Accessible Emergency Notification and Communication

Research and Policy Recommendations

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Contents

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The National Organization on Disability and TVWorldWide video-recorded the conference and made the web archive available at http://www.tvworldwide.com/events/nod/051102/default.cfm.

Sponsorship

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Introduction

The "Accessible Emergency Notification and Communication: State of the Science Conference" was held at Gallaudet University's Kellogg Conference Center Hotel on November 2–3, 2005. The 160 participants came from state, local and federal government agencies; consumer groups; communications companies; telecommunications relay service providers; and research and consulting groups. The conference was video-recorded courtesy of the National Organization on Disability and TVWorldWide. The captioned video archive can currently be found at **http://www.tvworldwide.com/events/nod/051102/default.cfm.** The print materials from the conference, including speakers' remarks or written summaries, can be found at: **http://tap.gallaudet.edu/emergencycommconf.htm**. A resource page containing reports of other organizations regarding emergency communications and disability can be found at: http://tap.gallaudet.edu/Emergency-Resources.htm.

The conference program was designed to cover as many issues as possible pertaining to technology and emergency communications for people with disabilities. Topics of sessions of the conference were:

- Accessibility tools and gaps

- Government activities on accessible emergency communications

- Broadcast media notification

- Alerting and communication in facilities and campuses

- Person-to-person communication—interfaces and networks

- Policy and technology for access to 9–1–1

- Relay services in emergency

- Emergency alerting through email, wireless devices, the Emergency Alert System, and emergency telephone notification systems

- Coping with severe communications infrastructure loss in times of disaster

Guiding the development of the program were documents on consumer needs, suggestions from an expert advisory group, and a framework that was developed by the Global Standards Committee, in which the Telecommunications Industry Association is the U.S.-designated representative. The GSC partitioned the large and complex realm of emergency communications into four general areas[1]:

1. Government to government:
Intra- and inter-governmental communications for the purpose of emergency management.

2. Government to individual (or organization):
Official government sources communicating with the public. This includes government-initiated alerting to an emergency, recovery information, and other urgent communications and one-way information from official sources.

3. Individual to government:
Requesting help or information from official government sources, agencies; reporting problems. Examples include 9–1–1 and toll free numbers advertised by FEMA.

4. Individual to individual:
Private communications between and among individuals and groups for the purpose of helping each other; finding children or other family members (or persons in one's care); providing egress information to people at work, in stores, and other public places; and many other types of communications.

The State of the Science Conference addressed areas 2, 3, and 4 as having the greatest impact on people with disabilities. These three categories are used as a basis for organizing the research, training, and policy recommendations presented here.

One of the goals of the conference was to develop a list of research topics that can be helpful to funding agencies and businesses that are considering how to use research dollars to improve access to emergency communications. This document lists research topics that were specifically mentioned at the conference, provided as written comments by participants, or derived from the information and issues raised. A list of suggestions for information and training projects as well as policy recommendations based on conference information are also included. The recommendations do reflect the authors' judgments and attempts to summarize; therefore this should not be considered a consensus document from the conference. The recommendations are geared toward accessibility issues. We did not include other research topics that have general application to emergency communications, although some of these would also benefit people with disabilities along with everyone else.

Footnote

1 Resolution GSC–9/2 (Joint GTSC/GRSC): Emergency Communications. Global Standards Committee – 9, Seoul, South Korea, May 19, 2004.

Recommendations for Research

Accessibility of Mainstream Personal Technologies Used for Communications and Information

R–1. **Development of techniques to make mainstream technologies used for notification and communication usable by people with disabilities**. Problems include inability to use without vision, lack of text communication features and phone complexity. Technology accessibility affects the ability of people with disabilities to be notified of important information prior to and during an emergency and during recovery; and to engage in emergency communications. If the basic technologies are not accessible, then emergency and recovery messages will be missed and people will be prevented from communicating in order to seek help or give help to others.

R–2. **Inclusion of disability access in research on next generation emergency notification technologies.** Researchers that are specializing in projects on emergency communications have an obligation to coordinate with researchers working on the broader accessibility issues, as sometimes these two will overlap.

R–3. **Development of accessible communications devices for persons who are deaf-blind.** At our conference, the limitations in accessibility of current technology vis-à-vis deaf-blind persons were a particular concern. Most in this group have visual and hearing impairments that prevent them from being able to use television, radio, or cell phones. Thus they cannot use typical visual or auditory warning and communication devices. This group is growing in size as the U.S. population ages.

Research, Development, Evaluation, and Technical Assistance Targeted at Accessible Emergency Communication Systems

R–4. **Conduct a systems engineering analysis** to determine:
- Needs regarding emergency communications, including coverage at various times of day and for various types of emergency situations.

- Capabilities assessment, including evaluation of performance under load.

- Requirements analysis and assumptions, including requirements matrix (specifications which can be realized in solutions/products).

- Long-term solutions and not merely incremental approaches.

R–5. **Assess accessibility of current and proposed/planned emergency notification and communications,** particularly during situations where people with disabilities are disproportionately vulnerable to missing alerts or information, and target research and standards development there. Some examples of situations where individuals with disabilities would be particularly vulnerable in emergencies:

- while driving if unable to listen to radio or call 9–1–1;

- while sleeping if unable to hear alerting sounds;

- while out in a public place if unable to see what others are doing or hear what they are saying;

- in a power outage if dependent mainly or solely on a computer for communications and information;

- in any situation if deaf-blind.

R–6. **Gather information, using regional expertise of both consumers and emergency management personnel, on successfully providing accessible and timely communications during various types of emergencies.** Document best practices and recommend models for federal, state and local governments to follow.

R–7. **Sponsor participation of accessibility technical experts in emergency communications standards and guideline development, and in industry and government advisory groups.**

Examples:

- wireless technology consortia developing specifications for location-based notification

- government's integrated Public Alert and Warning System (iPAWS)

- 9–1–1 government/industry partnerships addressing technology migration

R–8. **Development of methods to apply advanced technologies such as intelligent agents to automatically ensure emergency information generated in one format is available in all formats.** Such technologies could also be applied to simplify complex messages to reduce cognitive load.

R–9. **Conduct lab and field tests of promising technologies for improved accessibility of emergency communications, working with partners in the public and private sectors and involving people with disabilities.** In particular, assessments need to be made to determine the extent to which the various methods of information delivery being considered in projects being coordinated by FEMA as well as local governments' systems, will achieve accessibility.

Government to Individual Communications and Broadcast Coverage of Emergencies

R–10. **Research the concept of streaming text over radio data channels to deliver emergency text messages through radio displays.** Radio is frequently depended upon by the public for emergency and recovery information, particularly when driving or when there is an extended power outage. Radio is inaccessible to people who are deaf and some who are hard of hearing.

R–11. **Develop technology for conversion of text-based information to auditory information, such as text displayed on television screens during emergencies** (e.g., school closing information and local telephone numbers to call for help). (Note: This area of research is being funded by NIDRR through a Field Initiated Research grant to WGBH.)

R–12. **Assess commercial products that perform emergency telephone notification functions** ("reverse 9–1–1") against a list of accessibility features needed for people with disabilities and publish the information in an accessible format on the web and promote its availability to local and state governments, professional associations, industry trade associations, and disability organizations.

R–13. **Determine the most effective way of making EAS television alerts accessible to people who are blind.** Current methods provide only an audio alert squawk, and not spoken information, when the television distributor sends the message in text only. The audio alert is sometimes accompanied by a spoken direction to tune to another channel, but the emergency information is not necessarily provided on that other channel. (Note: This issue is being considered by the FCC at this time, although no research is being carried out. Policy recommendations regarding the EAS can be found in the next section of this report.)

R–14. **Evaluate speech recognition technology for the specific application of automatically and accurately transcribing audio messages when spoken announcements are made,** e.g., in public places such as airports and for automated telephone notification systems. If the additional step of separately typing in messages is required during an emergency, there is a greater likelihood that it will not happen and a text version will not be sent.

R–15. **Address technical problems in timeliness of message delivery, spam filters terminating emergency messages, and other issues that can affect whether people with disabilities obtain emergency information.** Although these problems are shared by non-disabled people, mobile email is more relied upon by people with hearing disabilities than those without disabilities.

R–16. **Research liability issues with non-emergency service providers that are in the path between the alerting organization and the public.** Examples: wireless carriers, other servers of information. Liability issues may hamper the ability of local governments to work with carriers to provide highly localized alerts (e.g., chemical spill, road closure) to wireless users. If legal barriers would present problems, these would need to be addressed.

R–17. **If national and satellite radio takes over much of the broadcast radio market, research techniques for getting local alerts while listening to national/satellite radio.** Radio is often the first place people who are blind will seek information. Competition from national radio sources may change the marketplace for radio. The accessibility implication is that local emergency information may be harder to come by via radio.

R–18. **Research use of streaming video to mobile devices that can support video for sign language alert and recovery information.**

R–19. **Assess accessibility of NOAA Weather Radios** on the market to people with visual disabilities including deaf-blind persons.

Individual to Government Communications

R–20. **Study technologies and operational procedures for network security and control during emergencies** that can hamper access to useful technologies such as video and text. For example, email alerts are already losing effectiveness due to spam control procedures and a lack of priority setting for email. Video and instant messaging are often disallowed or blocked by firewalls in many organizations. Recommend solutions to these problems.

R–21. **Build in accessibility to planned changes in 9–1–1 architectures.** The migration of the nation's Public Safety Answering Points (PSAPs) to packet-switched technologies is a wonderful opportunity for better accessibility. But if accessibility concerns are not considered, it could be a missed opportunity. In this endeavor, NIDRR could coordinate and perhaps co-fund projects with the U.S. Department of Transportation, which has been designated the point agency for the development and testing of next-generation technology for 9–1–1.) PSAPs need to be able to receive voice, data or video transmissions in real-time, and then be able to pass along the information received to specific emergency responder networks. Technology coordination is needed so that accessibility occurs shoulder to shoulder with upgrades to 9–1–1, without repeated changes to PSAP requirements overtime.

R–22. **Study methods for TTY functionality in wireless PDAs** and other methods that may be short term solutions to E9–1–1 access with mobile location-finding and coverage equal to that of voice users. The TTY devices on the market are quite large and not really mobile devices, so they are not being used by deaf people. In contrast, wireless PDAs using Internet-based services are widely used. Companies should build TTY functionality into phone devices that have QWERTY keyboards so that direct calls to 9–1–1 are possible without any specialized equipment. The networks already support TTY; this is a last step to achieving direct 9–1–1 access in the short term.

R–23. **Study and demonstrate options and issues for relay services' handling of 9–1–1 calls.** Research in this area could provide informed decisions for call handling in the future and may enable improved handling of relayed calls to 9–1–1.

Recent FCC rules indicate that new forms of relay services will soon be required to handle 9–1–1 calls. Research investment is needed to move this area ahead quickly, as many text users have abandoned the PSTN and TTY due to the availability of text and video over broadband. IP-based and video relay centers need to be able to determine the correct PSAP, based on the caller's locations, and be capable of exchanging information with PSAPs. IP-based forms of speech-to-speech relay service and CapTel are forthcoming; these also will need to be compatible with 9–1–1. Tests of this concept, as well as one-step calling might include the use of one or more specialized relay centers for routing and relaying these calls.

R–24. **Demonstrate and evaluate methods of connection and call handling to 9–1–1 using IP text and IP-based relay services.** For direct calling to 9–1–1 by people who cannot use the voice phone, continued support of standard, reliable and interoperable real-time text communication will be needed. However, the antiquated TTY technology of the PSTN should not be perpetuated in new systems that operate over IP networks.

Individual to Individual Communications (including residential situations and communications within facilities and campuses)

R–25. **Research effective and accessible methods of communicating egress or shelter instructions in buildings and building complexes.** There are basically two situations: one in which the person being alerted has some relationship to the building, such as an employee or a student, and the building management can to some degree control the situation; and one in which people are transient, such as stores, restaurants, rail stations, or airports. One concern is that with more threats of terrorism and biohazard incidents, we do not have ways to communicate directions to people with disabilities in an emergency: exit, shelter in place, move to another area, etc. Another concern is that, even for routine egress, better use of technology could be made to signal the direction to exit if a person cannot see, as a result of blindness or smoke in the building.

R–26. **Study and evaluate technologies for finding people with hearing and/or speech disabilities in a collapsed structure or other rescue situations** where speech and hearing would routinely be used to communicate between rescuer and rescuee, for example, after an earthquake or bomb detonation.

R–27. **Study methods of awakening people with hearing disabilities while sleeping.** Recent research involving awakening people from sleep indicates that guidelines for accessibility are inadequate for awakening a large percentage of people who cannot hear or cannot hear well. Further study should include additional signals (such as low or variable frequency sounds); and specific products and technologies should be evaluated against these requirements. The possibility that some persons could sleep through vibrations or other signals after habituation should be

studied. Guidelines may need to be changed as a result of this research.

R–28. **Improve alerting interfaces; Implement standard connections in emergency systems for external flashing/loud audio/vibrating devices.** Develop and transfer to the private sector a portable vibrating alerting device with standard connector and battery backup. This simple type of device would permit people who cannot be alerted by an auditory signal to move from location to location and plug in a vibrating device to an alarm.

R–29. **Study human factors issues related to audio alerting and hard of hearing people while awake.** For example, people who have progressive hearing loss and who may not be attuned to seeking visual information, due to age or late onset of disability. What are the most effective forms of audio alerts?

R–30. **Study human factors issues around alerting people who are deaf-blind.** Deaf-blind people are not served by most technologies that are on the market. Special attention needs to be paid to emergency communications access for people who are deaf-blind, and for whom most communications technologies are inaccessible.

R–31. **Study information needs and communication specific to certain disability groups and identify effective practices for peer-oriented communications and help.** Networking and self-help within disability groups has been an important recovery tool during severe and widespread disasters such as hurricanes Katrina and Rita. What specialized emergency information is needed by people with various disabilities in an emergency? How and by whom does such information get produced now and how should it be produced in the future? How can such information best be delivered? What role should non-profit relief organizations have, and how can they coordinate and work with disability-specific groups? Should institutions serving specific groups effectively (e.g., state schools for deaf children) have official roles as shelters?

R–32. **Demonstrate and test the use of IVR** (Interactive Voice Response – telephone menus) to make emergency information on the web more accessible to people when not in the presence of a computer or smartphone, and to make the information more easily and universally accessible to people who are blind. For example, a blind person could dial a phone number, listen to a list of categories and chose the topic of interest to receive more information.

Recommendations for Information and Training Projects

Although the State of the Science Conference did not explicitly address non-research initiatives, several recommendations were raised during the conference. Implicit in all recommendations is that people with disabilities must be involved in the planning, training, and implementation of these initiatives.

I–1. **Develop recommendations for technical and production strategies for local television stations to make emergency information accessible;** promote these to the television industry as guidelines. Examples: making advance arrangements for remote real-time captioning and equipment; and promoting methods of providing on-screen information in audio format for access by people who are blind.

I–2. **Train emergency management personnel** in emergency communications involving people with disabilities.

I–3. **Train people with disabilities on preparedness,** and also on emergency management and sharing of best practices for advocates at state and local levels. Special efforts should be made to train deaf-blind individuals, who remain largely without any emergency information.

I–4. **Develop special information and training projects addressing deaf-blind access** to emergency communications as well as other aspects of emergency preparedness.

I–5. **Develop more/sustained information projects on emergency management and preparedness for people with disabilities** including information on specific technologies to provide accessible communications during emergencies, updated on a regular basis.

Recommendations for Public Policy

P–1. **People with disabilities must be represented** in any working groups addressing emergency communications.

P–2. **Companies need to make greater efforts to ensure that their user interfaces are accessible to all people with disabilities.** Although this is already required for telecommunications products and services (under Section 255 of the Communications Act), the proliferation of soft buttons and on-screen menus on wireless and other telecommunications devices, without accessibility provisions, shows that this mandate is often disregarded. In addition, policy changes are needed to require accessible interfaces on televisions, computers, radios, and Web-enabled devices, which may not be presently covered by federal law.

P–3. Funding for both emergency communications and accessible telecommunications access has historically been tied to universal-type funding mechanisms that are supported by telephone companies. As our nation transitions away from traditional telephone networks and toward Internet-based communication systems, **funding to support these emergency and accessibility programs must come**

from VoIP providers and other companies that provide services over the Internet.

P–4. **Accessibility should be handled in the main proceedings or projects of an agency regarding emergency communications, not after the fact.** In some cases requiring technology coordination, there may need to be an integrated proceeding to fix accessibility problems.

Government to Individual Communications and Broadcast Coverage of Emergencies

P–5. **Fund NOAA Weather Radio infrastructure upgrade** to provide text servers that will allow full text messages to be displayed on accessible NOAA Weather Radios. Currently the NOAA Weather Radio system provides full information in audio format but very limited information in text format, because the infrastructure is lacking to take the original message (which was produced in text) and broadcast it as text as well as in synthetic speech.

P–6. The Common Alerting Protocol (CAP), although not an assurance of message accessibility in itself, provides a needed framework for multi-modal messages that are essential for accessibility. **The CAP should be acquired in implementation of all systems used by federal, state, and local governments for alerting.**

P–7. The Emergency Alert System (EAS) is currently used only to deliver emergency information through broadcast (TV and radio) and cable service media. New rules will extend EAS obligations to digital television and radio, satellite television and radio, and digital cable. **The FCC needs to complete its recently released further notice of proposed rulemaking** to ascertain how this system can also be used to deliver content via other transmission protocols, including the Internet, relay services, and wireless based systems.

P–8. **The integrated Public Alert and Warning System (iPAWS) should have specific guidelines for implementation that include accessibility provisions.** Testing of all technologies must include people with disabilities as recipients of messages.

P–9. **The FCC's current rules on the provision of emergency information to people who are blind and visually disabled only require an audible tone,** designed to alert individuals that an emergency exists. Those individuals are then expected to obtain additional information elsewhere (e.g., via a radio broadcast). The FCC needs to improve these rules to ensure that access by this population of individuals is equal to what is afforded individuals without vision disabilities. One possibility is to send audio emergency alerts over the second audio channel.

P–10. Although the Decoder Circuitry Act of 1990 requires captioning capability on all televisions with screens larger than 13 inches, and on any television receiver (of any size) that provides digital programming, newer devices, including battery-

operated TVs, cell phones and PDAs that have not traditionally been defined as "television apparatus" are now beginning to receive television signals. These **PDAs, cellphones, etc., have the ability to clearly present text and need to be capable of receiving and displaying captions, especially in the event of an emergency.** A legislative change may be needed to make this possible.

P–11. **The FCC has to take a more proactive role in enforcing its rules on visual access to televised emergency programming** (contained at 47 C.F.R. [[section]]79.2). While enforcement has improved over the past year, compliance remains inadequate. One option is for the FCC to conduct regular compliance reviews of local stations around the country. Similarly, the FCC needs to improve enforcement of its digital captioning rules. Although these rules now require all new digital programming to have captions, consumers report that most programming providers are not fulfilling this obligation.

P–12. **The Department of Justice (DOJ) should clarify that where emergency telephone notification systems ("reverse 9–1–1") are used by local and state governments,** these must be capable of contacting people with disabilities, including people with hearing loss, either by TTY or other means that have yet to be determined under Title II of the ADA.

P–13. **Improved DOJ enforcement is needed to ensure that emergency information is available in accessible formats to people with disabilities.** There has been considerable frustration with the fact that 15 years after the ADA was enacted, many state and local governments are still not making the information that they disseminate in emergencies accessible, as is required by Title II of the ADA. Similarly, Section 504 is not always being followed by the federal government, although in some cases significant work toward equal alerting of employees and citizens has been done.

P–14. **Stronger enforcement of requirements that emergency information posted on the Web be accessible.** Increasingly, people are turning to the Web for information in an emergency. Yet this is the time when accessibility is often dispensed with. Given that most other channels are often not accessible, this is a key resource, and must be made accessible.

Individual to Government Communications

P–15. Achieve improved coordination among 9–1–1 PSAPs, perhaps through a quasi-federal 9–1–1 office that would promote standardized call routing, accurate and consistent 9–1–1 databases and the dissemination of information to local PSAPs to encourage utilization of upgraded technology.

P–16. The Department of Justice needs to conduct a thorough review of its 9–1–1 Title II rules (under the ADA) to bring these in line with advanced telecommunications technologies. These rules, while comprehensive for TTY access, do not impose any obligations on PSAPs to receive IP-based calls, pages, or calls using other advanced text and video technologies. This review should be in conjunction with the FCC's own review of emergency access by people with disabilities, and should be coordinated with the Interagency Coordinating Council on Emergency Preparedness and Individuals with Disabilities at the U.S. Department of Homeland Security. Once changes are made to its Title II rules, DOJ should incorporate any new functional requirements into its Project Civic Access compliance reviews of state and local governmental programs. These reviews are conducted to achieve compliance by these governments with the Title II mandates.

P–17. Solutions for the handling of emergency relay calls need to be developed by Internet and video relay service providers. The FCC needs to consider various options, including possible registration by all users of these services, consistent with what is required of VoIP users.

P–18. Either Congress or the FCC should extend the requirements of Section 255 of the Telecommunications Act to information service providers, and more specifically to VoIP providers, so that these entities are required to provide accessible emergency services to people with disabilities. As deaf people steadily abandon their TTYs, they are losing their existing means of directly contacting and having interaction with 9–1–1 services. The provision of real-time text over wireless devices would resolve this problem. This can be pursued through voluntary cooperation by the industry or via an FCC mandate. One option is for the FCC to open a rulemaking proceeding to define the obligations of VoIP providers as 9–1–1 access by people with hearing loss migrates from the public switched telephone network to Internet-based services.

Individual to Individual Communications (including residential situations and communications with facilities and campuses)

P–19. **The Americans with Disabilities Act's Architectural Guidelines do not adequately address the need for both audio and visual information (e.g., audio beacon, visual displays corresponding to audio information) during emergencies.** Spoken messages and emergency telephone notification systems (phone calls to the desktop) are increasingly used in facilities and campuses without a visual counterpart. Public address speaker quality in these systems is often too low for even people with mild hearing loss to understand reliably. New guidelines are needed.

P–20. **The FCC should adopt policy changes to ensure that users of emerging technologies, such as IP-based text and video technologies, have identifiable end-user points to enable call-backs from PSAPs and emergency telephone notifications** ("reverse 9–1–1" calls). VoIP systems are now being connected to the North American Numbering Plan (NANP). Connecting text and video based callers to the NANP (by assigning them end-user numbers) would be one solution to this problem. (The FCC already has an open rulemaking proceeding to consider the use of proxy numbers for video relay users to allow such call-backs.)

P–21. The FCC recently required interoperability across video relay providers to enable relay users to place calls through any relay provider regardless of the equipment that they have. However, competing video protocols, such as SIP and H.323, continue to raise concerns about the interoperability of both video relay services and peer-to-peer video services. Similar issues exist in IP text relay where there are no standards. **Basic technical standards are needed to ensure that video and text users can access each other, regardless of the transmission protocol that they use.**

P–22. **Federal policy (through regulation or legislation) needs to require that text and video communications be able to pass-through wherever voice can pass through.** This policy would eliminate current problems with firewalls and other technologies that currently block text or video communications.

P–23. At present, universal service programs subsidize only basic telephone service. Two universal service programs, Lifeline and Link-up, provide direct subsidies for low income individuals so that they may hook up their telephones and receive telephone service at a reduced cost. **Insofar as deaf people are increasingly relying on broadband-based and mobile services rather than services over the traditional telephone network, these individuals should be given the option of using funds available through these programs for these more advanced communication technologies.** This would require a legislative change.

HTML and PDF versions of this report can be found at
http://tap.gallaudet.edu/EmergencyConf/recommendations.htm