Silicon Flatirons

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*Roundtable Series on Entrepreneurship, Innovation, and Public Policy**

The Challenges and Opportunities for Public Safety Communications: The Adams County Case Study

Christopher Cook, Rapporteur[1]

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[1] 2012 J.D., University of Colorado School of Law.

Executive Summary

On September 23, 2011, the Silicon Flatirons Center brought together academics, lawyers, and members of the public safety communications industry to discuss the challenges and benefits of implementing a 21st century nationwide wireless broadband public safety network that is envisioned by the National Broadband Plan. This discussion was held at the University of Colorado School of Law, and it was moderated by Phil Weiser, Executive Director of the Silicon Flatirons Center and Dean of the University of Colorado School of Law, and Dale Hatfield, Silicon Flatirons Senior Fellow and University of Colorado Adjunct Professor. The discussion addressed the implementation of a 21st century broadband public safety communications network through study and dialogue surrounding the development of a broadband public safety network in Adams County, Colorado.

The roundtable began with an overview of the developments in Adams County, Colorado and the state of current public safety communications networks generally. Participants analyzed the deficit in public safety communication technology in comparison to the commercial markets, and they discussed the many advantages of an interoperable broadband public safety communications network over current public safety communications networks. Through the lens of the developments in Adams County, participants discussed the benefits of a broadband network, particularly the efficiencies evident in a fully broadband system.

Despite the many benefits, the discussion also addressed numerous challenges associated with the development and implementation of a broadband public safety communications network. These challenges included governance, funding, technological challenges (such as the inability of LTE technology to support mission-critical simplex voice), and sustainability. Participants suggested numerous solutions for the future development of broadband public safety

communications networks, and were optimistic about their success. If these challenges can be overcome, public safety will reap the benefits of a nationwide interoperable public safety network.

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Introduction

On September 23, 2011, the Silicon Flatirons Center brought together academics, lawyers, and members of the public safety communications industry to discuss the challenges and benefits of implementing a 21st century nationwide wireless broadband public safety network. A full list of attendees is included in an attachment to this paper. Notably, roundtable attendees included representatives from ADCOM 911 of Adams County, Colorado.[1] ADCOM 911 and its efforts in Adams County present a promising case study that aims to provide broadband capabilities to public safety responders through a Long Term Evolution (LTE) system within the 700 MHz band.[2] As discussed at the roundtable, ADCOM's network provided significant improvements to public safety communications in the county. This success can be attributed in no small part to the governance structure and funding received from a Broadband Technology Opportunities Program ("BTOP") grant.

Much can be said about the benefits of ADCOM's system. The single integrated 700 MHz LTE network will, when fully deployed, provide the county's police, fire, and emergency medical service (EMS) first responder agencies with a dedicated wireless broadband network that enhances public safety, improves citywide data communications, and lowers the cost of communication.[3] In addition, the ADCOM broadband public safety communications network enables the seamless flow of data to first responders from critical databases. For example, the Adams County Sheriff specifically requested a completely paperless jail management system from arrest to booking to detention. Ideally, ADCOM 911 will develop a system that is both

[1] Adams County, Colorado is the first jurisdiction in the United States to implement a broadband public safety communications network. *Adams County, Colorado Selects IPWireless' End-to-End LTE Government Broadband Solution for 700 MHz LTE Public Safety Network*, IPWIRELESS http://www.ipwireless.com/news/2011/07/adams-county-colorado-selects-ipwireless%E2%80%99-end-end-lte-government-broadband-solution-700 (last visited Jan. 23, 2012).
[2] *Id.*
[3] *Id.*

vertically and horizontally scalable so as to promote long-term sustainability and use of the network by neighboring public safety jurisdictions and second responders.

The development, success, and sustainability of the Adams County LTE public safety communications network is in no short part a result of ADCOM 911's unique governance framework. Also critical to the build out of the Adams County network is the funding that ADCOM 911 received for the project from a Broadband Technology Opportunities Program ("BTOP") grant administered by the NTIA.[4] BTOP grants are a part of the American Reinvestment and Recovery Act.[5]. While BTOP grants are not specifically intended for public safety communication networks, these grants have been allotted for and can be used to develop an interoperable network and upgrade 911 systems.[6]

Recently, Larry Strickling, Assistant Secretary of Commerce for Communications and Information and NTIA Administrator, asked seven previously awarded BTOP grantees to suspend any further development of their LTE networks.[7] The Middle Class Tax Relief and Job Creation Act of 2012 mandates the implementation of a nationwide broadband public safety network and the creation of an entity called FirstNet that will administer the funding for the network.[8] Citing FirstNet, and the uncertainties created by the new law, the NTIA has asked the seven BTOP winners to stop any further development of all LTE related activities.[9]

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[4] *Id.*
[5] U.S. DEPARTMENT OF COMMERCE NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION, GRANT GUIDELINES FOR THE RECOVERY ACT BROADBAND TECHNOLOGY OPPORTUNITIES PROGRAM (BTOP) (July 10, 2009), *available at* http://www2.ntia.doc.gov/files/btop_grant_guidelines_v1_0_july_10.pdf.
[6] LINDA K. MOORE, CONG. RESEARCH SERV., RL7-5700, FUNDING EMERGENCY COMMUNICATIONS: TECHNOLOGY AND POLICY CONSIDERATIONS 5 (2011).
[7] *See* Sanda Wendelken, *NTIA Official Tells Public-Safety BTOP Winners to Wait for FirstNet*, RADIORESOURCE MEDIA GROUP, http://www.rrmediagroup.com/newsArticle.cfm?news_id=8111 (last visited June 6, 2012); *see also Larry Strickling Cites Public Safety FirstNet As New Post-Stimulus Broadband Opportunity*, BROADBANDBREAKFAST.COM, http://broadbandbreakfast.com/2012/05/larry-strickling-cites-public-safety-firstnet-as-new-post-stimulus-broadband-opportunity/ (last visited June 6, 2012).
[8] *Id.*
[9] *Id.*

Unfortunately this suspension includes Adams County.[10] Consequently, the NTIA has asked Adams County to suspend all LTE related activities and provide a detailed accounting of already incurred LTE expenses.[11] The NTIA is specifically focused on LTE related activities because of spectrum licensing issues created in the 700 MHz band associated with the creation of FirstNet.[12] Currently, 700 MHz available for broadband public safety use is licensed to the Public Safety Spectrum Trust ("PSST"), but the new law requires the FCC to reallocate 20 MHz of 700 MHz spectrum to FirstNet. Once 700 MHz license authority is under the control of FirstNet, likely in September 2012, Adams County and the other BTOP awardees will have the opportunity to negotiate with FirstNet to utilize the 700 MHz spectrum for their LTE public safety networks and BTOP funding will be restored. Regardless of the suspension mandated by the NTA, because Adams County was awarded the first BTOP grant for a public safety communications network,[13] Adams County makes for a unique and instructive case study. Additionally, because of the passage of the Middle Class Tax Relief and Job Creation Act,[14] the Federal government is now fully committed to the development and implementation of a nationwide wireless broadband public safety network. Consequently, the lessons discussed herein are ones that merit close study.

With Adams County as the backdrop, this paper outlines the general conclusions of the roundtable discussion on 21st century public safety communication networks. After providing

[10] Letter from Arlene Simpson-Porter, Director, Grants Management Division NTIA, to Bill Malone, Director, Adams County Communication Center, Inc (May 10, 2012) (*available at* http://www2.ntia.doc.gov/files/grantees/adamscounty_infrastructure_amendment5_noticeofpartialsuspenionltr.pdf).
[11] *Id.*
[12] *Id.*
[13] Donny Jackson, *Raytheon Wins Contract for Adams County LTE Network*, URGENT COMMUNICATIONS, http://urgentcomm.com/networks_and_systems/news/raytheon-adams-county-lte-20110707/ (last visited Apr. 3, 2012).
[14] *Summary of the Middle Class Tax Relief and Job Creation Act*, THE UNITED STATES SENATE COMMITTEE ON FINANCE, http://finance.senate.gov/newsroom/chairman/release/?id=c42a8c8a-52ad-44af-86b2-4695aaff5378 (last visited Apr. 16, 2012).

background information, this report proceeds as follows: Part I examines the benefits and opportunities of a nationwide broadband public safety communications network with specific attention paid to efficiencies created by such a network. Part II addresses a number of challenges including: governance, funding, technical challenges, and sustainability. Part III addresses lessons learned from Adams County's experience and provides insight into how other broadband public safety communications networks should mimic ADCOM 911 and Adams County. Part IV providers a short conclusion.

Background

The safety of every citizen is highly dependent on the ability of first responders to effectively communicate in an emergency.[15] Yet commercial communications providers offer everyday users innovative and technologically advanced solutions that significantly outpace public safety communications technology.[16] Unlike these developed networks, public safety systems, critical to the safety needs of all Americans, rely on antiquated and outdated wireless communications technology when it comes to delivering high-speed data applications.[17] At a recent hearing before the Senate Commerce Committee, New York City Police Commissioner Raymond Kelly remarked that a 16-year-old with a smart phone has "more advanced communications capability than a police officer or deputy carrying a radio."[18] This is because

[15] MANNER ET AL, THE FCC PLAN FOR A PUBLIC SAFETY BROADBAND WIRELESS NETWORK, 2010 TELECOMMUNICATIONS POLICY RESEARCH CONFERENCE, 1 (2010).
[16] *Public Safety Communications Evolution*, DEPARTMENT OF HOMELAND SECURITY, http://www.imsasafety.org/PDFs/Public%20Safety%20Communications%20Evolution%20Brochure.pdf (Nov. 2011).
[17] Philip J. Weiser, C*ommunicating During Emergencies: Toward Interoperability and Effective Information Management*, 59 FED. COMM. L.J. 547, 553 (2007).
[18] Police Commissioner Raymond W. Kelly: Testimony on "Safeguarding Our Future: Building a Nationwide Network for First Responders," U.S. Senate Committee on Commerce, Science, & Transportation, at 1 (Feb. 16, 2011) available at http://commerce.senate.gov/public/?a=Files.Serve&File_id=04981480-8117-4289-905d-c1498aa72ee1.

public safety communications networks must support mission critical voice technology, which commercial technology has yet to address in a cost efficient technologically advanced manner. Therefore, the public safety communications community continues to rely on antiquated technology and fails to reap the benefits of the economies of scale and innovation taking place in the private sector.[19]

The cost of updating public safety systems is particularly problematic because first responders are supported by state and local revenue and have always bought equipment on their own local budgets. The high capital cost of switching from their 1930s land mobile radio (LMR) technology has proven insurmountable.[20] Although the systems generally meet mission-critical public safety needs, the communication tools used are often expensive, incompatible across vendors and jurisdictions, and limited in functionality.[21]

The high price of antiquated public safety equipment is a result of manufacturers spreading development costs over a small customer base.[22] Because LMR systems are unique to each public safety jurisdiction, public safety communications have historically been poorly coordinated. Additionally, public safety networks were developed when "smart controllers" of networks were not an option and public safety agencies had to provision their own services, compounding the problem of interoperability.[23] As a result, interoperability among public safety jurisdictions is significantly lacking.

Adams County Colorado and ADCOM 911 represent a unique opportunity to learn from an early adopter of a broadband public safety communications network. ADCOM 911 was

[19] *Id.* at 3.
[20] *Supra* note 11, THE WHITE HOUSE, THE BENEFITS OF TRANSITIONING TO A NATIONWIDE WIRELESS BROADBAND NETWORK FOR PUBLIC SAFETY 2 (2011).
[21] *Supra* note 11.
[22] *Supra* note 7, at 4.
[23] *Id.*

founded in 1974 to provide a single, shared resource for emergency and routine dispatch services to public safety entities.[24] ADCOM 911 currently serves a population of approximately 440,000 citizens, through both emergency 911 calls and non-emergency phone calls.[25] In 2010, ADCOM911 generated over 331,000 requests for service, making ADCOM 911 one of the largest and busiest emergency call centers in the State of Colorado.

Funding is a major problem that will have to be overcome by jurisdictions across the country wishing to implement a broadband public safety network. In order to solve this problem, the ADCOM 911 participating agencies use a collaborative approach, where the capital and operating expenses would be shared amongst each of them, based on their proportional use of the system.[26] ADCOM 911 was formed as a non-profit entity, whose sole mission was to provide communication services to the agencies it serves.[27] As such, both capital expenses and operational expenses are paid by each member and contract agency.[28] Each year, ADCOM 911 prepares a budget which covers all expenses for the coming year and calculates the number of requests for service generated on behalf of each agency.[29] Each agency then proportionally splits the cost of the budget, based on their annual use of the system.[30] This structure allows for a great deal of flexibility because each agency can make small financial contributions but still realize the same benefits they would have received using their own dispatch center.[31] For these reasons, ADCOM 911 and Adams County represent a model that future public safety agencies may choose to emulate in setting up their own broadband public safety communications network.

[24] *About Us*, ADCOM 911, http://www.adcom911.org/AboutUs.aspx (last visited Jan. 23, 2012).
[25] *Id.*
[26] *Id.*
[27] *Id.*
[28] *Id.*
[29] *Id.*
[30] *Id.*
[31] *Id.*

In the Summer of 2011, in an attempt to better facilitate the transition to a broadband public safety communications network, the United States Senate considered a bill entitled S. 911 Public Safety Spectrum Wireless Innovation Act.[32] As proposed in the Summer of 2011, S. 911 would reallocate 10 megahertz (MHz) of radio spectrum, known as the "D Block," to facilitate creation of a nationwide public safety broadband network and support interoperable communications for first responders.[33]

In February of 2012, Congress passed the Middle Class Tax Relief and Job Creation Act.[34] This law included S. 911 and allocated an additional 10 MHz of 700 MHz "beachfront" spectrum and $7 billion federal dollars to support the build out of a nationwide public safety network.[35] This legislation is a major victory for public safety because it provides the critical capital and spectrum needed to get a nationwide broadband public safety network off the ground. The lessons learned from Adams County and its public safety network will be a crucial for the eventual build out of a nationwide broadband public safety network as ordered by this law.

I. Benefits and Opportunities of Nationwide Broadband Public Safety Network

An interoperable broadband public safety communications network provides a number of benefits to both first responders and the public safety entities that administer the network. If implemented in a manner consistent with the lessons learned from Adams County, a broadband public safety network can provide first responders and operators of public safety networks with operational and technical cost efficiencies. Therefore, with the implementation of a broadband

[32] S. 911, 112th Cong. (2011).
[33] *Id.*
[34] *Summary of the Middle Class Tax Relief and Job Creation Act,* THE UNITED STATES SENATE COMMITTEE ON FINANCE, http://finance.senate.gov/newsroom/chairman/release/?id=c42a8c8a-52ad-44af-86b2-4695aaff5378 (last visited Apr. 16, 2012).
[35] *Id;* Mary Rose Roberts, *Sen. Rockefeller Gets Big Praise From NVFC,* FIRE CHIEF, http://firechief.com/government-relations/sen-rockefeller-gets-big-praise-nvfc (last visited Apr. 16, 2012).

public safety communications network, the state-of-the-art technology available to first responders will, as a whole, cost less than current networks. These benefits are discussed below.

1. Efficient Operational Use by Public Safety

Currently public safety jurisdictions across the country rely on outmoded networks and handsets.[36] The development and build-out of a nationwide interoperable broadband public safety network will provide the backbone network for all public safety jurisdictions to utilize throughout the country. Vertically scaled infrastructure would minimize the need for jurisdictions to expend capital to build and maintain redundant towers, cells, and evolved packet cores. Anna Gomez, Deputy Administrator at the NTIA, noted that President Obama put a nationwide public safety communications network into both his Jobs Act and Wireless Initiative with the hopes of creating a network that is self-sustaining and available to all first responders across the country so as to reduce overall costs.

The opportunity to use infrastructure that can be shared between public safety and other users can greatly lower the cost for public safety communications.[37] Additionally, standardized equipment will reduce the cost of developing and maintain a fully functioning network. Perhaps most importantly, a fully interoperable network will allow jurisdictions to launch calculated responses in coordination with other jurisdictions. For example, Dan Hawkins, Regional Coordinator in the Office of Communications at the Department of Homeland Security, noted that in a fully interoperable broadband public safety communications network, the challenge of maintaining sufficient mobile broadband availability at the scene of an emergency could be

[36] Police Commissioner Raymond W. Kelly: Testimony on "Safeguarding Our Future: Building a Nationwide Network for First Responders," U.S. Senate Committee on Commerce, Science, & Transportation, at 1 (Feb. 16, 2011), *available at* http://commerce.senate.gov/public/?a=Files.Serve&File_id=04981480-8117-4289-905d-c1498aa72ee1.

[37] THE WHITE HOUSE, THE BENEFITS OF TRANSITIONING TO A NATIONWIDE WIRELESS BROADBAND NETWORK FOR PUBLIC SAFETY 4 (2011).

eased. For example, when five patrol vehicles from different jurisdictions converge on the location of a robbery in progress, five streaming videos will be utilizing the available mobile broadband spectrum. A coordinated and prioritized response would allow a single video stream, rather than five streams, to be utilized by multiple public safety agencies. This would increase the availability of mobile broadband at the scene of an emergency, allowing the mobile broadband spectrum to be utilized by other instrumentalities. A broadband public safety network that can create recognizable efficiencies such as these is a great benefit to first responders across the country

a. Technical Use by Public Safety

A broadband public safety network employs countless advantages over legacy LMR networks because it provides the ability to transmit data across a number of applications. This benefit differs from current legacy LMR networks that are incapable of transmitting large chunks of data. This section analyzes the deficiencies in the LMR standards and looks at the benefits of an all IP based public safety communications network.

Legacy LMR public safety networks are the standard among first responders in today's environment. These networks, based on P25 standards,[38] cannot support broadband applications because they operate on narrowband channels,[39] which prevent them from leveraging the

[38] "In the early 1990s, the public safety community sought to take advantage of the opportunity to deploy modern multi-channel trunked systems by launching an effort to develop standards that would further facilitate interoperability. This effort evolved into the Project 25 Initiative ("P25"), which utilizes a standardized air interface and standardized signaling messages."
Philip J. Weiser & Dale Hatfield, *In Pursuit of a Next Generation Network for Public Safety Communications*, 16 COMMLAW CONSPECTUS 1, 7 (2007); The P25 project is a multi-phase, multi-year project jointly conducted by the public safety communications community and industry to establish a suite of open standards (known as the *P25* Standard) that enable the manufacture, procurement, and operation of interoperable digital wireless communications equipment and systems to satisfy the service, feature, and capability requirements of public safety practitioners and other users. *Project 25 Documents & Standards Reference*, PUBLIC SAFETY COMMUNICATIONS RESEARCH, http://www.pscr.gov/outreach/p25dsr/about_p25_standards/introduction.php (last visited Jan 23, 2012).

[39] The current P25 public safety systems still focus on voice communications, but provide circuit switched and packet switched data access that is limited in rate by the narrowband channels employed. Weiser, *supra* note 39 at 12.

benefits of commercial broadband developments.[40] Migration to a nationwide broadband public safety network would support packet-based transmissions against an Internet Protocol ("IP") backbone, consequently promoting interoperability.[41] "Telecommunications networks worldwide are evolving toward a converged, broadband, Internet Protocol ("IP")-based network-of-networks model."[42] Next-Generation broadband public safety networks capable of supporting voice, data, image, and video applications will all be IP-based. Therefore, regardless of what standard jurisdictions utilized previously, under a nationwide LTE network there will be complete interoperability because of the entirely IP-based network. Romy Ricafort, a senior systems engineer at Sprint/Nextel, noted that "Interoperability over the nation is possible because IP is ubiquitous," and that IP standardization can make it possible for any public safety agency to develop interoperable applications and utilize them in whatever manner suits the agency best. A completely IP-based network would go a long way towards ensuring interoperability among jurisdictions (there would still need to be some form of interoperability testing for equipment from different manufacturers), and it would provide additional capabilities to users on the network not currently available to users on an LMR-based network.[43]

2. Cost Efficiencies for Public Safety

A major benefit of a nationwide interoperable broadband public safety communications network is the expansion of users on the network that promotes both operational and technical cost efficiencies. A broadband public safety communications network will not only provide for a more coordinated response with more robust data in a shorter response time, but it will save public safety entities financial resources. This section analyzes these efficiencies.

[40] *Id*. at 19.
[41] *Id*. at 14.
[42] *Id*. at 19.
[43] *Id*. at 20.

a. Operational Cost Efficiencies

Operational cost efficiencies for users are enormous under a nationwide broadband public safety system. For example, the Adams County sheriff called for all bookings to be electronic. His goal is to completely eliminate the need for paper filings. This is possible on a broadband network because broadband public safety communications networks allow packetized data to flow both to and from first responders instantaneously. NYPD Police Commissioner Raymond Kelly, in his testimony before the Senate Commerce Committee on S. 911, summarized the many benefits of a broadband public safety network for officers around the country:

> [An effective broadband network] could provide officers with an immediate, digital snapshot of anyone they detain. It would give them the suspect's address, prior arrest history, and other critical details. The officer would be able to take electronic fingerprints at the scene and compare them instantaneously with those in local, state, and federal databases. This kind of situational awareness is vital to the safety of the officers and members of the public.[44]

In order to utilize the applications Commissioner Kelly alludes to, there must be enough bandwidth and sophisticated handheld devices to allow transmission and receipt of data. Brian Shepherd, Operation Director of ADCOM 911, explained that Adams County believes that an LTE broadband network is capable of handling the bandwidth necessary to allow first responders to utilize high intensity data applications over the network. A broadband network provides several opportunities for public safety to reap the benefit of cost efficiencies not previously available under the legacy LMR system. Day-to-day activities of first responders can become much more streamlined and allow first responders to focus on responding to emergencies.

b. Technical Efficiencies

[44] *Safeguarding our Future: Building a Nationwide Network for First Responders: Hearing on S. 911 Before the S. Comm. On Commerce, Science, &* Transportation, 112th Cong. (2011) (statement of Raymond Kelly, Police Comm'r of the City of New York), *available at* http://pdf.911dispatch.com.s3.amazonaws.com/senate_hearing_d-block_feb2011.pdf.

A completely interoperable nationwide public safety network creates economies of scale that allow for technical efficiencies. It has been stated that "given the tremendous inefficiencies of the current fragmented system . . . it is perhaps no surprise that the cost of building an entire nationwide system is comparable to what is likely to be spent in just a few years to upgrade and maintain the existing infrastructure."[45] Dale Hatfield, Silicon Flatirons Senior Fellow and University of Colorado Adjunct Professor, stated that efficiencies arise from a nationwide networks, especially in the case of non-duplication within and across networks as is illustrated by Home Subscriber Servers ("HSS").

Roger Quayle, Chief Technology Officer of IP Wireless, Inc., provided a good example of how such a system plays out. Quayle explained that in Texas there are different vendors in different regions, but they all come together to form a single system. Therefore, Quayle stated, in Texas there are separate HSSs regionally but a single Public Land Mobile Network ("PLMN") ID numbering space for the entire state. Quayle stressed the importance of defining a "national network." He explained that for some it means a national HSS or a National Evolved Packet Core ("EPC"), but for others it is a single PLMN ID.

Quayle advocated for a single PLMN ID, which is the 3rd Generation Partnership Project ("3GPP") network identifier. He explained that a single HSS can support the entirety of the United States. For Example, Quayle's IP Wireless HSS runs on a Linux or Unix platform and can scale to handle a million subscribers, which is not a large HSS in the public safety communications system. Quayle illustrated his plan by showing that you can have a network of HSSs when they all work together for a single PLMN ID. For example, in Texas there are separate HSSs regionally, but the state shares PLMN ID numbering space for all of its regions.

[45] Ryan Hallahan & Jon M. Peha, *Quantifying the costs of a nationwide public safety wireless network*, 34 Telecomm. P. 200 (2010).

Dale Hatfield agreed that the specific architecture of broadband public safety communications networks is a key issue and somewhat revolves around the definition of a national public safety network. However, whether or not a single definition of a national public safety network exists, the basic premise of a national public safety network is that economies of scale will be created by a greater number of users on the network, thereby reducing the cost of using the network to each individual user.[46]

In addition, these efficiencies encourage the development of applications that can be utilized on the network. Phil Weiser, Dean of the University of Colorado School of Law and Executive Director of the Silicon Flatirons Center, noted that these efficiencies would be evident in the so called "public safety app store." A nationwide public safety app store would allow public safety jurisdictions across the country to consistently utilize applications that are both interoperable with neighboring jurisdictions and efficient because standardization within the app store will allow local jurisdictions to choose apps that best suit their needs.

During the discussion it became clear that the benefits of a broadband public safety network are limitless. The efficiencies created by the network, both technical and cost, will allow for the development and use of state-of-the art applications and technologies that will permit first responders to excel in the time of an emergency to save the lives of those in need. A nationwide broadband public safety network will increase these efficiencies on a national magnitude and benefit first responders everywhere.

II. Challenges

Although the benefits of a broadband public safety communications network are quite extensive, the challenges of developing and building out an interoperable broadband public

[46] THE WHITE HOUSE, THE BENEFITS OF TRANSITIONING TO A NATIONWIDE WIRELESS BROADBAND NETWORK FOR PUBLIC SAFETY 7 (2011).

safety communications network are immense. As illustrated by ADCOM 911, governance issues, funding, technical needs, and sustainability are critical in developing and building out a public safety network. Each raises its own set of challenges to the development of a long-term reliable public safety communications network.

1. Governance

Governance was identified by roundtable participants as the single biggest challenge in developing and implementing a nationwide LTE public safety network. "Governance is a broad term that can include a number of factors."[47] Dale Hatfield noted that the specific issues surrounding governance include the role of the federal, state, and local governments, management of the network, enforcement of standards, coordination, and determination of priorities on the network. In order to successfully implement a broadband public safety communications network, these governance challenges must be addressed.

a. Standard-Setting

Standard setting is crucial in the development of a nationwide broadband public safety network. However, the basic architecture of broadband public safety communications networks will be directly related to the definition of a "national network," which in turn will directly affect the governance of the public safety communications network or networks. As was previously alluded to, the definition of a national network is yet to be determined. Therefore, before implicating standards or governance, the definition of a national network must be decided. Once the network is defined, the basic architecture of the national broadband public safety network can reflect that definition.

Roundtable participants noted that establishing the architecture involves both governance and standard-setting issues. To promote interoperability and benefits from economies of scale,

[47] *Id.*

participants agreed that there must be a consensus among the public safety community on standards for a public safety communications network.

In order to foster a network that is fully interoperable across jurisdictions throughout the United States, network standards must be developed and implemented consistently throughout the entirety of the network. Governance issues arise in determining who will develop and enforce these standards. Currently standards are driven by the commercial market. Packet based wireless broadband networks are driven by the commercial market. 3GPP is the standard currently being adopted for LTE networks across the United States in LTE Releases 8 and 9.[48] Roger Quayle, of IP Wireless, noted that 3GPP standards evolve about every eighteen months,[49] but the standard, regardless of release, is backwards compatible with previous releases. Therefore, the FCC ordered that the 3GPP shall be the standard used to build a nationwide LTE public safety communications network.[50] The development and overall success of a nationwide broadband public safety network will be directly tied to the 3GPP standard, but the standard is crucial in insuring interoperability, priority, and sharing among public safety jurisdictions.

b. Enforcement

Once standards are set, they must be enforced. If enforcement mechanisms are non-existent, the benefits of the standards will be lost and interoperability among networks will sputter. Determining what entity will enforce these standards throughout the country proves itself to be a more difficult task. In order to ensure a fully interoperable nationwide LTE public safety network, there must be cooperation and coordination among federal, state, and local

[48] MANNER ET AL, THE FCC PLAN FOR A PUBLIC SAFETY BROADBAND WIRELESS NETWORK, 2010 TELECOMMUNICATIONS POLICY RESEARCH CONFERENCE 7 (2010).
[49] Kevin Flynn, *3GPP Standards Update*, FORESTA, (Mar. 31, 2011) http://www.forestaproject.eu/site2/app/webroot/media/files/public/D2.3/FORESTA-Project-No-248676_D2.3-Report_ANNEX-9_Flynn.pdf.
[50] FCC Order (Jan. 26, 2011) http://transition.fcc.gov/Daily_Releases/Daily_Business/2011/db0126/FCC-11-6A1.pdf.

jurisdictions. ADCOM 911 represents a local jurisdictional model of governance that seems to be successful in implementing and enforcing standards in a single jurisdiction. However, to ensure continuity across a nation of jurisdictions more than likely requires the guidance of the federal government, a role that could be played by "FirstNet," a federally created entity to hold the spectrum license for public safety broadband. As envisioned by Congress, FirstNet will develop the overarching framework of the broadband public safety network, and will work with state and local authorities on a number of issues pertaining to the development of the network.[51] Given that the FirstNet board was only established in August 2012, it will likely take a significant amount of time before it is fully functioning[52]

Senate Bill S.911, The Public Safety Spectrum and Wireless Innovation Act, which sought to allocate the D-Block for nationwide public safety use, proposed the creation of a public safety broadband non-profit corporation to implement and maintain the nationwide broadband public safety network.[53] In the Middle Class Tax Relief and Job Creation Act that role will be played by FirstNet.[54] Whether FirstNet can effectively enforce the broadband public safety network standard and coordinate effectively across jurisdictions is yet to be determined.

Regardless of how network standards are enforced, openness of the network for application development and improvement is critical for innovation. Dale Hatfield noted that one of the tragedies of the narrowband public safety network was its lack of openness. Hatfield observed that the lack of openness on the narrowband public safety network restricted innovation and drove up costs. Therefore, public safety networks today are impeded by inefficiency and

[51] U.S. Dep't of Comm., First Responder Network Authority Board of Directors Recruitment Prospectus 4 (2012), *available at* http://www.ntia.doc.gov/files/ntia/publications/firstnet_prospectus_-_final.pdf; National Governors Association, Preparing for Public Safety Broadband 1 (2012), *available at* http://www.nga.org/files/live/sites/NGA/files/pdf/1206PREPAREBROADBANDPAPER.PDF.
[52] U.S. Dep't of Comm., First Responder Network Authority Board of Directors Recruitment Prospectus 3 (2012), *available at* http://www.ntia.doc.gov/files/ntia/publications/firstnet_prospectus_-_final.pdf.
[53] S. 911, 112th Cong. (2011).
[54] *Supra* note 53, at 4.

costly handsets that drastically lag behind the technology employed in commercial handsets. In order to successfully develop and implement a nationwide broadband public safety network, enforcement of standards is critical and must be an issue that is tackled before a successful build out can occur.

c. Coordination & Prioritization of Use

Governance also includes decision making and planning in both development and implementation of the network.[55] Chris Yaw, Director of Strategic Initiatives at Northrup Grumman, along with several other roundtable participants, noted that priority on the system is a critical governance issue. Critical components of a broadband public safety communications network are "priority schemes, load sharing arrangements, and methods of eliminating non-essential traffic."[56] Consequently, governance mechanisms must also address sharing of the infrastructure in a completely interoperable broadband public safety network for coordination and priority of use. A governance model that properly fosters coordination among jurisdictions, maintenance, and use of the network is essential.

Jim Lynn, from the Colorado Governor's Office of Technology, noted that in Colorado there is an abundance of dark fiber running along highways. However this fiber remains unused because of a lack of coordination among agencies. Hatfield noted that coordinated funding, maintenance, and proper analysis of scalability are critical features of a governance scheme. For example, Brian Shepherd noted that, as Adams County considers expanding its network to incorporate Denver, ADCOM 911 must determine the appropriate number of evolved packet cores that are optimally needed to serve both jurisdictions.

[55] LINDA K. MOORE, CONG. RESEARCH SERV., RL7-5700, FUNDING EMERGENCY COMMUNICATIONS: TECHNOLOGY AND POLICY CONSIDERATIONS 6 (2011).
[56] S. 911, 112th Cong. (2011).

In addition, governance mechanisms must also address prioritization among users on the network.[57] In order for the network to function efficiently, users' utilization of the network must be coordinated in a functional scheme. Discussion at the roundtable focused on allowing traffic cameras access to the public safety wireless broadband network. There were some advocates for allowing traffic cameras full access to the broadband public safety network. However, general agreement is that access to traffic cams and other devices that use a large amount of bandwidth should be limited and data from these devices should be transmitted via fiber if possible during times of bandwidth constraint.

Priority on the network is a crucial aspect that needs to be addressed by mechanisms of governance. Certain responders, in order to effectively respond to an emergency situation, must be given priority on the public safety network over other responders. Critical to the question of priority is who should determine priority? The answer to this question is especially difficult when considering how interoperability will allow coordination across several jurisdictional levels at which each wants to determine priority. Brian Shepherd gave the example of when a snow plow is required to clear the way for first responders to reach the scene of an emergency. More likely than not, the snow plow should be given priority access on the public safety communications network.

The determination of priority in any given emergency is often more related to individual decision making than technology. There are several competing interests on the public safety communications network, and coordination among users is critical. A system of command and control governance that can answer these questions is essential to the sustainability of a successful interoperable broadband public safety network.

[57] Andrew Seybold, *Mission-Critical Voice and LTE: Be Careful!*, 1 (Aug. 26, 2011).

An added level of complexity to the priority discussion stems from the use of commercial networks. If a public safety communications network operates over a commercial network, during times of an emergency the commercial networks gives all of its bandwidth to public safety or throttles commercial use of the bandwidth. This is called a "commercial flip-over." Should a public safety network be run concurrently to a commercial LTE broadband network, it begs the question as to whether commercial wireless carriers would throttle the usage of commercial users in favor of public safety during an emergency. If a nationwide broadband public safety network can only be accomplished through sharing infrastructure with commercial networks, the commercial flip-over approach is likely a necessary requirement in determining priority.

The governance of a broadband public safety communications network is crucial to support its successful development. In order to reach obtain many of the benefits of a public safety network, standards must be implemented and enforced. By implementing and enforcing standards, efficiencies can be realized as part of the public safety communications network. Additionally, to maintain reliability of the network prioritization on the network must be established and maintained. When these governance challenges are addressed the roundtable participants agreed that the benefits of a public safety network can be realized.

2. Funding

Funding is perhaps the most critical issue when trying to implement a build-out of a nationwide broadband public safety network. Funding must be allocated in a cost-efficient manner that meets the needs of the public safety community. In order to develop a long-term sustainable funding scheme for a nationwide public safety network, mechanisms must be developed to ensure adequate funding in the long-term, such as infrastructure sharing and

leveraging of existing assets. In addition, technology choices must be made to reduce the overall capital costs of a nationwide broadband public safety network. Funding necessary for the build-out of a nationwide broadband public safety communications network is extremely difficult in the near term because maintenance and upkeep of existing legacy public safety networks must be funded concurrently to the development and implementation of a nationwide broadband public safety communications network.[58]

a. Performance-Based Funding

In order to ensure capital is allocated in a cost-efficient meaningful manner, funding needs to be allocated and tied directly to the successful development and implementation of a nationwide broadband public safety network. Therefore, Dale Hatfield believes that money allocated by statute to build out a broadband public safety communications network, whether at the federal level or on a state-by-state basis, should be tied to performance requirements. Roundtable participants posited that funding linked to performance requirements ensures that all capital spent on a network will be directly tied to the needs of the public safety community, making every dollar spent cost effective.

In contrast to a performance-based funding schema, a technology-based funding schema distributes capital based on consistent technology across jurisdictions to foster interoperability.[59] Under a technology-based system, those projects that conform to the standards set forth by the grant making authority will receive funding regardless of how the network actually performs in the field, or if it meets the needs of the public safety community.[60] For example, the FCC

[58] Philip J. Weiser & Dale Hatfield, *In Pursuit of a Next Generation Network for Public Safety Communications*, 16 COMMLAW CONSPECTUS 1, 42 (2007).
[59] PUBLIC SAFETY INTEROPERABLE COMMUNICATIONS GRANT PROGRAM, NTIA 14 (2008), *available at* http://www.ntia.doc.gov/legacy/psic/PSIC%20Investment%20Data%20Analysis%20(report%20and%20appendix).pdf.
[60] *Id.*

provided 700 MHz waivers to 21 governmental entities who were planning to build public safety LTE networks.[61] A handful of these entities were then given federal grants based not reliability of their networks, but on the fact that they were LTE networks.[62]

While performance-based benchmarks can possibly increase the cost of a network, a network funded by performance-based requirements will better meet the needs of the public safety community when compared to technology-based funding requirements.[63] Performance-based funding is more efficient in terms of utility derived from each dollar spent and may actually increase the overall cost of a network because of the increased benchmarks for performance.

Hatfield noted that in-building coverage it is an important component of public safety communications networks and is critical to performance. In-building coverage refers to the reliability of the communications network when a responder is within the walls of a building.[64] The goal of any public safety communications network is to provide its responders with the same reliability of coverage in-building as responders enjoy outdoors.[65] Therefore, if in-building performance is lacking in certain areas, repeaters and additional cells will be required; therefore, driving cost up.

Additionally, the coverage area requirements of the network can significantly drive up cost.[66] Rural areas, which are disperse in population, require more cells for complete coverage. For example, in Adams County about 95% of the population lives in a third of the county.[67] This

[61] DONNY JACKSON, PROCUREMENT ISSUES HINDERING PUBLIC-SAFETY LTE EFFORTS 1 (Aug. 2011).
[62] *Id.*
[63] *Id.*
[64] *In-Building Communications*, NPSTC, http://www.npstc.org/inBuilding.jsp (last visited Apr. 21, 2012).
[65] *Id.*
[66] *Infra* note 74.
[67] ADAMS COUNTY COMMUNICATION CENTER, INC., ADCOM 911 OVERVIEW (Aug. 2011).

area is covered by 15 cell sites, while the rest of Adams County has more disperse coverage.[68] If additional funding is available for Adams County in the future, the cores provide for vertical scalability.

b. Resolving cost issues

Public safety communications networks, which require a high degree of coverage and signal reliability, consequently have very high capital costs.[69] A nationwide broadband public safety communications network will require significant capital in order to fully meet public safety performance requirements, but these initial capital expenditures can be offset by sharing infrastructure with commercial communications networks and maintaining low operating costs.

Commercial-Public Safety infrastructure sharing can significantly alleviate up-front capital cost. However, if commercial sharing does occur, it is important that the commercial network meet the coverage and reliability mandates instituted by public safety.[70] In contrast to commercial network users, public safety requires guaranteed reliability at all times in order to meet the needs of first responders in an emergency.[71] At this time, commercial carriers cannot ensure total reliability of their networks at all times, making coverage and reliability requirements a must if commercial infrastructure sharing is to occur in the future.

In addition to infrastructure sharing, broadband public safety network operating expenses must be kept to a minimum by utilizing spectrum alternative mediums to transmit data. Brian Shepherd noted that operating expenses increase with each additional user on the network. He said ADCOM 911minimizes operating expenses by leasing out excess spectrum to commercial carriers. The federal grants that ADCOM 911 received to build out the public safety network

[68] *Id.*
[69] *Supra* note 46, at 6.
[70] *Id.* at 7-8.
[71] *Id.*

allow ADCOM 911 to earn revenue from leasing its spectrum to commercial carriers as long as that revenue is put directly back into the network.

In addition, in order to minimize operating expenses, Shepherd noted that, investments must be made into alternative mediums for data delivery. Whenever data can be transmitted via another medium, such as terrestrial fiber, public safety communications networks become more cost effective because the data intensive traffic flowing over them is reduced.[72] For example, almost all roundtable participants agreed that, whenever possible, traffic cam data should be transmitted via terrestrial fiber instead of over-the-air public safety networks because traffic cam data is of a lesser magnitude of importance than the availability of free spectrum during an emergency. This will reduce traffic on the public safety network, making it more responsive to the actual needs of public safety during an emergency. Infrastructure sharing, spectrum sharing, and efficient use of alternative data transmission media must be taken into consideration when developing the nationwide broadband public safety communications network. By doing so, the architects of the network will ensure the network is robust, efficient, and cost effective.

3. Technical Challenges

Mission-critical voice communications are essential to first responders during an emergency. Without the ability to speak to one another, first responders are often left in the dark, which hinders their effectiveness and puts them in danger. Unfortunately, at this time LTE technology is incapable of supporting mission-critical voice communications. Roger Quayle noted that the current Release 8 and Release 9 LTE standards are incapable of supporting group mission-critical push to talk communications. Quayle stated that with an LTE public safety network there must a downlink channel for group communications where the same radio

[72] MANNER ET AL, THE FCC PLAN FOR A PUBLIC SAFETY BROADBAND WIRELESS NETWORK, 2010 TELECOMMUNICATIONS POLICY RESEARCH CONFERENCE 18 (2010).

resources can be used for everyone responding to an emergency. Quayle explained that LTE cannot currently support this because LTE adapts modulation and coding to each user. According to Quayle, LTE will eventually be able to support voice communications, but the technology has not been become available yet and it is unclear when it will be available. More than likely, it will be 5-10 years before channelized voice systems will be established to support mission-critical talk-around voice as part of LTE public safety networks.[73] Further, Hatfield noted that when LTE networks and devices can support mission-critical voice, the public safety network must be backward compatible with existing networks so as to minimize the costs associated with deploying a public safety communications network.

Until that time, Dale Hatfield noted that the current disconnect between LMR and LTE communications technologies results in the need for two networks: one for mission-critical voice and one for broadband data. In addition, Rich Lee, CEO of iPosi, noted that in dense urban areas multiple channels are needed during an emergency because of urban geography and heavy traffic on the network.[74] Maintaining two networks unnecessarily increases operating expenses and creates a need for a much larger amount of spectrum for channelized mission-critical communications.[75] Until currently available spectrum for public safety is utilized more efficiently, and a single device that supports mission-critical voice and data is created, both LMR and LTE networks are needed for public safety.[76]

Dale Hatfield and Raytheon representative Bob Scott noted that one way to increase spectrum availability for multi-channel mission-critical voice communication is by fitting emergency vehicles with WiFi hotspots. WiFi hotspots would not only free up spectrum, but

[73] *Supra* note 58.
[74] *Id.*
[75] *Id.* at 3.
[76] *Id.* at 4.

they would also provide more efficient upload and download capabilities for first responders responding to an emergency.[77] Scott illustrated that the idea is to have vehicles that could arrive on the scene of emergencies and support multiple users from a single hotspot.

This solution, however, comes with some downside. Romy Ricafort noted that WiFi uses public spectrum that is greatly susceptible to interference problems. Additionally, Roger Quayle described how most LTE public safety devices do not support WiFi. However, Quayle did note that Qualcomm Band 14 chipsets, which should be available in the near future, will support Wifi in LTE devices. Quayle also commented that WiFi generally may not be suitable in an emergency environment for public safety because of the setup time required to make sure devices are properly connected and functioning. Therefore, while WiFi may provide some benefits, ultimately an LTE device supporting mission-critical voice is the ultimate goal of public safety communications advocates.

4. Sustainability

Sustainability is a challenge consistently at issue in developing a nationwide interoperable broadband public safety communications network, but has partially been addressed by the federal allotment of $7 billion and 10MHz of D-Block spectrum for public safety. Sustainability can continue to be addressed by creating public/private infrastructure and spectrum sharing arrangements. Dale Hatfield commented at the roundtable that sustainability means establishing a consistent source of funding for the network, interoperable and backwards compatible technology, and a clear future plan for the network. Anna Gomez pointed out that the number of users on the network is crucial in establishing a sustainable network. More users on a network create favorable economies of scale, make the network more valuable, and decrease the cost per person. A network that balances the number of public safety users with available

[77] *Supra* note 47.

network resources also increases the potential for long-term viability. As the network grows larger the value of the network increases and economies of scale allow for cost-efficient inputs to also increase the long-term sustainability of the network.

The availability of spectrum will also create a more sustainable solution. To address this need, the Middle Class Tax Relief and Job Creation Act allocates an additional 10 MHz of 700 MHz "beachfront" spectrum to public safety entities across the nation, creating a 20 MHz block of spectrum for public safety wireless broadband.[78] This is a major victory for a nationwide interoperable broadband public safety network. However, if public safety wishes to utilize more spectrum than has been allocated by the Middle Class Tax Relief and Job Creation Act, other spectrum management solutions will need to be adopted to ensure adequate spectrum is available across all jurisdictions to support bandwidth intensive LTE. Jeff Johnson, CEO of the Western Fire Chiefs Association, believes that one solution will be to require use of existing infrastructure. Those that can use fiber to transmit data, for example, will be required to do so over adopting new infrastructure solutions. Fiber is especially important for transmitting traffic camera data. If too many traffic cameras are on a non-fiber network, the transmission is unsustainable and unreliable as the data could overload the system. Jim Lynn, of the Colorado Governor's Technology Office, stated that in Colorado there are several thousand miles of fiber running along the state's highways that could carry bandwidth intensive data. Lynn did inform the roundtable that the State of Colorado is more than willing to talk with public safety entities about leveraging this existing infrastructure around the state.

[78] *Supra* note 7.

In order to establish a network that is both sustainable, reliable, and meets the needs of public safety, the roundtable participants agreed that commercial assets must be leveraged.[79] In-building coverage, for example, is crucial for public safety but is expensive. Roundtable participants noted that leveraging commercial assets would address, to an extent, in-building coverage by utilizing commercial cells and repeaters in areas not covered as well by the public safety communications network.[80] Brian Shepherd stated that ADCOM 911 leverages existing commercial infrastructure to minimize overall capital and operating expenditures. Sustainability of a broadband public safety communications network will be crucial in encouraging a nationwide build-out. Sustainability can be accomplished through the efficient use of newly allocated spectrum, infrastructure and spectrum sharing arrangements between the public and private sectors, and striking a healthy balance between network resources and users on the network.

III. Adams County – Lessons Learned

Adams County and ADCOM 911 provide a great case study in the implementation of a broadband public safety network that can be used when developing a nationwide broadband public safety network. While most roundtable participants agree that Adams County has been a success on almost every level, the roundtable noted that replicating Adams County's success on a national scale presents significant challenges. Nancy Jesuale, former Communications Director for the City of Portland, Oregon, agreed in saying that many of ADCOM 911's attributes cannot be duplicated, such as a large BTOP grant, ADCOM 911's history, and

[79] MANNER ET AL, THE FCC PLAN FOR A PUBLIC SAFETY BROADBAND WIRELESS NETWORK, 2010 TELECOMMUNICATIONS POLICY RESEARCH CONFERENCE 8 (2010).

[80] "The cost of providing in-building coverage is dropping dramatically with the continuing development of pico-cell, femto-cell, and distributed antenna system technologies. Moreover, more and more commercial buildings are being installed with in-building systems that "light-up" commercial cellular spectrum." *Id.* It bears note, however, that commercial providers are not dedicated to providing the level of in-building coverage sought by first responders, making this an important issue to be aware of.

operations within a single jurisdiction. Many roundtable participants noted that while it is fantastic that Adams County was a BTOP recipient, other jurisdictions will need alternative sources of funding and cost-effective implementation strategies. In addition, it will be difficult to replicate the governance structure implemented by ADCOM 911. ADCOM 911 is unique in that it was developed over forty years ago and has a longstanding relationship with the Adams County first responders. ADCOM 911 also has expertise, experience, and firsthand knowledge of the public safety challenges and needs within Adams County.

1. Governance

While ADCOM 911 may not scale, ADCOM 911's implementation of a broadband public safety network in Adams County has been successful and should serve as a nice blueprint for other public safety networks.

One particularly important example of governance undertaken by ADCOM 911 was the determination of priorities on the network. Brian Shepherd stated that ADCOM 911, as operators of the LTE system, determined that first responders have absolute priority on the network because they were the most critical individuals in responding to emergencies. The only exceptions come when second responders, like snow plows, are critical in providing first responders access to emergencies. Additionally, Adams County is making every effort to reserve all LTE bandwidth for first responders. Shepherd noted that traffic cams in Adams County will be relegated to transmitting data via fiber. Although these may not be the right priorities for other jurisdictions, it is important that priorities be established for a successful broadband public safety network. In the case of Adams County, a strong central scheme of governance was critical to its success.

2. Funding

As stated above, Adams County benefitted greatly from a federal BTOP grant. The county was able to utilize this money to subsidize the initial capital expenditures to implement the broadband public safety network. Brian Shepherd noted that in order to reduce initial capital expenditures, ADCOM 911 utilized existing towers to build-out the network. By not constructing a single tower, ADCOM drastically reduced its initial costs. The county also receives additional revenue by leading spectrum to commercial users. This lessens the cost of long-term capital, but it also does not affect the federal grants as long as any revenue derived from leasing spectrum on the system is put back into the network. These solutions provide a good model for other public safety entities to replicate when building out broadband public safety communications networks. Funding is crucial, but it is only beneficial if it is implemented in a cost-efficient and methodical manner.

Shepherd did point out that ADCOM 911 has run into trouble in the rural portions of its jurisdiction. Cell towers require a large capital investment, and in rural areas it does not make financial sense to build cell towers that will only serve a few individuals. In a situation like this, it makes sense to leverage existing commercial infrastructure in rural areas. However, Shepherd noted that it does not make business sense for a company like AT&T to build a cell tower either because it hurts their bottom line. Therefore, ADCOM 911 has had to utilize terrestrial lines to transmit data to rural areas of the jurisdiction. Going forward, other jurisdictions that are largely rural will have to develop a means to transmit data across the jurisdiction if cellular towers are unavailable.

3. Technical Challenges

As discussed previously in this paper, the LTE standard is currently incapable of supporting mission-critical voice communications. Therefore, when the Adams County system is fully operational in 2013, mission-critical voice will be supported by legacy LMR networks, while LTE will be the primary medium for data transmission. Brian Shepherd did note that Adams County will rely on a microwave and fiber backhaul system to support data transmission when the LTE network bandwidth is maxed out.

Shepherd also noted that the LTE network will be entirely based on an IP structure. This will allow ADCOM 911 to build layers upon the network as technology develops. Additionally, an all IP backbone will promote interoperability among other broadband public safety networks in the future. Until LTE is capable of supporting mission-critical voice, legacy LMR networks will continue to be a drain on capital for public safety, but the potential advantages to LTE technology will be great when it is fully implemented.

4. Sustainability

Sustainability of a broadband public safety communications network is an issue that is crucial to any entity across the country attempting to develop and implement a network of its own. ADCOM 911 has focused closely on creating a sustainable network. ADCOM 911 is already utilizing existing towers, and plans to lease spectrum to commercial users to generate revenue. By doing so, ADCOM 911 ensures that the network will be advantaged by commercial advances in LTE technology. Additionally, by leveraging commercial assets, ADCOM 911 is opening its broadband public safety network up to the economies created by a larger user base. This will drastically reduce costs for ADCOM 911 in the long run, and force ADCOM 911 to only invest heavily in maintaining stringent public safety standards of coverage and reliability.

Adams County has yet to launch its broadband public safety communications network, but the model it has established is on the right track to producing a long-term powerful public safety network. Broadband public safety communications networks developed in the future should follow the Adams County model of leveraging existing infrastructure and commercial networks to promote sustainability.

Conclusion

A nationwide interoperable broadband public safety network holds great promise if it can be successfully implemented nationwide. Once implemented, first responders would no longer need to use technology far inferior to commercial users. Roundtable participants agreed that the cost efficiencies and technical efficiencies presented by a broadband public safety communications network are extremely beneficial. All participants emphasized, however, that there are significant challenges that must be overcome in the near term before the country is anywhere close to a nationwide broadband public safety communications network, particularly with respect to an effective governance strategy.

Participants identified a number of significant challenges related to governance. ADCOM 911 was able to overcome these challenges, thereby making it an instructive case study. Nonetheless, it merits emphasis that some of the unique features of ADCOM 911 make it unrepresentative of the country as a whole. Funding will be a critical issue to overcome initial capital costs of building out a broadband network. ADCOM 911 was able to address this issue through the BTOP grant, but such grants will not be available to the entire country. Additionally, participants identified LTE's inability to support mission-critical simplex voice communication as a major issue that could require the maintenance of two networks at once,

underscoring that sustainability is also an issue that needs to be addressed. The encouraging lesson from Adams County is that, if strong systems of governance, funding, and technology are able to come together, the build-out of a sustainable broadband public safety communications networks can occur.

ATTACHMENTS

Silicon Flatirons Roundtable Series: Public Safety Communications
September 23, 2011, 9:00 AM – 12:00 PM
University of Colorado School of Law, Boulder CO

PARTICIPANTS

Brad Bernthal, *Silicon Flatirons, Colorado Law*
Joe Boyer, *Baseline Telecom, Inc.*
Daryl Branson, *Colorado 9-1-1 Resource Center*
Chris Cook, *Colorado Law*
Trey Forgety, *NENA*
Brian Gerber, *Buechner Institute for Governance, University of Colorado Denver, School of Public Affairs*
Anna Gomez, *NTIA*
Gary Hampton, *Chief Technologist, Hampton Technologies, Inc.*
Dale Hatfield, *University of Colorado, BITAG, Silicon Flatirons*
Dan Hawkins, *U.S. Department of Homeland Security*
Nancy Jesuale,
Jeff Johnson, *Western Fire Chiefs Association*
Therese Kerfoot, *Silicon Flatirons, Colorado Law*
Scott Lane, *ADCOM 911*
Rich Lee, *iPosi, Inc.*
Walt Leslie, *ADCOM 911*
Jim Lynn, *Governor's Office of Information Technology*
Bill Malone, *ADCOM 911*
Bob McKenzie, *Crown Castle International*
Stephen Meer, *Intrado*
Becca Montgomery, *Senator Bennett's Office*
Scott Newman, *ADCOM 911*
Morgan O'Brien, *Founder of Nextel*
Dereck Orr, *NIST*
Preston Padden, *Silicon Flatirons*
Roger Quayle, *IP Wireless, Inc.*
Romy Ricafort, *Sprint Nextel*
Jennifer Richter, *Patton Boggs*
Bob Scott, *Raytheon*
Brian Shepherd, *Deputy Director, ADCOM 911*
Jake Slaughter, *Raytheon*
Ryan Tharp, *Colorado Law*
Phil Weiser, *Silicon Flatirons, Colorado Law*
Chris Yaw, *Northrup Grumman*