Addressing the Accessibility of TTY with VoIP

By Robin Springer

Voice over IP is becoming mainstream.

Results are back from early adopters and, according to Alex Hadden-Boyd, director of marketing for IP communications at Cisco, the ROIs are being measured in months, not years.

Voice over IP, which converges multiple communications channels, encompasses many aspects of universal design. It allows a visually impaired individual to listen to her e-mail through a telephone and a hearing-impaired person to have his voicemail converted to text to be read on a terminal.

Voice over IP is not inherently more difficult to make accessible for people with disabilities than traditional PSTN phones. In fact, in many ways VoIP is easier to make accessible. We can access information on the computer with speech input, text-to-speech, word prediction or hands-free mice. Even a severely disabled individual can use a computer by blinking an eye. If we can use the computer as a means to telecommunicate, people with disabilities can access their telephones the same way they access their computers.

"We've pretty much solved the computer problem (with regard to accessibility)," says Jim Tobias, president of Inclusive Technologies. "Now we can solve the telephone problem."

TTYs, or text telephones, allow people who are deaf or hard-of-hearing to communicate over the phone. Created in the 1960s, TTYs are a primitive version of instant messaging. Unlike modems, TTYs are silent when not transmitting. Because there is no handshake or CNG tone, users are able to intermix voice and TTY tones on the same line. That way, one person in the conversation may talk into the handset while the other person may type on the TTY. Or an individual who is hard of hearing may prefer reading text on the TTY and replying by speaking into the handset. Paul Michaelis, Ph.D., of Avaya explains, "The device will not self-identify so it is impossible to know that a TTY unit is on the other end until the user begins typing."

Each TTY character consists of a sequence of seven tones; a start tone, five tones to identify the character and a stop tone to identify the end of the character. The information is transmitted at 45-baud rate, or about the same speed as the crawl on cable news shows.

To efficiently transmit audio information over IP, information is compressed and sent across the network in packets. A standard digital phone transmits 64,000 bits per second. The audio compress coder transmits this information at approximately 8,000 bits per second. If there is a gap in audio on the receiving end, packet concealment algorithms can do a pretty good job of tricking the listener's ear and the loss in accuracy is indistinguishable. This compression is not compatible with TTY. Because there is no error correction in TTY, if any of the tones are lost or damaged, the entire message will be corrupted and the TTY will display gibberish, preventing communication.

Quality of Service attempts to reduce packet loss by giving voice transmission priority at the expense of other information. Cisco utilizes QoS to give TTY top priority on the network.

"While congestion can be managed on a proprietary network, it cannot be controlled over the Internet," says Tobias.

To eliminate the concern of packet loss, Avaya does not send TTY tones over the voice channel at all; instead they open the data channel to the same destination. The audio and data packets are identified with the same address and the verbal description of the tones is sent with a command to reconstruct the tones on the other end. The command might say something like "reconstruct a tone of 1800 hertz at 22 ms." To offset the potential of packet loss, redundant packets are sent. Because no actual tones are being transmitted over the IP pipeline, audio compression is not harmful and compressed audio can still be used on the call. Packet loss and compression have no impact on TTY transmission in this scenario.

New technology often results in people with disabilities losing access to products. For example, when speakerphone technology was introduced, hearing aid compatibility was eliminated until legislation required manufacturers restore lost functionality. Cell phones were exempted from accessibility compliance, precluding people who are blind from using many functions on the phone that are only displayed with visual prompts, including battery charge, roaming status and menus.

Traditional telephones are accessible to people with disabilities because PSTN telecommunications, governed by the Federal Communications Commission, must comply with Section 255 of the Telecommunications Act, which mandates accessibility of telecommunications products and services. Currently, the FCC does not have jurisdiction over the Internet and it is unclear what role the FCC will play in regulating the Internet and VoIP.

Many people who have disabilities and their advocates are concerned that if the Internet remains completely unregulated, as telephone infrastructure transitions to Internet telephony, all of the legislation we have regarding accessibility for telecommunications will be lost, leaving many people with disabilities unable to communicate telephonically.

With estimates of the number of TTYs in the United States exceeding one million, Michaelis says, "TTY is not going away."

If developers don't ensure accessibility from the beginning, we will find ourselves in a perpetual retrofit mode, which is more expensive to implement. There is agreement as to problems with TTY/VoIP compatibility that need to be addressed. Now we need to agree on protocols to fix them.

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