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Before the
Federal Communications Commission
Washington, D.C.

In the Matter of	)	
Telecommunications Relay Services and	)	CC Docket No. 98-67
Speech-to-Speech Services for	)	
Individuals with Hearing and Speech	)	
Disabilities	)	

FURTHER NOTICE OF PROPOSED RULEMAKING

COMMENTS OF THE REHABILITATION ENGINEERING RESEARCH CENTER ON TELECOMMUNICATIONS ACCESS, GALLAUDET UNIVERSITY AND TRACE CENTER, UNIVERSITY OF WISCONSIN

May 5, 2000

Gallaudet University and the Trace Center of University of Wisconsin have extensive experience in engineering, research, consultation and guideline development regarding accessibility of technology to people with disabilities. The two groups collaborate on a Rehabilitation Engineering Research Center on Telecommunications Access, funded by the National Institute on Disability and Rehabilitation Research (NIDRR).

Better integration of TRS with the PSTN

We applaud the FCC for addressing network technologies in the FNPRM. Some of the frustrating and time-consuming elements of consumers' experience with TRS are billing problems and procedures, which result from TRS not being fully integrated with the rest of the network.

The billing problems associated with inadequate data-sharing between TRS and wireless carriers will likely grow as the wireless network becomes more accessible to TTY users. Now that the wireless industry is working to fix compatibility problems with TTYs, it would be extremely unfortunate to see TTY users not adopt these technologies because TRS cannot detect that the call is originating from a wireless phone.

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- Ability to contact service via a variety of web-capable devices (including wireless ones), not necessary to use specialized equipment (TTY).
- Reduction of carriage of the call to the TRS site, as some ISP costs would be borne by the end-users.
- Direct text calls from Internet users to TTY users would cut down on need for operator's involvement.
- Direct web-to-TTY): Possibility of greater success with callbacks from businesses and others who can call back via Internet rather than via relay service.
- Possibility of greater competition in relay service provision.
- Greatly improved functional equivalency through advanced applications such as video communication for interpreting, lipreading, and other improvements.

Challenges inherent in this approach would include:

- VCO and HCO are not seamlessly supported at present.
- Potential exists for abuse of system due to the open nature of the Internet.
    - Internet does not operate on a state-by-state basis.
    - Any caller could be located anywhere in the world.
- Tools are needed for appropriate and fair billing of the call.
- Regulatory changes may be needed to accommodate this approach
- A structure for reimbursement to providers will need to be developed.
- Set-up costs to providers would be substantial at first.

Conclusion

It is important that administrative issues not tie TRS users to the oldest and slowest technologies. Internet is being underutilized by the TRS community because of ties to the past, but the ADA calls for improvements to TRS over time to realize greater functional equivalency. It is in the spirit of the law to re-examine our system in a more comprehensive way so that the basic TRS as we know it does not impede deaf people and other TRS users from moving to newer technologies.

Use of the Internet could also make it easy for, where desired, the deaf person to see both the interpreter and the person being called. All could be linked through a multi-media web-based product.

For those who lipread but do not know sign language, the video could be "captioned" by the TRS communication assistant (typist), while the VCO user could listen, lipread, and read the text transcription. Video might also have advantages to people with speech disabilities, who may have more success in phone communication when they are visible to the other person, reducing the need for operator assistance (speech-to-speech) in place of a more natural and private conversation.

Multiple communication streams and conversion of modes will also be possible in the Internet environment, opening the possibility for almost unlimited permutations of communication options, based on consumers' needs.

Gearing up for change

Service criteria for i-Relay would need to be defined. Websites can be very slow depending on the size of the pipe going into them. The idea here is to speed up the process, not slow it down. Site development would need to be done. The billing and reimbursement schedule would need to be determined. But such considerations are being deliberated for other advanced services, such as video relay interpreting, and should not preclude implementation of methods that provide greater functional equivalency.

Summary:

Advantages of i-Relay approach would include:

- Greater speed of typing possible due to faster throughput.
- Efficient call set-up.
- Standardized interface (web) for wide variety of users.
- Ability for users to maintain their own calling profiles.
- All-text conference "calls."
- Ability of mobility-disabled text users to take advantage of computer-access software not available on TTY.

Communications has demonstrated a WWW interface to TTY via TTY modems on a server.

An intelligent web interface could be developed that would automatically attempt to reach the called party via Internet chat, and if the party were unavailable via Internet, would automatically connect to TRS for making a PSTN call to the person's phone number.

Text chat on the Internet is now a mainstream product, whereas it never developed in the mainstream on the switched telephone network using computer modems. The ability to call back via the Web would reduce the number of calls made through operator-assisted relay service, eliminating the cost of the operator's time and improving privacy.

As with the i-Relay, the attribution of costs and billing may require new models.

Advanced applications

Internet Video

Video relay interpreting permits even faster and more natural communication than the best text-chat methods. A sign language interpreter replaces the typist. The interpreter is linked to the deaf caller via a video link, and the interpreter communicates with the hearing party on a voice link.

Since IP technologies do not currently lend themselves to reliable video transmission for signing.When transmission speed is low, the resolution and speed of image refresh can be inadequate for sign language overall. Even when transmission speed is relatively high, the uneven rate can disrupt sign communication, for example, causing the image to repeatedly freeze.

However, the Internet is widely available at low cost and easy to use, unlike many broadband-switched services. High-quality sign transmission through the Internet could increase the use of VRI and, therefore, increase functional equivalency. In comments to the FCC on broadband services, we have noted that Quality of Service issues should apply to video signing as well as to voice communication.

Billing Issues

Many of the issues that appear to be obstacles to i-Relay are borne out of the historical context for billing arrangements. These would likely have to be re-tooled for this application of technology.

Specifically, the problem arises as to the origin of the calling party. In the current system, callers are billed for a call as if it were made directly and not through the relay service. The extra costs of carriage are recovered via the relay funds. Because states want to pay only for their own citizen's relay calls, the issue of residence would seem to remain an important issue.

To get around this problem, solutions will doubtless surface. At first pass, it appears that there are several alternatives worthy of consideration: One is to bill as is currently done, with the caller providing a number from which calls are made, and using a PIN to access the relay service. This would rely heavily on the honor system, but would provide an approximation of functional equivalency because set-up would be quick. Another alternative would be to devise a new, fair billing system that incorporates the cyber nature of the incoming call. Note that carriers are beginning to abandon the old billing system and go to flat rates for all carriage. This would aid in implementation of this type of system.

Direct Web-to-TTY

The ability to call directly from the Web to TTY should assist in migrating the TTY community toward the use of more advanced technologies for chat. It is also a helpful application for encouraging direct communication between hearing people and TTY users.

Many people who are deaf, hard of hearing, and speech disabled have difficulty getting hearing/speaking people to call them back through relay when they have initiated a call. There are a variety of reasons for this problem. One is the need to involve a third party on the call. Another is the unusual nature of the call: First calling an 800 number and requesting a second number from an operator. This is confusing to many people and company databases usually do not support the entry of two phone numbers.

For many people, particularly businesses, a web interface for direct calls to TTY may be a viable option to the operator-assisted relay. As noted previously, NXi

calls. Baudot's maximum throughput is about 60 words per minute (however faster protocols than Baudot are supported in all TRS centers). Under the new TRS rules, relay operators are expected to type at 60 words per minute. With the web as the interface, even the fastest typist can be accommodated.

Split screen conversations are another benefit of Internet conversation. The use of split screen permits more natural turn taking including interruption and, when the split is vertical (two columns) the flow of the conversation is easy to follow visually.

Conference calling

Internet permits multiple-user chat, or the text equivalent of conference calling. This can currently be accomplished using communication software such as ICQ, Yahoo, and AOL Instant Messaging. Web text chat has also been demonstrated, and technology from NXi, Inc. permits that TTY phone calls be conferenced into sites by use of a TTY modem; this functionality is on the market. A logical extension of this technology would be for TRS centers to be able to provide a more functionally-equivalent method of conference calling.

Voice channels

The voice half of the conversation could be accomplished by dialing on the circuit-switched telephone network. It may be necessary for the VCO and HCO user to have a second line; one for the Internet modem connection and one for voice. If the user had a digital subscriber line or cable modem service that bundles voice and Internet on one subscription, then this might solve the problem. At work, where the Internet connection is typically separate from the voice phone, this could also easily be handled.

In the future, as voice networks move over to Internet protocol, more integrated approaches to TRS can be achieve. Voice over IP services could be used for the voice part of the conversation, saving further on carriage costs. Quality of transmission would be very important, however. The speech must be clear enough for the relay operator to be able to transcribe; and people whose speech is impaired would be harder to understand if the speech were heavily compressed and distorted.

elements are still subject to some problems and few end-users are equipped to initiate or receive video calls.

Using the Internet in Support of Functional Equivalency

Like these examples, the Internet as a gateway to the TRS provides additional benefits in the area of functional equivalency. TRS text users could simply point their web browser to a website operated by a relay service. TRS voice users whose text party may be accessible via Internet could also initiate phone calls to Internet text users through the relay. This i-Relay approach could be combined with direct Internet-to-TTY all-text approaches that cut down on the need for operator assistance.

Setting up the Call

On an ordinary relay call, "setting up" the call requires interaction with the relay operator. In most calls, this is done via two-way text on a Baudot terminal. Often the basic set-up of multiple calls can be achieved at the outset of the first of consecutive calls. The amount of information exchanged depends on (1) whether a profile exists that helps the operator identify desired choices, (2) the typing speed of both parties, (3) the number of options the user chooses, and (4) the proficiency and knowledge of the operator regarding TRS policies and procedures, (5) the knowledge of the consumer about what his or her rights and responsibilities are, and (6) the extent to whether the operator has access to the same information that the caller expects. (For example, some wireless providers do not provide information about the type of device from which a wireless TTY user is calling, and this confuses the call set-up process.)

A web-based menu approach would allow the user to point and click to make choices. The operator could begin chat with the caller about these options after the caller submits the list of choices. Profiles could be stored for repeat use, further cutting down on the call set-up time. Invalid choices could be explained on the site without operator involvement. Operator time would be conserved and caller time would be saved through use of the point-and-click interface.

Faster Conversation

Internet TRS would support fast typists and encourage the use of stored text macros for faster throughput. Currently Baudot calls constitute the vast majority of relay

Precedent: Technology in Support of Functional Equivalency

A number of technical improvements to TRS have been authorized or required by the FCC in its rules, in an attempt to move toward functional equivalency. The following are examples of FCC requirements designed to move toward functional equivalency:

- Two-way text conversations are slower than voice conversations because of the need to type them. This problem remains but has been addressed by the FCC in requirements that the TRS connect in ASCII (as well as the slow Baudot protocol), and a new requirement that operators have a typing speed of 60 words per minute.

- Some people with hearing and speech disabilities do not need to use text in both directions in their communication with the relay service. They may be able to speak for themselves, or they may be able to hear the other party but use text for expressive communication. The regulations for TRS from their inception have required "voice carry-over" (VCO) and "hearing carry-over" (HCO). This permits half the call to be transacted in voice where desired by the user. More recently, "speech-to-speech" has been mandated; this does not involve text communication at all and allows the entire conversation to be assisted via speech.

- The need to call a relay center before executing a call adds time and complexity to the process. The large number of ten-digit toll-free numbers for relay services prohibits seamless use of the relay service when traveling. The FCC has therefore reserved 7-1-1 as an access number for TRS to help address the problem.

- Another, forward-looking way to address functional equivalency is through the use of video for sign language interpretation and/or lipreading, rather than typing, as the visual communication medium. The conversation goes faster, provides ability to express emotion, and does away with the artificial turn-taking necessary on text calls. The FCC has authorized reimbursement of costs of video relay interpreting, although it has not required this service because the technological

i-Relay: Internet-Enhanced Telecommunications Relay Service

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April, 2000

This paper describes the possible use of Internet as an interface with Telecommunications Relay Service (TRS), augmenting and perhaps eventually replacing the traditional TTY through the circuit-switched network. It also covers direct web-to-TTY applications that might be used to reduce dependency on operator assistance, for long-term cost savings as well as greater flexibility for consumers.

Introduction

Telecommunications Relay Services are mandated in Title IV of the Americans with Disabilities Act, where TRS is defined as "telephone transmission services that provide the ability for an individual who has a hearing impairment or speech impairment to engage in communication by wire or radio with a hearing individual in a manner that is functionally equivalent to the ability of an individual who does not have a hearing impairment or speech impairment to communicate using voice communication services by wire or radio. Such term includes services that enable two-way communication between an individual who uses a TDD or other non-voice terminal device and an individual who does not use such a device." Note that the law does not *limit* telecom relay services to situations where one person has a TTY and the other is a voice user, but focuses on functional equivalency to the experience of two voice users in conversation.

The Federal Communications Commission issues rules for TRS. With regard to technology, the law states: "The Commission shall ensure that regulations prescribed to implement this section encourage...the use of existing technology and do not discourage or impair the development of improved technology."

If V.18 cannot be demonstrated to provide consumers with advantages offered by the current constellation of codes and protocols used in TRS, it cannot be justified as a regulatory requirement and indeed should not be implemented in TRS.

The larger issue is, however, that TRS stands squarely in the TTY users' network of communications. To some extent, TRS as well as 9-1-1 may have the end result of perpetuating old technology unnecessarily. We face a scenario, perhaps ten to 15 years from now, where people could need to own a TTY for the sole purpose of having direct access to 9-1-1. The FCC should ensure that TRS technology moves ahead expeditiously and examine whether there are any financial disincentives for TRS providers to encourage the use of digital technologies for direct, operator-free calls.

Included in this comment (below) is the white paper, "I-Relay: Internet-Enhanced Telecommunications Relay Service," which outlines the role that Internet can play in improving functional equivalency and moving toward digital chat as well as direct communication between hearing Internet users and TTY users.

Respectfully Submitted,

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services are available. This issue needs to be addressed now; TRS should at least keep pace with the changes in the network, and in some cases needs to help lead the way toward uses of advanced technology and integration of text telephony with other text chat services that have become popularized on the Internet.

Within the telecommunications industry, there has been considerable effort in defining a migration path for text telephony, so that it may eventually be "mainstreamed" with other data communications products. The efforts have been in the area of technical standards development, including V.18 and T.140 as mentioned in this NPRM. However, the migration path has been a rocky one, in that the new specifications have not been built into mainstream products.

V.18

Recommendation V.18 was first approved by the International Telecommunications Union's Technical section in 1994. It has never been implementation in data modems or other mainstream digital products, which would have assisted with migration of text telephony toward digital technologies. V.18 is more complex than a purely domestic standard need be, because it includes the numerous text telephone protocols present in Europe and elsewhere in the world, but not used in the U.S. The importance of V.18 is that it permits international product development. Regional, specialized product development for text telephony has led to high cost and isolation of the technology from mainstream data communications.

V.18 has been designed in consideration of the TRS environment, including VCO and HCO. However, whether V.18 offers advantages to consumers over the current constellation of codes in TRS is not known, because of the dearth of V.18 products for testing within a TRS environment. Recently the wireless applications company Europolitan developed a soft V.18 using a DSP modem chipset. Its U.S. subsidiary, Aspiro (formerly Telesta) has indicated a willingness to cooperate with TRS vendors to make their V.18 implementation available for assessment. We would urge that the TRS industry keep pace with these development and conduct tests on V.18 to assess its viability for TRS. Again, the goal would be a migration path toward all-digital text telephony.

Certainly the slow interactive mode of collecting data from consumers is not functionally equivalent to the voice subscriber's experience; and some of the costs of implementation of SS7 will be offset by the reduction in operator time devoted to profile development and billing inquiries. (However, the reduction in operator time might actually be a disincentive to TRS vendors, which can currently be reimbursed for operator time for call set-up.)

Thus we wholeheartedly support the designation of TRS as a carrier in SS7 implementation, and ask that the FCC consider making it a requirement that TRS become an integrated part of the network – including SS7 implementation if other viable alternatives are not shown -- with costs recoverable for this purpose.

This is an appropriate exercise of FCC's jurisdiction; the current system of state-by-state RFPs has not worked well in all areas, and this is an example. Where there is a need for nationwide upgrading to achieve functional equivalency, the FCC's involvement will be essential; and if integration with SS7 is the path to functional equivalency in call routing and billing, then the FCC has an obligation under ADA to implement this recommendation as part of nationwide standards.

Obviously, SS7 is hardly new. We are concerned that (with the exception of some technology trials in the area of operator services, including VRI and ASR) not all technology issues are being anticipated adequately via the current staggered process of RFPs in each state. We support the idea of a Federal Advisory Committee on TRS and suggest that there be a strong engineering component to the membership, with a goal of moving TRS implementation to be coordinated with all technical developments that lead to functional equivalency.

Analog to digital evolution in telecommunications

One area in which telecommunications is changing is in the use of digital subscriber services. The growth of digital subscriber services should be anticipated in the evolution of TRS network technology. This is just one issue in the long-term evolution toward digital telecommunications, which needs to be thoroughly planned for.

Currently, digital subscribers can contact the TRS by using an analog TTY across the their digital service, but there is, to our knowledge, no direct-data connection into the TRS. TRS should not perpetuate slow motion communication in analog when fast digital