Before the

Architectural and Transportation Barriers Compliance Board.

In the Matter of:

Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Telecommunications Act Accessibility Guidelines; Electronic and Information Technology Accessibility Standards	)))))	36 CFR Parts 1193, 1194 Docket No. ATBCB-2015-0002 RIN 3014-AA37

COMMENTS

Hearing Loss Association of America (HLAA), Telecommunictions for the Deaf and Hard of Hearing, and the National Association of the Deaf, (Consumer Groups) , the Telecommunication Access RERC and the Universal Interface and Information Technology Access RERC submit these comments in response to the Notice of Proposed Rulemaking (NPRM) released by the Architectural and Transportation Barriers Compliance Board (Access Board or Board) to begin the process of updating its standards for electronic and information technology and its Telecommunications Act Accessibility Guidelines.

These comments are restricted to those sections of the NRPM that impact people with hearing loss.

I. General Comments

Consumer Groups once again applaud the Access Board for their impressive work processing previous 508 and 255 guidelines as well as the TEITAC report and public comments to the two ANPRM to draft the NPRM. The Access Board has created a set of guidelines that are an improvement over current 508 and 255 guidelines and help catch the standards up to advances in technology.

We commend the Access Board for:

- Harmonizing 508 and 255: The harmonization of Sections 508 and 255 is a major step forward, especially in light of the way ICT technologies are converging. It would be a large burden on those creating devices that would fall under both 508 and 255 to not have harmonized accessibility guidelines and could create situations where the playing field is not level for all.

- WCAG (Web Accessibility Guidelines) Harmonization: The harmonization with WCAG is critical to those entities, including the federal government, that have web pages that exist and are viewed from many different states and countries.

- Simplification: In a number of locations, the Access Board used subclauses, exceptions, and advisory provisions to simplify language.

- Embedded examples and advisory text: By embedding advisory notes and examples directly in the provisions the Access Board has made some of the more complex provisions much easier to understand. These advisories also provided flexibility to handle future changes in technology.

- Equivalent Facilitation: Provision E106 (Equivalent Facilitation) is of key importance to both industry and consumers. It allows industry the freedom to create solutions that differ from the technical provisions where they will provide equivalent access. This is important especially for new technologies where the technical provisions may not fit well.

Specific comments to this NPRM follow:

Functional Performance Criteria

302.5 With Limited Hearing. Where an auditory mode of operation is provided, ICT shall provide at least one mode of operation that improves clarity, one mode that reduces background noise, and one mode that allows user control of volume.

We applaud the Board and support the goals of looking at ICT in terms of providing a functionally better experience for people with hearing loss. However, we are unsure the language the Board is suggesting reaches that goal.

Consumers with hearing loss need user control of audio output to the greatest extent possible for as many modes as possible. So, multiple tracks with different operational modes is highly desirable. We also need to be clear the user has the ability to make appropriate adjustments for each mode. If there is user control for some modes, but not others, the possibility of some modes being pre-set to provide what is assumed to be an adequate reduction in background noise or an increase in clarity may not in fact provide the desired results for the consumer.

We do support user control of at a minimum, all three modes suggested: clarity, background noise and/or sound track (where appropriate), and overall volume. In addition, where appropriate, user control of a separate speech track and music track would also be highly desirable and should be considered.

402 Closed Functionality

See attached Addendum

410.2 Volume Gain. Volume gain shall be provided and shall conform to 47 CFR 68.317.

The Board proposed to adopt 47 CFR 68.317, the FCC's current standard for volume control for analog and digital phones. We agree with the Board that in the future, if the FCC does revise its regulation and adopt ANSI/TIA 4965, or other consensus standard, the Board should also update its regulations to reflect these revisions.

As the Board noted, "conversational gain" method of measuring amplification for wireline phones holds much promise. Consumers with hearing loss to date have been confused by the claims of some makers of "specialty phones," i.e., phones made for people with hearing loss that allow the user to control and increase the volume significantly. With the present method there is little way to compare the gain on different phones by marketing material alone: you must go to the effort to purchase a phone, often on line or via mail order, to try out the phone and return it if the gain on the volume is not sufficient. With a "conversational gain" standard in place, it's our understanding that consumers would be better able to compare phones and purchase the phone appropriate for their hearing loss. Consumers stand to benefit when the manufacturers of phones adhere to a set standard.

We support the Board's proposal to update the regulations to reflect a revision of these standards.

410.3 Magnetic Coupling. Where ICT delivers output by an audio transducer that is typically held up to the ear, ICT shall provide a means for effective magnetic wireless coupling to hearing technologies, such as hearing aids, cochlear implants, and assistive listening devices.

We support the continued inclusion of magnetic coupling provisions in both 508 Standards and 255 Guidelines.

410.4 Minimize Interference. ICT shall reduce interference with hearing technologies to the lowest possible level and shall conform to 410.4.

410.4.1 Wireless Handsets. ICT in the form of wireless handsets shall conform to ANSI/IEEE C63.19-2011 (incorporated by reference in Chapter 1).

410.4.2 Digital Wireline. ICT in the form of digital wireline devices shall conform to TIA 1083 (incorporated by reference in Chapter 1).

Just as the Board proposes to adopt by reference updated FCC standards on volume gain, the Board should also be alert to changes and updates to the standards for hearing aid compatibility of wireless phones. We support harmonization of these regulations with the FCC's revisions and updated standards and regulations.

410.5 Digital Encoding of Speech. ICT shall transmit and receive speech that is digitally encoded in the manner specified by ITU-T Recommendation G.722

(incorporated by reference in Chapter 1) for encoding and storing audio information.

We applaud the Board for including this new requirement. We strongly support digital encoding and decoding two-way voice communication with an upper frequency range of at last 7000 Hz.

Wide band audio has great potential for all users, but is critical for people with hearing loss. Wideband audio extends the frequency range of audio signals transmitted over telephone lines, resulting in higher quality speech. The range of the human voice extends from 80 Hz to 14 kHz but traditional, or narrowband telephone calls limit audio frequencies to the range of 300 Hz to 3.4 kHz. Wideband audio relaxes the bandwidth limitation and transmits in the audio frequency range of 50 Hz to 7 kHz or higher.

Telephones pose a particular problem for people with hearing loss. Traditional phones not only provide a signal on a narrow audio band, but typically, the user is listening with one ear and the information provided is only audible – no visual clues are available to help understanding. Digital encoding should provide significant additional audible information that will help someone with hearing loss better hear and understand when using a landline telephone or mobile device.

We strongly support this addition to both the 508 Standards and the 255 Guidelines.

407.8 Audio Signaling. Audio signaling shall not be used as the only means of conveying information, indicating an action, or prompting a response.

We strongly support a provision that prohibits audio signaling as the only means of conveying information. We applaud the Board for including this new provision.

410.6 Real Time Text Functionality

See attached Addendum

410.6.5 HCO and VCO Support

We agree that where ICT provides real-time two-way voice communication, it must permit users to intermix speech with the use of real-time text.

RTT with voice has the potential to greatly enhance telecommunications for people with hearing loss. Consumers with hearing loss who now depend on Telecommunication Relay Services using captioned telephones for every call, may be able to rely on voice and RTT to hold casual conversations. While we envision captioned phones will be useful for a long time for work-related calls,

casual and even emergency calling could be greatly enhanced with voice-enabled RTT.

410.7 Caller ID. Where provided, caller identification and similar telecommunications functions shall be visible and audible.

We agree and support caller identification and similar telecommunications functions shall be both visual and audible.

411 Closed Caption Processing Technologies

411.1 General. Where ICT displays or processes video with synchronized audio, ICT shall conform to 411.1.1 or 411.1.2.

411.1.1 Decoding of Closed Captions. Players and displays shall decode closed caption data and support display of captions.

411.1.2 Pass-Through of Closed Caption Data. Cabling and ancillary equipment shall pass through caption data.

We support the provisions of 411.1-411.1.2. People with hearing loss, as well as those who do not have a hearing loss, benefit from readily available captions in both private and public settings. There should be no barrier created by a devices that prevents an individual from accessing captioning where available.

413 User Controls for Captions and Audio Description

413.1 General. Where ICT displays video with synchronized audio, ICT shall provide user controls for closed captions and audio description conforming to 413.1.

EXCEPTION: Devices for personal use where closed captions and audio description can be enabled through system-wide platform settings shall not be required to conform to 413.1.

413.1.1 Caption Controls. ICT shall provide user controls for the selection of captions in at least one location that is comparable in prominence to the location of the user controls for volume.

Question 30 Does proposed 413.1 strike an appropriate balance between ensuring users with hearing or vision impairments can readily find and use controls for closed captioning and audio description, while also affording device manufacturers sufficient design flexibility? Should the requirement for a captioning button be limited to devices that have both up/down volume controls and a mute button? Or, more generally, should the provision of caption controls be limited to certain types of hardware?

We strongly support these new requirements. We believe the Board has stuck an appropriate balance between ensuring users with hearing or vision loss can readily find and use controls for closed captioning, while providing manufacturers with some flexibility. We believe the requirement should *not* be limited to devices that have an up/down volume control and a mute button or other types of hardware.

We are hesitant to support the exception. We do understand the Board's rationale that it would be difficult with some small personal devices to provide a button that would turn on the captions. However, we fear that leaving it open to manufactures will again put us in the same or similar position of searching for the captioning on procedure or icon in these devices. So we suggest and addition to the exception above:

> Where system-wide platform settings are available, the control for these settings must be easily found and user-friendly.

As the Board noted, user controls for closed captioning, and provisions that would require the location of the captioning control where it is equally prominent to the location of the user control for volume can be critical in an emergency and an important barrier to overcome generally. Consumers who have attempted to find the captioning controls have often been frustrated when the control has been located in such a way that turning on the captions is complex and not at all intuitive. This is a particular problem if the user is faced with an emergency event while in a facility far from home where the equipment is unfamiliar. In addition, both the Americans with Disabilities Act and some state statutes require captions on in public places when requested. If the captions controls are difficult to find, the facility's staff may not be able to comply with a simple request to turn the captions on. We strongly support user-friendly, easy to find captioning controls.

Question 31. While the Board believes that proposed 413.1.1 would greatly benefit persons who are deaf or hard of hearing, we did not monetize the benefits or costs of providing caption controls on covered hardware. The Board seeks data and other information from the public in order to estimate the monetized costs and benefits of this proposal.

We do not have data that would estimate the monetized costs and benefits of this proposal. How do you monetize the value of an easily found closed captioning control to a person with hearing loss in a hotel in Oklahoma during a tornado? We suggest that the human cost of not providing such a requirement far out ways the monetary cost of providing it.

504 Authoring Tools

504.1 General. Where an application is an authoring tool, the application shall conform to 504 to the extent that information required for accessibility is supported by the destination format.

We support these new requirements for software used to create or edit electronic content, i.e., authoring tools, to ensure the accessibility of this content in general and specifically as suggested by the Board.

CHAPTER 6: SUPPORT DOCUMENTATION AND SERVICES

We support the accessibly requirements for support documentation and services as outlined in Chapter 6 by Board.

Attached also find detailed comments on

1. Functional Performance Criteria
2. Closed Functionality
3. Real-time Text
4. Gesture
5. Depth Perception
6. Flashing

We thank the Board for this opportunity to submit comments.

Respectfully submitted,

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Functional Performance Criteria

302 Functional Performance Criteria

302.1 Without Vision. Where a visual mode of operation is provided, ICT shall provide at least one mode of operation that does not require user vision.

Comment: this one is excellent. Clear and testable.

302.2 With Limited Vision. Where a visual mode of operation is provided, ICT shall provide at least one mode of operation that magnifies, one mode that reduces the field of vision required, and one mode that allows user control of contrast.

Comment: The problem here is that it assumes the content was not accessible in the first place. If a kiosk already has letters that are 96 point and content on the screen is minimal, then a zoom will yield very few words on the page, and add complexity. In this case the easiest way to conform would be to create a page with smaller text so your default page could be the magnified version. Ditto for field of vision. What if the default page already allows people to use it with an extremely limited field of vision. Does it make sense to create a worse page so that you can have the default page reduce it?

Suggest that the criterion not be to change but to achieve. That way if your default already meets the criterion, it is fine as is. (and this is the prefered mode)

Remember also that this needs to apply to public signs and to personal devices

PROPOSED
302.2 With Limited Vision. Where a visual mode of operation is provided, ICT shall provide at least one mode of operation where the fonts and graphics are readable by someone with 20/40 vision, one mode that is usable with a 10 degree field of vision, and one mode that provides high contrast. For personal devices both high and low contrast must be provided.

(or if a more generic version is required)

302.2 With Limited Vision. Where a visual mode of operation is provided, ICT shall provide at least one mode of operation that provides large fonts and graphics, one mode that is usable with a reduced field of vision, and one mode

that provides high contrast if a public device, and high and low contrast if a personal device.

302.3 Without Perception of Color. Where a visual mode of operation is provided, ICT shall provide at least one mode of operation that does not require user perception of color.

Comment: this one is excellent. Clear and testable. Except that the current language can be met with a voice output mode. Suggest you add the word VISUAL in front of MODE so that it reads

302.3 Without Perception of Color. Where a visual mode of operation is provided, ICT shall provide at least one **visual** mode of operation that does not require user perception of color.

302.4 Without Hearing. Where an auditory mode of operation is provided, ICT shall provide at least one mode of operation that does not require user hearing.

Comment: this one is excellent. Clear and testable.

302.5 With Limited Hearing. Where an auditory mode of operation is provided, ICT shall provide at least one mode of operation that improves clarity, one mode that reduces background noise, and one mode that allows user control of volume.

Comment: this one has the same problem as low vision. What if there is no background sound and the audio is flawless. The only way to conform would be to add a mode with background noise so you can have the default be better than something.

Second, this would also apply to public address systems where user control of volume is not practical (and would be a problem for other listeners).

Finally it would be burdensome to have to put a volume control on the error beep of a simple device like a printer.

PROPOSED
302.5 With Limited Hearing. Where an auditory mode of operation is provided, ICT shall provide at least one mode of operation that **has high audio clarity**, one mode that **has minimal background noise**, and, **if device is for single person use and audio is not a simple alert,** one mode that allows user control of volume.

302.6 Without Speech. Where a spoken mode of operation is provided, ICT shall provide at least one mode of operation that does not require user speech.

> **Comment:** this one is pretty good. Clear and testable. Two problems. A "spoken mode of operation" is ambiguous. Also AT is allowed as a solution, so assuming the user has voice output AT could allow meeting this while still requiring speech. A slight change would fix this.
>
> **PROPOSED**
> **302.6 Without Speech.** Where **speech is used for input, control, or operation,** ICT shall provide at least one mode of operation that does not require speech **from the user or their assistive technology.**

302.7 With Limited Manipulation. Where a manual mode of operation is provided, ICT shall provide at least one mode of operation that does not require fine motor control or operation of more than one control at the same time.

> **Comment:** Sentence construction leaves it ambiguous as to whether both are required or just one or the other.
>
> **PROPOSED**
> **302.7 With Limited Manipulation.** Where a manual mode of operation is provided, ICT shall provide at least one mode of operation that does not require fine motor control and that does not require operation of more than one control at the same time.

302.8 With Limited Reach and Strength. Where a manual mode of operation is provided, ICT shall provide at least one mode of operation that is operable with limited reach and limited strength.

> **Comment:** No comment.

ADDITIONAL FPC

Cognitive - Cognitive has been part of 255 for a long time. It was dropped from TEITAC because it was not testable. Several of the provisions above however are now written to be aspirational but not testable. Another reason cited was that there were no Technical provisions for people with cognitive, language, and learning disabilities. This is not true and we will be filing a report later showing that there are dozens of provisions that benefit people with cognitive, language, and learning disabilities. We therefore suggest that another FPC be added as follows.

> **PROPOSED**

302.9 With Limited cognitive, language, and/or learning. ICT that has a user interface shall provide at least one mode of operation that minimizes cognitive, memory, language and learning skills required of the user

ADDITIONAL TECHNICAL OR FPC

There are three other new phenomena in interface design that are appearing and that have disability consequences. They should be included in the TECHNICAL provisions of the standard. However, since it is at the NPRM stage this may not be possible. In this case we suggest their inclusion in the Functional Performance Criteria.

They are “depth perception”, “gesture”, and “skin contact”. In all three cases they require things that not all users have due to birth, illness, accident, injury, war, or aging. It is suggest that these new methods be permitted for those who can use them but the there always be another way of achieving full product functionality without them.]

PROPOSED

302.10 Without depth perception. Where a visual mode of operation is provided, ICT shall provide at least one visual mode of operation that does not require binocular perception of depth.

302.11 Usable without gestures. Where a manual mode of operation is provided, ICT shall provide at least one mode of operation of all functionality that does not require the user to make gestures on a surface or in three-dimensional space.

302.12 Without Human Skin Contact. Where a manual mode of operation is provided, ICT shall provide at least one mode of operation of all functionality that does not require electrical contact with, or close proximity to, human skin.

Closed Functionality

The closed functionality section has been broken since the TEITAC committee turned in their report. It has come a long way and is much improved. There are still some key problems here however.

These are enumerated below with proposed solutions.

Issue 1: Software with Closed Functionality and the software in hardware that has closed functionality appear to not be covered.

Closed Functionality provisions are placed under Chapter 4 Hardware and the examples given in Advisory 402.1 are all hardware products (self-service machines, information kiosks, set-top boxes, and devices like most copiers, fax machines, and calculators). This is potentially misleading, giving the impression that 402 only applies to closed hardware or hardware with closed functionality.

In actuality, software can also have functionality that is closed. And in fact there may be more instances of software with closed functionality than there is hardware. For example, an e-book application might have an interface that is completely accessible to a screen reader - except for the text of the e-book itself, which is closed because of digital rights management [DRM] or other restrictions. A screen reader cannot access the e-book text, but the e-book application itself could provide text-to-speech and other features necessary for accessing the closed portion of the software..

> **This scoping sentence of the hardware section (Where the closed functionality is located) seems to imply that the "closed functionality provisions would only apply to hardware."**
>
> > **401.1 Scope.** The requirements of Chapter 4 shall apply to ICT that is hardware where required by 508 Chapter 2 (Scoping Requirements), 255 Chapter 2 (Scoping Requirements), and where otherwise referenced in any other chapter of the 508 Standards or 255 Guidelines.

Software developers may look no further at that section

RECOMMEND:

1) **that closed functionality be moved out of hardware**
2) **that it be its own chapter**
3) **that it be made clear that other provisions apply as well**
4) **that examples of software with closed functionality be provided in the advisory note as well**

Issue 2: Insufficiency of 402 if Used Alone

The current wording of 402.1 reads as if products with closed functionality **only need to conform to 402, but not other provisions**.

Conformance to 402 only is severely insufficient.

Some examples

- 402 does not cover reach range - so all ATMs or Kiosks with closed functionality would have to conform to those provisions as well.
- And to provisions for line of sight,
- And the seizure provisions of WCAG for its software - especially ads.
    - (The advertisements for the Olympics in England caused 30 seizures before it was pulled).
- Biometrics would have to apply
- Requirements for captions
- Requirements for audio to be visual etc.
- and many more.

In fact all of the provisions would have to apply except ones specific to Assistive technology compatibility. This is understood by people who worked on 508 but is not clear from the current NPRM language.

Issue 3: AT Compatible and Programmatically Determined DO NOT Apply

If 402 scopes in the other provisions, it need to also provide an exemption from those that refer to AT or "programmatically determined". Otherwise, closed functions, (which by definition don't work with AT), would be required to be compatible with AT.

Issue 4: Additional 402 Provisions

In our research, we have identified several provisions that are important for access and usage of products with closed functionality that are not included in section 402. Additionally, some of the provisions already in section 402 require edits.

One provision that is needed in 402 (and was in earlier versions) is for an audio cutoff. People who use headphones should be able to use a public product, such as a kiosk, without having their private information broadcast through a speaker. The following new suggested provision addresses this issue.

> **402.5 (new) Audio cutoff.** For ICT that delivers output through an external speaker that broadcasts information in public, inserting a plug into the headphone jack shall cutoff sound from that speaker.

The provision about the size of characters on closed products needs to be edited. As currently worded, if a system has a screen enlargement feature, then it is exempt from the 3/16 inch text requirement--even if the screen enlargement feature does not go up to that size. Instead, the provision should require at least 3/16-inch high font size in at least one mode. A screen enlargement function is one way to meet the requirement.

> **NPRM language**
> **402.4 Characters.** At least one mode of characters displayed on the screen shall be in a sans serif font. Where ICT does not provide a screen enlargement feature, characters shall be 3/16 inch (4.8 mm) high minimum based on the uppercase letter "I". Characters shall contrast with their background with either light characters on a dark background or dark characters on a light background.
>
> **PROPOSED**
> **402.4 Characters.** At least one mode of characters displayed on the screen shall be in a sans serif font. **In at least one mode**, characters shall be 3/16 inch (4.8 mm) high minimum based on the uppercase letter "I". Characters shall contrast with their background with either light characters on a dark background or dark characters on a light background.

The provision on private listening also should be edited. Private listening can be accomplished by providing a headphone jack or other strategies. A headphone jack requires a volume control but does not itself need effective magnetic wireless coupling to hearing technologies. The headphones, neck loop, or other device that a user plugs in may or may not have magnetic coupling depending on the user's needs.

NPRM Language

402.3.1 Private Listening. Where ICT provides private listening, it shall provide a mode of operation for controlling the volume and a means for effective magnetic wireless coupling to hearing technologies.

Proposed

402.3.1 Private Listening. Where ICT provides private listening, it shall provide a mode of operation for controlling the volume**. Speakers intended to be held to the ear shall have** a means for effective magnetic wireless coupling to hearing technologies.

We are proposing new provisions in other Chapters, such as FPC 302.9 ~ 302.12. These additional provisions, if not exempted in 402.1, should also apply.

402.2.2 Braille Instructions. Where speech output is required by 402.2, braille instructions for initiating the speech mode of operation shall be provided. Braille shall conform to 36 CFR Part 1191, Appendix D, Section 703.3.

Requiring braille instructions can be problematic on small devices such as cellphones and e-book readers. On personal devices, braille instructions are usually not necessary. Also, the device needs to be obvious to use for people who are blind and who do not know braille. So Braille is very helpful but should not be the only means of learning how to use.

We suggest that this be removed as a requirement - and included as an advisory note with strong recommendation.

The provision about user control of speech output seems to assume a particular type of interaction. It seems to apply to ATM and ticket machines where a person presses buttons to select a particular transaction. Other closed products might allow a person to navigate a screen using buttons and text-to-speech--this interaction is not covered well by this provision. As another issue, pausing speech output is technically very difficult with many text-to-speech engines. To make the speech output more technically feasible, it would be sufficient for a user to be able to interrupt and silence the speech output.

NPRM Language

402.2.1 User Control. Speech output for any single function shall be automatically interrupted when a transaction is selected. Speech output shall be capable of being repeated and paused.

Proposed Language

402.2.1 User Control. Speech output for any single function shall be automatically interrupted **when a different element is navigated to and** when **an action** is selected. Speech output shall be capable of being repeated and **interrupted by the user**.

Proposed Changes

X02.1 General. Closed functionality of ICT shall be operable without requiring the user to attach or install assistive technology, except for personal headsets and other audio couplers, and shall conform to 402 and to all other provisions except those listed in Exception 402.1.

Advisory 402.1 General. Self-service machines, information kiosks, set-top boxes, and devices like most copiers, fax machines, and calculators have closed functionality because, by design, these products preclude the user from adding peripherals or software. ICT also may have closed functionality in practice even though the manufacturer did not design or develop it to be closed. Computers with security restrictions that prevent end users from adjusting settings or adding assistive technology have closed functionality.

Exception 402.1. Closed functionality of ICT shall not be required to conform to the following provisions and their sub-provisions

- 406 Standard Connections,
- 502 Interoperability with Assistive Technology,
- 503.2 User Preferences,
- 503.3 Alternative User Interfaces,
- WCAG 2.0 provisions that refer to AT, programmatically determined or programmatically set, including 1.3.2, 1.4.4, 1.4.5, 2.4.4, 3.1.1, 3.1.2, 4.1.1, 4.1.2.

402.2 Speech-Output Enabled. ICT with a display screen shall be speech-output enabled. Operating instructions and orientation, visible transaction prompts, user input verification, error messages, and all displayed information for full use shall be provided in speech and be

accessible to, and independently usable by, individuals with vision impairments. Speech output shall be delivered through a mechanism that is readily available to all users, including, but not limited to, an industry standard connector or a telephone handset. Speech shall be recorded or digitized human, or synthesized. Speech output shall be coordinated with information displayed on the screen.

Advisory 402.2 Speech-Output Enabled.

- Object Information. Names, current values, any set or range of allowable values, and state(s) of objects shall be read aloud.
- Roles, boundary, and description of objects shall be read aloud upon user request.
- Event Notification. Notification of events relevant to user interactions, including but not limited to, changes in the component's state(s), value, name, description, or boundary, shall be read automatically or on user request.
- Information, structure, and relationships shall be read automatically or on user request.
- Text attributes, and the boundary of text rendered to the screen shall be read aloud on user request.
- Meaningful Sequence. When the sequence in which content is presented affects its meaning, the content should be read in a correct reading sequence.
- Link Purpose. The purpose of each link shall be determinable from the text read along with the link, except where the purpose of the link would be ambiguous to users in general.
- Language changes. Elements or content shall be read aloud in the proper language or the name of the language shall be announced when the language changes.
- Audio Cursor. Users shall be able to move an audio cursor to all visual software elements (e.g. text, graphics and controls) that are not purely decorative, in a logical linear reading sequence, using tactilely discernable controls that do not require vision to find or operate.
- Highly Visible Audio Cursor. The audio cursor shall, in at least one mode, be visible to someone with 20/20 vision at 3.5 times the anticipated viewing distance for most users.

EXCEPTIONS: 1. Audible tones shall be permitted instead of speech where the content of user input is not displayed as entered for security purposes, including, but not limited to, asterisks representing personal identification numbers.

2. Advertisements and other similar information shall not be required to be audible unless conveying information necessary for the transaction being conducted.

402.2.1 User Control. Speech output for any single function shall be automatically interrupted **when a different element is navigated to and** when a transaction is selected. Speech output shall be capable of being repeated and **interrupted by the user**.

~~**402.2.2 Braille Instructions.** Where speech output is required by 402.2, braille instructions for initiating the speech mode of operation shall be provided. Braille shall conform to 36 CFR Part 1191, Appendix D, Section 703.3.~~

402.3 Volume. ICT that delivers sound, including speech required by 402.2, shall provide volume control and output amplification conforming to 402.3.

EXCEPTION: ICT conforming to 410.2 shall not be required to conform to 402.3.

402.3.1 Private Listening. Where ICT provides private listening, it shall provide a mode of operation for controlling the volume**. Speakers intended to be held to the ear shall have** a means for effective magnetic wireless coupling to hearing technologies.

Advisory 402.3.1 Private Listening. A handset that is hearing aid compatible and has a volume control would meet the requirements of this section.

402.3.2 Non-private Listening. Where ICT provides non-private listening, incremental volume control shall be provided with output amplification up to a level of at least 65 dB. Where the ambient noise level of the environment is above 45 dB, a volume gain of at least 20

dB above the ambient level shall be user selectable. A function shall be provided to automatically reset the volume to the default level after every use.

402.4 Characters. At least one mode of characters displayed on the screen shall be in a sans serif font. Where ICT does not provide a screen enlargement feature, characters shall be 3/16 inch (4.8 mm) high minimum based on the uppercase letter "I". ~~Characters shall contrast with their background with either light characters on a dark background or dark characters on a light background.~~

Real-time text

These comments are divided into the following 6 Sections (links will jump you to these sections)

1. **Good and should be PRESERVED.**
   a. Good, effective language that the Access Board has in current NPRM that should not be removed or weakened.

2. **THINGS to ADD or CHANGE**
   a. Things that are missing or need a change in order to cover access issues.

3. **Clarifications on support of Real-time text**
   a. Clarification and rationale for inclusion of RTT on all phones.

4. **Why the European RTT provisions much weaker than NPRM**
   a. Showing why European version essentially doesn't require anything
   b. Showing that current NRPM language does not conflict in any way with EN 301 549
   (you can conform to both 508 and EN 301 549 by conforming to 508 NPRM)

5. **Answers to Access Board Questions relating to Real-time text**
   a. Answers to questions 1, 2, 2a, 3, 8, 8b, 9, 10, 11

6. **Specific Recommended Edits to Provisions (change tracked)**
   a. Specific edits to the NPRM RTT provisions to address issues in 2, and 3 above and the Access Board questions

7. **Some final counter arguments to arguments against the current NPRM provisions**
   a. This section provides some data, references, and counter arguments to those commenting against the NPRM Real-time text provisions, or against requiring RFC 4103 as the initial Real-time text standard for SIP networks.

1. Good and should be PRESERVED.

1. **PRESERVE**: The recognition by the AB that RTT is "an important technological advance that provides an equivalent alternative to voice communications for persons who are deaf, **as well as those with limited hearing or speech impairments**." In fact the **largest number of beneficiaries are likely to be people who are hard of hearing** since they outnumber people who are deaf and many who are deaf are likely to continue to use text-only communication channels (such as messaging) except for some types of interaction. However RTT is also an important real-time communication backup to video for many deaf users when the video connection is too poor, or in an emergency.

2. **PRESERVE: RTT + Voice on the same call**- This is key and critical. This was removed in the European version which says that RTT can be on a separate device and service and still meet their provision. People who are older (and most of us) cannot figure out how to make to separate calls (one audio and one Real-time text) to a person at the same time so they can answer on one and reply on the other. If you made such a pair of parallel calls (one voice and one text) to a company, is it likely that the two calls (voice and one text) would be routed and answered by the same person at the same time? And how would a person transfer such a call?

   The FCC is looking forward to RTT + Voice providing an alternative way for people who can't hear well enough to rely on voice calls to be able to use Voice supplemented by Real-time text for the hard bits. This is their preference as well. But it requires that real-time text be available on regular calls -- and on regular handsets (so people who are hard of hearing (or hard to understand) can call anyone and not just people who have special phones or installed a special app that is compatible with their phone. And they can be called by anyone using a standard phone and standard phone plan and not just by people who have special phones or apps and special services.

3. **PRESERVE: RTT + Voice on regular phones where this does not require adding a display or text entry method not already on the phone for other reasons**.
   Same reasons as above.

   Note that because NPRM language only applies to phones with multi-line displays (that all have some form of text entry) there is no extra hardware cost and software to do this is small, and versions are already available in open source that can be used as a model.

4. **PRESERVE: Requirement that the RTT format defined for a telecom environment (system) be used by all terminal and network components (hardware and software) on that system.**
   If this is not true, there is no interoperability between terminal components

(hardware and software), or with any of the components (hardware and software) in the network through which the calls must flow.

5. **<u>PRESERVE</u>: The requirement for TIA-825a for PSTN -- and RFC 4103 for SIP.**
   Below we provide the rationale for this a way to cover other systems.

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2. THINGS to ADD or CHANGE (Items are listed here. Specific edits are below)

1. **<u>AFFIRM</u>: That private, and closed systems have the right to define the RTT format for their systems.**
   AND
   ADD: A requirement that they actually do so (Require that purchased systems have a robust RTT format that is supported by their terminal and network components (hardware and software).)
   These two go together. One problem has been that, outside of the PSTN and SIP based VoIP, the developers of voice communication systems have not created standards for Real-time text, nor endorsed any standard for use in their systems. As a result, a requirement that companies use an interoperable RTT standard on these systems cannot be complied with, because no single standard is specified, and they cannot support any and all standards that anyone else on the system might be using (which would be required for interoperability) Individual developers simply do not know what other standard(s) might be used by other companies. A single standard for RTT that is supported by all components in a system must be defined if there is to be interoperability. (More than one can be required but then all must support all or there is no interoperability) (See below for mechanism for evolution and change over time).

2. **<u>ADD</u>: A provision describing the proper method for introducing new, transitioning to new, and retiring old Real-time text formats over time (and also for other access technologies like headphone jack).**
   It is true that things will always progress, and that in the future we will eventually evolve off all of our current standards for doing everything. This is true in voice communication and will be true in accessibility. Industry has a regular method for retiring old required codecs - but it relies on market pressure, and pressure from carriers to make it work. Market pressure and carrier pressure has repeatedly been shown to not work for accessibility (There would be no need for these regulations if it did). Using the same approach as industry we propose a path and a provision for evolution of real-time text (and any other transition areas for accessibility), that is based off of current industry practice, to provide a means for both creating regulations that will cause accessibility to occur soon, and provide

the ability for industry to evolve to next generation technologies without requiring modification or reissuing of the regulations.

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3. Clarifications on support of Real-time text

Clarification of requirements on mainstream products to support Real-time text

In the NPRM the Access Board has the following paragraph.

> Proposed 410.6 would require that, where ICT supports real-time voice communication, it must also support RTT functionality. Subsections of this proposed provision would, in turn, establish technical requirements for display, text generation, and interoperability. Importantly, proposed 410.6 would not mandate that all ICT provide RTT functionality. Rather, only those ICT that already have real-time voice communication capabilities would be required to support RTT functions. In this way, the Board's approach to requirements for RTT in the proposed rule mirrors the approach taken in the existing 508 Standards and 255 Guidelines toward TTY compatibility. Neither the existing standards and guidelines nor the proposed rule establish an across-the-board command that telecommunications equipment or devices "build in" text capability. Instead, both sets of rules simply require that, when such equipment or devices offer voice communication functions, they must also ensure compatibility with certain types of text communication (i.e., TTY and RTT) by supporting use of specified cross-manufacturer, non-proprietary signals. See 36 CFR 1193.51((e), 1194.23(b).

We interpret this to mean that

- ICT that does not have two way real-time voice communication does not need to provide RTT.
- Also ICT that **does** provide two way real-time voice communication but does **not** have multi-line screen (or text input) does not have to add a multiline display (or add text input) in order to provide full Real-time text functionality.

But it would be a shame if mainstream ICT that supports two-way voice communication, and that has both the display and text generation capability did not have to support Real-time text with voice as an integral part of its voice service. The provisions themselves seem to require that when ICT (that provides two way voice) has a screen and text input capability that the device should support Real-time text.

The above text from the NPRM sounds like it is saying that this is not so -- and that the phone only needs to support "pass through" of RTT signals from the voice service to another device or program.

If this is the intent, then it would be a huge loss to the deaf and hard of hearing population and their families as well. Instead of moving mainstream technologies so that they are inclusive of people who are hard of hearing, it would move us back into the TTY era where people who are hard of hearing and deaf (and have speech that is hard to understand) would all have to

- secure a “special” device or program and hook it into their voice phone/service.
- Then they need to learn this special software/device.
- When they call for technical support the person would not know what they were using or how to provide them with support
- They would only be able to communicate with people who also secured and attached or loaded the necessary special software and hardware
- we would have to require all restaurants and public accommodations to go secure this special software or hardware on their phones -- and train their staff on how to use it for them to comply with the ADA.
    - And for 508 -- all government agencies and supervisors - and anyone in the government that any deaf or hard of hearing employee or member of the public might want to call would have to secure and install this ‘special’ hardware or software on their phone.
- And in an emergency, someone who is older and can't hear the instructions would not be able to benefit from RTT from 911 because it would be unlikely that they had it installed.
- And in an emergency someone who is Deaf, HoH, or has impaired speech could not just call a neighbor or others to help because their neighbors would not have the special app or hardware device connected to their phone.
- and on - and on

- And a person would get a phone call on one screen but the RTT would not be part of the mainstream phone interface but would instead be on another device (they have to carry with them) OR be on another app screen that they have to know how to get to when they are on the phone. (or they have to not answer the main phone feature like everyone else - and have to go find the app and answer it.
- And if their phone died or broke, they could not just use another person’s phone to make a call.
- People will have to fall back to relay services when they can't call people directly, with all the associated problems (third party on the call, privacy concerns, miscommunication between the relay operator and the person with disability, etc.)

On the other hand, if the mainstream devices - that already have to be compatible the RTT - and link the connected (software or hardware) to their call so they can be used together, - and be able to receive and pass the RTT signals through ,---- were to be required to go that one last step and just add the RTT display and input to their voice communication software, then all of the above issues disappear -- and instead:

- **A person who is deaf or hard of hearing will (fairly soon) simply be able to use any phone to call anyone, who can then answer on any phone**

and

- They can call 911 like everyone else - on any phone
- They can call neighbors when they need help
- They can call doctors, pizza place, any place, -- without requiring that the person they call has special hardware or software (and know how to use it)
- it will save hundreds of millions in relay costs since people can talk directly to each other
- when they call tech support - the person will know what they have and are talking about
- they won't have to buy or install or figure out anything new and “special”
- restaurants and companies and employers and everyone would not have to buy, install, or be trained in anything special (saving tens of millions in time and confusion complying with ADA requirements that they support people who need RTT to understand or be understood) (unless relay is used instead in which case the cost is hundreds of millions)
- people who are older can continue to use mainstream technologies including those in denial that would lose communication before using assistive technologies
- and they won't have to figure out how to answer a voice call and then find and launch (or install the app so that it co-launches but appears on another screen they have to find) in order to answer each call.
- etc

This only involves a small amount of software to take the RTT (which they already are required to receive) and pop up a display to display it to the user. And a small amount of code to allow the text entry mechanism on the phone to send RTT.

To make it easier, reference open source software is already available, shortening the R&D time and cost.

We strongly recommend to the Access Board and the FCC that they go the last mile and require that all VoIP ICT support Real-time text as an integral part of their VoIP calling software. The cost savings to society far exceed the cost to implement the software to make this happen.

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4. Why the European RTT provisions much weaker than NPRM

The EN 301 549, while tracking the 508 overall, has deviated significantly in its final wording - and the final text is shown below. [COMMENT blocks] are added by commenters

6.2 Real-time text (RTT) functionality

6.2.1 RTT provision

6.2.1.1 RTT communication

Where ICT supports two-way voice communication in a specified context of use, the ICT shall allow a user to communicate with another user by RTT.

[COMMENT: This says that the provision only applies when two way voice is in a "specified context of use" which is not defined in the standard. During the final meeting where this was added, the question was asked what the specified context of use. Participants were told that the specification would be made by the purchasing agent. (this would be impossible for a company to create products for since product design takes place long before purchase requests are released.)

It was also pointed out that a standard cannot refer to a specification normatively when that specification was not a qualified standard. The reference was preserved anyway.

NOTE 1: The RTT capability can be provided as a factory default or added later.

[COMMENT: This can be read "provided at the time of sale or downloaded by users later. This would defeat the purpose of the provision by making this a ghettoized form of communication again that only works between people that have the feature added - rather than being a standard part of the product.

This can also be read, that a phone would pass even if RTT did not exist for the product at the time - as long as it could be developed and provided later. At the final meeting it was asked if something would pass if the RTT were developed later and they answered yes. This interpretation is within the wording of the note - but not within the original intent of the provision.]

NOTE 2: Provision of RTT may require additional service provision, additional hardware and/or software which may be provided separately or together.

[COMMENT: This can be read that this RTT might require an additional provisioning of the phone, or an additional piece of hardware connected to the phone. Again this defeats the purpose and potential and would create a separate communication system just among those that had gotten the special provisioning and hardware.

This can also be read that the provisioning of RTT would occur on a completely separate piece of hardware (e.g. a computer) running a completely different service (broadband) and provided

by a completely different company. Again this was a concern and at the meeting it was asked if RTT running on a computer and voice occurring on a cell phone was intended to be sufficient to meet this. The answer was that yes that was the intention. And again this interpretation consistent with the language of the note. In fact it is hard to see why the note would be written this way (RTT on different hardware, different service, and separately from the phone) if this was not the intention. NOTE that RFC 4103 uses the same RTP and SIP signalling as the voice channel so there is no need for any additional hardware on IP phones themselves - and the RTT provision only applies to phones that already have a multiline display and no keyboard is required by the provisions, just the ability to generate text which is already provided for other functions on the phones - including setting them up, entering passwords etc.

[Ironically, the two notes taken together say that a phone could pass even if RTT did not exist for the phone at the time of purchase as long as it could be provided later, by another party, on another device, requiring another service.
Given that, every phone would pass this provision by default, since with any equipment there is the option to add another piece of hardware with another service later. Ergo, the provision is de facto meaningless.]

6.2.1.2 Concurrent voice and text

Where ICT supports two-way voice communication in a specified context of use, and enables a user to communicate with another user by RTT, it shall provide a mechanism to select a mode of operation which allows concurrent voice and text.

NOTE: The availability of voice and RTT running concurrently can allow the RTT to replace or support voice and transfer additional information such as numbers, currency amounts and spelling of names.

[Again the language above allows for the concurrent use of speech and RTT on two pieces of hardware (like a phone and a computer). There is no requirement that the voice and text be “on the same call” and adding that phrase was also rejected.]

6.2.2 Display of Real-time Text

6.2.2.1 Visually distinguishable display

Where ICT has RTT send and receive capabilities, displayed sent text shall be visually differentiated from and separated from received text.

6.2.2.2 Programmatically determinable send and receive direction

Where ICT has RTT send and receive capabilities, the send/receive direction of transmitted text shall be programmatically determinable, unless the RTT has closed functionality.

NOTE: The intent of clause 6.2.2.2 is to enable screen readers to be able to distinguish between incoming text and outgoing text when used with RTT functionality.

6.2.3 Interoperability

Where ICT with RTT functionality interoperates with other ICT with RTT functionality (as required by 6.2.1.1) they shall support at least one of the four RTT interoperability mechanisms described below:

a) ICT interoperating over the Public Switched Telephone Network (PSTN), with other ICT that directly connects to the PSTN as described in Recommendation ITU-T V.18 [i.23] or any of its annexes for text telephony signals at the PSTN interface;

b) ICT interoperating with other ICT using VOIP with Session Initiation Protocol (SIP) and using real-time text that conforms to RFC 4103 [i.13];

c) ICT interoperating with other ICT using RTT that conforms with the IP Multimedia Sub-System (IMS) set of protocols specified in TS 126 114 [i.10], TS 122 173 [i.11] and TS 134 229 [i.12];

d) ICT interoperating with other ICT using a relevant and applicable common specification for RTT exchange that is published and available. This common specification shall include a method for indicating loss or corruption of characters.

[COMMENT: Because of the way this is worded the only requirement in this long provision is that each product “must use SOME relevant and applicable common specification for RTT exchange that is published and available. Each vendor can choose a different one. It say that the ICT covered are “ ICT interoperating with other ICT” but it does not say that each piece of ICT must be able to interoperate with whatever other RTT standard is provided on the next piece along the call. To do that it would need to know in advance
(provisions a, b, and c are not required at all by this construction -- even for the networks mentioned in the provision. Option d is an option for all networks. So provisions a,b,and c could all just be listed as notes mentioning different standards that are out there and that a device might use along with any other standard covered by d. In fact provision d does not even require that the specification be a standard.

See INTEROPERABILITY discussion at the end explaining why interoperability cannot be achieved in this manner - and that this is not the procedure used for interoperable voice telecom (or it would not work).

Note that the last sentence in (d) does not require that the specification in (d) even be reliable or have a reasonable error

rate. It just requires that the user can see corrupt characters and tell when characters have been dropped.

6.2.4 Real-time text responsiveness

Where ICT utilises RTT input, that RTT input shall be transmitted to the ICT network supporting RTT within 1 second of the input entry.

NOTE 1: Input entry is considered to have occurred when sufficient user input has occurred for the ICT to establish which character(s) to send.

NOTE 2: Input entry will differ between systems where text is entered on a word-by-word basis (e.g. speech-to-text and predictive-text based systems) and systems where each character is separately generated.

[COMMENT: This is a bit circular in that it says that if you use RTT the RTT must meet the basic definition of RTT. The notes also redefine the provision (which notes should not do. they should be informative of the intent of the provision but not change it.)

The notes are quite good though and should have been incorporated in the provision.

Better wording for RTT that avoids this problem is provided in section 6 (edit-tracked provisions)

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5. Answers to Access Board Questions relating to Real-time text

(Questions 1, 2, 2a, 3, 8, 8b, 9, 10, 11, 26b,)

> QUESTION 1.

To realize the full potential benefits of the Section 508 proposal to require RTT functionality wherever an ICT product provides real-time, two-way voice communication, federal managers would need to direct their employees to keep the RTT features on their phones enabled when needed to accommodate employees with disabilities who use RTT, and federal employees would need to follow such directives. How would keeping RTT enabled on an "as needed" basis affect federal employees' use of texting? For example, would it cause them to substitute texting with other

methods of communication? How can the Board analyze and quantify such effects?

RESPONSE: No. it need not interfere if designed correctly. RTT could be treated in a manner similar to video - where you press a button to turn on the video. Otherwise your keyboard would be free to use however else it was desired. Also - if any Real-time text came in, it could be displayed without requiring that the person use RTT or their keyboard in response. In fact many hard-of-hearing individuals communicate in speech just fine and have no need to send RTT, just to receive RTT (along with - or instead of - speech coming to them)

RTT would be "on" in a phone in the same manner as SMS is always on. If you are making a call and no one sends text - your call proceeds as usual. The RTT can be designed so that, if you don't use RTT, and if your caller doesn't, it won't show up on your screen any more than your mute or other button. If you receive Real-time text (or want to send it) it could then show up on the screen.

No (meaningful) bandwidth is used for a call when the real-time text is not being used. And when it is being used, it (RFC 4103) is a fraction of the bandwidth of voice.

With RFC 4103 the best method is for Real-time text to be enabled on all phones everywhere by default. If no real-time text is used, then the call would appear as a call today. If someone (anyone, even those with perfect hearing) wanted to send a phone number, or spell a hard name, or give an address etc, instead of having to say Alpha, foxtrot, 7, 8 etc, they could just type and the other person would see it accurately.

When calling an IVR (that allows the caller to "enter your choice at any time"), the RTT could give the caller the list of choices immediately allowing them to see and choose (for example #6) before the voice is done reading the first or second choice in the recitation - saving all users a lot of time and frustration.

If the federal employees didn't have it turned on all the time - many would likely not ever figure out how to when they needed it. But the utility of RTT is likely to have them want it on and -- if they never

want or need it -- having it “on” would be invisible (but always ready to receive). Then if they wanted it, they could bring it up on screen.

> QUESTION 2.
The benefits of the RTT proposal under Section 255 are dependent upon the extent RTT features would be enabled and used by the public. The public would not be required to use or keep the RTT features on their phones enabled. Is there available information regarding the extent the public would use RTT features if they were available on their phones? Would use of RTT be different for people with and without disabilities?

RESPONSE: See above, if properly designed it would not appear unless it was wanted by the caller or the called. Phones would look and work as they do now.

When wanted - it would show up (when text was received or when the user decided to send text).

RTT for everyone would be the same. They would all have the ability to choose different formats available on the phone - to match their preference. (e.g. side by side - or “message-like with real-time preview” or as pop ups etc. But other than personal preferences for format, font size, skins, etc, it would work the same for everyone.

This is important for one of the main functions of Real-time text. **To allow users who are hard of hearing or hard to understand to be able to make regular phone calls to anyone and be able to communicate.** It is also important to allow people who are aging to be able to continue to communicate with their friends, doctors, people in an emergency (and not just 911) as they lose their hearing. The cost for losing communication is often the cost of losing the ability to live independently longer - and the cost of that is enormous (“billions and billions”).

Finally, the relay services are rapidly being overburdened, and the aging population is expected to put a huge additional and increasing burden on them. The ability to use RTT along with voice on all phone calls can allow people, who are progressively losing their hearing, to be able to use voice calls longer, thus relieving this burden.

The ability to use Real-time text with the ever increasingly accurate voice recognition on phones, also allows people to bypass relay services, and to have private conversations with loved ones. They are able to both have the text sent continuously to the person on the other end - AND to watch what is being said so they can repeat anything that is not recognized correctly - and hand type any unusual words if needed. The instant availability of this mode (no waiting for a relay operator to be connected, become available, get the call connected etc), combined with the speed of recognition and the privacy of the communication can be enough incentive to have people use RTT plus speech recognition instead of the relay service. The relay service will always still be available if this does not work for someone, but this can provide a valuable and much less expensive option for those for whom it does work. And it also provides a natural path to the future where speech recognition gets good enough to recognize most or all speech. As speech recognition gets better and better, more and more people will find that this works for more and more calls. Faster, more conveniently, more accurately (look at the printed transcripts of many relay calls), and more privately.

Again - for each person who is losing their hearing there is a much larger number of people they have been communicating in voice with -- and they would like to continue to (and it is in both the social and economic interests of the country that they continue to be able to).

> QUESTION 2b
the Board also seeks comment on whether additional standards for real-time text, which are in the process of being finalized (such as XEP-0301), should be referenced.

RESPONSE: Our center has worked on many of these (including XEP-0301) and one of our center staff is co-author on XEP-0301 (and others worked on it as well). XEP-0301 is a real-time text format but it is quite different from RFC 4103. It is an extension to a messaging format XMPP that brings real time text to XMPP in the same way our work with AOL brought the Real-time text option to AIM. And XEP-0301 could become the designated real-time text format for use on XMPP networks. It is not now, however, specified as the RTT format to use on voice calls on XMPP networks and there is no known company

that is planning an XMPP voice service with integrated XEP-0301 for concurrent RTT on the same call. In fact the voice+XEP-0301 real-time text has not even been demonstrated experimentally on a call.

So XEP-0301 is a very valuable implementation of real-time text option in XMPP messaging environments, but it has not been chosen by any company or the XMPP community to be used on voice calls. And it is not the Real-time text format chosen by IETF or any carrier for use on SIP networks, IMS, or emergency networks to provide Real-time text on SIP based voice calls (while RFC 4103 has been designated by IETF and chosen by AT&T (and other products companies) to provide Voice+RTT in their networks/products.

So it would not be a viable choice of RTT on SIP or IMS or Emergency systems if one were to mandate conformance to just one standard, but it could be a second standard to explore with if one wanted to require two. (You can't of course allow manufacturers to use one or the other (or a third or fourth) or things won't work together and calls will not complete from end to end. (The voice part will because networks require that all components in their networks support one (or more) voice codecs, but the rtt will not.

NOTE: That it would be fine to use XEP-0301 or ANY OTHER single reliable format for real-time text on private or closed networks as the designated format that all devices should support as long as that format is transcoded into RFC 4103 when the connect to SIP networks.

(See also "RTT STANDARD TRANSITIONS" sections below for the method to migrate off of RFC 4103 in the future in a superior SIP real-time text format is developed.)

Access Board: We are not proposing to adopt the other four standards referenced by EN 301 549 because they are not applicable to the type of technology used in the United States. Just as mobile phones are not directly compatible between the United States and Europe (i.e., CDMA phone systems versus GSM (Global System Mobile)), portions of the four standards referenced in EN 301 549 are simply not relevant in the U.S. market, and there are no indications that they will have domestic relevance in the near future.

COMMENT: For native phone applications the rules will primarily be looking at VoLTE or voice over LTE for mobile (and fixed wireless) systems. The standards referenced for IMS in EN 301 549 are valid for use in USA and for technologies used in USA. The numbers referenced by EN 301 549 are the ETSI numbers. Identical documents but with 3GPP numbers are used in the US and internationally.

However, as noted in question 8 and 10, this is all moot. None of these are real-time text standards. They are wide ranging IMS specifications and all of them specify RFC 4103 as the technology to use for Real-time text. And IMS is SIP based. So the current NPRM language requiring RFC 4103 on SIP environments covers them.

So although the path is different we agree that they do not need to be listed.

> QUESTION 3.
We are seeking further information on the benefits and costs associated with adopting standards that address total communications, including voice, video, and data transmission rates and speeds. We seek recommendations for specific standards that the Board might reference to address total communication.

RESPONSE: Total communication extends the discussion above by adding video to the voice+RTT dynamic and options. The video provides several advantages:

1. The addition of video allows people who use sign language to be able to use this in their communication with anyone else you can sign. This included not only other deaf people but also many others who know sign who could communicate with people who are deaf in this manner if their standard phones would support total conversation. (see below for bandwidth required)
2. For those who do sign - real-time text combined with video gives them distinct advantages over sign alone. If one thinks about how hard it is to accurately write down long number or addresses or strange names correctly when they are spelled, imagine doing it where you have to keep looking up and down to see the signing (fingerspelling) and then down to write the bits you just saw and then back up again -- and never knowing if you missed a letter without back and forthing to confirm. Compare this to real-time texting the information.
3. It is easier to understand speech when you can see people's lips -and with time stamped data these can be synchronized.

4. Emergency personnel comment that any contextual information they can get from the other end greatly increases their ability to respond in a manner that is maximally beneficial to the caller - and also often to the responders who often do not understand the context they are walking into. The ability to combine video with either speech or silent (text) communication can benefit callers with and without disabilities. And can help when noise causes even callers who usually use speech to be unable to hear accurately.

COSTS (and bandwidth):

- **Real-time text** does not require any additional hardware (even codecs are micro-programmed and everything voice, real-time text and video) are data. Real-time text uses significantly less bandwidth than audio, and consumes essentially zero bandwidth when data is not being transmitted.

- **Video** does require a camera with sufficient resolution and frame rate. Almost all modern phones already have a camera that more than meets the needs for signing. (A very high resolution is not needed.) The concern for hardware cost can be addressed by simply restricting the video support to devices that already have a sufficient camera and capture rate on the phone for other purposes.

  Video does use more bandwidth but again the bandwidth required is much lower than that needed for movies. Research has shown that with H.264 at 25 fps only about 220 kBit/s at CIF resolution is needed for sign language communication. And with newer, more efficient codecs this will only decrease. This is less than 1/10th the bandwidth needed to stream HD movies (if estimated at 3 to 6 MBit/s).

STANDARDS:

- **Depends on the network. For SIP / IMS backbone**
  - **Real-time text:** RFC 4103
  - Voice: G.722
  - Video: Any video standard that supports with 25 FPS reliably and that is supported on all video capable SIP VoIP network and terminal devices.

More research and information on this is available from the following FCC filings:

http://apps.fcc.gov/ecfs/comment/view?id=6016375091 and
http://apps.fcc.gov/ecfs/comment/view?id=6017024116

ACCESS BOARD: In the 2011 ANPRM, the Board elected to remove those proposed technical requirements in favor of simply requiring the quality of the video to be sufficient to support communications using sign language. We received no comments on this approach, and retain it here in this NPRM. … In general, the approaches taken in EN 301 549 and this NPRM are similar and complimentary. We elected to pursue this course in response to public comments and our desire to make use of a number of voluntary consensus standards by incorporating them by reference. This approach will result in better harmonization of accessibility standards worldwide.

> **RESPONSE**: We think the specification based approach is better - and things are much advanced since 2010, but we can live with this since Video is being driven by mainstream use and ever increasing bandwidths.
>
> Real-time text on the other hand we believe is more like television captioning. It is widely use by mainstream users but it would not have happened and does not stay in place without regulation.

> QUESTION 8.
If the XEP-0301 standard is finalized, the Board is considering incorporating it by reference as an alternative standard for XMPP networks. We seek comment on the benefits, costs, and possible drawbacks associated with referencing this standard in addition to the RFC 4103 standard.

The European standard, EN 301 549 would allow the use of multiple standards for RTT. As discussed in 4.6, Harmonization with European Activities above, EN 301 549 lists several standards for RTT, as well as an unspecified "common specification" for RTT. The common specification must indicate a method for indicating loss of corruption of characters. **>The Board seeks comment** on whether other standards should be incorporated by reference. The other standards are:

- ITU-T v.18, Recommendation ITU-T V.18 (2000) "Operational and interworking requirements for DCEs operating in the text telephone mode" (see EN 301 549 6.3.3(a)). This Recommendation specifies features to be incorporated in data carrier equipment intended for use in, or communicating with, text telephones primarily used by people who are deaf or hard of hearing.

- IP Multimedia Sub-System (IMS) protocols specified in TS 126 114, TS 122 173, and TS 134 229 (see EN 301 549 6.3.3(c)). ETSI TS 126 114, Universal Mobile Telecommunications System (which was referenced in the EAAC Report and Recommendation noted previously in Section IV.F.2) supports a "total communication" approach by establishing a minimum set of codecs and transport protocols that must be supported by all elements in the IMS system for video, real-time text, audio, and high definition (HD) audio. As noted previously, the Board decided not to require standards for video, audio, or HD audio in this proposed rule beyond the technical requirements set forth in proposed 410 (ICT with Two-Way Voice Communication). Both the ETSI TS 122 173 and ETSI TS 134 229 standards are still under development, and, therefore, cannot be referenced at this time.

RESPONSE: It is unclear what ***referencing*** means here. But summarizing some of our responses above may answer your question:

1. Having multiple Real-time text standards is fine but the only way to have interoperability would be to require that **all** devices (in a system) **support all of the RTT standard for that system**. That is much more difficult than supporting just ONE per system and we do not recommend requiring more than one in a system

2. Allowing manufacturers / integrators to use different Real-time text standards in the same network will prevent interoperability or successful calls reliably end to end.

3. Different systems can specify different RTT formats for their system, but then all terminal and network components (hardware and software) should support the only one specific standard.

4. TU-T v.18, is for analog networks and is not generally used in the US. Since the PSTN is on the way out and TIA-825a is phasing out with it we see no benefit to requiring or citing TU-T v.18 in the 508/255 regulations

5. TS 126 114, TS 122 173, and TS 134 229 are all IMS standards
   and they all cite RFC 4103 as the real-time text standard to use.
   Since IMS uses SIP, specifying these standard for Real-time text on IMS is redundant with the requirement to use RFC 4103 for all SIP Voip (which includes IMS).
   It is therefore recommended that these not

be listed because it doesn't change things (the requirement ends up being RFC 4103 anyway).
But it does and will confuse people. There would be two provisions that would both apply to IMS (the SIP and the IMS provisions - if you included the IMS provisions) and they would ***appear*** to require different standards, when they in fact do not.

So adding TS 126 114, TS 122 173, and TS 134 229 adds nothing. They just specify RFC 4103 anyway. And they are not Real-time text standards to begin with, so referring to them along with all the other Real-time text standards is confusing.

6. For VIDEO you should reference the specifications but if you wish to require video you must say it specifically. The standards often refer to video standards but they are often "if you use video" in nature. But since video is mainstream, this will be interoperable in IMS systems so we see no need to specify it further here. Your approach mentioned elsewhere of specifying that it be provided and be good enough for sign language should suffice, (again because it is mainstream and because of the trends in video calling and ever increasing bandwidth)

7. RE XMPP. It should most certainly not be cited as an ALTERNATIVE for XMPP networks. There should only be ONE standard for XMPP and XEP-0301 is the only XMPP real-time text standard. So for XMPP based Voice systems, **XEP-0301 should be specified as THE XMPP Real-time text standard** (that all components must support). There is no other standard and there is unlikely to be any other for many years. Again, if a better standard comes available XEP-0301 could be phased out - but that is likely to be a decade or two or 5 from now.

8. Again - interoperability requires that there be AT LEAST ONE standard on each system that ALL THE COMPONENTS on the system support and that is TRANSLATED at the borders to other systems to THE ONE REQUIRED STANDARD on the other system. More than one can be required (as with voice) but then EVERYTHING

needs to support ALL OF THEM.

It is much less expensive to support just one per system -- so we recommend that only one be required for each system.

- **TIA-825 (only)** is REQUIRED **for PSTN**
- **RFC 4103 (only)** is REQUIRED **for SIP based (bi-directional) VoIP systems (including IMS)**
- **XEP-0301 (only)** is REQUIRED **for XMPP based (bi-directional) Voice systems**
- OTHER SYSTEMS
    i. **Choose their own ONE RTT format** for use by everything in their system
    ii. **The RTT format must be reliable and have character error rate below 1%**
    iii. The RTT format is chosen by the company for private or closed systems. It is chosen by the standards organization that specifies the voice standard(s) for the system.

. (Note: the 1 % character error rate is widely used in the industry for Real-time text. for example http://www.3gpp2.org/public_html/specs/C.S0028.pdf,

> QUESTION 9.
Are there sufficient net benefits to be derived from requiring ITU-T v.18 that the Board should reference it in addition to TIA 825-A (2003)? We are requesting that telecommunication equipment manufacturers, in particular, provide any data regarding potential costs related to complying with this standard. Are there suggestions for other standards which would result in the same level of accessibility?

RESPONSE: No. See comments above regarding PSTN lifetime and usage in the US.

> QUESTION 10.
Are there net benefits to be derived from requiring more standards addressing multimedia than what we propose? The Board is requesting that telecommunication equipment manufacturers, in particular, provide any data regarding potential costs related to complying with the standards in EN 301 549 6.3.3(c). Are there suggestions for other standards which would result in the same level of accessibility?

RESPONSE: See comments above. Additional standards would need to be IN ADDITION TO, not instead of, the single required standard for each environment (system). Adding more would increase costs and not increase interoperability.

However, it is extremely valuable to specify the one initial format for each environment. We have heard for years from companies that were ready to deploy but would not, could not, until there was a clear specification of which standard would the standard for Real-time text. (In each case the standard they were prepared to deploy after they had tested them was RFC 4103)

SO - it would be beneficial, and accelerate things - if you were to specify the initial required real-time text standard for additional environments beyond just **PSTN** (TIA-825a) and **SIP-VoIP (including IMS)** (RFC 4103). XMPP is a good choice for another environment.

And it would be good to provide more info on the fact that private and closed systems can specify their own -- and the basic requirements for those.

But do not specify more than one standard for any environment or else there will either not be interoperability, or products will need to support all the specified standards and that is unnecessarily costly for companies.

(See **RTT Standard Transition** below for info on how industry evolves from one interoperability standard to another as better standards come out over time.)

> QUESTION 11.
Is ETSI TS 122 173 or ETSI TS 134 229 sufficiently significant that the Board should consider referencing either standard when it becomes final?

RESPONSE: NO. This was covered in Question 8 item 5 which is pasted immediately below for convenience. The long and short of it however is that
a) those are not Real-time text standards. They are IMS standards
b) they all specify that RFC 4103 be used for real-time text
c) IMS is based on SIP so IMS already covered by the SIP provision in 508

(Copied from above)

5. TS 126 114, TS 122 173, and TS 134 229 are all IMS standards and they all cite RFC 4103 as the real-time text standard to use. Since IMS uses SIP, specifying these standard for Real-time text on IMS is redundant with the requirement to use RFC 4103 for all SIP Voip (which includes IMS).

It is therefore recommended that these not be listed because it doesn't change things (the requirement ends up being RFC 4103 anyway).
But it does and will confuse people. There would be two provisions that would both apply to IMS (the SIP and the IMS provisions - if you included the IMS provisions) and they would ***appear*** to require different standards, when they in fact do not.

So adding TS 126 114, TS 122 173, and TS 134 229 adds nothing. They just specify RFC 4103 anyway. And they are not Real-time text standards to begin with, so referring to them along with all the other Real-time text standards is confusing.

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6. Specific Recommended Edits to Provisions (change tracked)
- With Rationale

410.6 Real-Time Text Functionality. Where ICT provides real-time voice communication, ICT shall support real-time text functionality on the same call and shall conform to 410.6.

RATIONALE:adding on the same call prevents the interpretation heard at european meeting that the provision could be satisfied without having the RTT be an integral part of the voice call (in essence a voice+RTT call). The voice and text can be on different channels of the call but the user should call once and then be able to invoke or use voice or real-time text or both at their discretion.

410.6.1 Display of Real-Time Text. Where provided with multi-line displays, ICT shall be compatible with displaying real-time text that is received using the real-time text format defined for ~~systems used on~~ the network.

RATIONALE:

1) the first edit is because it isnt the displays that need to be compatible but the ICT.
2) there are two choices for compatibility section of the requirement.

   EITHER the ICT must be compatible will ALL of the RTT systems used on a network

   OR there needs to be one standard for each network, and everything works with it.

   The former is the way the current text reads but it is very expensive and difficult to impossible to do. We suggest the latter, which requires that ICT work with just one RTT format -- the one that is THE standard for that network. This latter approach however requires that a standard RTT format exist for each network. (See interoperability below)

410.6.2 Text Generation. Where provided with features capable of text generation, ICT shall be compatible with the real-time text systems ~~used on~~ defined for the network.

RATIONALE: Same as above.

410.6.3 Interoperability. Where ICT interoperates outside of a closed system of which it is a part, or where ICT connects to other systems, ICT shall conform to 410.6.3~~.1 or 410.6.3.2.~~

RATIONALE:

The “OR” maked it sound like there was a choice between them.

- If the ICT is a gateway connecting PSTN to SIP it must comply with both.
- If (to aid in PSTN transition) a hybrid ICT was designed to be able to connect to EITHER the PSTN - **OR** - an IP-

SIP system, then it would need to meet both since both provisions would apply.

- For the ICT that interoperate with ONLY PSTN (or ONLY SIP), then it will conform to both provisions if it complies with the one that pertain to it - becuase the other provision(s) are self scoping and the device would automatically pass them.

410.6.3.1 PSTN. Where ICT interoperates with the Public Switched Telephone Network (PSTN), real-time text shall conform to TIA 825-A (incorporated by reference in Chapter 1).

410.6.3.2 VoIP Using SIP. Where ICT interoperates with Voice over Internet Protocol (VoIP) products or systems using Session Initiation Protocol (SIP), real-time text shall conform to RFC 4103 (incorporated by reference in Chapter 1).

410.6.3.3 VoIP Using XMPP. Where ICT interoperates with Voice over Internet Protocol (VoIP) products or systems using XMPP, real-time text shall conform to XEP-0301 (incorporated by reference in Chapter 1).

410.6.3.4 VoIP on other systems. Where ICT interoperates with Voice over Internet Protocol (VoIP) products or systems on systems using technologies other than the above, real-time text shall conform to the Real-time text format established for the system by the organization that defines that system.

410.6.3.5 Real-time text Reliability. All real-time text standards defined for systems must have a character error rate of less than 1%.

410.6.3.6. Transition to other Protocols. Other standards for real-time text may be introduced and eventually replace the "initial" standards defined above for any system as long as the new standards are included in parallel with the initial standards (named above), and the initial standards continue to be supported by all ICT (that interoperates with the networks) untill all ICT in the network support both the initial and the new standard. At that time the initial standard is redundant and can be retired without causing any ICT in the network to lose interoperability. This same process can then be used to replace the new standard as well.

Advisory 410.6.6 Transition to other Protocols The transition point begins with the introduction of the new standard, in parallel with the initial standard, on each new product. The transition is complete when all of the older ICT that only supported the initial standard are retired from the field. At that point, new products do not need to support the older standard anymore. This is the same strategy used by the telecom industry for introducing new required voice standards and retiring older standards as requirements.

RATIONALE:

This adds the XMPP real-time text format as the “initial” required format for XMPP.

It also adds a provision that provides a path for the replacement of any of these standards over time. This uses the same technique used in industry to replace other standards that are required for interoperability.

410.6.4 Voice Mail, Auto-Attendant, and IVR Compatibility. Where provided, voice mail, auto-attendant, and interactive voice response telecommunications systems shall be compatible with real-time text that conforms to 410.6.3.

410.6.5 HCO and VCO Support. Real-time voice communication shall permit users to intermix speech with the use of real-time text and shall support modes that are compatible with Hearing Carry Over (HCO) and Voice Carry Over (VCO). Real-time text on IP networks shall support simultaneous speech and real-time text on the same call.

Advisory 410.6.5 HCO and VCO Support. This provision supports the use of intermixed speech and text on PSTN/Analog networks, and simultaneous text and speech on IP networks, in two-way communication, including telecommunications relay service. HCO allows a person with a speech disability to type their side of a conversation which is read by the other party and to listen directly to their voice. VCO allows a person who is deaf or hard of hearing to read conversation that is typed by the other party and to speak directly to them. HCO and VCO may be facilitated by a telecommunications relay service communication assistant. On IP networks, simultaneous speech and real-time text supports captioned telephony and personal text additions to speech, to aid understanding.

410.7 Caller ID. Where provided, caller identification and similar telecommunications functions shall be visible and audible.

Advisory 410.7 Caller ID. Examples of functions addressed by this requirement include messages waiting, duration of call in progress, dialing directory, wireless signal strength, and battery power.

410.8 Video Communication. Where ICT provides real-time video functionality, the quality of the video shall be sufficient to support communication using sign language.

Copy of revised provisions with rationale removed

410.6 Real-Time Text Functionality. Where ICT provides real-time voice communication, ICT shall support real-time text functionality on the same call and shall conform to 410.6.

410.6.1 Display of Real-Time Text. Where provided with multi-line displays, ICT shall be compatible with displaying real-time text that is received using the real-time text format defined for ~~systems used on~~ the

410.6.2 Text Generation. Where provided with features capable of text generation, ICT shall be compatible with the real-time text system~~s used on~~ defined for the network.

410.6.3 Interoperability. Where ICT interoperates outside of a closed system of which it is a part, or where ICT connects to other systems, ICT shall conform to 410.6.3~~.1 or 410.6.3.2.~~

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410.6.3.4 VoIP on other systems. Where ICT interoperates with Voice over Internet Protocol (VoIP) products or systems on systems using technologies other than the above, real-time text shall conform to the Real-time text format established for the system by the organization that defines that system.

410.6.3.5 Real-time text Reliability. All real-time text standards defined for systems must have a character error rate of less than 1%.

410.6.3.6. Transition to other Protocols. Other standards for real-time text may be introduced and eventually replace the “initial” standards defined above for any system as long as the new standards are included in parallel with the initial standards (named above), and the initial standards continue to be supported by all ICT (that interoperates with the networks) untill all ICT in the network support both the initial and the new standard. At that time the initial standard is redundant and can be retired without causing any ICT in the network to lose interoperability. This same process can then be used to replace the new standard as well.

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for introducing new required voice standards and retiring older standards as requirements.

410.6.4 Voice Mail, Auto-Attendant, and IVR Compatibility. Where provided, voice mail, auto-attendant, and interactive voice response telecommunications systems shall be compatible with real-time text that conforms to 410.6.3.

410.6.5 HCO and VCO Support. Real-time voice communication shall permit users to intermix speech with the use of real-time text and shall support modes that are compatible with Hearing Carry Over (HCO) and Voice Carry Over (VCO). Real-time text on IP networks shall support simultaneous speech and real-time text on the same call.

Advisory 410.6.5 HCO and VCO Support. This provision supports the use of intermixed speech and text on PSTN/Analog networks, and simultaneous text and speech on IP networks, in two-way communication, including telecommunications relay service. HCO allows a person with a speech disability to type their side of a conversation which is read by the other party and to listen directly to their voice. VCO allows a person who is deaf or hard of hearing to read conversation that is typed by the other party and to speak directly to them. HCO and VCO may be facilitated by a telecommunications relay service communication assistant. On IP networks, simultaneous speech and real-time text supports captioned telephony and personal text additions to speech, to aid understanding.

410.7 Caller ID. Where provided, caller identification and similar telecommunications functions shall be visible and audible.

Advisory 410.7 Caller ID. Examples of functions addressed by this requirement include messages waiting, duration of call in progress, dialing directory, wireless signal strength, and battery power.

410.8 Video Communication. Where ICT provides real-time video functionality, the quality of the video shall be sufficient to support communication using sign language.

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7. Some final counter arguments to arguments against the current NPRM provisions

a) Status of RFC 4103 as a standard - and its use by industry

There have been comments in some forums to the effect that RFC 4103 was

- not a real standard yet
- not supported by any companies
- not supported by any carriers

Not a real standard
It has been stated by some who oppose RFC 4103 that RFC 4103 is not a real or usable standard because of it's current status level on the standards track. This shows either an intent to confuse, or a misunderstanding of the IETF and its standards and terminology. If you go to the IETF site and search one can see that the SIP protocol on which most VoIP public networks are based is in the exact same status as RFC 4103. As is 3GPP and all other VoIP standards. So RFC 4103 is an industry standard that is at the same status as almost all the standards being used by industry in the VoIP networks. And it is designed specifically to be the Real-time text format for SIP based VoIP. (Reference: <http://www.rfc-editor.org/search/rfc_search_detail.php?title=SIP&pubstatus%5B%5D=Standards+Track&std_trk=Proposed+Standard&pub_date_type=any>)

> EDITORIAL NOTE: In section G of the SECTION-BY-SECTION ANALYSIS, RFC 4103 is listed as **"Request for Comment RFC 4103"** This is not done for any other RFC and it is misleading. In future preambles etc it should be listed just as RFC 4103 in the same manner as all the other RFCs in the document

Not supported by any companies
RFC 4103 is used in dozens of products from companies in the US and abroad. It has been used as the core real-time text format in the Swedish telecom system for a decade.

Not supported by any carriers
Just this last month AT&T has announced that RFC 4103 is the standard it will be using throughout its network for Real-time text and plans to have it deployed by 2017.

Other companies have also said that they have researched RFC 4103 and are ready to move forward with products as soon as it is announced as the standard to use for SIP based VoIP.

b) Solution to the concern that you can't cite a standard in the 508 document or else it can't ever be changed.

There is a proper and normal industry process for replacing required interoperability standards. The language of the 508 already allowed for its use but to make it explicit we have suggested text that can be added to the interoperability section to cover this process.

Specifically citing standards in the final rule (with this clause for eventual replacement as needed) is critical to any company moving forward. Multiple

companies have told us that they had explored RFC 4103 and real-time text and were prepared to move forward with RFC 4103 products but they could not do so until someone officially declared RFC 4103 as the standard everyone needed to conform with. Until the standard was named their company was not able to move forward with the product line using any standard.

Gestures

Gestures can be a very convenient and intuitive method of access for many people. On typical touchscreen systems, gestures can be made in two dimensions across the face of the screen. Newer touchscreen technology adds an additional dimension to gestures--a gesture may require differing levels of force at different points along the screen. There are also other gesture systems that use cameras or other sensors to allow a person to make gestures in three dimensions.

While gestures offer convenience for some people, they can also be unintuitive for some people and physically preclude other people from access as well. A person with a physical disability may be unable to make an arm or body motion that a 3D-gesture system requires. A person with a tremor, fatigue, or other physical disabilities may not be able to make a gesture that is quick enough or fluid enough to be recognized on a touchscreen. A person with a cognitive disability may not understand or remember that they need to make a particular gesture in order to interact with a particular component on the screen. If systems require gestures for operation, then some people will be precluded from access. Systems must have alternative methods of input.

In practice, it is relatively easy to allow for non-gesture input. Systems simply need to be operable through a keyboard or keyboard interface (which allows users to attach or pair keyboards or keyboard-emulating assistive technologies) or, in the case of closed systems, have tactilely discernable keys.

In the Hardware: Operable Parts section (407), provision 407.3 is relevant to this discussion of gestures because of the proposed exception. The currently NPRM provision reads:

> **407.3 Tactilely Discernible.** At least one tactilely discernible input control shall be provided for each function and shall conform to 407.3
>
> > **Exception:** Devices for personal use with input controls that are audibly discernible without activation and operable by touch shall not be required to be tactilely discernible.

As written this exception would allow for the design of devices that would be inaccessible to individuals who have physical or other disabilities that make it difficult or impossible to make or remember gestures. Certainly touchscreen reading techniques that use gestures like those implemented in VoiceOver and Talkback are very useful for people who are blind and these types of modes are very important. However,

VoiceOver, Talkback, and similar modes are insufficient for and of little use to people with physical disabilities who cannot make gestures. Such users may wish for accessible, tactile controls or to be able to attach their own specialized keyboards or keyboard-emulating assistive technologies and control the products from them. Also, for people who have both vision and physical disabilities (including elders) the ability to use the iOS screen reading technology without needing to use gestures is important. And it is possible on the iOS devices. There is a keyboard equivalent for all of the gestures of voiceover -- allowing it to be controlled from a bluetooth connected keyboard.

Recommendation

We recommend that a provision about gestures be added to the Functional Performance Criteria (302). The following wording is proposed:

> **PROPOSED NEW FPC**
> **302.*new*. Usable without gestures.** Where a manual mode of operation is provided, ICT shall provide at least one mode of operation for all functionality that does not require the user to make gestures on a surface or in three-dimensional space.

Further Provision 407.3 should be revised to address several other problems with it as well (see below) .

> **PROPOSED NEW 407.3**
> **407.3 Tactilely Discernable.** All functionality should be achievable using only tactilely discernible controls in at least one mode and shall conform to 407.3.
>
> **Exception:** Devices for personal use that have a keyboard interface that allows access to all functionality in at least one mode shall not be required to conform to 407.3.

The edits to provision 407.3 make it clear that all functionality needs to be achievable from tactilely discernable controls. The current wording suggests that there would need to be an individual control for each potential function. Even on systems with keyboards, this is not the case: for example, the keyboard combination Ctrl/Cmd+C to copy a selection or the Tab and Shift+Tab keys to navigate through many different functions in a menu or form elements on a screen.

The new exception does not preclude a mode of operation that uses gestures and audio output (like VoiceOver and Talkback on touchscreen devices). It just makes it clear that such a mode of operation is insufficient for access for some people to personal devices. People who are blind and people with physical disabilities alike would benefit from having at least one mode of operation that allows them to attach a keyboard, braille chordic keyboard, or other AT to a keyboard interface (such as USB or Bluetooth).

Depth Perception provision

For much of the past, the display of three-dimensional (3D) content has been more of a novelty than an everyday reality. However, with improving displays, decreasing costs, and increasing computing power, the display of information and content in 3D is becoming more widely available

Currently, one can purchase televisions and other flat panel displays that display 3D content without requiring the user to wear special glasses. Companies have recently been demonstrating *productivity* and *office* software that will make use of and display 3D content.

The next version of the Microsoft Windows operating system is expected to include support for 3D imaging and viewing, including support for 3D-viewing headsets. Computing and communication systems in the near future may utilize 3D vision as part of everyday use.

While there are many potential cues to providing a sense of three dimensions or depth to users, 3D systems primarily rely on binocular vision--viewing a scene with two eyes that have slightly different perspectives. Unfortunately, some people do not have a sense of binocular depth perception. This may be the result of only having one eye with sufficient vision, eyes that do not move in a coordinated fashion, or other conditions. Similar to people who are color-blind, people who lack visual depth perception should not be precluded from using ICT.

Recommendations

We recommend that provisions be added in parallel with those that are about color perception. For example, in the Functional Performance Criteria (Chapter 3), we suggest the following provision:

> **302.*new.* Without depth perception.** Where a visual mode of operation is provided, ICT shall provide at least one visual mode of operation that does not require binocular perception of depth.

This parallels the existing provision:

> **302.3 Without Perception of Color.** Where a visual mode of operation is provided, ICT shall provide at least one [visual] mode of operation that does not require user perception of color.

The Hardware chapter (Chapter 4) also includes a provision on colorblindness:

> **407.7 Color.** Color coding shall not be used as the only visual means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.

A suggested parallel provision is:

> **407.*new*. Depth perception.** Binocular depth perception shall not be used as the only visual means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.

The Software chapter (Chapter 5) relies on WCAG 2.0 for guidance on color use.

> *(WCAG 2.0)* **1.4.1 Use of Color:** Color is not used as the only visual means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.

WCAG was accepted as a W3C Recommendation in 2008 (before the current interest in commercial 3D systems), and does not address visual depth perception. Because of this, the proposed regulations in the NPRM would not address depth perception issues in software-based systems. A provision should be included that specifically applies to software in Chapter 5. An example is:

> **50x.*new*. Depth perception.** Binocular depth perception shall not be used as the only visual means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.

We think that it is important to “get ahead” of technology and research in this area. Adding provisions related to binocular depth perception will provide useful guidance to companies and organizations as they research and develop 3D interfaces and communication systems. These provisions are good for future proofing and preventing future barriers to access.