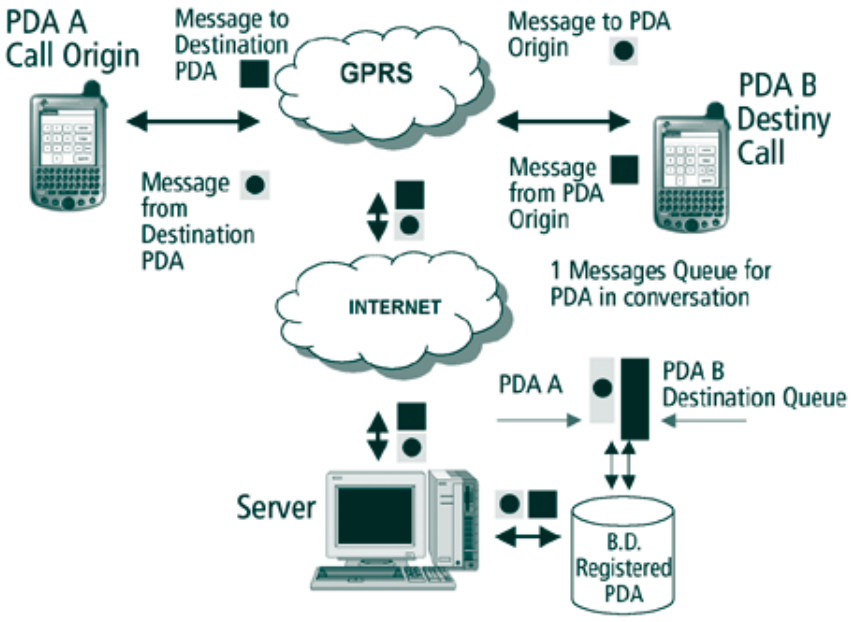

Figure 2.39 Details of the process in the server during an established conversation between a PDA A and a PDA B.

Evaluation

The evaluation phase started at the beginning of 2006. Around 60 PDA terminals were distributed among deaf users belonging to the Spanish Deaf Organization Foundation (FCNSE), which was a partner of the project. The objective of the evaluation was to detect any operational problems that may occur in a large-scale user trial. Furthermore, new functionalities that may be of interest to add to future versions of the GPRS text telephone were studied.

The system proved to be very efficient for the following reasons:

- *Due to the fact that the billing system is based on data traffic rates, which is quite low in the case of text conversations between two deaf users. Furthermore, this form of real-time textual communication is more effective than SMS conversations*
- *This solution allows a great variety of different terminals to be used in a rapidly changing market where new, lower-priced PDA terminals with better characteristics and functionalities are continuously appearing*
- *It allows communication with any user who has a PC, without the need for special terminals.*

Additional functions to be considered for the next versions are:

- *To allow communication with conventional text telephones connected to the fixed telephone network, through a gateway that carries out the protocol translation*
- *To add functions offered by conventional telephony: voice mail, telephone agenda, party calls, etc.*

This project was developed by the Universidad Autónoma de Madrid and the Universidad Politécnica de Madrid under the direction of Professor Santiago Aguilera, with the collaboration of the Spanish Deaf Association Foundation. It was funded by the Spanish Vodafone Foundation. The project was awarded with the prestigious IMSERSO-Infanta Cristina 2003 grant, given by the Spanish Social and Labour Ministry.

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