Comments on Research and Development Priorities for Desirable Features of a Nationwide Public Safety Broadband Network

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Comment 1: Building a National Broadband Infrastructure (General Comment)

While it is clear that the "boots-on-the-ground" first responders dealing with emergencies, catastrophes and other public safety events will need to employ wireless technology to enable communications and the flow of information needed to manage these events, it seems highly likely that the ultimate architecture of a national public safety broadband network infrastructure will include a significant "wired" component. Such a "wired" portion of the infrastructure (most likely, employing fiber optics technology) would provide ultra-high speed broadband capabilities to enable, as examples, data and communications interconnections or bridging among public safety programs and public safety districts or regions, and the ability to offload and route potentially massive amounts of critical data from the wireless broadband spectrum. Capabilities such as these would seem vitally important in case of large, complex public safety events that might involve multiple public safety agencies in multiple geographic jurisdictions. The massive flooding in the northeast U.S. that occurred early this fall would be but one example of such an event.

It would seem prudent for those responsible for conceiving, planning and implementing a nationwide public safety broadband network to explore engaging other organizations and programs already involved in the deployment of national broadband infrastructures. Specifically, a substantive "conversation" between those planning the national public safety broadband network and the U.S. Unified Community Anchor Network or US-UCAN is strongly encouraged. U.S. UCAN is an initiative of Internet2 and is funded by the NTIA BTOP program. The fundamental mission of US-UCAN is to leverage the Internet2 broadband infrastructure to create a nationwide backbone network that will interconnect regional and local broadband networks. The ultimate goal, then, is to reach community anchor institutions across the U.S. with high performance broadband connectivity. Public safety organizations and agencies are specifically identified as target community anchor institutions for US-UCAN.

It seems that there could be several benefits to a collaborative effort between the implementers of a national public safety broadband network and the US-UCAN program. These would include taking advantage of an existing robust, resilient and reliable broadband network infrastructure and working from the perspective of a shared vision to keep bandwidth limitations "off-the-table" with respect to deploying broadband technology to advance the programs' missions. Also, through collaborative discussions with US-UCAN, it may be possible to bring some of a growing portfolio of "Net+" services being developed under Internet2 to the national public safety broadband network. For example, the Internet2 network offers a dynamic virtual circuit

provisioning service known as ION. With ION, end users can, on-demand, provision virtual circuits with dedicated bandwidth for designated periods of time. Should, through a collaborative effort of the public safety community and the US-UCAN program, this service be "ported" to the US-UCAN infrastructure, public safety agencies would have the ability to, under their own control, quickly establish a dedicated, private high performance network interconnecting critical public safety agencies, programs and resources.

It is difficult to predict whether the mission, goals, parameters and constraints of the national public safety broadband network and the US-UCAN program would align. Such an alignment could have a substantial payoff for the public safety broadband network effort. However, this can only be realized if appropriate parties in the public safety broadband effort and the US-UCAN team engage in an exploratory conversation to examine the potentials and feasibility of such a joint endeavor. This conversation may result in a set of research priorities that could help to further articulate the needs of the public safety broadband network program and shape the development of services and features in the US-UCAN infrastructure.

Comment 2: Public Communications and Bandwidth Contention (requirement 15)

The use of cellular telephones has become a way of life in the United States. In fact, the CTIA, a member organization of the wireless communications industry, estimates that the penetration of wireless communications devices (cell phones, tablet computers, etc.) in the U.S. actually exceeded 100%[1]. This means that the ratio of cellular and other wireless communications devices to the population is slightly greater than one to one. This does not mean that everyone in the U.S. has a cellular phone but it does suggest that we are getting pretty close. The Neilson organization estimates that the market penetration of smartphones relative to all cellular phones reached 40% by mid-2011[2] and it seems reasonable to expect that this penetration will increase in the near term.

The capabilities of smartphones and, to some extent, feature phones include a number of features and services that could be highly valuable in public safety situations. Most modern cell phones (feature and smartphones) have the ability to send and receive text messages and include some form of GPS location tracking, in addition to voice communications. Smartphones have the additional ability to receive and view images, maps, etc. and send "on the scene" photos of events and situations. There is also the potential for the development of smartphone applications that may be useful in public safety scenarios.

The point here is that, in the U.S. we have a growing cadre of citizens in possession of sophisticated (and increasing so) wireless communications devices. These devices in the hands

[1] http://www.ctia.org/advocacy/research/index.cfm/aid/10323
[2] http://www.intomobile.com/2011/09/01/study-smartphone-penetration-hits-40-of-overall-u-s-mobile-market/

of our citizens offer an unprecedented capability to communicate with the populace. It would be possible, theoretically, to communicate directly en mass, in groups or even to individuals impacted by and dealing with public safety events. For example, public safety information systems could, by knowing a person's location (from their cell phone), dispatch customized evacuation plans in the event of an evacuation of a town or community. Consider, as a further illustration, someone who recently encountered high water and repeated road closures during localized flooding in northern Virginia. By consulting Virginia's 511 on-line system (http://www.511virginia.org), he was able to identify passable roads and a safe route home.

From a public user standpoint, we have, with smartphones and other wireless devices, the technology in place to do these things, and create a well informed citizenry in the face of public safety related events and scenarios. What we probably do not have is sufficient bandwidth. This was notably demonstrated when a 5.8 earthquake hit Washington, DC (and much of the mid-Atlantic U.S.) on August 23rd of this year. In addition to the earthquake itself, one of the more notable and newsworthy observations was the sudden lack of cell phone service in Washington (and perhaps some other places). Cell phone users found themselves unable to make voice calls to let their friends, families and loved ones know that they were ok. Some cell users did discover that sending and receiving text messages did work. This apparent disruption to the cell phone service was not due to a failure of network hardware or land based communication links. Rather, it was, most likely, due to an oversaturation of the cell network's bandwidth. There were simply too many people trying to make calls at the same time with an insufficient amount of bandwidth to support those calls. Text messages did work in this case because they require substantially less bandwidth on the network. You can replicate this scenario at major sporting events (and probably concerts, etc.). Cram 60,000 people in a stadium and it will be difficult to make a cell phone call and even text messaging will be impaired. Again, this is a result of a large number of people trying to use more bandwidth than is available in a limited geographic area.

The value of a capability to send targeted messages to citizens facing a catastrophe or other forms of crisis events seems self-evident. However, the issue of how much bandwidth would it take to realize this capability is an open question. The answer undoubtedly includes a number of factors such as the nature, frequency and volume of messages, as well as the distribution of bandwidth within an impacted area and the distribution of the population within that area. This suggests that a robust program of research examining these issues is warranted. In particular this research program should explore the bandwidth requirements associated with targeted citizen messaging in the context of such factors as types of messages sent and received, the geographic concentration or distribution of citizens, and the impact of user mobility, to name just a few. Insights into these and related issues, that could be revealed through such a program of research, may open the door to new technologies and public safety tools to better manage catastrophic events, local and regional emergencies and other situations that may bear on the well-being of communities.