October 10, 2016

Francine Alkisswani
National Telecommunications and Information Administration (NTIA)
U.S. Department of Commerce
1401 Constitution Avenue, NW., Room 4621
Washington, DC 20230

Re: Notice, request for comments
National Telecommunications and Information Administration (NTIA)
[Docket No. 160831803–6803–01] RIN 0660–XC031
***National Broadband Research Agenda***

Dear Ms. Francine Alkisswani:

Enclosed for filing in the above referenced Public Notice are the comments of the Georgia Institute of Technology (Georgia Tech), Center for Advanced Communications Policy (CACP) and the Rehabilitation Engineering Research Center for Wireless Inclusive Technologies (Wireless RERC).

Should you have any questions concerning this filing, please do not hesitate to contact me via email at helena.mitchell@cacp.gatech.edu.

Respectfully submitted,

Helena Mitchell, Ph.D.
Principal Investigator, Wireless RERC
Executive Director, Center for Advanced Communications Policy
Georgia Institute of Technology
Enclosure

**National Telecommunications and Information Administration (NTIA)**
**Washington, D.C. 20230**

In furtherance of the Broadband Opportunity Council's recommendation to improve data collection, analysis and research on broadband, the National Telecommunications and Information Administration (NTIA) and the National Science Foundation (NSF) request public comments to inform the development of a National Broadband Research Agenda (Agenda) in collaboration with the Networking and Information Technology Research and Development Program and other agencies that form the Council. This Agenda will reflect the most significant opportunities for data collection, analysis, and research to keep pace with, and take advantage of, the massive digital changes that permeate our economy and society.

COMMENTS OF
GEORGIA INSTITUTE OF TECHNOLOGY (GEORGIA TECH), CENTER FOR ADVANCED
COMMUNICATIONS POLICY (CACP)
AND THE REHABILITATION ENGINEEERING RESEARCH CENTER
FOR WIRELESS INCLUSIVE TECHNOLOGIES (WIRELESS RERC)

Georgia Tech's Center for Advanced Communications Policy (CACP) in collaboration with the Rehabilitation Engineering Research Center for Wireless Inclusive Technologies[1] (Wireless RERC) hereby submits comments in the above-referenced Public Notice released on September 9, 2016.  CACP is the home of the Wireless RERC.  CACP is recognized at the state and national level as a neutral authority that monitors and assesses technical developments, identifies future options, and provides insights into related legislative and regulatory issues.  CACP evaluates technological trends that can impact issues as diverse as wireless accessibility for people with disabilities, emergency communications, vulnerable populations and social media.  The mission of the RERC for Wireless *Inclusive* Technologies is to promote

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[1] The **Rehabilitation Engineering Research Center for Wireless Inclusive Technologies** is sponsored by under a grant from the National Institute on Disability, Independent Living, and Rehabilitation Research (NIDILRR grant number 90RE5025-01-00). NIDILRR is a Center within the Administration for Community Living (ACL), Department of Health and Human Services (HHS). The contents of this document do not necessarily represent the policy of NIDILRR, ACL, HHS, and you should not assume endorsement by the Federal Government.

Center for Advanced Communications Policy and Wireless RERC

integration of established wireless technologies with emerging wirelessly connected devices and services for an inclusive transformative future where individuals with disabilities achieve independence, improved quality of life, and enhanced community participation. We believe it is essential that levels of accessibility to Information and Communications Technologies (ICT) and services be improved for people with disabilities. Broadband can enable the provision of equal access communications for people with disabilities by allowing more bandwidth to deliver text-based communications and internet access, which has been identified among their most important broadband wireless device functions. For more than a decade both CACP and the Wireless RERC have been actively involved with research and regulatory issues concerning accessible ICT and wireless communications and devices. The comments respectfully submitted below are based on subject matter expertise and findings from our research portfolio.

¶4: **What are the critical data and research needs in the areas of broadband technology and innovation?**

While a significant deal of attention has been focused on the landscape of underlying broadband technologies and basic services[2] (e.g. advances in fiber transmission, 5G wireless connectivity, and the anticipated Internet of Things), additional proactive data collection on broadband connectivity and associated applications and services is needed. Further collection of evidence-based statistical user needs data and conduct of summative research is also merited toward understanding not only technological, but social, cultural and usage *barriers to deployment and access* for all citizens.

Many of the challenges related to the accessibility of existing wireless technologies and ICT apply to the future implementations of broadband technologies, magnified by the social, cultural, and economic consequences of deployment and adoption of ubiquitous, always accessible flows of information, connected sensors and environmental monitoring, and data collection. Undertaking deep-dive research to examine the optimal speed of broadband transmission and deployment of broadband equipment, software, and content, and front-end

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[2] As noted in Jayakar, K, Maitland, C., Peha,J. Strover, S. & Bauer, j. (2016). *Broadband 2021, Report of the Interdisciplinary Workshop on the Development of a National Broadband Research Agenda* July 25, 2016

Center for Advanced Communications Policy and Wireless RERC

consultation and testing with consumers is critical to improvements in both expanding broadband infrastructure as well as for accessible end products and services. Equally important should be research that brings the key players in emergency communications management to the table because an interoperable broadband network is critical for public safety and provides the fastest exchange of notifications between officials and delivery of emergency alerting in all modes to all citizens.

The growth of a connected Information Society is fueled, in addition to broadband deployment, by a multiplicity of elements that generate pervasive and radical changes – changes which are not entirely well understood. In order to be truly effective these ICTs need to be broadly available in spite of economic and access barriers. Leveraging broadband connectivity allows that "all persons are able to participate as creative and productive members of their communities" and has the potential to enable people with disabilities "to live their lives with dignity" which is increasingly recognized as an urgent priority worldwide.[3] This objective, of course, is facilitated by the collection of user data as well as research into design and development approaches that enhance the *accessibility* and *usability* of information technologies and services. The ability of broadband to work over multiple platforms and be flexible to allow future change, requires that government and the private sector work together to create accessible and cost effective broadband innovation initiatives.


¶9: **What specific research and data are needed to understand how rural residents and other population groups that have traditionally under-utilized broadband technology (e.g., seniors, low-income families, persons with disabilities) can better adopt and use broadband??**

The widespread adoption of information intensive wireless technologies, location-based services, telework, and governmental services, and home-based healthcare are just a few signs that access to broadband technologies has become critical for full social engagement and participation in society. As with the general U.S. population, those with disabilities and the

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[3] UNESCO, "WSIS [World Summit on the Information Society] Forum 2015: Making Empowerment a Reality - Accessibility for All," UNESCO Press Release, May 27, 2015. http://www.unesco.org/new/en/media-services/single-view/news/wsis_forum_2015_making_empowerment_a_reality_accessibility_for_all/#.VXgbakZz9mM [retrieved: June 2015].

Center for Advanced Communications Policy and Wireless RERC

aging, are becoming significant users of the Internet[4] and wireless technologies, in spite of barriers to access. Broadband connectivity fuels applications and services enabling social inclusion and access to community, educational, commercial, professional, and governmental resources.[5]  Yet access to these resources for people with disabilities is dependent on *usability*, that is the accessibility of the devices needed to access the internet, and the accessibility of the content posted to the internet. "For a technology to be accessible, it needs to be usable in an equal or equitable manner by all users without relying on specific senses or abilities, and it needs to be compatible with assistive technologies that users may rely on […] and many other devices that persons with disabilities may employ."[6]

CACP and the Wireless RERC are strong proponents of conducting national surveys to obtain the widest range of data collection on critical issues of broadband and wireless technologies that impact the lives of people with disabilities. We are always inclusive of coordination with disability organizations, which should be a key component of all surveys on technology adoption, access and affordability by people with disabilities. For example, data from the most recent 2015 Wireless RERC Survey of User Needs revealed a high percentage of respondents identifying mobile broadband applications among their most used wireless device functions. Email (68%) and web browsing (65%) exceeded that of voice calling (57%) and voicemail at 46%. Other broadband enabled app activity included navigation and wayfinding – 55%; Downloading apps – 54%; Sharing photos – 54%;Listening to Music 44%; Social networking – 52%; Watching video – 47%; Gaming 43%; Shopping 37%; Paying bills 37%; Instant messaging 36%; Video calling – 30%; Health monitoring 22%. Longitudinal studies would lead to better understanding of adoption rates and usage regarding rural, disability and minority populations.

The provision of accessible information and services is highly dependent on robust, information intensive, networks. For instance, the increasingly common vocal response agents (e.g. Amazon *Echo*, Apple *Siri*, and Google *Assistant*), are simply front ends and clever

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[4] Pew Research Center (2010). Americans living with disability and their technology profile.
[http://www.pewinternet.org/2011/01/21/americans-living-with-disability-and-their-technology-profile/]
[5] Jaeger, P. (2006). "Assessing Section 508 compliance on federal e-government Web sites: A multi-method, user-centered evaluation of accessibility for persons with disabilities." *Government Information Quarterly* 23: 169-190.
[6] Jaeger, P. [2002].  *Disability and the Internet: Confronting a Digital Divide*. Boulder, Colorado: Lynn Rienner Publishers.

Center for Advanced Communications Policy and Wireless RERC

interfaces to a robust data driven set of machine intelligences. These assistive technologies offer the possibilities for people with disabilities to operate more independently, but a robust research agenda needs to be undertaken to identify technological barriers to use of these technologies as well as develop device prototypes and processes for inclusive technologies.[7] Populations (be they geographically defined, or in terms of capabilities) that are excluded from access to broadband based infrastructure and applications risk increasing marginalization.

The Americans with Disabilities Act of 1990 (as amended)[8]; rulemakings by the Federal Communications Commission (FCC) on emergency alerts systems[9] and advanced communications provisions[10] all address ensuring critical and equal access for people with disabilities, but most likely will need additional resources to undertake research regarding the final legs of transitioning from legacy technologies to all-inclusive broadband technologies, both from an engineering perspective and to enable policy development strategies.

The ability to connect with anyone anytime, as well as the independence facilitated by broadband connectivity, are among the most important reasons people with disabilities use these technologies. "Today's lifelines are advanced technologies, relied upon to conduct daily activities inside and outside the home enabling people to interact anytime from anywhere"[11]. Broadband connectivity promises to broaden the availability of, as well as the range of, life enhancing services. In addition to services intentionally and directly used by people with disabilities, the array of supportive technologies include passive sensors, environmental monitors, and alerting devices that make independent living of people with disabilities, and the aging, exponentially more feasible. While much of the literature notes, generally, the fact that people with disabilities, the aging, and other groups tend to be underserved by availability of broadband infrastructure and services, crafting appropriate policy approaches would be

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[7] Wireless RERC. (2016). *Proceedings of the Envisioning Inclusive Futures Summit*, May 13-15, Atlanta, GA. Retrieved from http://www.wirelessrerc.org/content/post-summit-content

[8] The Americans with Disabilities Act of 1990, Pub. L. No. 101-336, 104 Stat. 327, 1990 (codified at 47 U.S.C. §225) ("ADA Title IV").

[9] FCC. (2004). *In the Matter of Review of the Emergency Alert System* [04-296] Federal Communications Commission: Washington D.C

[10] FCC. (2014). *Tentative Findings about the Accessibility of Communications Technologies for the 2014 Biennial Report Under the Twenty-first Century Communications and Video Accessibility Act* [10-213]. Federal Communications Commission: Washington D.C., August 28, 2014.

[11] H. Mitchell, "Great Expectations: Keeping People with Disabilities Connected in a Wireless Future," The End of the Phone System Workshop. Wharton Business School, University of Pennsylvania. May 17, 2012.

Center for Advanced Communications Policy and Wireless RERC

well informed by the collection of empirical data to capture the specific perceptions of barriers by these target groups. We would recommend undertaking qualitative data collection of target stakeholder groups using focus group and nominal group methodology to capture the dimensions of perceptual, and real barriers experienced by these groups as well as explore opportunities to inform the design of innovative platforms for inclusive broadband technologies. Some research avenues might include: accessibility of monitoring systems in nursing homes,[12] audio publications over platforms for those with visual impairments, growth in telepresence robotic systems[13] current and innovative navigation systems,[14] and developing accessible prototypes to provide applications to/or integrate wireless emergency alerts into travel sized devices for people with disabilities.[15]

As new Federal U.S. and global regulations and industry standards are negotiated, internet access via mobile devices, cost effective delivery of (wireless) broadband services to people with disabilities, especially all people living in rural areas, may well become the primary platform for information and communications access among people with and without disabilities.[16] It is extremely important that 1) proactive federal policy be developed and 2) regulatory bodies provide broad-based accessibility provisions that can deliver a flexible applicable broadband architecture, with the ability to guide industry and engage appropriate stakeholders in developing accessible produces and services that also promote usability of the same.

**¶12: Are there specific socioeconomic research areas that can help measure the effectiveness of federal programs seeking to foster broadband access, adoption, or competition?**

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[12] J. Huang, (2013). "Research on Application of Internet of Things in Nursing Home." *AMM Applied Mechanics and Materials* 303-306: 2153-156. Web. http://www.scientific.net/AMM.303-306.2153

[13] R. Leeb, L. Tonin, M. Rohm, L. Desideri, T. Carlson, and J.D. R. Millan, "Towards Independence: A BCI Telepresence Robot for People With Severe Motor Disabilities." *IEEE Xplore*. N.p., June 2015. Web. http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7109829

[14] "A Multiple Sensor-based Shoe-mounted User Interface Designed for Navigation Systems for the Visually Impaired." *IEEE Xplore.* N.p., n.d. Web. http://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=5452688

[15] D. Bennett. (2015). "Findings from People with Disabilities and Emergency Managers on the Use of Websites and Social Media to Deliver Accessible Emergency Alerts." National Hurricane Conference, Austin, TX, March 2015.

[16] Gould, M. &  Studer, E. (2010). *Convention on the Rights of Persons with Disabilities (CRPD) 2010 ICT Accessibility Progress Report*.  G3ict – the Global Initiative for Inclusive Information and Communication Technologies, 2010 http://g3ict.org/resource_center/CRPD_Progress_Report_On_ICT_Accessibility_2010

Center for Advanced Communications Policy and Wireless RERC

Broadly speaking research needs to be conducted not only on ways in which physical infrastructure can be made resilient and predictable, but also on the human and socio-technical practices that rely on these systems. For instance, Individuals with disabilities, and to an extent, the aging, can be highly vulnerable during emergency situations for several reasons. This diverse demographic represents those with sensory, cognitive, physical, and perceptual limitations, and those who are elderly or aging into such disabilities. For these populations, it can be very important to clarify the message, acquire more information, and ask questions to those that can help them best.[17] Broadband based infrastructure and applications can serve to coordinate information flow across hybrid and legacy systems (helping to cross legacy system and geographic boundaries). Federal agencies such as the FCC, IPAWS, DHS Science and Technology Directorate could be tasked to revisit and measure how effective their projects have been to increase adoption of broadband in the emergency notification and alerting space. In the end a robust broadband framework can serve to communicate, alert and warn populations by providing information at the point that is readily accessible (for instance via wearable devices), and facilitate connection with bottom-up social networks.[18, 19, 20]

National surveys have also proved highly effective in conducting research on the response to emergency communications by people with disabilities. By example, the use of mobile devices has become an integral part of the emergency communications ecosystem, and according to a survey of user needs, 82% of 1600 respondents with disabilities stated that wireless devices were increasingly important to them while 72% stated that wireless devices were especially important during emergencies[21] and depended on them to receive lifesaving information and to seek help.[22] Thus a robust broadband infrastructure and the associated wireless services allow for use of digital technologies and expands the capabilities, and as important, accessibility of emergency communications.

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[17] Mitchell, H and Louchez, L. White Paper on Accessibility in the IoT World. (2016).

[18] Mitchell, H and Louchez, L. (2016).

[19] Bricout, J.C., & Baker, P.M.A. (2010). Leveraging online social networks for people with disabilities in emergency communications and recovery. *International Journal of Emergency Management,* 7(1), pp. 59-74.

[20] H. Mitchell, D. Bennett, and S. LaForce, (2011) "Planning for Accessible Emergency Communications: Mobile Technology and Social Media," 2nd International AEGIS Conference Proceedings, Brussels.

[21] Muller, J et al "Accessibility of Emergency Communications to Deaf Citizens" International Journal of Emergency Management 7.1 (2010): 41-46

[22] R. Wei and L. Ven-Hwei (2006). "Staying Connected While on the Move: Cell phone use and social connectedness." New Media and Society 8(1): 53-72.

Center for Advanced Communications Policy and Wireless RERC

**¶13: What opportunities exist to improve the sharing of research from federal research programs with external stakeholders (e.g., industry, academia)? Likewise, how can external stakeholders better share their research with federal agencies?**

Great strides in research sharing have been made between academia and federal agencies such as the FCC and the Department of Homeland Security (Science and Technology Directorate and Integrated Public Alert and Warning System) to ensure all emergency notifications are accessible. CACP and the Wireless RERC have a history of sharing our research with federal agencies, the wireless industry and disability organizations through ex parte comments, white papers, survey results, or published articles on accessibility of wireless technologies for people with disabilities. Entities such as ours that receive significant funding from federal agencies such as the National Institute on Disability, Independent Living, and Rehabilitation Research should have an obligation to share research, development and training information. While many of us do, there are probably other federal grantees who might be interested in the same if they were aware of the need. Through advisory groups such as the FCC's Disability Advisory Committee further insights and research has also been shared, proving that proactive outreach by the federal government works. By an example one area that could benefit from additional collaborate research is the modernization of the Lifeline Program to include broadband subsidies to support efforts like TTY to RTT conversion, as well as other NG911 access applications such as Video Relay Interpreters.

While not specifically mentioned in the public notice, critical applications of communications technology, such as emergency communications and disaster management are highly dependent on an effective, robust and resilient information infrastructure. Modern emergency communications systems are composed of a number of technologies including traditional analog, digital technology and computer mediated networks. Enhanced broadband infrastructure and communications applications represent, depending on implementation, a variety of approaches to integrate and enhance the ability to communicate with vulnerable populations during emergencies and disasters. Given that adoption of these technologies optimally requires coordination across agency, jurisdictional, and more importantly, research domains, any proposed broadband research agenda should consider exploring: 1) technology

driven collaborative practices, 2) interoperability barriers, and 3) translation barriers between federally funded research, technology manufacturers and services providers.

In closing, the Center for Advanced Communications Policy (CACP) and Wireless RERC strongly support the NTIA and NSF solicitation of public comment to inform the development of a National Broadband Research Agenda and to identity key opportunities for data collection, analysis, and research to keep pace with, and take advantage of, broadband deployment. The CACP and the Wireless RERC, wish to emphasize the importance of including accessibility for people with disabilities to the greatest extent possible as part of the conceptualization and articulation of this research agenda.  We further urge that 1) accessibility implications of future connected technologies should be a high-level consideration when planning Federal level technology development strategies and policy, and 2) people with disabilities should be proactively consulted throughout the development and implementation of the National Broadband Research Agenda.

Respectfully submitted,

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Phone: (404) 385-4640 Dated this 10th day of October 2016