

LOCATING 911 CALLERS IN A WIRELESS WORLD

HEARING

BEFORE THE

SUBCOMMITTEE ON COMMUNICATIONS,
TECHNOLOGY, AND THE INTERNET

OF THE

COMMITTEE ON COMMERCE,
SCIENCE, AND TRANSPORTATION
UNITED STATES SENATE

ONE HUNDRED THIRTEENTH CONGRESS

SECOND SESSION

JANUARY 16, 2014

Printed for the use of the Committee on Commerce, Science, and Transportation



U.S. GOVERNMENT PRINTING OFFICE

91-524 PDF

WASHINGTON : 2014

For sale by the Superintendent of Documents, U.S. Government Printing Office
Internet: bookstore.gpo.gov Phone: toll free (866) 512-1800; DC area (202) 512-1800
Fax: (202) 512-2104 Mail: Stop IDCC, Washington, DC 20402-0001

SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ONE HUNDRED THIRTEENTH CONGRESS

SECOND SESSION

JOHN D. ROCKEFELLER IV, West Virginia, *Chairman*

BARBARA BOXER, California	JOHN THUNE, South Dakota, <i>Ranking</i>
BILL NELSON, Florida	ROGER F. WICKER, Mississippi
MARIA CANTWELL, Washington	ROY BLUNT, Missouri
MARK PRYOR, Arkansas	MARCO RUBIO, Florida
CLAIRE McCASKILL, Missouri	KELLY AYOTTE, New Hampshire
AMY KLOBUCHAR, Minnesota	DEAN HELLER, Nevada
MARK WARNER, Virginia	DAN COATS, Indiana
MARK BEGICH, Alaska	TIM SCOTT, South Carolina
RICHARD BLUMENTHAL, Connecticut	TED CRUZ, Texas
BRIAN SCHATZ, Hawaii	DEB FISCHER, Nebraska
EDWARD MARKEY, Massachusetts	RON JOHNSON, Wisconsin
CORY BOOKER, New Jersey	

ELLEN L. DONESKI, *Staff Director*

JOHN WILLIAMS, *General Counsel*

DAVID SCHWIETERT, *Republican Staff Director*

NICK ROSSI, *Republican Deputy Staff Director*

REBECCA SEIDEL, *Republican General Counsel and Chief Investigator*

SUBCOMMITTEE ON COMMUNICATIONS, TECHNOLOGY,
AND THE INTERNET

MARK PRYOR, Arkansas, <i>Chairman</i>	ROGER F. WICKER, Mississippi, <i>Ranking</i>
BARBARA BOXER, California	<i>Member</i>
BILL NELSON, Florida	ROY BLUNT, Missouri
MARIA CANTWELL, Washington	MARCO RUBIO, Florida
CLAIRE McCASKILL, Missouri	KELLY AYOTTE, New Hampshire,
AMY KLOBUCHAR, Minnesota	DEAN HELLER, Nevada
MARK WARNER, Virginia	DAN COATS, Indiana
MARK BEGICH, Alaska	TIM SCOTT, South Carolina
RICHARD BLUMENTHAL, Connecticut	TED CRUZ, Texas
BRIAN SCHATZ, Hawaii	DEB FISCHER, Nebraska
EDWARD MARKEY, Massachusetts	RON JOHNSON, Wisconsin
CORY BOOKER, New Jersey	

CONTENTS

Hearing held on January 16, 2014	Page 1
Statement of Senator Pryor	1
Statement of Senator Wicker	2
Statement of Senator Johnson	26
Statement of Senator Blumenthal	28
Statement of Senator Markey	32
Statement of Senator Ayotte	36

WITNESSES

Gigi Smith, President, Association of Public-Safety Communications Officials (APCO) International	4
Prepared statement	5
Claude L. Stout, Executive Director, Telecommunications for the Deaf and Hard of Hearing, Inc. (TDI)	7
Prepared statement	9
Christopher Guttman-McCabe, Executive Vice President, CTIA—The Wireless Association	11
Prepared statement	12
Kirk Burroughs, Senior Director of Technology, Qualcomm Engineering Services Group, Qualcomm Incorporated	14
Prepared statement	16
Telford E. Forgety III (“Trey”), Director of Government Affairs and Regulatory Counsel, National Emergency Number Association (NENA)	18
Prepared statement	19

APPENDIX

Hon. Amy Klobuchar, U.S. Senator from Minnesota, prepared statement	41
Letter dated January 27, 2014 from Fred J. Michanie, President and Founder, Direct Technology, Inc. to Senate Subcommittee on Communications, Technology, and the Internet	41
Response to written questions submitted to Gigi Smith by:	
Hon. Bill Nelson	42
Hon. Amy Klobuchar	44
Response to written questions submitted by Hon. Bill Nelson to Claude L. Stout	45
Response to written questions submitted to Christopher Guttman-McCabe by:	
Hon. Barbara Boxer	46
Hon. Bill Nelson	46
Response to written questions submitted by Hon. Bill Nelson to Kirk Burroughs	48
Response to written questions submitted to Telford E. Forgety III (“Trey”) by:	
Hon. Barbara Boxer	49
Hon. Bill Nelson	50
Hon. Amy Klobuchar	54

LOCATING 911 CALLERS IN A WIRELESS WORLD

THURSDAY, JANUARY 16, 2014

U.S. SENATE,
SUBCOMMITTEE ON COMMUNICATIONS, TECHNOLOGY, AND
THE INTERNET,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The Subcommittee met, pursuant to notice, at 10:34 a.m. in room 253, Russell Senate Office Building, Hon. Mark Pryor, Chairman of the Subcommittee, presiding.

OPENING STATEMENT OF HON. MARK PRYOR, U.S. SENATOR FROM ARKANSAS

Senator PRYOR. I will call this to order here.

Thank you all for being here. I want to thank all of our witnesses for coming and participating in this very important hearing.

Today we are going to discuss the importance of locating persons who call 911, especially in an increasingly wireless world.

I want to particularly thank those who are here representing public safety communications professionals and first responders. We appreciate your service and appreciate all you do to keep us all safe.

There is no question that a call to 911 may be the most important call that you will ever make, and also there is no question that when the public does that, they expect that public safety officials will have the ability to find them as quickly as possible. But, as it happens, I think most consumers would be surprised to know that if you are calling from a wireless phone, the 911 system may not be able to locate exactly where that person in need is.

The issue was brought home to me recently when one of the FCC Commissioners, Jessica Rosenworcel, came to Arkansas. When she was in Little Rock, she went to the Little Rock 911 center. And the first thing they talked about when they were there is that about 86 percent of all the calls that come into that center are wireless calls. So about 86 percent.

So if we have a system where wireline phones, when they call in, they get recognized and they get located virtually immediately, that means that, you know, here we are only working a small portion of the time when it comes to wireless, at least potentially. Nationally, the number is about 70 percent of the calls coming in from wireless phones.

But, also, as Commissioner Rosenworcel has shown, depending on literally where you stand in that center, if you are using a wire-

less phone, the location accuracy varies widely. Even, at some point, if you stand in the center, you may be sent to another call center. I know that doesn't make sense, but that is just the way it works sometimes in the wireless world.

I think most consumers would be alarmed if they understood this, and I think that the problem is especially true for phone calls made from indoors. And we will talk about that here in a moment.

So it is time for an upgrade, and it is time that we recognize that there are just too many stories affecting too many individuals that have led all too often to unnecessary suffering. And we need the ability to fix this.

So this is not to say, by the way, that our nation's wireless carriers and equipment manufacturers haven't been trying. I want to thank them for all that they have done. And they have been co-operating with the FCC in the CSRIC process, and I think that is very constructive. I think that all the efforts that they have done up to this point will serve as key building blocks to moving this forward. And that is where we must go; we must go forward on this. We need a more accurate and more timely and more robust system.

In September of last year, Senators Klobuchar, Boxer, and Feinstein and I signed a letter to the FCC asking them to closely examine wireless 911 call location accuracy issues. And I appreciate the work that the Commission has already done on this. They recently had a workshop, and they brought all the stakeholders in, and they, it is my understanding, spent an entire day going through this, and that is important.

But, also, I will say I believe it is time for the FCC to take concrete steps to make sure that all wireless callers can be located by 911 centers. And I call on the FCC today to initiate a proceeding to make that happen.

At the same time, it is my hope that the Commission will continue to encourage these ongoing collaborative efforts like CSRIC and that they will continue to look at all available data and try to improve all their accuracy today and also going forward. So I support the FCC taking all the necessary steps to solve this problem, a public safety need.

And today we look forward to hearing from our panel of witnesses. We look forward to hearing your thoughts on the strengths and weaknesses of the 911 system, how we should move forward, how it should work, and things that we can do to improve it. And the stakes are, you know, just too high for us to do nothing.

So, again, I want to thank you all for being here.

And I would like to recognize Senator Wicker.

**STATEMENT OF HON. ROGER F. WICKER,
U.S. SENATOR FROM MISSISSIPPI**

Senator WICKER. Thank you, Chairman Pryor.

Americans' right to dependable 911 service in times of emergency is a top priority. Lives absolutely depend on it. That dependability is challenged as more and more calls are placed using wireless devices.

This hearing should serve our members and make a record as to a detailed status update on the current state of wireless 911 location accuracy, the rules on the books, and the practices of carriers

and public safety entities. This hearing also provides a forum for determining what still needs to be done.

Our goals are straightforward, as the Chairman stated: ensuring that the ever-increasing wireless calls to 911 are answered and that we have the best possible emergency communications infrastructure in place to do so.

Now, Mr. Chairman, it is important to note that our home states of Mississippi and Arkansas have a distinct and unique interest in ensuring wireless callers can be quickly and accurately located by first responders.

First, as we have noticed in previous hearings, Mississippi and Arkansas are leading the way in wireless-only households, with 42.3 percent of adults in Mississippi and an even larger 44.4 percent of adults in Arkansas making a full conversion and cutting the cord. That same study found that, by the second half of 2011, one in three households had only wireless phones.

Regrettably, I prepared no such data on the state of Wisconsin for this subcommittee hearing.

Additionally, Mr. Chairman, you and I are both from states with vast rural areas, and we do have that in common with Senator Johnson. Our states are populated and visited by family farmers, sportsmen, and everyday citizens. Unlike our nation's big cities, our states have fewer and more remote critical care facilities that can be hours away from a caller in need.

Considering these facts, it is critical that when a 911 call is placed, first responders know precisely where the call is coming from. Of course, like any issue of national significance, this issue has many complicated and moving parts to consider.

I want to welcome and thank our witnesses for testifying today. Their perspectives on the current state of wireless 911 accuracy in this country are much appreciated.

And I urge all stakeholders to work in a collaborative fashion, and I urge industry officials, public safety professionals, and regulators to work together to make our nation's emergency communications capabilities as robust, responsive, flexible, and consumer-accessible as possible.

Thank you, sir.

Senator PRYOR. Thank you.

And what I will do now is we will recognize each of our witnesses. And instead of doing a long introduction, I will just give an abbreviated introduction of all five of you at one time, and then we will just go down the row for your opening statements. And we would ask you to keep your opening statements to 5 minutes, maybe less, but 5 minutes. And we are going to have lots of questions for you.

First we have Ms. Gigi Smith. She is President of APCO International. Next is Claude Stout, Executive Director, Telecommunications for the Deaf and Hard of Hearing, Inc. Next is Christopher Guttman-McCabe, Executive Vice President, CTIA—The Wireless Association. Next is Kirk Burroughs, Senior Director of Technology at Qualcomm, Inc. And last, and certainly not least, we have Trey Forgety. He is the Director of Governmental Affairs, National Emergency Number Association.

So, with that, Ms. Smith.

**STATEMENT OF GIGI SMITH, PRESIDENT, ASSOCIATION OF
PUBLIC-SAFETY COMMUNICATIONS OFFICIALS (APCO)
INTERNATIONAL**

Ms. SMITH. Good morning, Chairman Pryor, Ranking Member Wicker, and members of the Subcommittee. My name is Gigi Smith. I am the President of the Association of Public-Safety Communications Officials International, or APCO International. Thank you for inviting me to testify before you today.

I have been active in public safety communications for over 28 years. I started as a call taker and now serve as the Police Operations Manager for the Salt Lake Valley Emergency Communications Center in West Valley City, Utah. My public safety answering point, or PSAP, is a 911 police, fire, and emergency medical services dispatch center.

I welcome this opportunity to discuss APCO with you, highlight issues that are increasingly important to our membership base, and offer some thoughts on the importance of wireless 911 location accuracy.

APCO is the world's oldest and largest organization of public safety communications professionals, at over 20,000 members. Effectively, our members field 911 calls and dispatch critical information to first responders. APCO has served a leading role in advancing policies to improve public safety communications, including wireless 911 services.

In short, the prompt and effective dispatch of emergency services is dependent upon obtaining the best location information possible from the caller. If you are indoors and call 911 from a landline phone, your address is usually quickly reported to the PSAP. However, 911 calls made with wireless phones do not afford the same degree of location accuracy.

At my own PSAP, we have noticed an upward trend in calls from wireless devices, including from indoors. Further, consumer expectations of the location capabilities of their devices do not match our actual experience in the PSAP.

The predominant location technology for most of these wireless 911 calls, Assisted GPS, or A-GPS, has been generally effective outdoors. However, A-GPS relies on having direct line of sight for GPS signals, which do not penetrate buildings well in most cases.

Because we are growing accustomed to fielding wireless calls, we often lead off by asking, "911. What is the address of your emergency?" If the caller cannot provide his or her address, then we question the caller in detail. However, this can be time-consuming, and 911 callers are occasionally panicked, scared, injured, or otherwise unable to speak or provide correct information.

We employ these and other methods along with automatic location identification technologies deployed by the wireless carriers, which have been successful in helping PSAPs locate 911 callers.

Because the best location data may not arrive within the initial wireless 911 call, call takers will commonly solicit updated location data, which is known as a "rebid." Rebidding often affords more accurate Phase II location information, which provides the latitude and longitude of the caller.

APCO has implemented training protocols, standards, and best practices to address rebidding. APCO recommends rebidding to en-

sure the most accurate information is available. While policies on rebidding vary, the phone system at my PSAP automatically rebids every 15 seconds. Further, call takers can manually rebid at shorter intervals if necessary.

From my own experience in the greater Salt Lake Valley area, we encounter a diverse natural topography with mountains, canyons, large gullies, and river bottoms, as well as a bustling downtown complete with subterranean parking, basements, and high-rise concrete structures. Thus, I know firsthand the impact on the PSAPs from the growing use of wireless phones to place 911 calls.

APCO stands ready to work with the wireless industry location technology vendors, our partners in the public safety community, and the FCC to explore new wireless location accuracy solutions. APCO would also support revised FCC rules that require improvements in indoor location accuracy over a reasonable period of time.

I appreciate that the Subcommittee has taken up this important topic in a timely manner. Thank you for the opportunity to address you, and I look forward to answering any questions you may have.

[The prepared statement of Ms. Smith follows:]

PREPARED STATEMENT OF GIGI SMITH, PRESIDENT, ASSOCIATION OF PUBLIC-SAFETY COMMUNICATIONS OFFICIALS (APCO) INTERNATIONAL

Good morning Chairman Pryor, Ranking Member Wicker, and Members of the Subcommittee.

My name is Gigi Smith, and I am the President of the Association of Public-Safety Communications Officials International, or APCO International. Thank you for inviting me to testify before you today.

I have been active in public safety communications for over 28 years. I started as a call taker, and then worked my way through the ranks of dispatcher, trainer, supervisor, and I now serve as the Police Operations Manager for the Salt Lake Valley Communications Center in West Valley City, Utah. My Public Safety Answering Point (PSAP) is a 9-1-1 police, fire, and medical emergency services dispatch Center.

I welcome this opportunity to discuss APCO with you, highlight issues that are increasingly important to our membership base, and offer some thoughts and observations on the important role of wireless 9-1-1 location accuracy.

APCO International is the world's oldest and largest organization of public safety communications professionals, at over 20,000 members. Our members are mainly state and local government employees who manage and operate communications systems for law enforcement, fire, EMS and other public safety agencies.

Effectively, our members are the individuals that are responsible for fielding emergency 9-1-1 calls and dispatching critical information to first responders.

For many years, APCO has served a leading role in advancing policies to improve public safety communications, including wireless 9-1-1 services and related location accuracy issues. In this regard, we are active participants in the numerous related proceedings and workshops at the Federal Communications Commission, and appreciate the work of the agency for its commitment and dedication toward these important matters. APCO has urged the Commission, wireless carriers, and location technology vendors that improvements must be made in wireless location accuracy for 9-1-1 calls, including calls from indoor locations.

Our commitment to improving location accuracy extends to our active participation in the FCC's Communications Security, Reliability and Interoperability Council, or CSRIC, including its focus on developing solutions for wireless 9-1-1 indoor location issues. We also seek to regularly collaborate with our partners in the industry to share information and pursue ways to improve upon past efforts and address new challenges.

Turning to the subject of this hearing, the prompt and effective dispatch of appropriate emergency services to any reported event is dependent upon obtaining the best location information possible from the caller. This essential element of dispatching must occur regardless of the technology used to access 9-1-1.

If you are indoors and place a call to 9-1-1 from a landline phone, your phone number and location, which typically is your street address, are usually automati-

cally and quickly reported to the PSAP. However, 9-1-1 calls made with wireless phones do not afford the same degree of location accuracy. This difference in accuracy between wireline and wireless calls, coupled with the fact that more and more Americans are “cutting the cord” and relying exclusively on wireless devices for all of their voice communications, means that PSAPs must be increasingly vigilant to ensure they have the most accurate location information available.

At my own PSAP, we’ve noticed an upward trend in calls originating from wireless devices, including from inside buildings. Further, there is a gap between the expectations of consumers and our actual experience in the PSAP regarding the ability of their devices to promptly and accurately convey their location during a 9-1-1 call. Whether this disconnect comes from viewing too many good entertainment programs, or developing certain assumptions as our mobile devices get “smarter” and “smarter,” it’s critical we educate consumers about current technological limitations with regard to wireless location accuracy.

The predominant location technology for most of these wireless 9-1-1 calls, “Assisted GPS” or “A-GPS,” has been generally effective in outdoor locations. However, A-GPS relies in large part on having direct line-of-sight for GPS signals, which do not penetrate buildings well in most cases. Wireless 9-1-1 calls from an indoor location will thus generally provide significantly less accurate location information than a call from an outdoor location. Even outdoors, natural and man-made features, such as “urban canyons,” mountainous terrain, and heavy forestation, can negatively impact location accuracy determined with A-GPS.

The key point however is that growing reliance on wireless devices for making 9-1-1 calls from indoor locations is limiting, and will continue to limit, the location accuracy for those calls. In this regard, and before I turn to the location technologies that have been deployed for wireless 9-1-1 service, I’d like to describe the special skills and procedures employed by 9-1-1 call-takers to help determine a wireless callers’ location.

Because we are growing accustomed to the use of wireless location technology, we often lead off each call by asking, “9-1-1, what is the address of your emergency.” If the caller is not able to provide his or her address, we then question the caller in detail to provide verbal information regarding his or her location. For example, we inquire of any landmarks like billboards or a local store. We also utilize a program that helps us match landmarks referenced on a call through what we refer to as a “commons place” table within our Computer Aided Dispatch (CAD) system. When none of this works, we employ our experience and become even more creative: in one case I recall, we advised an injured person who was inside a car to continually honk his horn, which resulted in a 9-1-1 call from a nearby home with a noise complaint that led first responders to the victim. However, implementing these methods can be time consuming, and 9-1-1 callers are occasionally panicked, scared, injured, or otherwise unable to speak or provide correct information.

We employ these methods along with the automatic location identification technologies deployed by the wireless carriers, which have been successful in helping PSAPs locate 9-1-1 callers. When provided, accurate “Phase II” information, which contains the “x, y” coordinates of the caller within a certain radius that meets or exceeds FCC requirements, is extremely helpful in those situations.

When a wireless 9-1-1 call is delivered to the PSAP, it is initially accompanied by some form of location information. In some instances, the technology used to locate the wireless 9-1-1 caller may not have determined his or her specific location by the time the time the emergency call is delivered to the PSAP. In order to ensure quick routing of the voice portion of the call, wireless calls are initially routed based on “Phase I” location information, which consists only of the location of the cell site or base station transmitting the call. This means that the caller can be anywhere within the radius of that particular cell site.

Subsequent and nearly simultaneous to receiving the routing location, a request (or “bid”) is made to obtain more accurate, or Phase II, location information to deliver with the call. This request utilizes the carrier’s location information infrastructure to obtain the x,y coordinates of the caller when available. This request will result in delivery of initial Phase II data that may not be the best location information available, but it is better than Phase I data only.

Because the best location data may not arrive with the initial wireless 9-1-1 call, a common practice for call-takers is to solicit updated location data from the wireless carrier at some point after initiation of the call, which is known as a rebid. Re-bidding for this information often affords more accurate, Phase II location information, which provides the PSAP call-taker with the latitude and longitude of the wireless caller. The Phase II information provided to the PSAP must meet FCC accuracy standards, ranging from 50 to 300 meters, depending on the type of technology used.

APCO, an American National Standards Institute (ANSI) certified standards development organization, has implemented training protocols, standards, and best practices to address the rationale and methods for rebidding wireless 9-1-1 calls. APCO recommends that PSAPs rebid the Phase II location data to ensure the most accurate information is available. Policies on rebidding vary from agency to agency. At my PSAP, the phone system we use automatically rebids every 15 seconds. Further, because even 15 seconds in some cases can be too long to wait, call takers can also manually rebid the location information at shorter intervals.

Phase II information sometimes lacks sufficient accuracy to ensure a rapid and efficient emergency response. This is especially the case for calls from indoor locations, where accuracy is compromised both by the technical limitations of GPS, and the lack of vertical information (often referred to as the “z-axis”) for tall buildings. Yet, location is especially important for indoor calls, as emergency responders are often unable to make visual contact upon arriving at the approximate address.

As I mentioned, rebidding can help improve the location fix. However, the rebidding process adds time to the call-taking/dispatching process, potentially delaying emergency response to the correct location. For indoor locations, even a rebid may not provide sufficient information for responders to locate the caller quickly in a building, or even identify the correct building in a dense urban area.

From my own experience in the greater Salt Lake City area, we encounter a diverse natural topography with mountains, canyons, large gullies, and river bottoms that are often concealed by the surrounding terrain. At the same time, we also have a bustling downtown complete with subterranean parking, basements, and high-rise concrete structures.

Thus, I know first-hand of the impact to PSAPs from the growing use of wireless phones to place 9-1-1 calls, as well as the technological limitations of A-GPS technology in challenging environments such as inside buildings. Further, we lack agreed-upon accuracy standards for indoor environments. APCO stands ready to work with the wireless industry, location technology vendors, our partners in the public safety community, and the FCC to explore new wireless location accuracy solutions that make sense for PSAPs and the general public. APCO would also support revised FCC rules that require improvements in indoor location accuracy over a reasonable period of time.

I appreciate that the Subcommittee has taken up this important and timely topic. This hearing will help highlight the needs of public safety communications professionals who answer 9-1-1 calls and dispatch emergency responders, to best serve the general public.

Thank you for the opportunity to address you, and I look forward to answering any questions you may have.

Senator PRYOR. Thank you. And you set a great example by finishing 30 seconds early. We love that.

[Laughter.]

Senator PRYOR. Mr. Stout?

**STATEMENT OF CLAUDE L. STOUT, EXECUTIVE DIRECTOR,
TELECOMMUNICATIONS FOR THE DEAF AND HARD
OF HEARING, INC. (TDI)**

Mr. STOUT [Speaking through an interpreter]. Thank you for the opportunity to give this testimony. My testimony today will focus on the exciting possibilities that can come from improving our access to 911 services, more specifically, through new and emerging location-identifying technologies.

We highly applaud the FCC, APCO, NENA, CTIA, and the four major wireless carriers—Verizon, AT&T, Sprint, and T-Mobile USA—for listening to consumer demands and collaboratively implementing new accessible solutions and emergency services, such as text-to-911 and Next Generation 911.

Deaf and hard-of-hearing Americans no longer rely on legacy TTYs and have moved on, with everyone else, to using broadband technologies for their communication needs, including access to

emergency services. Today we are using smartphones, tablets, videophones, captioned telephones, or desktop computers.

We can have direct communications with others that use the same devices that we are using. For example, we use videophones to converse with each other in sign language. And if we want to call someone who doesn't know sign language or does not use the same devices, we are able to call them indirectly by using a video relay service, captioned telephone relay service, or Internet protocol relay service.

Many years ago, when deaf and hard-of-hearing people had to make an emergency call on the TTY, we had to dial 911 on a regular phone and then put the handset on an acoustic coupler in order to transmit and receive tones between the phone and the TTY. If we lost consciousness or just simply didn't have the time or the ability to continue the phone call, we would just drop the handset and leave it off the hook. Most 911 centers would still detect the originating telephone number and the physical address linked to that number. In the absence of any further information, the dispatcher would still verify the call by sending at least a police officer to the site of the incident.

There seems to be a consensus today that, despite the new technologies, we simply cannot send accurate location details to the 911 center in an emergency. Current GPS and other triangulation systems available on most wireless devices, such as pagers, phones, or tablets, can only help 911 centers pinpoint our street-level location to within 50 meters. However, if we live or work in multistory buildings, the responders can only identify the building address, not the apartment or the office suite.

We have learned that there are companies working hard to improve location-identifying technologies that not only can determine your location on a horizontal plane, known in the industry as the X-Y coordinates, within 50 meters, but also pinpoint the vertical Z coordinate, as well, within 3 meters. This helps emergency responders to go directly to the floor and to the room inside the building where the 911 call originated.

Callers using voice or text could just concentrate on giving a description of the emergency itself and not lose time on trying to describe the location. This would be a huge plus for anyone not familiar with their surroundings, such as children, senior citizens, people with other disabilities, or people just traveling through who are unfamiliar with the territory.

In the event that the caller is physically unable to provide further information due a physical medical condition or extenuating circumstances, such as during a kidnapping or an escalating domestic violence scenario, help would be forthcoming much quicker. Those that do not have any disability will benefit from this new technology, as well.

We simply want the same capabilities like anyone else to initiate and participate fully in communications with emergency services.

Thank you.

[The prepared statement of Mr. Stout follows:]

PREPARED STATEMENT OF CLAUDE L. STOUT, EXECUTIVE DIRECTOR,
TELECOMMUNICATIONS FOR THE DEAF AND HARD OF HEARING, INC. (TDI)

Thank you for the opportunity to present this testimony. My name is Claude Stout, and I am the Executive Director of Telecommunications for the Deaf, Inc. (TDI). TDI¹ is a national consumer advocacy organization that shapes an accessible world by ensuring that 48 million Americans who are deaf or hard of hearing² have equal access to telecommunications, media and information technology. As a non-technical person, my testimony today will focus on the consumer perspective on the exciting possibilities that can come from improving our access to 911 services. More specifically, through new and emerging location identifying technologies that can pinpoint the origin of our voice or text calls with enhanced accuracy. I would like to compliment the FCC for its excellent work so far in this important area.

Over the past decade there have been tremendous changes in the way Americans use technology to communicate with and obtain access to emergency services. Deaf and hard of hearing Americans are benefiting from this transition also. We no longer rely on legacy TTYs and have moved on with everyone else to using broadband technologies for our communications needs.

Today we use smart phones, tablets, videophones, captioned telephones or desktop computers. We make and receive calls like the rest of you through several different channels. We can have direct or “peertopeer” communication with others that use the same devices we are using, for example—we use videophones to converse with each other in sign language.

If we want to call someone that doesn’t know how to sign, or does not use the same devices, we are able to call them indirectly by using a Video Relay Service. There are other different ways deaf and hard of hearing people can contact their family or friends and conduct business affairs, such as through Captioned Telephone Relay Services, or Internet Protocol Relay Service.³

Many years ago, when deaf and hard of hearing people had to make an emergency call on the TeleType or “TTY,”⁴ we had to dial 911 on a regular phone and then put the handset on an acoustic coupler in order to transmit and receive tones between the phone and the TTY. If we lose consciousness or just simply don’t have the time or the ability to continue the phone call, we would just drop the handset, and leave it off the hook. Most 911 centers will still get location details from the Automatic Number Identifier (ANI) and Automatic Location Identifier (ALI)⁵ features within the e911 system to detect the originating telephone number and the physical address linked to that number. In the absence of any further verbal (or textual) information, the dispatcher would still verify the call by sending at least a police officer to the site of the incident.

There seems to be a consensus today that despite these advances, there remain challenges with accurate location details when using a wireless phone indoors in an emergency. The FCC exempted indoor locations⁶ from its wireless location accuracy rules in 2010 pending further studies and the availability of more accurate and reliable indoor location technologies. Current GPS and other triangulation systems available on most wireless devices today (ie: pagers, phones or tablets) often do not work reliably indoors, and other trilateration “fallback” systems provide only generalized location information which may cover many city blocks. Particularly if we live or work in multistory buildings, the responders frequently cannot identify the building address, and most certainly not the apartment or office suite. This is a problematic issue that needs to be addressed.

Others can provide the technical details, but the consumer groups understand from reviewing test results published last year by the FCC’s CSRIC industry advisory group, there are companies working hard to improve location identifying technologies that can not only determine your location, generally within 50 meters on an horizontal plane, known in the industry as the XY coordinates, but can also reliably pinpoint the vertical “Z” coordinates⁷ as well within three meters. This helps emergency responders to go directly to the floor and to the room inside the building where the 9-1-1 call originated. When this location information is included with a 9-1-1 call or text, callers and dispatchers can concentrate on the details of the emergency itself and not lose time on trying to describe the location. This would

¹ www.TDIforAccess.org

² <http://www.hearingloss.org/content/basic-facts-about-hearing-loss>

³ <http://www.fcc.gov/guides/telecommunications-relay-service-trs>

⁴ <http://www.911.gov/911-issues/serving.html>

⁵ <http://www.911dispatch.com/911/911glossary.html>

⁶ <http://findme911.org/resources/providers-support-moving-forward/>

⁷ <http://www.fcc.gov/document/amending-definition-interconnected-voip-service-section-93-com-missions-rules-wireless-e911>

be a huge plus for anyone not familiar with their surroundings such as children, senior citizens, or people just travelling through who are unfamiliar with the territory.

Once the connection is made to the public safety answering point, the location information needs to be immediately and automatically transmitted. This would allow the caller and the dispatcher to give primary focus to the details of the emergency. In the event that the caller was physically unable to provide further information due to deteriorating medical condition such as a heart attack or stroke, deafness or speech disability, or extenuating circumstances where it becomes unsafe to speak such as during a kidnapping or an escalating domestic violence scenario, since the location is already known to the responders, help will be forthcoming much quicker. Even if a heart attack victim was able to initiate a verbal or textual 9-1-1 call on his wireless device, the victim may lose consciousness and become unable to sustain a prolonged conversation with the 9-1-1 dispatcher.

People with visual, speech, cognitive, or mobility disabilities will not have to worry about consuming additional minutes trying to identify their location as technology will provide that data for them immediately. Those that do not have any disabilities will benefit from these new technologies as well.

Like the ANI and ALI features of legacy e911 services, we need the same capabilities to call for help, and then let the location identifying metadata be instantly transmitted to emergency responders for prompt and timely assistance. Although today's communication networks have become more robust in the last several years, it's reliability still has not yet achieved the same parity with legacy networks. Various systems are still vulnerable to disruptions from natural phenomena and man-made incidents, and any call could be disconnected without any advance warning.

By transmitting key location data at the beginning of each call, the 9-1-1 system would serve as a regionwide "Life Alert" system⁸ that would notify the PSAP an emergency has occurred, and to please send help. Senior citizens living alone have relied on such alerting mechanisms, but for us, we are unable to subscribe to these services, usually because it involves a voice telephone call from the "Life Alert" service personnel verifying our emergency prior to notifying the local public safety agencies.

I strongly applaud the FCC, APCO, NENA and the four major wireless carriers, AT&T, Sprint, T-Mobile USA, and Verizon for listening to consumer demands and collaboratively implementing text to 9-1-1⁹ and other efforts as part of the Next Generation 911 (NG-911)¹⁰ efforts. I believe strongly this will be more powerful and useful if precise location information including data on indoor location and floor level where the call originated were included with every voice or text call.

Therefore, my first request is that location technologies deployed to assist emergency wireless calling have a fast enough TimeToFirstFix, or "TTFF" for the precise location information to be included in the initial voice call or text to 9-1-1 message sent to the emergency dispatcher.

My second request is for stricter indoor location accuracy requirements. Current FCC location requirements for outdoor calling¹¹ requires accuracy of within 50 meters 67 percent of the time and within 150 meters 90 percent of the time. This may be adequate to locate a caller outdoors or even indoors in a rural or less dense environment. However, we understand that accuracy requirements less demanding than 50 meters in an urban environment can only provide general location information and may be inadequate to identify the exact building location. In the interest of utmost public safety, this request for accuracy of 50 meters or less needs to be given a very high priority.

My third and final request is to have floor level vertical accuracy location information included with emergency calls or texts, particularly in areas with dense urban and multistory buildings. Although this attribute may not be as important in rural settings or outdoors, it is critically vital in large multistory housing and office complexes. We understand the high value that emergency responders place on floor level accuracy as well. It is no less important to the deaf and hard of hearing community and for people with other disabilities.

We deeply appreciate this hearing today, and thank you for the opportunity to express our concerns. Please know that the solutions proposed by industry have the power to save lives by bringing immediate help in time of need. We simply want the same capabilities like anyone else to initiate and participate fully in communica-

⁸<http://www.lifealert.net/home/home.html>

⁹<http://www.fcc.gov/document/chairman-genachowski-announces-commitments-accelerate-text-911>

¹⁰<http://transition.fcc.gov/pshs/services/911-services/nextgen.html>

¹¹<http://www.fcc.gov/document/fcc-strengthens-e911-location-accuracy-wireless-services>

tions with emergency services. And if for some reason, we are medically or physically unable to communicate our needs to the responders, or understand their instructions, we would still be confident that help would be on its way to us.

Like our family members and friends who can hear, we do pay local property taxes and Federal taxes that support our local public safety services, and also pay subscriber fees to access the telephone networks as a conduit to emergency services. As 9-1-1 centers continue to rely on funding from these sources, so should we rely on them to be fully accessible to every single one of us in the community.

Thank you once again for this opportunity to speak with you today about these important issues.

Senator PRYOR. Thank you.
Mr. Guttman-McCabe?

**STATEMENT OF CHRISTOPHER GUTTMAN-McCABE,
EXECUTIVE VICE PRESIDENT,
CTIA—THE WIRELESS ASSOCIATION**

Mr. GUTTMAN-McCABE. Thank you. And good morning, Chairman Pryor and members of the Subcommittee. On behalf of CTIA, thank you for the opportunity to participate in this morning's discussion of 911 location accuracy and other issues that impact the delivery of 911 services.

CTIA and its members have a long history of working to enhance the utility of wireless 911 services for consumers and public safety officials. The wireless industry has worked closely with Congress, the FCC, the PSAP community, technology vendors, and others to improve the safety of consumers through the development and deployment of innovative 911 solutions. As a result, wireless carriers are meeting their regulatory obligations and providing accurate and timely location information to PSAPs that today receive more than 400,000 911 calls a day from wireless devices.

Even with this impressive record, the industry hasn't been resting on its laurels. Just over a year ago, working with NENA and APCO, the four national carriers voluntarily committed to offer their subscribers text-based emergency communications services by mid-May of this year. This text-to-911 effort represents an important step toward better meeting the emergency communication needs of the deaf, hearing-impaired, and speech-impaired communities who use wireless text-messaging services every day, even as the wireless industry continues to work toward a comprehensive, next generation 911 system.

Additionally, the industry is actively involved in the ongoing work of the Communications Security, Reliability, and Interoperability Council, CSRIC, to examine the effectiveness of various technologies and products through an indoor location test bed. While CTIA is optimistic that the test bed process can lead to results that will enhance indoor location accuracy, we agree with the public safety experts participating in CSRIC's E911 Location Accuracy Working Group that additional development is required before first responders will have access to the sort of actionable location information they need, especially in urban and dense-urban environments.

While neither the text-to-911 or CSRIC efforts on indoor location accuracy require the imposition of rules by the FCC, these initiatives, enhanced by billions of dollars in annual investment in new wireless infrastructure and continued innovation in the wireless

device marketplace, promise to expand the emergency communications capabilities available to America's wireless subscribers and enable our first responders to provide improved protection to the public.

But even as we work toward that goal, important issues remain that require policymakers' attention, and in my remaining time I would like to highlight them.

First, there is a need for clear, comprehensive, nationwide limitation of liability protection for all entities participating in any aspect of emergency services access, including NG911 services. The current liability protection framework is premised on protections available to legacy telephone networks under state law, but the industry is rapidly evolving to IP-based technologies in which services are diverse, increasingly mobile, and potentially multijurisdictional. All parties would be better served if Congress enacts liability protection at the national level.

Second, in multiple FCC reports stemming from the NET 911 Act, it is apparent that some states continue to divert fees collected for the support of 911 services to pay for other purposes. The diversion of these fees is unacceptable, and CTIA urges Congress to use every tool at its disposal to halt the practice of raiding 911 funds.

Third, 31 states and several territories have adopted point-of-sale collection statutes to ensure that those who use prepaid services contribute to the support of the emergency communications system. Several others are moving toward enactment of point-of-sale collection regimes. However, a number of states still have failed to do so, and their failure to address this issue negatively impacts the emergency communications system and creates comparative disparities among service providers.

Finally, CTIA urges Congress and the FCC to examine the potential intellectual property implications associated with the deployment of E911 and NG911 capabilities. A number of CTIA members involved in the provision of 911 services have been the subject of unfounded patent litigation, as patent trolls attempt to use the FCC's rules to force carriers and their vendors into licensing agreements or face crippling litigation expenses.

Senator Cardin has introduced the Protect Advanced Communications for Emergency Services Act to address this matter, and CTIA urges support for S. 1478 and other measures aimed at curbing abusive patent litigation. Providing E911 service should not make the wireless industry a target for predatory litigation.

CTIA looks forward to working with the Subcommittee and other stakeholders to address these issues and to ensuring that America's wireless consumers have access to the world's most comprehensive emergency communications capabilities.

Thank you.

[The prepared statement of Mr. Guttman-McCabe follows:]

PREPARED STATEMENT OF CHRIS GUTTMAN-McCABE, EXECUTIVE VICE PRESIDENT,
CTIA—THE WIRELESS ASSOCIATION®

On behalf of CTIA—The Wireless Association®, thank you for the opportunity to participate in this morning's discussion of 911 location accuracy and other issues that impact the delivery of 911 services.

CTIA and its members have a long history of working to enhance the utility of wireless 911 services for consumers and public safety officials. The wireless industry

has worked closely with Congress, the Federal Communications Commission, the PSAP community, technology vendors, and other interested parties to improve the safety of consumers through the development and deployment of innovative E911 solutions. As a result, wireless carriers are meeting their regulatory obligations and providing accurate and timely location information to PSAPs that today receive more than 400,000 911 calls a day from wireless devices.

Even with this impressive record, the industry hasn't been resting on its laurels. Just over a year ago, working with NENA and APCO, the four national carriers voluntarily committed to offer their subscribers text-based emergency communications services by mid-May 2014.¹ This text-to-911 effort represents an important step toward better meeting the emergency communications needs of the deaf, hearing-impaired, and speech-impaired communities who use wireless text-messaging services every day, even as the wireless industry continues to work toward a comprehensive Next Generation 911 system.

Additionally, the industry is actively involved in the ongoing work of the Communications Security, Reliability and Interoperability Council (CSRIC) to examine the effectiveness of various technologies and products through its Indoor Location Test Bed. While CTIA is optimistic that the Test Bed process can lead to results that will enhance indoor location accuracy, we agree with the public safety experts participating in CSRIC III's E911 Location Accuracy Working Group 3, who have said that the Test Bed process indicates that "additional development is required to ensure the positional coordinates provided on an emergency caller sheltered indoors result in an 'actionable location' for emergency response, especially in urban and dense urban environments."² Vendors that believe they have technology to provide this information should participate in the Test Bed process. This will offer objective evidence to carriers, the FCC, and the public safety community that a solution is ready for deployment.

While neither the text-to-911 launch or the CSRIC efforts on indoor location accuracy require the imposition of rules by the FCC, these initiatives, enhanced by billions of dollars in annual investment in new wireless infrastructure and continued innovation in the wireless device marketplace, promise to expand the emergency communications capabilities available to America's wireless subscribers and enable our first responders to provide improved protection to the public. But even as we work toward that goal, important issues remain that require policymakers' attention.

First, as evidenced by comments from NENA, APCO, carriers, and vendors in the FCC's proceeding on the Legal and Regulatory Framework for Next Generation 911 Services, there is a need for clear, comprehensive, standardized limitation of liability protection for all entities participating in any aspects of emergency services access, including NG911 services. The current liability protection framework is premised on protections available to legacy telephone networks under state law and regulations, but the industry is rapidly evolving to IP-based technologies in which services are diverse, increasingly mobile, and potentially multi-jurisdictional. Accordingly, all parties would be better served if Congress enacts liability protection at the national level, for both Federal and state causes of action, for all persons and entities involved in the provision of and access to 911 services, on a technology-neutral basis.

Second, the ongoing effort to upgrade PSAP facilities and training requires funding. However, in multiple FCC reports stemming from the NET 911 Act³ (enacted in 2008 with leadership from Senator Nelson), it is apparent that some states continue to divert fees collected for the support of 911 services to pay for other purposes. While the situation is better today than it was in 2009 when the first Report to Congress was issued, it remains a problem in a number of states. The diversion of these fees is unacceptable and CTIA urges Congress to use every tool at its disposal to halt the practice of raiding 911 funds, as the FCC suggested in its February 2013 Report to Congress and Recommendations on the Legal and Regulatory Framework for Next Generation 911 Services.⁴

¹ See <http://apps.fcc.gov/ecfs/document/view?id=7022074960> and <http://apps.fcc.gov/ecfs/document/view?id=7022074962>.

² CSRIC III E911 Location Accuracy Working Group 3, Indoor Location Test Bed Report, March 14, 2013, at 8 (Public Safety Foreword), available at http://transition.fcc.gov/bureaus/pshs/advisory/csrc3/CSRIC_III_WG3_Report_March_%202013_ILTestBedReport.pdf.

³ P.L. 110-283.

⁴ Legal and Regulatory Framework for Next Generation 911 Services, Report to Congress and Recommendations, February 22, 2013, at 4.1.4.2, available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-319165A1.pdf.

Third, since this Committee urged “States and localities to study fee structures that accommodate pre-paid telecommunications services”⁵ when it crafted the NET 911 Act, thirty-one states, the District of Columbia, and the U.S. Virgin Islands have adopted point-of-sale collection statutes to ensure that those who use prepaid wireless services contribute to the support of the emergency communications system. Several others are moving toward enactment of point-of-sale collection regimes. However, a number of states still have failed to adopt the NCSL-endorsed model legislation to facilitate the collection of 911 fees.⁶ With almost 23 percent of wireless subscribers choosing to take service on a prepaid basis, those states’ continued failure to address this issue negatively impacts the emergency communications system and creates competitive disparities among service providers.

Fourth, to ensure that consumers have consistent public safety expectations across America, the wireless industry also recommends that PSAP regionalization and consolidation be encouraged. State-level coordination is practical from a technical and financial perspective, as the range of technologies envisioned for NG911 may impose higher costs and administrative complexities that are better addressed at a state or regional level than by an individual PSAP. The wireless industry encourages the consolidation of PSAPs into regional PSAPs covering as large a number of counties as can be efficiently served on a regional basis.

Finally, CTIA urges Congress and the FCC to examine the potential intellectual property implications associated with the deployment of E911 and NG911 capabilities. CTIA member TeleCommunication Systems Inc. (“TCS”) has noted in comments filed at the Commission that companies subject to the Commission’s jurisdiction and others may own, control, or develop intellectual property rights that are directly relevant to the provision of 911 location services and sometimes use the Commission’s 911 rules to create “an unfortunate arbitrage opportunity for litigation-minded [intellectual property rights] holders, patent assertion entities, sometimes called ‘patent trolls,’ that use the FCC’s rules to force carriers and their vendors into licensing agreements or face crippling litigation expenses.”⁷

With this concern in mind, TCS has filed a Petition for Declaratory Ruling and/or Rulemaking that asks that the Commission either issue guidance that in all circumstances compliance with E911 rules is in furtherance and fulfillment of a stated government policy, and therefore is by and for the government, thus triggering 28 U.S.C. § 1498⁸, or alternatively require that patents that cover E911 or NG911 services and capabilities be offered for licensing pursuant to reasonable terms and conditions that are demonstrably free of any unfair discrimination.⁹ Senator Cardin has introduced the Protect Advanced Communications for Emergency Services Act to address this matter and CTIA urges support for S. 1478 and other measures aimed at curbing abusive patent litigation. Providing E911 service should not make the wireless industry a target for predatory litigation.

CTIA looks forward to working with the Subcommittee and other stakeholders to address these issues and to ensuring that America’s wireless consumers have access to the world’s most comprehensive emergency communications capabilities.

Senator PRYOR. Thank you.
Mr. Burroughs?

**STATEMENT OF KIRK BURROUGHS, SENIOR DIRECTOR
OF TECHNOLOGY, QUALCOMM ENGINEERING SERVICES
GROUP, QUALCOMM INCORPORATED**

Mr. BURROUGHS. Good morning, Chairman Pryor, Ranking Member Wicker, and members of the Subcommittee. On behalf of

⁵ S. Rept. 110–142, at 9.

⁶ http://www.ncsl.org/documents/standcomm/scomfc/Point_of_Sale_Model_Bill2010.pdf.

⁷ Comments of TeleCommunication Systems, Inc., PS Docket Nos. 10–255, 11–153, and 12–333, at 11 (Dec. 13, 2012).

⁸ This statute provides, in relevant part, that “[w]hen an invention described in and covered by a patent of the United States is used or manufactured by or for the United States without license of the owner thereof or lawful right to use or manufacture the same, the owner’s remedy shall be by action against the United States in the United States Court of Federal Claims for the recovery of his reasonable and entire compensation for such use and manufacture.” 28 U.S.C. § 1498.

⁹ Petition for Declaratory Ruling and/or Rulemaking of TeleCommunication Systems, Inc., GN Docket No. 11–117, WC Docket No. 05–196, PS Docket Nos. 11–153 and 10–255 (filed July 24, 2012).

Qualcomm, I would like to thank you for inviting me to this hearing.

Qualcomm is a licensor of highly innovative wireless technology and manufacturer of cutting edge chips for wireless devices. Qualcomm was one of the primary inventors of A-GPS and the first to implement Assisted-GPS. For more than 10 years, Assisted-GPS has located millions of emergency callers and saved lives.

With an increasing number of indoor calls, the need to accurately locate wireless users indoors is increasingly important. As a result, Qualcomm and its partners are actively researching and developing next generation technologies to improve both outdoor and indoor wireless location accuracy in the absence of any new Federal mandate.

Based on the CalNENA report to the FCC and the recent FCC workshop, there is some confusion about when and how an accurate location estimate of an emergency caller is made available to the 911 call center. I would like to clarify this.

Currently, each 911 call from a mobile device is routed to the call center that is closest to the device's serving cell. The call center then uses a separate communication channel to bid, often referred to as "rebid," for a more accurate location estimate. In other words, the call center has to ask the network to provide it with the caller's location. This two step process has not changed since E911 was first implemented in response to the FCC's E911 mandate established over a decade ago.

Qualcomm participated in the last FCC Communications Security, Reliability, and Interoperability Council, CSRIC, which issued its report in 2013. We provided support to both Verizon Wireless and Sprint in demonstrating their E911 hybrid location technology, which utilizes both Assisted-GPS and Advanced Forward Link Trilateration, AFLT. AFLT is a 3G technology based on measurements of signals from cellular base stations.

The work of the last CSRIC was critically important, as it enabled the industry to learn the state of technologies available to improve indoor location accuracy. CSRIC invited all industry participants to present location technologies for independent third-party testing, and CSRIC reported the results from three technologies. One of those was Assisted-GPS/AFLT, which is an open standard with products available from multiple vendors.

There are several key points to note about the CSRIC results. First, the results were obtained on unmodified Verizon Wireless and Sprint networks. Second, this is the first publication of performance results of A-GPS/AFLT. Third, although this technology has worked well for over 10 years, until recently the focus has not been on indoor performance. The performance reported by CSRIC ranged from tens of meters to hundreds of meters for indoor sites spanning from rural to dense-urban environments. The CSRIC results confirm that this 3G technology works reasonably well indoors.

But as I will explain, Qualcomm and its partners are working on 4G-based technology that will perform better, specifically Observed Time Difference of Arrival, OTDOA. OTDOA, like AFLT, is handset-based and relies on the measurements from cellular base stations. But 4G OTDOA technology has been designed to perform

even better than 3G AFLT, including through use of signals that are dedicated to positioning.

Qualcomm believes, and test data support, that OTDOA will be a very useful indoor positioning technology for locating emergency callers. Initial field trials of the technology show that OTDOA is able to provide accuracies within a few tens of meters. Even better results are expected in the future through a robust roadmap of improvements for future generations of the standard. All major U.S. carriers have plans to deploy OTDOA.

Qualcomm believes in leveraging the 4G LTE cellular network for indoor location for many reasons, including that cellular, by nature, provides coverage wherever the call is made, including indoors. OTDOA positioning is based on the trusted and accurate information of the cell locations. OTDOA uses the LTE handsets being deployed for voice-over-LTE services. Once deployed, any LTE-capable phone from any vendor will support OTDOA. No special handset hardware is required.

CSRIC has reconvened and is proceeding with planning the next round of testing. Qualcomm strongly supports this process and CSRIC's recommendation to the FCC to consider including OTDOA in a future test bed. This allows the industry and regulators to make informed decisions.

Qualcomm also believes that information about Wi-Fi access points may be used to supplement indoor positioning that uses Assisted-GPS and AFLT or OTDOA. Standards exist allowing for Wi-Fi information, including the positions used by existing consumer location services, to be provided as supplemental information to E911 location servers. However, Wi-Fi solutions face challenges because there is no assurance that Wi-Fi data bases are accurate. Clarification of liability for an inherently unreliable source might be a first step.

In summary, currently deployed A-GPS plus AFLT-based technologies work well when callers are outdoors and reasonably well indoors.

With an increasing number of indoor 911 calls, it is important that additional technologies be implemented in order to improve performance and the ability to quickly and accurately locate emergency callers, wherever they are. This process is well under way and is occurring in the absence of any new Federal mandate. For example, the major U.S. carriers are actively expanding their 4G LTE networks to enable OTDOA.

Qualcomm recommends a measured approach by the FCC in gathering data in considering how to support the industry's ongoing efforts. Qualcomm believes the industry, along with valuable participation from CSRIC, is moving in the right direction in a reasonable timeframe.

Thank you.

[The prepared statement of Mr. Burroughs follows:]

PREPARED STATEMENT OF KIRK BURROUGHS, SENIOR DIRECTOR OF TECHNOLOGY,
QUALCOMM ENGINEERING SERVICES GROUP, QUALCOMM INCORPORATED

Qualcomm is a licensor of highly innovative wireless technology and manufacturer of cutting edge chips for wireless devices. Qualcomm was one of the primary inventors of Assisted-GPS and the first to implement Assisted-GPS. For more than 10 years Assisted-GPS has located millions of emergency callers and saved lives.

With an increasing number of indoor 911 calls the need to accurately locate wireless users indoors is increasingly important. As a result, Qualcomm and its partners are actively researching and developing next-generation technologies to improve both outdoor and indoor wireless location accuracy in the absence of any new Federal mandate.

Based on the CALNENA report to the FCC, and the recent FCC Workshop, there is some confusion about when and how an accurate location estimate of an emergency caller is made available to the 911 call center. I would like to clarify this.

Currently, each 911 call from a mobile device is routed to the call center that is closest to the device's serving cell. The call center then uses a separate communication channel to "bid", often referred to as "rebid", for a more accurate location estimate; in other words, the call center has to "ask" the network to provide it with the caller's location. This two-step process has not changed since E911 was first implemented in response to the FCC's E911 mandate established over a decade ago.

Qualcomm participated in the last FCC Communications Security, Reliability and Interoperability Council (CSRIC), which issued its report in 2013. We provided support to both Verizon Wireless and Sprint in demonstrating their E-911 hybrid location technology, which utilizes both Assisted GPS and Advanced Forward Link Trilateration (AFLT). AFLT is a 3G technology based on measurements of signals from cellular base stations.

The work of the last CSRIC was critically important as it enabled the industry to learn the state of technologies available to improve indoor location accuracy. CSRIC invited all industry participants to present location technologies for independent third-party testing, and CSRIC reported the results from three technologies. One of those was A-GPS/AFLT, which is an open standard with products available from multiple vendors.

There are several key points to note about the CSRIC results. *First*, the results were obtained on unmodified Verizon Wireless and Sprint networks. *Second*, this is the first publication of performance results for A-GPS/AFLT. *Third*, although this technology has worked well for over 10 years, until recently the focus has not been on indoor performance. The performance reported by CSRIC ranged from 10s to 100s of meters for indoor sites spanning rural to dense urban environments. The CSRIC results confirm that this 3G technology works reasonably well indoors.

But as I will explain, Qualcomm and its partners are working on 4G-based technology that will perform better. Specifically Observed Time Difference Of Arrival (OTDOA). OTDOA, like AFLT, is handset based and relies on measurements from cellular base stations. But 4G OTDOA technology has been designed to perform even better than 3G AFLT, including through use of signals that are dedicated to positioning. Qualcomm believes, and test data support, that OTDOA will be a very useful indoor positioning technology for locating emergency callers. Initial field trials of the technology show that OTDOA is able to provide accuracies within a few or tens of meters. Even better results are expected in the future, through a robust roadmap of improvements for future generations of the standard. All major U.S. carriers have plans to deploy OTDOA.

Qualcomm believes in leveraging the 4G LTE cellular network for indoor location for many reasons, including that cellular, by its nature, provides coverage wherever the call is made—including indoors. OTDOA positioning is based on the trusted and accurate information of the cell locations. OTDOA uses the LTE handsets being deployed for voice over LTE services; once deployed, any LTE-capable phone, from any vendor, will support OTDOA; no special handset hardware is needed.

CSRIC has reconvened and is proceeding with planning the next round of testing. Qualcomm strongly supports this process and CSRIC's recommendation to the FCC to consider including OTDOA in a future test bed. This allows the industry and regulators to make informed decisions.

Qualcomm also believes that information about Wi-Fi access points may be used to supplement indoor positioning that uses Assisted-GPS and AFLT or OTDOA. Standards exist allowing for Wi-Fi information, including the positions used by existing consumer location services, to be provided as supplemental information to E911 location servers. However, Wi-Fi solutions face challenges because there is no assurance that Wi-Fi databases are accurate. Clarification of liability for an inherently unreliable source might be a first step.

In summary, currently deployed A-GPS plus AFLT based technologies work well when callers are outdoors and reasonably well indoors. With an increasing number of indoor 911 calls, it is important that additional technologies be implemented in order to improve performance and the ability to quickly and accurately locate emergency callers, wherever they are located. This process is well underway, and is occurring in the absence of any new Federal mandate. For example, the major U.S. carriers are actively expanding their 4G LTE networks to enable OTDOA.

Qualcomm recommends a measured approach by the FCC in gathering data and considering how to support the industry's ongoing efforts. Qualcomm believes the industry, along with valuable participation from CSRIC, is moving in the right direction in a reasonable time frame.

Senator PRYOR. Thank you.
Mr. Forgety?

**STATEMENT OF TELFORD E. FORGETY III ("TREY"), DIRECTOR
OF GOVERNMENT AFFAIRS AND REGULATORY COUNSEL,
NATIONAL EMERGENCY NUMBER ASSOCIATION (NENA)**

Mr. FORGETY. Thank you, Chairman Pryor, Ranking Member Wicker, Senator Johnson. I appreciate your being here today. This is a very important issue that we are pleased to see Congress taking an interest in.

I have submitted my written testimony for the record, so I would rather just talk with you a little bit about the history of E911, how things came to be as they are, where they are today, and some implications of the recent data that we have seen released, and what public safety's needs are for the future.

So, first of all, let's talk a little bit about E911 and how we got here. In 1968, the first 911 call was made from Haleyville, Alabama. In those days, 911 was little more than a call-forwarding number. You dialed 911, and the call got sent by a local switch to a 10-digit number at a predesignated PSAP. And I think that is an important point. It wasn't necessarily the one for your jurisdiction; it was the one that the switch was attached to.

And that is sort of the same way we find ourselves today once we have implemented E911 in wireless. Enhanced 911 gets us a couple of things. First off, it gets us the ability to route calls selectively to the right PSAP, not just the closest one, the right one, so that we can get to the jurisdiction that is actually responsible for providing services in the field.

Second, it gets us the ability to identify the call-back number of the wireless or wireline caller who makes a 911 call, so if the call drops, which no one likes but it does happen, if the call drops, we can get back to them. That is an important point.

And the third point is automatic location identification. As several of the other witnesses have already noted, in the wireline world we get a civic address. We get 123 Main Street, Apartment 4B. That is a fixed data base process. It has worked well since the late 1970s, early 1980s. In the wireless world, things are very different because individual devices are not tied to a specific location. So we have to come up with a way to deal with the fact that these things are out there and they move around a lot.

And the way we do that in the routing regime—and, Senator Pryor, you mentioned this in your opening statement—is we decide in advance where every cell sector—and there may be three to six or even more sectors per site—where every cell sector is going to be routed. And then any 911 call that gets attached to that cell sector is always going to go to the 911 center that that sector is tied to, regardless of where the caller actually is jurisdictionally.

That is one thing that improved location data will help us to deal with, because it is not always the closest 911 center that that cell sector is tied to. A perfect example: in California, frequently a cell

sector will actually route you to a California Highway Patrol station that may be dozens or even hundreds of miles away, because originally that was where all of the wireless calls went to. It was assumed that they would be coming from highways and interstates and freeways and so forth.

In order to get past that problem to where we can start to route calls to particular places based on where the person actually is, we have to have faster location capabilities. But, moreover, in order to deal with the realities of how wireless is used today, indoors, in cities, in tall buildings with multiple floors, we have to have the ability to locate people precisely. And that means down to the room level and the floor level within a large structure.

This building is a perfect example. This is a large structure in an urban environment with multiple floors. Right here and now, it would be challenging for public safety to accurately locate any one of us or any one of you who made a 911 call. So we need those things.

We need better, we need faster, and we need vertical.

Now, I realize this is a lot, and as one of the other witnesses cited, public safety has said that, look, we need continued development so that we can get to the level we ultimately need. But here is the thing. Technology is available today—and the CSRIC process has already shown this. Technology is available today to improve our ability to respond to emergencies, to improve the ability of wireless networks and devices to locate consumers.

The time for further study, the time for further delay has passed. It is time we improve our ability to locate consumers when they are in trouble and the ability of public safety to get to them when they are in need.

Thank you.

[The prepared statement of Mr. Forgety follows:]

PREPARED STATEMENT OF TELFORD E. FORGETY III “TREY”, DIRECTOR OF
GOVERNMENT AFFAIRS & REGULATORY COUNSEL, NENA: THE 9-1-1 ASSOCIATION

Summary

1. The mobile revolution has driven a rapid consumer exodus from wireline service and explosive growth in indoor wireless use: more than 38 percent of all households are now wireless-only.
2. Wireless calls now account for more than 70 percent of all 9-1-1 traffic.
3. In some jurisdictions, as many as 50 percent of wireless 9-1-1 callers can provide no useful location information by voice.
4. Even where callers can provide *some* location information, latitude/longitude information is still used to assign and route field responders.
5. Some data suggest that carriers may not always meet their existing location performance obligations.
6. The Committee should support an FCC inquiry to determine whether carriers currently meet their obligations, and, if not, why.
7. Existing FCC rules do not require *any* ability to locate wireless callers when they dial 9-1-1 from indoors.
8. Technologies that are already in the market on a competitive basis can provide sufficiently improved outdoor location performance and sufficiently meaningful indoor location performance to justify their adoption.
9. The Committee should support an FCC rulemaking to begin the phase-in of indoor location performance requirements.

Testimony

Chairman Pryor, Ranking Member Wicker, and may it please the Committee: My name is Trey Forgety,¹ and on behalf of NENA: The 9-1-1 Association's more than 7,000 public- and private-sector members, I want to thank you for holding this hearing. Providing emergency response service is perhaps *the* core function of government, and 9-1-1 is the crucial first link between the public and emergency responders. I would also like to thank Senators Klobuchar and Burr for their leadership as the Senate Co-Chairs of the Congressional NextGen 9-1-1 Caucus, and Senator Boxer for her membership in the Caucus. All too frequently, we hear "public safety" described only in terms of field-response disciplines like law enforcement, fire, and EMS, so it is particularly meaningful that you and the other members of the Caucus have dedicated yourselves to ensuring that 9-1-1 is consistently recognized as a co-equal component of the public safety community. I am pleased, too, to be here today with representatives of the public safety radio community, the cellular industry, disability advocacy organizations, and technology providers. From consumer to telecommunicator to dispatcher, to field responder, each of these communities plays an important role in ensuring that emergency response services are available, accessible, effective, and reliable for everyone.

Since the establishment of the first official night watch at Boston in 1631, local governments throughout our country have worked diligently to ensure that all people can reach help in their moments of need. In 1968, that work culminated in the establishment of a unified emergency telephone number for all emergencies: 9-1-1. Over the years, 9-1-1 service evolved from little more than a call-forwarding destination to a system that was, for its time, remarkable in its sophistication and ubiquity. Enhanced 9-1-1 systems, introduced in the 1980s, can not only route calls to the correct local Public Safety Answering Point, but can also provide a call-back number in case a caller hangs up and display the address of the home or office building from which a call originates. As time marched on, however, new technologies radically reshaped the ways in which the public communicates. The '80s and '90s brought us a mobile revolution unimaginable only a decade before, and transformed the cellular telephone from an expensive, heavy luxury into a affordable, tiny, and ubiquitous means of communication.

As the mobile revolution unfolded, it presented a series of challenges to consumers, public safety agencies, and the nascent industry. Access to 9-1-1, call-back capability to deal with dropped calls, and caller location were all areas of significant technical and policy disagreement. One by one, these challenges were overcome, however, thanks to strong and unwavering voices from the public and the public safety community, and, in key instances, from industry leaders willing to do the right thing. Here, I would be remiss if I did not highlight the contribution of FCC Chairman Tom Wheeler: It was he who, as then-President of CTIA: The Wireless Association, engaged with NENA's then-President Mary Boyd to conclude an agreement on wireless E9-1-1 location capabilities that are the subject of today's hearing. Without visionary leaders like Chairman Wheeler and Mrs. Boyd, the United States might have succumbed to the forces of fear, uncertainty, and doubt, and lost valuable time in establishing wireless as a primary consumer technology. Even today, when mobile devices are used for everything from hailing a cab to ordering dinner, the sense of safety and security consumers derive from carrying a mobile device remains a key motivator for service adoption—a motivator premised on the ability of the consumer to reach 9-1-1 and of the 9-1-1 center to dispatch help.

In order to effectively respond to emergencies, 9-1-1 centers must be able to tell field responders *where* to go. The basic technologies, like GPS, which make that possible are now more than twenty years old, a lifetime in today's technology cycle. Yet there are still circumstances in which 9-1-1 centers cannot locate callers who, rightly and reasonably, believe that when they call, they can be found. Understanding that belief is critically important: In preparing for today's hearing, I spoke with

¹I joined NENA: The 9-1-1 Association in 2010 after two years as a Presidential Management Fellow in the Department of Homeland Security (DHS) Office of Emergency Communications. During my fellowship, I served temporarily with the Federal Communications Commission's (FCC) Public Safety and Homeland Security Bureau and with the Department of Commerce's National Telecommunications and Information Administration (NTIA). At the FCC, I developed recommendations for the Public Safety chapter of the National Broadband Plan. Later, at Commerce, I worked to implement the Plan's recommendations as NTIA evaluated applications to the Broadband Technology Opportunity Program (BTOP). Both at NTIA and DHS, I participated in discussions with senior administration officials from the Office of the Vice President, the Office of Management and Budget, the Office of Science and Technology Policy, and the National Economic Council to develop policies for the deployment of the nationwide mobile broadband network for first responders, now known as FirstNet. I hold a Bachelor of Science in Applied Physics and a Doctor of Jurisprudence, both from the University of Tennessee.

PSAP managers from several jurisdictions around the country. In Pennington County, South Dakota, for example, approximately 10–15 percent of callers can provide no useful location information at all. These callers typically fall into one of two categories: tourists visiting Mount Rushmore or hiking in the Black Hills, and travelers transiting the I–90 corridor. Even for callers who can provide some information, location coordinates still play a very important role: In 50–70 percent of calls, the caller is unable to provide a precise, dispatchable address. Examples of this type of call include tourists in hotels, hunters, who may only be able to describe the location where they parked based on a single road, farmers working in fields that are not associated with addressed structures, and patrons of shopping complexes calling from parking lots. In those cases, the caller’s information can sometimes be used to initially mobilize response assets, while the precise latitude and longitude are used to provide a final destination while the assets are in route. Outside South Dakota, the problem can be even worse in some areas. For example, in Horry County, South Carolina (home to Myrtle Beach and the “Grand Strand”), sixty miles of beaches, fertile riparian soils, and popular inland hunting grounds place millions of visitors, hundreds of farmers, and thousands of hunters in remote or unfamiliar territory every day. There, as many as 50 percent of callers cannot provide meaningfully precise location information. Consequently, dispatchers must resort to asking about nearby landmarks or waiting for latitude/longitude data. And, of course, for millions of individuals with hearing or speech disabilities, voice 9–1–1 calls (the only kind that can currently be made in all but ~20 jurisdictions), do not afford *any* opportunity to supply information, location or otherwise. To solve these problems and facilitate a public safety response, the FCC requires wireless carriers to implement location determination technology in their networks or subscriber handsets. Data derived from those systems can then be used by local Enhanced 9–1–1 systems to locate callers in need.

Wireless Enhanced 9–1–1 is deployed in two formally-defined phases, with an informal “Phase 0” added for the sake of completeness. Phase 0 permits wireless callers to reach a 9–1–1 center and provides only a call-back number in case a call drops. Phase I allows the 9–1–1 system to look up the address of the cell tower serving the caller, and in many cases the cardinal or inter-cardinal bearing along the center of the sector to which the caller’s device is attached (*e.g.*, N, W, NE, SW, etc.). Phase II allows the 9–1–1 system to request more precise location information related to the caller’s device, rather than the cell, and can provide the telecommunicator with an estimate of the caller’s latitude and longitude coordinates.²

PSAPs and 9–1–1 authorities must affirmatively request each phase of service from each carrier serving their jurisdiction once they have deployed the hardware, software, and training required to accept and handle each new form of location information. Additionally, in many states, PSAPs must pay carriers to provide the requested service out of state- and locally-collected 9–1–1 fees, often with no audit or capital amortization requirements. In those states much of the revenue collected in 9–1–1 fees each year never reaches local 9–1–1 centers because it is paid directly back to the carriers. As state legislatures have raided 9–1–1 funds as a quick fix for short-term budget problems, these dual pressures have left some local PSAPs contemplating a previously unthinkable reduction in service from Phase II to Phase I or less. While such a reduction would preserve core 9–1–1 operations, it would also place countless lives at risk as PSAPs and field responders struggled to locate callers without an address or lat/long coordinates. Yet while PSAPs face dual pressures reducing their funding, carriers reap a dual benefit to their revenues: Carriers sell consumer location data, often derived from the very same hardware and software that supports E9–1–1 operations, as part of Commercial Location-Based Services offerings, generating almost \$1 billion in revenues per year.³ Given the dual revenue

²In all cases, wireless 9–1–1 calls are routed to a Public Safety Answering Point based on fixed database entries that link each cell sector with a pre-selected PSAP, regardless of where a caller may be in that sector. That is, if a sector spans a jurisdictional boundary, all calls will go to the assigned PSAP, even if it does not actually serve the caller’s location. One estimate, based on an extensive routing study conducted in California, puts the fraction of sectors with central-bearing errors between 90° and 180° at 10 percent. Of course, not all such errors will necessarily result in misrouted calls: only those sectors that subtend an area encompassing a jurisdictional boundary will be subject to such errors. Consequently, states like Texas and Tennessee, which have a large number of sub-state administrative boundaries will likely experience a larger number of errors, while states like Nevada and Colorado, which have a smaller number of administrative boundaries, will likely experience fewer, assuming the California findings are consistent across network deployments in areas of varying jurisdictional density.

³Mobile Location-Based Services, 7th ed., Research and Markets (Feb. 2013) (available at <http://www.researchandmarkets.com/research/36fd44/mobile>).

stream E9-1-1 location systems have created for carriers in some states, then, it seems reasonable that the public should expect not only assurances of adequate location performance, but also concrete data to support those assurances. Until recently, however, public safety agencies have lacked both the ability to collect and analyze data on carrier network performance on their own. And although the FCC's basic Wireless E9-1-1 location accuracy rules have been in place for more over 12 years now, and localized county- or PSAP-level performance rules have since been promulgated, neither has the Commission collected any data on real-world carrier location performance. That paucity of data, however is no longer the rule.

The advent of "big data" analytics systems has begun to offer the public safety community a glimpse into the world behind the curtain. As PSAPs have deployed advanced Management Information Systems (MIS), call-data monitoring platforms, and cutting-edge analytics and visualization systems, they have gained insight into the apparent performance of entire E9-1-1 systems, including wireless networks. Here, it is important to emphasize that the data available to PSAPs is *apparent* data: It reflects the reality experienced by the front-line 9-1-1 telecommunicators responsible for answering calls on a daily basis, and does not include visibility into the records, interfaces, or flows of calls and data that lie strictly within carriers' networks. Nonetheless, it is the apparent data which matter: Telecommunicators cannot dispatch help based on information that never reaches them. As these apparent data have become available, they have raised myriad questions and legitimate concerns throughout the 9-1-1 community.

Over the Summer CalNENA, the independent chapter of my organization that serves the state of California, released data which appeared to show two causes for concern: First, the data showed a surprisingly small fraction of wireless 9-1-1 calls for which Phase II latitude and longitude data were displayed to the telecommunicator by the end of the call. Second, the data showed a long-term secular down trend in the fraction of calls for which Phase II latitude and longitude data were displayed to the telecommunicator by the end of the call for all but one of the four largest wireless carriers. Since that time, additional states and localities have filed data with the FCC, some of which supports the CalNENA findings, and some of which does not. After reviewing all publicly-available data in concert with the carriers, CalNENA officials, analytics experts, and NENA's own technical experts, we discovered several issues that could potentially explain, at least in part, the low overall apparent performance of the carrier networks, as well as the apparent down trend in the fraction of calls with Phase II data.

First, we discovered that the apparent down-trend in Phase II availability could be explained, at least in part, by an industry-wide transition away from older "network based" location technology to newer "handset based" technology. Network based location systems have historically used Location Measurement Units (LMUs) situated on cell towers to listen for precisely-timed transmissions from mobile devices. Based on the speed of light in air and certain other known properties of radio signal propagation, these units could then combine 3 or more distance measurements to estimate the location of the caller's device. This approach can provide a very fast "Time To First Fix," but only at the expense of producing a lower-accuracy estimate of position. Newer handset-based solutions, by contrast, can produce much more accurate position estimates, but take a longer time to acquire a fix as they must "listen" for signals from lower-powered satellite transmitters (*e.g.*, GPS, GLONASS). Because PSAP equipment typically makes an initial request or "bid" for Phase II location data at a fixed time after a call is connected, the transition from fast but less accurate technologies to slower but more accurate ones could have produced the trend observed by CalNENA in the absence of a timing change at the PSAPs. This would have lowered apparent location yield early in calls, but potentially improved location accuracy once a fix was obtained later in calls.

Second, we discovered that long-since overcome technical challenges associated with certain early CDMA handsets, coupled with erroneous beliefs about carrier charges for location update requests or "re-bids" had led to a widespread policy against the use of automatic re-bids. This policy may have prevented the PSAPs involved in the CalNENA study from receiving Phase II location information when it might otherwise have been available, thus lowering carrier's apparent rate of Phase II location delivery. Consequently, it could be assumed that reinstituting automatic rebids would raise the apparent fraction of calls for which Phase II location information is available.

Third, we believe that fundamental changes in consumer use patterns for mobile devices could be driving down the fraction of calls for which Phase II location information can be estimated. As originally envisioned in the FCC's rules and incorporated into wireless network architecture, location determination obligations were premised on callers using mobile devices outdoors. At the time, mobile airtime was

expensive, the vast majority of consumers still had landlines at home and at work, and cellular devices were still thought of as “car phones.” It was therefore logical to assume that such devices would be used primarily outdoors on roads and highways. Now, however, mobile devices have become the default and landline use has declined precipitously. In its place, almost 40 percent of consumers rely solely on wireless devices for their everyday communications needs, including access to 9–1–1.⁴ Indeed, most 9–1–1 centers report that more than 70 percent of all calls they receive originate from wireless devices. It follows, then, that a higher fraction of calls now originate from indoors locations where landline calls would previously have dominated. Because this state of affairs could not have been anticipated at the time the rules were implemented, it has caught consumers, public safety, carriers, and technology providers somewhat off-guard.

I wish to emphasize, however, that it is still possible that none of these explanations may fully explain the discrepancy between the levels of location performance reported by many carriers after the CalNENA filing and the levels found in the CalNENA study. To date, carriers’ assertions of aggregate performance levels have not included disclosures of the underlying data which might allow public safety agencies or the FCC to fully evaluate their claims. This is a key point: NENA has been unable to locate any record of a location performance audit conducted by the FCC since that agency first adopted its location accuracy rules in 2001. Carriers routinely report that they are in compliance with their location performance obligations. They may well be. But while NENA believes the general level of location performance to be decent, the experience of front-line telecommunicators, anecdotal though it may be, paints a concerning picture of real-world results. NENA therefore supports a policy of “trust, but verify.” To that end, we strongly support the establishment of a meaningful disclosure and monitoring regime to ensure that these critical public safety service obligations are met consistently throughout the United States. Whether such is a regime is established through cooperative efforts between NENA and the carriers or by the FCC, I sincerely hope we find that they are.

All of this debate about whose data says what and how it should be interpreted, however, is, to some extent, beside the point: Ultimately, what matters to the public safety community and to consumers is whether a caller can be accurately located when she or he calls for help. Circumstances today are very different than they were in 2001. New technologies are already in the market, ready to compete, and can provide improved location capabilities that reach inside homes and businesses to the places where consumers use mobile devices today. As mobile networks move into the 21st century with advanced broadband data capabilities and high-accuracy location technologies for consumer applications, it is critical that we ensure 9–1–1 systems are not left behind. Now, anticipation and speculation about a potential indoor location requirement may be holding back carrier investments in improved location technology.

Over the past year, the FCC investigated the potential of several new or improved technologies through a rigorous test bed process conducted through the Communications Security Reliability and Interoperability Council or “CSRIC.” CSRIC is a Federal Advisory Committee composed primarily of carrier and technology vendor representatives, but which also includes a few public safety representatives. As part of the test bed, CSRIC retained the services of a neutral, third-party testing company to ensure competing location technologies would be evaluated on a thorough and fair basis.⁵ The results of the CSRIC trials were clear: All three technologies subjected to testing could permit some degree of indoor location performance for some morphologies, and two of the three showed significant improvements over existing capabilities across all morphologies (*e.g.*, urban, rural, etc.).⁶ Likewise, a fourth solution provider that did not participate in the initial round of testing later submitted to the test bed’s scrutiny and also demonstrated the ability to provide meaningful location information for callers in indoor environments. And, lest these be thought the only technologies available, companies as diverse as Apple, Boeing, and John Deere have also introduced location technologies that could be leveraged for 9–1–1 purposes.

⁴ Blumberg, Stephen J., Ph.D., & Luke, Julian V., *Wireless Substitution: Early Release of Estimates from the National Health Interview Survey, July–December 2012*, Division of Health Interview Statistics, National Center for Health Statistics, Centers for Disease Control and Prevention (Jun. 2013) (available at: <http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201306.pdf>).

⁵ CSRIC Working Group IV: E9–1–1 Location Accuracy Indoor Location Test Bed Report (Mar. 14, 2013) (available at: http://transition.fcc.gov/bureaus/pshs/advisory/csrc3/CSRIC_III_WG3_Report_March_%202013_ILTestBedReport.pdf).

⁶ *Id.* at 35–36.

Because the market for new and improved location technology has proven its ability to better meet the needs of the public safety community on a competitive basis, NENA is convinced that the time for study is at an end: While we support the continued operation of the CSRIC test bed as a means to provide unbiased evaluations of new technologies willing to endure its rigors, we do not believe that its existence should become a perpetual excuse for delay. The public and the public safety community need improved location performance—both outdoors and in—today. Every moment we delay the start of those improvements lives, property, and productivity are needlessly lost. We therefore encourage the Committee to support immediate FCC action to establish indoor location performance targets and a concrete timeline for their implementation.

Respectfully submitted,

TELFORD E. FORGETY, III,
Tenn. BPR No. 027226,
*Director of Government Affairs
& Regulatory Counsel,*
NENA: The 9-1-1 Association.

Senator PRYOR. Thank you.

We are going to start our round of questions here.

Mr. Forgety, let me start with you on your last point there. You basically said we need better, faster, vertical, and you talked about technology. Is it your view that the technology is here today to get all this done, or are we still evolving the technology?

Mr. FORGETY. Senator Pryor, this has been an area of intense innovation across the wireless networking and wireless device space. The answer to your question straightforwardly is yes. We have technology now in wireless handsets that can locate us for commercial location-based services very precisely.

As Mr. Burroughs mentioned, there are challenges in terms of making sure that we have reliable sources when we use things like Wi-Fi, Bluetooth beacons to locate things. But there are also services that are out there on the market today, ready to go, that can get us in-building and vertical.

So the answer, quite simply, is yes.

Senator PRYOR. OK.

And let me do a follow-up there. Does it take the FCC to get all this done, or can industry and just, in a more collaborative effort get it done? Or does the FCC have to lead the way?

Mr. FORGETY. Senator, I would like to see a world where this can get done without FCC action. The reality for the public safety community is that, in general, it does take regulation, simply because we have a very diverse market.

You know, we may be able to get to, say, the top 4 or the top 10 or the top 50 carriers to get the right thing done. The challenge, ultimately, is public safety operates in every corner of this country, and every citizen, regardless of where they live, be it urban or extremely rural, deserves the same level of service.

Senator PRYOR. Mr. Burroughs, let me follow up with you on one of Mr. Forgety's answers there, where he said basically, in his view, the technology is here today. And I know you mentioned a lot about technology in yours. So is it your view that the technology is here today, or is it still evolving?

Mr. BURROUGHS. Both. There is certainly technology that exists today that is being deployed that improves the accuracy, and there is a continuous roadmap for it to get better over the years via standardization and future deployments.

Senator PRYOR. And does that also include the Z, the vertical?

Mr. BURROUGHS. Yes.

Senator PRYOR. And you think it is ready—I will use a layman's term. Is it ready for primetime? I mean, is it ready to be deployed nationwide?

Mr. BURROUGHS. The Z axis is a bigger challenge. The X-Y axis is being deployed in the 4G networks today.

Senator PRYOR. OK.

Ms. Smith, let me ask you a question about your experience as a PSAP manager. Can you just elaborate a little bit on some of the specific challenges that 911 call centers face in this wireless world?

Ms. SMITH. Yes. It would be hard for me to speak for any specific PSAP, so I will speak for my own, but I do know that we are seeing an increase in users of wireless phones. They are cutting the cord, as mentioned earlier today.

And we are seeing it—it depends on, when I ask my call takers and my staff, what are you seeing and what are you experiencing, depending on, you know, the day of the week and possibly the shift, I may get a different answer. So I don't have specifics, but we are seeing a rise in the trend.

Senator PRYOR. And if you feel like you are qualified to answer this, do you think that we need the FCC's leadership to, you know, get a nationwide system here? Or do you sense that technology and the industry will just kind of all work together and collaboratively get us there?

Ms. SMITH. We definitely support collaboration, but we also realize that there are times, there are occasions when we do need a regulatory body to help us go down that path.

Senator PRYOR. OK.

Mr. Guttman-McCabe, let me ask you—first, let me say I appreciate what your industry has done, as well as Mr. Burroughs' industry, not just company but industry generally, because you all really have been innovative in working on this and, you know, have been trying to lead the way on this. So I appreciate you all for doing that.

But will your association commit today to work with the FCC if they in fact do set a more formal process, if in fact they do actually get rolling on this officially? Will you all participate in that and try to work with them to update any standards or, you know, help them craft something that makes sense nationally?

Mr. GUTTMAN-McCABE. Certainly. Thank you, Mr. Chairman. And, certainly, we will work with the FCC, with public safety entities.

I have to say I do have some concern about a regulatory process, you know, happening before the technology actually exists. So while I agree to some extent with what Mr. Forgety and Mr. Burroughs said, I also look at the recent CSRIC process and the results that came out of the three entities that decided to test their location accuracy. The one that did the best found the person in one-third of the buildings where the call was actually being made.

So there is a great deal of work. I know that Qualcomm and others are working on technologies that absolutely will improve the process. The carriers are actively and aggressively involved in it. You know, a great deal of resources are being spent by all of the

entities at this table to try to move this process forward. And no one would like nothing more than to be able to locate someone, you know, in extremely close proximity to where they are actually making their call. That is the goal.

There is a concern—and, I mean, I sat in front of Congress 10 years ago and testified as we talked about some of the other 911 issues. And when those rules were set based on promises made by technology vendors that never came true, 10 years later and 30 FCC proceedings removed, we are still today talking about location accuracy at the numbers, you know, that we set many, many years ago. So I do want us to be cautious about having an FCC process get ahead of the actual technology capabilities.

When we sat in front of the Senate and the House on emergency alerts and we had a collaborative process that brought all of the parties together, like the current CSRIC process, we launched emergency alerts without any follow-on FCC proceedings, no appeals, no challenges, and we have a working technology in emergency alerts. The same is true with wireless priority service.

So I think a collaborative, CSRIC-based approach, which is actually reviewing in real-time a test bed, real products in real-time in a real location, an urban, a dense-urban, a suburban, and a rural environment, is the right way to move forward in this. And as the technologies are developed, our carriers will implement them. They have a history of implementing the technologies in this space aggressively and quickly.

Senator PRYOR. Thank you.

Senator Johnson?

**STATEMENT OF HON. RON JOHNSON,
U.S. SENATOR FROM WISCONSIN**

Senator JOHNSON. Thank you, Mr. Chairman.

Well, there is a conflict in testimony right off the bat here. So I guess let me go to Mr. Forgety.

You say the technology exists. So what is the hang-up? What is preventing it from being implemented effectively?

Mr. FORGETY. So I think we are looking at two things. First is a semantic difference. The technology clearly does exist. I think the challenge is public safety has a level of need. We want to be able to locate down to the room level and down to the floor level, but today we can't get anywhere close to that. And having the technology that we have today is clearly better than having nothing.

So having something that is better but maybe not perfect I think is still good. And I think from the public safety standpoint, we don't want to let the perfect be the enemy of the good and therefore delay implementing technologies that are available.

So the second thing, I think—

Senator JOHNSON. But, again, the question was, what is preventing us from utilizing what technology we have for the good as opposed to the perfect? What is preventing it?

Mr. FORGETY. And this, I think, is my second point, which is, at this point, we have gotten ourselves to a circumstance where the fact that the FCC has not acted may actually be preventing implementation of technologies, as everybody waits around to see what the action will be. In other words, until we know what the rule is

going to be, people don't want to spend capital to invest in products that might not meet what the ultimate rule is or might be overkill.

Senator JOHNSON. But what is the required action? What does the FCC have to do?

Mr. FORGETY. I think the FCC needs to open a rulemaking proceeding to decide what the requirements ought to be and what the time-frame for the phase-in should be for those requirements.

Senator JOHNSON. Mr. Guttman-McCabe, can you just respond to that?

Mr. GUTTMAN-McCABE. Certainly, Senator.

I guess I would question, sort of, based on what? So how do you set indoor location accuracy requirements when you just did a test bed and the three entities that chose to participate—there were nine that began the process. This is very similar to our original 911 process. There were nine that began; only three were willing to actually go through and test in the light of day in front of public safety officials, in front of other vendors, in front of the FCC, and in front of carriers. And none of those three were materially better in terms of, you know, the ability to deploy in a timely basis, the ability to find people accurately.

And we think this process is moving forward. I know that there is a standard that has been developed and it is part of the 4G networks. And as we deploy our 4G networks, our LTE networks, the capabilities absolutely improve. They allow carriers to run simultaneously multiple different services to try to find a person, which is unique and new.

And that is happening, I mean, the fact that we have people, you know, carriers and vendors all working together with public safety officials and the FCC to try to test these technologies. As soon as there is one that is capable, that is deployable—the one that worked the best has already said that, at best, it could come out in 2016 in 27 urban markets, or 26 urban markets.

So, you know, the reality is we are trying to find a solution that we can deploy throughout the United States to find people in your jurisdiction, in your state and in others, and do it in a way that actually improves the ability to find people.

Senator JOHNSON. So, Mr. Burroughs, you know, I am amazed at the advancement of—you know, I have the old navigation system in my car; I never use it because I use this. I am sitting in a house, and it has me—my little blue dot is right where I am sitting. So the technology has already advanced quite a bit.

I am concerned about writing rules at the FCC that do outstrip reasonable advances in technology. So I kind of want you to basically respond to that.

Mr. BURROUGHS. OK, yes. Thank you, Mr. Senator.

Yes, so I want to echo the concerns and comments from Mr. Guttman-McCabe here, is that you need the technology—the decision should be based on the actual data, the technology. And even though the 4G technology shows promise, it has yet to have gone through the scrutiny of a CSRIC test bed so that everyone can look at it in the light of day and see its performance.

We are confident that it will provide the type of performance you need to enable the location of indoor accuracy at some acceptable level. But you can't outpace the laws of physics, you can't outpace

the laws of the technology. So it needs to be tested, and then decisions based on that.

Senator JOHNSON. I mean, just listening to the testimony, it does sound like there is fair amount of collaboration, sounds like there is a real will within the industry. I mean, does everybody agree with that?

Mr. BURROUGHS. Yes.

Senator JOHNSON. I would like to quickly go back to you, Mr. Guttman-McCabe. I am concerned about liability protection. I would think that would be one of the real drags on moving this thing forward. If companies really feel like, you know, through their best efforts, they are trying to locate people, and if they are not quite perfect, all of a sudden they face lawsuits, I would think that would be a real concern. I would certainly want to support liability protection.

Can you speak to that in a little more detail, as well as the patent troll aspect here?

Mr. GUTTMAN-McCABE. Yes, certainly, Senator.

Well, the liability issue is a difficult one because it is currently based on a state-based regime. And it is difficult for carriers to go into specific states and say, your 911 liability protection legislation or regime is imperfect and it creates an invulnerability, because, you know, God forbid something were to happen in that state, you are now on record saying that the state's liability protection is lacking.

So we believe if something could happen, as it has in times, at the Federal level, you will provide sort of a blanket over top of that. If a carrier or a vendor or a PSAP is acting in, you know, its best efforts and really trying to provide this service, they shouldn't be the subject of litigation.

And so something at the Federal level which would provide protection for those that are actually responding to FCC rules or delivering on a 911 service, any provider of that service should be protected.

Senator JOHNSON. So does anybody disagree with that?

Mr. FORGETY. No. NENA has actually supported exactly the type of liability protection that Mr. Guttman-McCabe mentioned as part of the Middle-Class Tax Relief Act of 2012. Didn't make it in that round, but it is something that we categorically support.

Senator JOHNSON. Of course, we don't have any trial lawyers at the table there.

[Laughter.]

Senator JOHNSON. OK. Thank you very much, Mr. Chairman.

Senator PRYOR. Senator Blumenthal?

**STATEMENT OF HON. RICHARD BLUMENTHAL,
U.S. SENATOR FROM CONNECTICUT**

Senator BLUMENTHAL. Thank you, Mr. Chairman. And thank you very much for having this hearing.

As we have seen already, there is a real importance to assuring the kind of protection that I think all of you believe is increasingly important with respect to the location accuracy of E911 calls. And, as we all know, dialing these numbers can be one of the most im-

portant phone calls anybody makes in his or her own life, entire life.

I want to focus on the FCC rulemaking issue. Commissioner Rosenworcel has indicated that she believes that a formal rulemaking proceeding is important to explore these questions.

I understand, Mr. Guttman-McCabe, that you believe that advancing technology is an argument against rulemaking proceedings. But that happens all the time in the FCC; there is always advancing technology. And right now we have no rules.

So my question really is to all of you, but let me begin with Mr. Forgety and Ms. Smith, because your organizations believe that indoor accuracy must be improved and FCC requirements would help. At least that is the thrust of what I have understood your testimony to be.

Don't you think that the FCC should open a formal rulemaking proceeding to explore whether there can be standards and requirements imposed in this area?

Mr. FORGETY. Senator, the answer is yes and soon.

And, you know, to the point that advancing technology makes this a complicated question, it does, but that is why we have the Administrative Procedure Act. The Commission is bound to consider all of the evidence put before it, in terms of the performance capabilities of the various technologies. So I think the interests of innovators and carriers and location vendors would be protected through that requirement.

Senator BLUMENTHAL. Ms. Smith?

Ms. SMITH. And, yes, I echo "yes and soon."

Senator BLUMENTHAL. And let me just go, then, to whoever may be opposed to the formal rulemaking procedure. Don't you think that the public has a right and a legitimate expectation that there be standards in this critical area? Isn't that the purpose of the FCC's existence?

And shouldn't it at least begin to address this topic, giving all of you a chance, as it would be required by law under the Administrative Procedure Act, to be heard on what the rules should be and perhaps even whether there should be rules?

Mr. Guttman-McCabe?

Mr. GUTTMAN-McCABE. Sure. Thank you, Senator.

I don't disagree with the—absolutely don't disagree with the goal of trying to improve location accuracy outdoors, indoors, continue the evolution. We just launched text-to-911 to try to provide a solution in that space.

I have to say, again, having lived through it, I am concerned about initiating a regulatory process when we haven't found a technology solution, in spite of the fact of, you know, vendors that would have a great deal of financial interest in finding a solution can't find a solution, including the company next to me, which is a member of CTIA.

So I believe that the FCC has a process in front of it; it is the FACA, it is the CSRIC process, which they have convened. They have a bully pulpit if they don't think that that is moving quickly enough.

I do believe that that is a collaborative effort. I have been around these processes enough to know that, particularly in the public

safety space, that the collaborative processes work immeasurably better. I wrote a law review article on it, I felt so passionate about it—I don't know what compelled me to do that—about 5 or 6 years ago. But I believe that the collaborative process works better.

And I am fearful, to some extent, that, you know, the FCC is starting a process, that they will develop standards based on vaporware or assurances from vendors which won't come to pass. We have seen it before.

And so that is where our concerns lie, not with ultimately setting standards once we have a capability and a technology that can deliver on that. That is not where—and so I hope I am not misrepresenting my members or myself. But I just don't want to have the cart get before the horse.

Senator BLUMENTHAL. I understand that point. I don't know whether I will use the cart-and-horse analogy, but sometimes the certainty and predictability of a rule can be an assurance and an incentive for the private industry folks to know what they are aiming to do with new technology, what the standards and requirements are going to be. We hear a lot here about the problems of uncertainty and lack of predictability. And sometimes rules are a good thing.

Mr. GUTTMAN-MCCABE. Sure.

Senator BLUMENTHAL. And I happen to believe that a formal rulemaking process is appropriate and necessary in this area because of its importance and precisely because of the uncertainties that otherwise might prevail. But I think I understand your point.

I want to switch briefly, if the chairman would indulge me with just a couple more minutes, with a question for Mr. Stout on 911 for people with disabilities, particularly the hearing-impaired and speech-impaired.

I have heard from many of my constituents recently regarding changes by the FCC to the Internet Protocol Captioned Telephone Service, known as IPCTS. We deal here with acronyms by the dozens, and that one is a little bit tongue-tying, for me at least.

But I am sure you are familiar with the captioned telephone service, which is an amazing technology, and it supports vital services for the hearing-impaired and speech-impaired. But many of my constituents who depend on such services have written to me, worried about the impact of the rule changes by the FCC.

And one of the FCC's new rules requires users of IPCTS to press a "captions on" button at the start of a call to turn on the captions services. And I just want to read to you an excerpt from one of those letters because I think it was very telling, to me, to hear this information from a constituent from Hartford, whose father is 82 years old and suffers not only from hearing loss but also shakes as a result of some medical condition, I mean physical impairment.

And she wrote, "My primary reason for giving him the phone was so he would be able to call 911 in an emergency and would be able to understand instructions from the operator. If the captioning is not automatic, he has to use a shaking hand to push a button, which he may strike multiple times or not at all, making the button more scary and dangerous if he can't understand the person on the other line." So we are dealing with an 82-year-old gentleman

who has not only the hearing or speech impairment but also the physical impairment.

I would appreciate your perspective on telecommunications for the deaf and hard of hearing and your comments, most especially on whether you have heard any of these kinds of complaints about the added difficulties that recent changes have had and the effects on people, the captions on” button, any of the related change in the FCC rules.

Mr. STOUT [Speaking through an interpreter]. Certainly.

What you have to realize is that, historically speaking, for several years the consumers using the IPCTS phones had them on demand, so when the phone came with a phone call, then they were there. But in the last couple of years, the FCC made a decision to change that so that some people, particularly the hearing members that are in the household living with a person who does need to use the assistance of the phone, were making phone calls while the captions were still on even though that person didn’t need that because they were hearing. And that, unfortunately, was impacting the budget in the FCC; it was using the funds.

And so the FCC made that change to require that there was a default-off function on the phone. And so this is what happened to your consumer and to other consumers that are out there. So we have seen that.

I mean, the good news about that is that your constituent, the fellow that you mentioned in your story, could make an application to the vendor to request a waiver to that and could get back the original default-on feature for the device because of his particular medical condition. And so then he wouldn’t have to try and deal with the default-off function. And that is because he has a legitimate medical concern for that, and so there wouldn’t be an argument for him to have a default-on function.

But from what I have been hearing from the testimony of the other witnesses and from you Senators here today, we support the FCC going ahead and working on the rulemaking for this topic. For any of the disability access issues, we have seen that we need to have government and industry cooperation and that they all need to act together. If we wait for one company to innovate or another company to take the lead, we find ourselves wasting time and getting lost in the process.

I believe that it is time for the FCC to get involved in the rulemaking on this process, first of all, and then to come forth with a decision on the rule to the industry.

You know, as Mr. Guttman-McCabe mentioned, you know, it is an issue of allocation of resources within the location technologies. But, honestly, we can’t wait. We are going to lose more lives. And those people, our consumers, need to be protected, they need to be saved.

Senator BLUMENTHAL. Thank you very, very much. That comment was very helpful and insightful. And I think I am going to want my staff to follow up with you to see whether we can be helpful to my constituent.

Mr. STOUT. [Speaking through an interpreter.] I would be happy to work with you and your staff on that.

Senator BLUMENTHAL. Thank you. Because I suspect that many of my colleagues have constituents, as well, who may be affected by this problem. And so your being here today is especially meaningful.

And I would like to thank all of the panel members. I think this topic is critically important. And we may not have the huge turnout on this panel, but I can assure you that this is a topic that has—as we say around here, this topic has legs. And your contribution has been very meaningful. Thank you.

Thank you, Mr. Chairman.

Senator PRYOR. Thank you.

Senator Markey?

**STATEMENT OF HON. EDWARD MARKEY,
U.S. SENATOR FROM MASSACHUSETTS**

Senator MARKEY. Thank you, Mr. Chairman.

Chairman Pryor and I teamed up back in 2010 to author the Communications and Video Accessibility Act that President Obama signed into law in October 2010. And while years ago the whole question was wheelchair accessibility, in the 21st century it is Web accessibility. And you need an on ramp to the Web in order to make sure that everyone has access—the deaf, blind, everyone.

So, Mr. Stout, what unique challenges do deaf and hard-of-hearing Americans face in this increasingly wireless world, especially during emergencies?

Mr. STOUT. [Speaking through an interpreter.] It is important that when we make a call for help, when we are experiencing an emergency for ourselves or we are seeing somebody else experience an emergency that we are trying to provide help for, that we basically have the Life Alert support.

Senior citizens have Life Alert support, but deaf and hard-of-hearing people don't necessarily benefit from that. You know, if a senior citizen has an emergency, they can press a button that they are wearing on a chain around their neck and receive help. And the Life Alert company is going to call them through the phone or through some other type of voice technology.

But our constituent population isn't able to communicate in that way; they are not able to speak on the phone using spoken English to the Life Alert responders. So if you were to give us internal location identifiers on that type of emergency pager system, like Life Alert technologies, then we would have that kind of parity of access.

So it is not just about making calls from a specific place or location. We need to have the ability to call for emergency services wherever we are in space, wherever we go, and to do it in much the same way that any of you are doing that in your lives.

Thank you, Senator Markey.

Senator MARKEY. May I ask, do you have any personal experiences in your own life where personal location identification technology could have been helpful to you?

Mr. STOUT. [Speaking through an interpreter.] Sure, I would be happy to tell you about a situation that happened to me a couple of years ago.

For right now, my doctor has told me that I have some coronary artery issues, and it is something that I am living with. And a couple of years ago, I had an experience where I was experiencing some issues with my breathing. Fortunately, I was in a place where staff members were able to assist me and take me to the hospital and to work out and coordinate the emergency services.

But today I work in an office by myself. I have no staff as I did before, and so I am there by myself. And my office is in a multi-level building in an urban area. And so I am concerned about a future where if, God forbid, something like that should happen to me again, that a call for help would have to come from my pager, and it would need to be able to transmit the location details in the technology.

Thank you.

Senator MARKEY. OK, great.

So thank you, Mr. Chairman. This is a very important hearing. And it is important for us to ensure that we have cooperation that comes from all segments of the industry in order to resolve this issue. And hopefully that can be achieved. And I appreciate very much your conducting this hearing.

Senator PRYOR. Thank you. And thank you for your work on this and many other issues related to this. So thank you for your great service and leadership on that.

If I can, let me just say, with Mr. Stout, you know, in a lot of these other questions, we are talking about carriers and technology and government and systems, but we should never lose sight that the consumer, the end user, is critically important in making this whole thing work. After all, that is what it is all about.

So, Mr. Stout, thank you for your testimony today and for your insights.

But I do want to get back, if I can, to some of these larger topics. And, specifically, I guess I will start with you, Mr. Guttman-McCabe, if that is OK. I want to ask about Phase II compliance data. And I know this is kind of technical, but the panelists understand this very well.

Do you think additional disclosure of Phase II compliance data could be helpful to spur additional conversations about location accuracy?

Mr. GUTTMAN-MCCABE. Mr. Chairman, I know that the carriers are constantly drive-testing their market, constantly having thousands of calls in each individual county. I also know that the reality is, anytime there is a problem at a PSAP or PSAP level, the PSAPs can interact with those carriers and get the data that they need. You know, we have reached out to CalNENA, for example, to talk about trying to test some of their PSAP markets to see if there are, in fact, problems.

So I don't believe a formal process is necessary. I think it is working now. I believe a formalized process is taking resources away from exactly what we are trying to do here.

And I think it is important to note, when you talk about 911, we don't have one thing going on right now. We are simultaneously trying to deploy text-to-911, which is, you know, taking a network component that wasn't designed for our service and trying to rig that service in to help people from the hard-of-hearing and the deaf

community. And we are also simultaneously trying to improve location accuracy as we are working on a third element, which is next-generation 911, which will give additional capabilities to the PSAP community—schematics.

So I don't believe a formalized process is necessary, although I know that our carriers are willing to work with any PSAP that believes it is having some concerns or issues.

I think the CalNENA response was a perfect response. The four carriers very quickly did testing, provided it formally. And 2 weeks after that testing, the California Governor's office submitted a letter to their PSAP saying, we are formally removing the proposal that you don't rebid.

And so, to me, that was a perfect example of how carriers were ready, they were at the call. I do believe we wish CalNENA had spoken to the carriers before they submitted the filing, but we think the results of it showed that the carriers were hitting their targets and hitting the requirements. And it actually resulted in a positive movement, we think, by the Governor's office and ultimately by CalNENA that they will begin the process of rebidding again to actually get the more granular data.

Senator PRYOR. OK.

Mr. Forgety, did you have any comment on that?

Mr. FORGETY. So, Senator, I would say a couple of things.

Mr. Guttman-McCabe is absolutely correct, we were very pleased with the collaborative response of the carriers, their willingness to work with us once our independent California chapter had submitted the data that they supplied to the FCC. And he is absolutely correct that they have since turned on rebidding statewide, or they are moving to do that.

I do want to be careful because of the fact that it has not been resolved conclusively yet that the only thing going on in California was a lack of rebidding. I don't think there is any question that that certainly affected the quality and the meaningfulness of the data that CalNENA submitted, but I think it is a bit early to say that that was all that the data from there showed us. So I think the important thing is that over the long term we have a more meaningful process to have that dialog.

The public safety community is only just beginning to get access to the kinds of location performance information that carriers have available internally from platforms available from Qualcomm and others to look at their performance data. And I think it is going to be part of an ongoing conversation. It is one we look forward to having.

We certainly hope that the carriers continue to be forthcoming with their granular data and continue to work with us to make sure that we understand what the data from one side or the other is actually saying.

Senator PRYOR. OK.

Excuse me, I know we have been joined by Senator Ayotte here. I will give her just a moment to collect her thoughts since she just sat down.

But let me, if I can, circle back around with you, Mr. Guttman-McCabe. In your opening statement, you kind of concluded with

three points, and I want to take those, if I can, just quickly, because I know we have other senators that want to ask questions.

But the third point was, I think, the point-of-sale collection. And my question for you is, is that best done at the retailer level, is that best done at the manufacturer level, or by the service provider? And I know you mentioned states. What is the ideal system there?

Mr. GUTTMAN-McCABE. At the retail level. Because of the uniqueness of a prepaid consumer, it is best done at the retail level. We have 17 states remaining where we would love to see some action by those states.

Senator PRYOR. And let me just interrupt right there. At the retail level, that means there is a one-time fee, basically, at the cash register?

Mr. GUTTMAN-McCABE. Correct.

Senator PRYOR. Now, if I were to go to, you know, a Verizon or to AT&T or a T-Mobile store, whichever one, am I paying monthly as I pay for my service?

Mr. GUTTMAN-McCABE. As a postpaid, you are paying monthly. You are paying through your bill.

Senator PRYOR. And so on prepaid, though, shouldn't they be collecting it if the people, you know, add more to their prepay, you know—I don't—

Mr. GUTTMAN-McCABE. Yes. I am turning back to—

Senator PRYOR. That is OK.

Mr. GUTTMAN-McCABE.—Mr. Carpenter. But, yes, as you refresh, you would—

Senator PRYOR. Pay.

Mr. GUTTMAN-McCABE. Yes, correct.

Senator PRYOR. OK. That is what I think, too.

OK. And you mentioned that all the fees—no fees should be diverted, right—

Mr. GUTTMAN-McCABE. Correct.

Senator PRYOR.—into other things?

Mr. GUTTMAN-McCABE. Correct.

Senator PRYOR. And is that happening right now?

Mr. GUTTMAN-McCABE. It is. It is. And we are seeing, you know, as many as a half dozen or more states each year are raiding the funds. And that is having a negative impact on the PSAP community. We think it is taking funds that were collected from consumers specifically for the 911 purpose and being redirected. And we have seen, you know, stories of what they are being used for, everything from dry cleaning, to things that make absolutely no sense, to just closing budgetary shortfalls.

And there are a number of states who have been guilty of it repeatedly over the last 3 or 4 or 5 years. And we would love, you know, at least a bully pulpit from Congress and even using some of the resources at your disposal to condition funding on not raiding those accounts.

It doesn't make any sense if there is an expectation from a consumer that you are paying for 911 funds out of their hard-earned money and it is being redirected to close budget shortfalls or other things that have nothing to do with emergency services.

Senator PRYOR. Right.

And you also mention limits on liability. And I know we have already had some discussion; you have had a couple of questions about that. But let me ask this: Currently, in the various states—this is a state-by-state issue—

Mr. GUTTMAN-McCABE. Correct.

Senator PRYOR.—are your members being sued currently in the various states?

Mr. GUTTMAN-McCABE. We have had suits over time. And part of the concern is some of the statutes, when they were written, were written for just a landline world, and so the language that was used includes things like “landline” or “phone” or “connected” or “wired.” And as you begin to use an IP-based or wireless service, particularly as you move to next-generation 911, there is a greater concern that that service would fall outside of the scope of protection.

And, some of our members have different thoughts about how to interpret those states. But there certainly is vulnerability in a fair number of states. I wouldn’t want to give a number on the record, but it is sufficient enough that there is concern.

Senator PRYOR. OK. Well, as we go forward, we will continue to talk with you about that.

Senator Ayotte?

**STATEMENT OF HON. KELLY AYOTTE,
U.S. SENATOR FROM NEW HAMPSHIRE**

Senator AYOTTE. Thank you, Mr. Chairman. I appreciate it.

I want to thank the witnesses for being here.

It strikes me that clearly there are concerns that exist with location capabilities on 911 calls originating from wireless devices. That is why we are all here today.

As we continue to look at this issue as a committee and how to best put in place policies and technologies that protect those in need during times of emergency and crisis. There is one thing that I would hope—and that is, that we always get the best results when we work together in a collaborative effort. There is a multi-stakeholder effort where we are all working together to get the best results for consumers.

And I know that we all want the best 911 system to function and make sure when someone picks up to make a call, he or she is going to get an emergency responder on the other end. We know that lives are at stake. So everyone at this table and the organizations that you represent, the best thing will be when we all work together and we find a way to work out some of the differences we have here. That is my hope for today.

There has been a lot of discussion about calls originating from densely populated areas and more specifically issues with calls originating from indoors. But New Hampshire, geographically, has many rural areas, and just like other areas, there is a high percentage of those who are making emergency phone calls from wireless devices.

Can you talk about the location challenges facing rural areas? And also as wireless carriers update their location accuracy technology, will public safety answering points make adjustments to

the technology that they use? And do these answering points have the ability to keep up with what the wireless carriers are offering?

Mr. FORGETY. I will be happy to take that, Senator Ayotte.

I think, to your first point, I come from a very rural part of east Tennessee. My family and my friends are farmers and sportsmen. And the reality is, in rural parts of the country, people are not just clustered around the towns and the highways. They are out in the woods, they are out in the fields. There is a lot going on, sort of, beyond the boundary of civilization.

Those are very challenging areas for public safety for a couple of reasons. Accessibility physically is a big one. But in terms of location accuracy, we tend to think of broad, open spaces as easy to deal with, because you are out, you are under an open sky, you can get 12 GPS satellites, plus differential corrections, plus all these other wonderful things that make positioning much better, theoretically.

But those are precisely the situations when Phase II is the most important, when that latitude and longitude is the most important. Typically, the reason for that is because you are not around physically addressed structures or prominent landmarks that you can use for positioning.

So a hunter may be able to tell you, you know what, I drove in off of Route 50, parked the truck under a big oak tree by a stone wall, and I hiked into my tree stand, which is about three-quarters of a mile to the east. That is not exactly precise location data. So those are the circumstances where, you know, we really have to have that Phase II latitude and longitude capability in place.

To your second point, there are, to some extent, changes that PSAPs have to make in order to keep up with newer location technologies. I am happy to say that the existing database processes that we have in place do have provisions in the protocols and in the fields to deal with other location elements that we don't currently have access to because the underlying positioning technology can't report them, so things like vertical location.

The good news is that we are already seeing deployments of Next Generation 911, which also makes it much easier from the standpoint of public safety to accept an extensible set of location parameters, including things like barometric altitude and room numbers and suite numbers and so forth.

Senator AYOTTE. Does anyone want to add to that?

Mr. BURROUGHS. Yes, sure. So I think you raise a good point about the ability for the public safety to be downstream and accept the advances of technology. In the rural case, to me, that is textbook Phase II A-GPS. Certainly, if the PSAPs aren't rebidding or somehow the position—

Senator AYOTTE. I know the experience, having been an attorney general, of making sure that all of the various law enforcement agencies actually had devices that could communicate with each other on the same radio frequency, took a long time in a state like mine and it wasn't unique to New Hampshire.

So when we think about the new technology in this context, I think there are similar challenges.

Mr. BURROUGHS. Yes. And I think the CalNENA report is an example of how we are not even current with our current best prac-

tices. All right? So the Phase II fixes were getting lost somewhere along the way.

So as we enrich the quality of the Phase II fixes and start to provide additional identifiers that might be indoor-specific, 6,000 PSAPs have to be able to sync that, and that is a challenge.

Senator AYOTTE. I think one of the challenges we face as a committee, as well, is any legislation that we put forward, will not account for the fact that the technology is always changing, and the anticipation of those changes. We didn't want to create more problems and hamstringing you just because we didn't know the next new thing that was coming.

I thank all of you for being here. To make sure when someone makes a 911 call, there is someone on the end of that line, and he or she is going to get the response needed to save their life or the life of someone that they know, is a very important topic. So thank you.

Senator PRYOR. Thank you, Senator.

Let me just follow up with a couple of short questions. And I will probably direct these to Mr. Burroughs.

Did you or your company participate in the FCC workshop recently on this issue?

Mr. BURROUGHS. Yes, I did, myself, personally.

Senator PRYOR. And was that helpful? Was that a constructive process?

Mr. BURROUGHS. Yes, I found it very helpful and very constructive.

Senator PRYOR. OK, great.

Let me ask about 4G LTE. As that, you know, continues to roll out around the country and as developments happen there, does that help solve the accuracy problem indoors and outdoors or not?

Mr. BURROUGHS. Yes, per my testimony, we believe it is a very compelling technology for indoor.

There is not an outdoor accuracy location issue, as far as I am aware. A-GPS works wonderfully.

Senator PRYOR. Right.

Mr. BURROUGHS. A-GPS even works indoors, is a point I would like to stress.

Senator PRYOR. Right. In your testimony, you went through a little riff on that, and I want to make sure I was following that.

Mr. BURROUGHS. Yes.

Senator PRYOR. So you think just, kind of, the nature of 4G LTE helps this issue considerably indoors?

Mr. BURROUGHS. Yes. So what you saw in the CSRIC report was the 3G terrestrial cellular base station range and technology—

Senator PRYOR. Right, right.

Mr. BURROUGHS. And as you go from 3G to 4G, you get a lot of inherent benefits of 4G—higher bandwidth, the actual efforts of the standards body to set a bar above 3G performance, so 4G. The 3GPP standards body just added a bunch of enhancements to the base stations to outperform 3G, and we are already seeing the fruits of that labor.

But to CTIA's point and our company's point, it needs to be properly vetted through a CSRIC process. It needs to be a multivendor environment for it to be successful. You are seeing some single-ven-

dor technology displays, but that ultimately will falter due to a lack of a healthy ecosystem. So if you can't procure infrastructure or handsets or chipsets or software from a healthy ecosystem, I think it is doomed to fail.

Senator PRYOR. I think the outdoor location issue, you know, may be more related to, you know, heavy forestation or mountains, things like that. Do you think that 4G helps that, as well?

Mr. BURROUGHS. Well, so 4G is a function of the base stations. So if you can make a call, then you have 4G coverage.

Senator PRYOR. Right.

Mr. BURROUGHS. So that is step one. If that is physically the only base station around you, then the technology I discussed wouldn't help.

Senator PRYOR. Right.

Mr. BURROUGHS. But the technology, as it is designed, has a hearability reach, a range, that is greater than even for cellular coverage. So you will pick up additional base stations that aren't used for cellular coverage that you couldn't make a voice call on. So it could potentially contribute.

There are also other means to augment the satellite system outdoors, as well, right? There are multiple constellations and things like that.

Senator PRYOR. OK.

Well, listen, this hearing has been great. And what we are going to do is we are going to keep the record open for 2 weeks. And what that means is we are going to allow any of our members who either couldn't stay or, you know, didn't have time to ask all their questions or couldn't make it today, we will let them submit to us questions. We will get those to you. We would love a prompt response on those, if possible. But we will keep it open for 2 weeks, so for all the staff to know that.

And also we just wanted to, more than anything, just say thank you all for being here. I know it took a lot of time to get here and participate in this. And all of your testimony has been very, very helpful.

And, with that, what I am going to do is conclude the hearing and, like I said, leave the record open for a couple of weeks.

Thank you very much.

[Whereupon, at 11:59 a.m., the hearing was adjourned.]

A P P E N D I X

PREPARED STATEMENT OF HON. AMY KLOBUCHAR, U.S. SENATOR FROM MINNESOTA

Mr. Chairman, thank you for holding this important hearing to discuss the importance of improving 911 location accuracy.

As Co-Chair of the Next Generation 911 Caucus, I believe that new technologies can be enormously helpful to our first responders, provided they are compatible with existing systems. Cell phones are the most obvious example of this. The FCC estimates that 70 percent of 911 calls are now made from cell phones. But because these devices are by definition mobile, it's not always easy for call centers to gauge their exact location.

That's a big problem, especially if we're talking about a car crash where the caller doesn't know where they are or an emergency in a building where the caller cannot describe an exact location or which floor they're on. In either scenario, 911 call centers should be able to pinpoint the callers' location.

To address this issue, the FCC has started requiring wireless carriers to provide more precise location information and has set benchmarks to make sure those goals are met. I know that there are technologies being tested to improve accuracy for mobile 911 calls and I hope the FCC will examine them carefully and make sure they are the right solutions to protect the public.

But we will still have work to do in ensuring our emergency response systems can reliably communicate with cell phones and next generation innovations. I was pleased to read FCC Commissioner Jessica Rosenworcel's editorial in "The Hill" where she called on the FCC to update its rules requiring location accuracy standards for 911 calls made from wireless phones indoors. I look forward to the Commission taking action to protect the public and ensure that first responders are able to get the information they need to get to any scene in as little time as possible and save lives.

DIRECT TECHNOLOGY
Roseville, CA, January 27, 2014

Senate Subcommittee on Communications, Technology, and the Internet
Washington, DC.

Re: For submission to the Record of Senate Subcommittee on Communications, Technology, and the Internet held on Thursday, January 16, 2014, at 10:30 a.m. titled, "Locating 911 Callers in a Wireless World."

Dear Senator, Senate Subcommittee on Communications, Technology, and the Internet:

My name is Fred Michanie, and I am the President and Founder of Direct Technology, a Delaware corporation with headquarters in Roseville, California, and offices in Bellevue Washington.

I have been involved in Public Safety since 1997, and I currently participate in multiple industry standard setting bodies including *CSRIC IV*, *iCert* and the National Emergency Number Association (NENA), where I hold a board member seat in the California chapter—CalNENA.

Back in 1997, when I was first introduced to the industry, I remember my dismay when I realized that one of the most critical services provided to the citizens of this great nation had no platform for reporting and accountability at either Statewide or National levels. More disturbing was and continues to be the fact that major Federal agencies such as the FCC utilizes self-reporting practices from the major telecommunication companies to validate compliance with regulations and 911 industry standards.

In response to this apparent void in reporting and accountability, Direct Technology developed a Public Safety Intelligence and Reporting platform named

ECaTS—Emergency Call Tracking System. The goal of this product was to collect, analyze and report against all 911 data within large Public Safety jurisdictions and utilize the extrapolated intelligence to assist State and County managers to implement efficient and cost effective 911 practices. Another goal of this solution was to empower those agencies responsible for making 911 decisions and enforcing regulations with the data necessary to ensure compliance, analyze the impact of new technologies to the 911 infrastructure. The 911 industry has embraced this concept and the product is currently installed at more than 1200 Public Safety Answering Points (PSAPs) across the United States. We are currently the only organization in the country with real, unbiased information that illustrates the health and issues in the 911 industry.

After listening to the 911 Wireless Call Location Accuracy, I was reminded of the fragile state of this most critical industry. Wireless and Telecommunication companies are self-reporting on items as pivotal as the presentation of wireless call and caller information both when the call arrives at the PSAP and for the duration of the call itself. The FCC has established multiple regulations that deal with wireless call routing, call location, subscriber information, but it does not have the independent and unbiased tools required to ensure and enforce their compliance. It was apparent during the hearing that the Committee could also use such information and associated intelligence to impartially and objectively understand the real impact that failure to comply with FCC regulations could have on the citizens of the United States. This is particularly important for citizens with disabilities whose very lives may be on the line should technology fail to deliver accurate and reliable location information to the call taker processing the emergency call.

Senators, with the advent of Next Generation (NextGen) 911 to support rich media and text-based communications between citizens and the Public Safety Answering Points, it is now more critical than ever that a ubiquitous, impartial and objective National Public Safety Intelligence and Reporting System be implemented. Without such a system, it is truly impossible to understand the health of our Public Safety Industry, the impact of companies failing to comply with regulatory statutes or the unforeseen and unknown risks associated with newer technologies that such as NextGen 911.

Please feel free to contact me directly at 916-501-9036 or e-mail *fmichanie@directtechnology.com*. Thank you and I look forward to speaking with you.

Respectfully,

FRED J. MICHANIE,
President and Founder,
Direct Technology, Inc.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. BILL NELSON TO
GIGI SMITH

Question 1. I have been a strong supporter of the move to Next Generation (“Next Gen”) 911 services. In my NET 911 Act, we made it the duty of IP-enabled voice providers to offer 911 services. Since then, we have also made progress in a number of other areas—including incentives to get states to become “early adopters” of Next Gen 911 systems.

I think the promise of Next Gen 911 systems is great, especially in terms of their resiliency during natural disasters. I am concerned, however, about the level of coordination on the Next Gen 911 effort.

We currently have the 911 coordination office with NTIA and NHTSA. Last year, the FCC provided to this Committee its statutorily required recommendations for creating a framework for the transition to Next Gen 911. In addition, I know the FCC is working on several other Next Gen activities. Do members of the panel believe these efforts are working well—or is further centralization or coordination of this effort necessary?

Answer. Senator, thank you for your leadership on the NET 911 Act and for your commitment to improving 9-1-1. APCO believes that a challenge facing stakeholders in NG9-1-1 deployment is a lack of coordination at the national level. Accordingly, there should be a multi-federal agency program to guide NG9-1-1 deployment, consisting of the Federal Communications Commission (FCC), the National Highway Traffic Safety Administration (NHTSA), the National Telecommunications & Information Administration (NTIA), and the Department of Homeland Security (DHS) that leverages and combines each individual agency’s expertise. This program should be led by the FCC and actively involve the other Federal agencies. The body should be given the responsibility of working with the public safety community to

create a standard, national framework that PSAPs can follow to ensure secure, effective, and efficient NG9-1-1 deployments.

Additionally, APCO appreciates the importance that Congress and the Commission have placed on ensuring timely and effective deployment of NG9-1-1 services. NG9-1-1 technology will lead to real advancements in emergency response, saving lives, securing property, and protecting the homeland. At the same time, NG9-1-1 deployment will require careful study and coordination to ensure success. APCO is pleased to contribute to this effort in any way it can.

Question 2. I am pleased to see the progress that has been made to date between public safety and the four nationwide wireless carriers to provide “text to 911” services to consumers later this year. The ability to text to 911 is particularly important for individuals who are deaf or hard of hearing.

In advance of the roll-out of “text to 911,” however, I want to be sure all stakeholders are carefully considering special location information issues associated with such a service. For example, if someone is sending a text on a device that is using Wi-Fi rather than a carrier network, will that text get to the correct 911 operator?

Answer. APCO is pleased to have played a leading role in the development of an agreement with the Nation’s four largest wireless carriers on a voluntary commitment to offer text-to-9-1-1 services. Text-to-9-1-1 capability will substantially improve the ability of individuals to seek emergency assistance when a voice call is not feasible. It will also be invaluable for individuals with speech or hearing disabilities, in rare situations where a voice call to 9-1-1 might be dangerous (*e.g.*, a hostage situation), or when voice calls are being blocked due to unusual network congestion.

Identifying the location of the person texting to 9-1-1 is essential to proper routing and efficient and rapid emergency response. APCO believes that the routing of texts based at least on cell sector location is currently feasible. Further, accurate location information for each 9-1-1 text should be provided to the PSAP. Ideally, that location information should be at least as accurate as the Phase II requirements for wireless voice calls to 9-1-1.

We are pleased that the FCC has recently sought comment regarding text to 9-1-1 on issues such as location and use of Wi-Fi networks, and we look forward to weighing in during the public comment period.

Question 3. After hearing the testimony today, I am somewhat worried about the ability of first responders to find 911 callers in large, multi-story buildings. This is obviously a very serious issue. How close are we to solving this issue—which is essentially getting phones to send the pinpoint “vertical” or “height” coordinates to the public safety answering points? Is there anything Congress can do to expedite deployment?

Answer. APCO has frequently urged the Commission, wireless carriers, and location technology providers that improvements must be made in location accuracy for 9-1-1 calls made from indoor locations. And, as I mentioned during my testimony, growing reliance on wireless devices for making 9-1-1 calls from indoor locations is limiting, and will continue to limit, the location accuracy for those calls. Further, precise location is especially important for indoor calls, including a vertical element, as emergency responders are often unable to make visual contact upon arriving at the approximate address (*e.g.*, a call for medical assistance from inside a large apartment or office building/complex, as opposed to an outdoor emergency such as a vehicle accident). APCO would certainly support revised FCC rules that require significant improvements in indoor location accuracy over a period of a few years (and ultimately including a vertical or z-axis component).

We are pleased that the FCC has recently sought comment on a number of wireless 9-1-1 location issues, including for calls placed from indoors. We look forward to participating in the public comment period.

Question 4. In the written testimony, there is a fairly robust discussion of both the network-based and handset-based (GPS) technology currently used to locate people on wireless devices who call 911—and their accuracy rates. Are there other technologies on the horizon that may prove even more effective in locating people calling 911?

Answer. While the technology industry may be best positioned to respond to this question, APCO looks forward to working with all stakeholders, including our partners in industry and the public safety community, location technology vendors, the FCC, and this subcommittee to implement the best and most effective technologies for wireless location accuracy.

Question 4a. If so, when should we expect to start seeing those technologies show up in consumer devices?

Answer. We would respectfully defer to other stakeholders with expertise in wireless location technology and the consumer marketplace.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. AMY KLOBUCHAR TO
GIGI SMITH

Question 1. The wireless industry has suggested that the solution to this problem is for 911 call centers to request updated location information from the providers or “rebid” the 911 calls in order to get that information. Can rebidding alone completely solve the problem of untimely or inaccurate location information being delivered to the 911 call centers?

Answer. Because the best location data may not arrive with the initial wireless 9–1–1 call, a common practice for call-takers is to solicit updated location data from the wireless carrier at some point after initiation of the call, which is known as a rebid. Rebidding for this information often affords more accurate, Phase II location information, which provides the PSAP call-taker with the latitude and longitude of the wireless caller. The Phase II information provided to the PSAP must meet FCC accuracy standards, ranging from 50 to 300 meters, depending on the type of technology used.

However, Phase II information sometimes lacks sufficient accuracy to ensure a rapid and efficient emergency response. This is especially the case for calls from indoor locations, where accuracy is compromised both by the technical limitations of GPS, and the lack of vertical information (often referred to as the “z-axis”) for tall buildings. Yet, location is especially important for indoor calls, as emergency responders are often unable to make visual contact upon arriving at the approximate address.

Additionally, delays associated with a telecommunicator or dispatcher obtaining an actionable location prolongs the time it takes for first responders to reach an individual in need of help. The rebidding process can add up to 30 seconds to the call-taking/dispatching process, potentially delaying emergency response to the correct location. For indoor locations, even a rebid may not provide sufficient information for responders to locate the caller quickly in a building (or identify the correct building in a densely developed area).

We are pleased to see that the FCC has recently sought input on ways to improve wireless location accuracy, including for indoor calls, as well as examining ways to shorten the “time to fix” interval so that accurate information is delivered more quickly. We look forward to participating during the public comment period.

Question 1a. How long does a rebid take for a Public Safety Access Point (PSAP)?

Answer. As an American National Standards Institute (ANSI) certified standards development organization, APCO International has developed an ANSI standard (APCO ANS 1.103.1–2008, Effective Practices 380741–45) along with training protocols and best practices for addressing the rationale and methods for rebidding wireless 9–1–1 calls. APCO recommends that PSAPs rebid the Phase II location data to ensure the most accurate information is available.

Because policies on rebidding vary from agency to agency, I can only comment on my experience as the Police Operations Manager for the Salt Lake Valley Emergency Communications Center in West Valley City, Utah. At my PSAP, the phone system we use automatically rebids every 15 seconds. Further, because even 15 seconds in some cases can be too long to wait, call takers can also manually rebid the location information at shorter intervals. However, the rebidding process can add up to 30 seconds to the call-taking/dispatching process, which can potentially delay emergency response to the correct location.

Question 1b. What proportion of 911 calls will not be located accurately by rebidding?

Answer. APCO does not have specific data on the proportion of 9–1–1 calls that are not located accurately by rebidding. However, in my experience, the proportion of calls for which rebidding will not yield sufficient enough accuracy for emergency response varies from agency to agency, and indeed, even from call-taker to call-taker, due to a number of factors. These include the topography of the region the PSAP covers, and the technology used to determine the location of the wireless caller.

The predominant location technology for most wireless 9–1–1 calls, is “Assisted GPS” or “A-GPS,” and has been generally effective in outdoor locations. However, A-GPS relies in large part on having direct line-of-sight for GPS signals, which do not penetrate buildings well in most cases. Regardless of rebidding practices, wireless 9–1–1 calls from an indoor location will thus generally provide significantly less accurate location information than a call from an outdoor location. Further, even

outdoors, natural and man-made features, such as “urban canyons,” mountainous terrain, and heavy forestation, can negatively impact location accuracy determined with A-GPS.

Question 1c. Would PSAPs need to upgrade their technologies in order to receive vertical as well as horizontal spatial location?

Answer. Multiple PSAPs in the United States currently have the ability to receive and work with vertical or Z axis location information. Further, some systems already have the ability to utilize Z axis as part of the system feature package. However, many PSAPs will need to upgrade their systems to process Z axis information. Some will have Z features incorporated into their software in the near term as a result of normal upgrading or upgrading to Next Generation capability. The remaining PSAPs will need to consider upgrading to receive this capability.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. BILL NELSON TO
CLAUDE L. STOUT

Question 1. I have been a strong supporter of the move to Next Generation (“Next Gen”) 911 services. In my NET 911 Act, we made it the duty of IP-enabled voice providers to offer 911 services. Since then, we have also made progress in a number of other areas—including incentives to get states to become “early adopters” of Next Gen 911 systems.

I think the promise of Next Gen 911 systems is great, especially in terms of their resiliency during natural disasters. I am concerned, however, about the level of coordination on the Next Gen 911 effort.

We currently have the 911 coordination office with NTIA and NHTSA. Last year, the FCC provided to this Committee its statutorily required recommendations for creating a framework for the transition to Next Gen 911. In addition, I know the FCC is working on several other Next Gen activities. Do members of the panel believe these efforts are working well—or is further centralization or coordination of this effort necessary?

Answer. I cannot say for sure on whether the efforts are working well with the FCC on related Next Gen activities. I would ask the FCC directly about them, ask for an update on these activities from FCC. Please know FCC has done an incredible job addressing our disability access needs such as TV captioning, relay services, IP captioning, broadband access, and emergency communications. Ask them for an update, along with some coverage on disability access.

Question 2. I am pleased to see the progress that has been made to date between public safety and the four nationwide wireless carriers to provide “text to 911” services to consumers later this year. The ability to text to 911 is particularly important for individuals who are deaf or hard of hearing.

In advance of the roll-out of “text to 911,” however, I want to be sure all stakeholders are carefully considering special location information issues associated with such a service. For example, if someone is sending a text on a device that is using Wi-Fi rather than a carrier network, will that text get to the correct 911 operator?

Answer. I would ask the FCC directly about it, or all the four major wireless carriers.

Question 3. After hearing the testimony today, I am somewhat worried about the ability of first responders to find 911 callers in large, multi-story buildings. This is obviously a very serious issue. How close are we to solving this issue—which is essentially getting phones to send the pinpoint “vertical” or “height” coordinates to the public safety answering points? Is there anything Congress can do to expedite deployment?

Answer. The FCC has distributed a FNPRM on this topic. Comments will be due around the third week of April, and the reply comments around the third week of May. I would ask the FCC for an update.

Question 4. In the written testimony, there is a fairly robust discussion of both the network-based and handset-based (GPS) technology currently used to locate people on wireless devices who call 911—and their accuracy rates. Are there other technologies on the horizon that may prove even more effective in locating people calling 911?

Answer. I cannot answer this one.

Question 4a. If so, when should we expect to start seeing those technologies show up in consumer devices?

Answer. I cannot answer this one, but industry can give you some idea approximately when this will become a reality.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. BARBARA BOXER TO
CHRISTOPHER GUTTMAN-MCCABE

Question 1. Data from the Centers for Disease Control show that 35.8 percent of Americans rely solely on a wireless phone, and, for Americans living below the poverty line, that percentage rises to just more than half—52 percent. You are also aware of the LifeLine program, which more than 1.2 million Californians rely on to stay in touch with their families, their jobs, and, most importantly, emergency services. LifeLine participants are able to choose subsidized service from either traditional wireline or wireless carriers, not both.

California LifeLine participants are serviced by a broad array of carriers, from national names like Verizon and AT&T to smaller operations like Winterhaven and Siskiyou Telephone Companies. Do we know the full range of technologies smaller carriers employ to provide Phase II information to emergency call centers and is there reason to believe that they are improving at the same pace as the larger carriers?

Answer. As you note, Americans increasingly rely on mobile devices for their communications needs, including making calls in times of emergency. And when they do, consumers should expect wireless services and handsets that meet the FCC's E-911 rules regardless of who their carrier is—large or small, facilities-based or MVNO. Typically, smaller providers employ similar E-911 Phase II location accuracy technologies as larger carriers. While larger carriers may be more directly involved in exploring and testing new location accuracy technologies with vendors, public safety and policymakers, CTIA is not aware of any major discrepancies in terms of deploying location accuracy technologies among carriers.

Question 2. As part of the transition from a wired and switch-operated telephone system to a next generation Internet protocol system, carriers and emergency call centers are being asked to update their technical capabilities to ensure that customers can get in touch with emergency service providers via SMS texting and data services. Do you expect GPS-based wireless 911 location systems will be fully compatible with Next Generation 911?

Answer. The Next Generation 911 ("NG-911") transition offers opportunities to improve on our current wireless 9-1-1 location accuracy capabilities, including GPS. Just as NG-911 will provide flexibility and opportunities for PSAPs to take advantage of various technologies, any location accuracy rules or requirements for wireless providers should be technology neutral and based on non-proprietary solutions. A technology neutral and non-proprietary framework will ensure that wireless providers can take advantage of innovative and competitive technological solutions that are commercially available and reasonably deployable in a timely and ubiquitous manner to improve our current location accuracy capabilities. CTIA and our member companies are actively engaged with the public safety community and policymakers to make the promise of NG-911 a reality. As NG-911 develops, CTIA expects stakeholders to pursue location information capabilities that account for existing 9-1-1 technologies.

It should be noted that the impending availability of SMS-based text-to-911 service is an interim solution to deliver text messages to PSAPs before the availability of NG-911. SMS-based text-to-911 service does not support all of the capabilities contemplated for NG-911 because, as an interim solution, text-to-911 is intended to be deployed quickly based on existing capabilities for SMS. At present, the FCC has tasked the Communications Security, Reliability and Interoperability Council (CSRIC) IV, an advisory committee of industry, public safety, government and technology vendor representatives, with developing a report by June 2014 on the technical feasibility of including enhanced location information in text messages sent to PSAPs. In addition, the FCC's recent Second Further Notice of Proposed Rulemaking on Facilitating the Deployment of Text-to-911 noted the "long-term objective is for text messaging services, whether from CMRS carriers or interconnected text providers, to provide for Phase II equivalent location information with text-to-911 calls."

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. BILL NELSON TO
CHRISTOPHER GUTTMAN-MCCABE

Question 1. I have been a strong supporter of the move to Next Generation ("Next Gen") 911 services. In my NET 911 Act, we made it the duty of IP-enabled voice providers to offer 911 services. Since then, we have also made progress in a number of other areas—including incentives to get states to become "early adopters" of Next Gen 911 systems.

I think the promise of Next Gen 911 systems is great, especially in terms of their resiliency during natural disasters. I am concerned, however, about the level of coordination on the Next Gen 911 effort.

We currently have the 911 coordination office with NTIA and NHTSA. Last year, the FCC provided to this Committee its statutorily required recommendations for creating a framework for the transition to Next Gen 911. In addition, I know the FCC is working on several other Next Gen activities. Do members of the panel believe these efforts are working well—or is further centralization or coordination of this effort necessary?

Answer. CTIA is deeply interested in proper governmental coordination of NG-911 and notes that the issues involved extend beyond the Federal government to states and localities as well. First and foremost, there must be clearly defined roles and responsibilities for the Federal agencies involved in NG-911. NTIA and NHTSA have their coordination functions, and CTIA believes for NG-911 to have a successful legal and regulatory framework, the FCC should lay out the framework for NG-911 implementation. Further, states and localities are generally best suited to manage the day-to-day elements of NG-911 deployment and operation for PSAPs and to monitor PSAP capabilities.

Question 2. I am pleased to see the progress that has been made to date between public safety and the four nationwide wireless carriers to provide “text to 911” services to consumers later this year. The ability to text to 911 is particularly important for individuals who are deaf or hard of hearing.

In advance of the roll-out of “text to 911,” however, I want to be sure all stakeholders are carefully considering special location information issues associated with such a service. For example, if someone is sending a text on a device that is using Wi-Fi rather than a carrier network, will that text get to the correct 911 operator?

Answer. The four national carriers and public safety announced an agreement to provide text-to-911 service by May 15, 2014 to PSAPs that request to receive text-to-911 service, and the FCC recently proposed that other CMRS providers offer text-to-911 service by December 31, 2014. The FCC acknowledged there are “technical issues that arise from the routing of texts from Wi-Fi locations,” and as a result the initial phase of text-to-911 implementation does not include interconnected over-the-top (OTT) texting. Nonetheless, the NPRM explores OTT text-to-911 issues in depth, and further study is underway to resolve the OTT issues. In the meantime, in May 2013 the FCC required all CMRS providers and interconnected text providers to provide a “bounce back” message to any consumer attempting to send a text to 911 to provide notice that the consumer should make a voice call to 9-1-1 when text-to-911 service is unavailable.

Question 3. After hearing the testimony today, I am somewhat worried about the ability of first responders to find 911 callers in large, multi-story buildings. This is obviously a very serious issue. How close are we to solving this issue—which is essentially getting phones to send the pinpoint “vertical” or “height” coordinates to the public safety answering points? Is there anything Congress can do to expedite deployment?

Answer. A working group of the FCC’s advisory committee, the Communications Security, Reliability and Interoperability Council (CSRIC), issued a report one year ago this month on the results of a test bed that examined indoor location technologies, including the ability to pinpoint vertical coordinates inside buildings. Seven location technology vendors expressed interest in the test bed, but only three participated—and only one “emerging technology” was identified that addressed the potential for indoor vertical location accuracy. More recently, the FCC issued an indoor location accuracy NPRM proposing vertical location accuracy requirements, and CTIA looks forward to examining the record closely to assess the status of technology. Any such claims require independent verification, like the CSRIC test bed. Technological advancements are the first step, of course, followed by standards development, incorporation into network and user device equipment, and then implementation. CTIA looks forward to additional data on capabilities of potential vertical location solutions to offer even more aid to first responders.

Question 4. In the written testimony, there is a fairly robust discussion of both the network-based and handset-based (GPS) technology currently used to locate people on wireless devices who call 911—and their accuracy rates. Are there other technologies on the horizon that may prove even more effective in locating people calling 911? If so, when should we expect to start seeing those technologies show up in consumer devices?

Answer. In addition to the current network-based and handset-based (GPS) location accuracy technologies that CMRS providers have deployed to provide meaningful location information, other location solutions are under close examination. These

include, for example, the technologies that participated in the CSRIC test bed—a beacon technology, RF fingerprinting, and an AGPS/AFLT location solution. Vendors of other technologies expressed interest in the test bed but did not participate, including U-TDOA Positioning, DAS Proximity-based Positioning, AGNSS/WiFi/MEMS (Microelectromechanical Systems) Sensor Hybrid Positioning, and LEO Satellite-based Positioning. Still other technologies could be examined in the future, including WiFi-based Location, AGNSS (A-GPS and A-GLONASS, and possibly other Satellite constellations), and OTDOA with LTE. CSRIC IV is in the process of setting forth the framework for a permanent test bed that will produce independent, verified data on new location technologies. CTIA looks forward to developments in this field and the ability to examine verified data regarding what new technology solutions can do to advance location accuracy.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. BILL NELSON TO
KIRK BURROUGHS

Question 1. I have been a strong supporter of the move to Next Generation (“Next Gen”) 911 services. In my NET 911 Act, we made it the duty of IP-enabled voice providers to offer 911 services. Since then, we have also made progress in a number of other areas—including incentives to get states to become “early adopters” of Next Gen 911 systems.

I think the promise of Next Gen 911 systems is great, especially in terms of their resiliency during natural disasters. I am concerned, however, about the level of coordination on the Next Gen 911 effort.

We currently have the 911 coordination office with NTIA and NHTSA. Last year, the FCC provided to this Committee its statutorily required recommendations for creating a framework for the transition to Next Gen 911. In addition, I know the FCC is working on several other Next Gen activities. Do members of the panel believe these efforts are working well—or is further centralization or coordination of this effort necessary?

Answer. While Next Gen may offer a potential for greater resiliency during disasters, the enhanced ability of Emergency Services IP networks or ESNets to dynamically route emergency calls when particular PSAPs are overwhelmed or themselves affected by a disaster may take some time and coordinated work among all stakeholders to ensure that Next Gen services are as resilient as legacy networks.

Qualcomm believes that substantial progress is being made by carriers and their vendors with rollout of NG911. However, additional effort and resources are needed to make ubiquitous Next Gen 911 services a reality, especially in the PSAP and ESNets sides. Roll-outs are happening regionally with some areas making excellent progress while others lag behind. This disparity tends to exacerbate end-user confusion as to which services are available and better coordination would help limit this confusion.

Question 2. I am pleased to see the progress that has been made to date between public safety and the four nationwide wireless carriers to provide “text to 911” services to consumers later this year. The ability to text to 911 is particularly important for individuals who are deaf or hard of hearing.

In advance of the roll-out of “text to 911,” however, I want to be sure all stakeholders are carefully considering special location information issues associated with such a service. For example, if someone is sending a text on a device that is using Wi-Fi rather than a carrier network, will that text get to the correct 911 operator?

Answer. If the device is using Wi-Fi as a stand-alone Internet access (and not as part of a carrier service), then it is an “over-the-top” service and will not be able to send an SMS text that is part of the current interim (pre-Next Gen) text-to-911 service. The FCC is currently seeking comment on a means of requiring OTT texting services to connect to PSAPs. While it would be possible to enhance the interim (pre-Next Gen) text-to-911 service to support this, doing so would require significant investment by multiple entities by text service providers, Internet access providers, and carriers. Such an investment would be solely for a pre-Next Gen service that would not be needed once true Next Gen services become available. In contrast, if additional resources and coordination were directed at providing widespread Next Gen service, this would allow Next Gen services to be provided to users sooner than would otherwise be the case.

Question 3. After hearing the testimony today, I am somewhat worried about the ability of first responders to find 911 callers in large, multi-story buildings. This is obviously a very serious issue. How close are we to solving this issue—which is essentially getting phones to send the pinpoint “vertical” or “height” coordinates to the

public safety answering points? Is there anything Congress can do to expedite deployment?

Answer. Qualcomm understands the concerns associated with vertical coordinates and the desire to obtain altitude information. However it is important to understand the limitations of the technologies, both in the absolute sense of determining the position, but also in the context of providing useful information in an end-to-end system. GPS systems are the only reliable source of providing altitude everywhere outdoors, but no such system exists indoors. While some spot solutions have been demonstrated, they have not been proven to be commercially viable. Moreover, ubiquitous coverage will take some time to get wide propagation in the industry. Additional data and time are needed to more fully research this matter, and the communications industry and public safety community are working hard to complete this work. The next stage of CSRIC testing will produce more data in the near future and standard bodies (*i.e.*, 3GPP, OMA, etc.) have started to add the mechanisms needed to ensure a solution based on a healthy ecosystem will be available as the technology is proven. Once a standards-based solution is in place, all stakeholders will need to work together to ensure the necessary in-building details are provided to PSAPs in a timely and efficient manner. More work may also be required to match accurate altitude estimates to a given floor inside buildings. This effort will likely require efforts to undertake mapping of buildings. Congress should encourage these efforts.

Question 4. In the written testimony, there is a fairly robust discussion of both the network-based and handset-based (GPS) technology currently used to locate people on wireless devices who call 911—and their accuracy rates. Are there other technologies on the horizon that may prove even more effective in locating people calling 911?

Answer. Per my written testimony, Qualcomm believes that leveraging the 4G cellular networks (*i.e.*, via standards-based OTDOA positioning technique) is the best solution for ubiquitous high accuracy indoor location in the horizontal domain. Also per my written testimony, Qualcomm believes Wi-Fi will play a key augmentation role in final solution once the database issues are addressed.

Question 4a. If so, when should we expect to start seeing those technologies show up in consumer devices?

Answer. The exact dates for the commercial roll out of OTDOA are determined by the wireless carriers, but I can say that they are actively working to deploy the technology in their networks.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. BARBARA BOXER TO
TELFORD E. FORGETY III ("TREY")

Question 1. There is some disagreement about what factors contributed to the results of the CalNENA survey released in March, 2013 that showed that many wireless 911 calls lacked sufficient Phase II information. Considering that more than 110,000 CA residents currently elect to receive wireless service only, these numbers are especially disturbing when you consider that these economically disadvantaged Californians have sometimes as little as a 1 in 5 chance in an urban environment of emergency services being able to find them. Do you agree with CalNENA's assessment that this was primarily the fault of the different technologies carriers rely on to provide Phase II information rather than the emergency call centers' rebidding practices?

Answer. The CalNENA filing urges FCC action on the basis of two apparent data points: First, that the fraction of wireless E9-1-1 calls for which Phase II latitude and longitude were received by the surveyed PSAPs, on the basis of their pre-existing bid/rebid practices, falls below the level required by the FCC's rules. Second, that that fraction has decreased over time. The filing proposes one hypothesis that could explain these observations: That the increasing use of A-GPS technology may have led to a decline in Phase II information delivery due to a simultaneous increase in the fraction of wireless 9-1-1 calls placed from indoors or urban canyon locations that pose particular problems for A-GPS.

NENA does not read the CalNENA filing to reach a conclusion that *either* carrier technology differences or PSAP re-bidding practices were primarily at fault for these observations. Importantly, the type of location technology in use by a carrier is not something PSAPs can currently determine. Since the CalNENA filing, it has become clear that the complexity of Phase II location determination and delivery precludes the identification of a single causal explanation for CalNENA's observations without integrating significant additional data, much of which is held exclusively by carriers. Several carriers have insisted that the low fractions of Phase II calls observed

by the PSAPs CalNENA surveyed should be attributed to the re-bidding practices that were in place at the time the survey data were collected. For its part, CalNENA has been responsive to these claims, and has successfully urged the California Office of Emergency Management, the office responsible for California's state-wide 9-1-1 program, to rescind an advisory memorandum that previously discouraged the practice of automatically re-bidding for Phase II data. NENA understands that CalNENA intends to continue monitoring data made available by the State of California following the implementation of revised re-bidding practices to determine whether that change alone brings about an increase in the observed fraction of calls for which Phase II information is received at the PSAP. If the resulting data indicate that Phase II fractions rise to the required levels under an automatic re-bidding regime, then this would lend credence to the carriers' claims. Conversely, if the resulting data indicate that Phase II fractions *do not* rise to the required levels, then this could indicate some technical or technological problem in the networks of the carriers which continue to appear to be out of compliance with the FCC's rules, or it could point to yet other problems in PSAP systems, 9-1-1 database systems, or carrier networks. Whatever the explanation or explanations ultimately prove to be, NENA is committed to working collaboratively with our members, chapters, and carrier and vendor partners to ensure that 9-1-1 professionals have timely and accurate location information for each caller.

NENA is aware of media reports which suggest that the CalNENA data can be explained by a shift toward increased reliance on handset-based A-GPS (and more recently multi-constellation A-GNSS) technology. It is true that certain older technologies can provide a faster Time To First Fix in certain circumstances and can even provide valuable location information for handsets located indoors. At the same time, however, these faster and deeper-penetrating technologies also tend to produce fixes with considerably greater uncertainties. NENA is therefore unconvinced that any particular technological explanation should be viewed as causal with respect to the data observed by the PSAPs CalNENA surveyed. Carriers typically deploy several different location determination technologies in parallel and perform actual wireless E9-1-1 locates using whichever technology or combination of technologies produces the least uncertain fix for a given call. NENA strongly supports this practice, and believes that the FCC's recently-initiated rulemaking provides a valuable opportunity for the Commission to clarify and extend its existing rules to ensure that carriers deploy a combination of technologies that will meet the needs of the public and the public safety community.

Question 2. As part of the transition from a wired and switch-operated telephone system to a next generation Internet protocol system, carriers and emergency call centers are being asked to update their technical capabilities to ensure that customers can get in touch with emergency service providers via SMS texting and data services. Do you expect GPS-based wireless 911 location systems will be fully compatible with Next Generation 911?

Answer. Yes. "Next Generation 9-1-1" commonly refers to the set of originating services, access networks, functional entities, interfaces, and protocols defined by the NENA i3 Standard and other industry standards promulgated by bodies such as the Internet Engineering Task Force, the Alliance for Telecommunications Industry Standards, and the 3rd Generation Partnership Program. As developed by NENA, the i3 Standard includes robust location retrieval and storage methodologies based on globally standardized protocols such as SIP, HELD, PIDF-LO, and GEOPRIV. Throughout the NG9-1-1 protocol suite, functional elements, and interfaces, the i3 Standard requires that NG9-1-1 systems accept both validated civic addresses *and* geographic coordinates (latitude, longitude, altitude, uncertainty) measured by devices and networks.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. BILL NELSON TO
TELFORD E. FORGETY III ("TREY")

Question 1. I have been a strong supporter of the move to Next Generation ("Next Gen") 911 services. In my NET 911 Act, we made it the duty of IP-enabled voice providers to offer 911 services. Since then, we have also made progress in a number of other areas—including incentives to get states to become "early adopters" of Next Gen 911 systems.

I think the promise of Next Gen 911 systems is great, especially in terms of their resiliency during natural disasters. I am concerned, however, about the level of coordination on the Next Gen 911 effort.

We currently have the 911 coordination office with NTIA and NHTSA. Last year, the FCC provided to this Committee its statutorily required recommendations for

creating a framework for the transition to Next Gen 911. In addition, I know the FCC is working on several other Next Gen activities. Do members of the panel believe these efforts are working well—or is further centralization or coordination of this effort necessary?

Answer. In short, these efforts *are* working well, and NENA does not see a need for further centralization. NENA is extraordinarily pleased with the support for Next Generation 9-1-1 deployment that has been provided to date by both the FCC and the National 9-1-1 Office. These agencies play fundamentally different yet equally important roles in facilitating this crucial transition. The Commission considers and enacts industry-facing regulations to ensure that NG9-1-1 systems can function as designed notwithstanding the significant technological differences between carrier networks and consumer devices, while the Office provides valuable government-facing coordination and education resources to facilitate the deployment of NG9-1-1 systems by state and local governments, notwithstanding radical differences in funding and governance models. These roles are consistent with the different statutes authorizing the respective agencies, and have proven highly successful over many years. Both agencies enjoy the full confidence of the broader public safety community, and NENA believes that the existing division of labor is appropriate and beneficial. With respect to further coordination, however, NENA believes that the National 9-1-1 Office could play an invaluable role in speeding the deployment of NG9-1-1 in states where no central 9-1-1 authority exists. While NENA does not believe that the Office should have authority over local 9-1-1 agencies or PSAPs, it could, with additional resources, provide critical support for planning, training, and education related to NG9-1-1 deployment that many local 9-1-1 systems cannot access in the absence of a state coordination regime. NENA would support such an expansion.

Question 2. I am pleased to see the progress that has been made to date between public safety and the four nationwide wireless carriers to provide “text to 911” services to consumers later this year. The ability to text to 911 is particularly important for individuals who are deaf or hard of hearing.

In advance of the roll-out of “text to 911,” however, I want to be sure all stakeholders are carefully considering special location information issues associated with such a service. For example, if someone is sending a text on a device that is using Wi-Fi rather than a carrier network, will that text get to the correct 911 operator?

Answer. At this time, the Carrier-NENA-APCO agreement does not contemplate a routing requirement for non-carrier interconnected text messaging services. However, NENA is acutely aware that the consumer marketplace for text messaging applications has expanded to encompass non-carrier provided text services over the past few years. Many of these services can operate over non-CMRS networks, like residential WiFi networks backhauled by cable or DSL. In its recent Notice of Proposed Rulemaking on Text-to-9-1-1, the FCC described two general means that application-based text originating service providers could use to ensure that texts to 9-1-1 are routed properly. In one, the device could initiate a CMRS fallback, routing a text over an available CMRS network rather than a WiFi network. This approach would work even if the device itself had no on-board location capabilities, or if it did, but was unable to calculate a fix. In the second approach, a device with on-board location capabilities that *is* able to calculate a fix could advise its in-house or third-party Text Control Center of its location regardless of whether its network connection is based on a CMRS network or a residential or commercial WiFi network. Of course, these approaches are far from the ideal.

As NENA has repeatedly made clear to the FCC, all Next Generation 9-1-1 services are heavily dependent on the availability of accurate location information supplied in standardized formats using globally-standardized protocols such as SIP, HELD, PIDF-LO, and GEOPRIV. The timely deployment of standards-compliant Location Information Servers (LISs) in access networks (*e.g.*, DSL, Cable, CMRS, etc.) is crucial to the IP transition and NG9-1-1 deployment. In this regard, CMRS carriers and legacy voice originating service providers enjoy certain advantages, as existing Mobile Positioning Centers and Automatic Location Identification databases can be reprogrammed or repurposed to serve this function with relative ease. It may be beneficial, however, for Congress to specifically incentivize the deployment or updating of these servers to ensure their universal availability in access networks as NG9-1-1 is deployed by state and local governments. Congress could do so by authorizing targeted loans for small or rural carriers who might not otherwise be able to quickly deploy LISs, and by conditioning expanded liability protection offered under previous 9-1-1-related Acts on the timely deployment of such servers. NENA would support the implementation of both measures.

Question 3. After hearing the testimony today, I am somewhat worried about the ability of first responders to find 911 callers in large, multi-story buildings. This is obviously a very serious issue. How close are we to solving this issue—which is essentially getting phones to send the pinpoint “vertical” or “height” coordinates to the public safety answering points? Is there anything Congress can do to expedite deployment?

Answer. Multiple effective solutions to this problem exist and are available on a competitive basis in today’s market.

Already-deployed A-GPS and A-GNSS chipsets are capable of calculating an altitude estimate as part of a regular fix. These fixes suffer from a relatively large uncertainty, however, if network-based assistance data is unavailable or does not include certain data that many handset GNSS chips cannot receive from augmentation beacons or satellites. In the best-case scenario, already-deployed A-GNSS chipsets can probably achieve $\sim\pm 10\text{m}$ uncertainty in altitude. This represents 2–3 floors in typical construction which, though greater than the public safety community might want, is still a significant improvement over the complete lack of vertical data available today. Fortunately, there are other technologies already on offer than can provide lower uncertainties.

Several smartphone devices are already on the market with built-in barometric pressure sensors. By themselves, these sensors can provide valuable in-building height information, even without local calibration references: A typical smartphone pressure sensor can detect a change in pressure as small as 1 Pa, more than enough to detect the $\sim 12\text{Pa/m}$ change in pressure due to increasing altitude in the near-surface atmosphere. Of course, these measurements will be subject to systemic uncertainties, as the reference pressure at mean sea level varies significantly due to geography, weather, time of day, temperature, and other factors. These challenges can easily be overcome by responders, however, by deploying cheap, commercially-available barometric altimeters (available in many wristwatches, GPS units, and, again, smartphones). At the same location, these devices will be subject to the same systemic uncertainties, meaning that responders can simply “go up til the numbers match.”

With the addition of wide-area sea-level reference data supplied by the network (e.g., altimetry measurements already made at thousands of local airports) or hyper-local reference data supplied by CMRS networks or terrestrial beacon networks, the systemic uncertainty limitations of barometric altimeters can be dramatically reduced, for total uncertainties on the order of $\sim 3\text{--}5\text{m}$, or one standard story. One beacon-system operator, NextNav, has already licensed this technology to Broadcom, one of the largest A-GNSS chipset vendors in the mobile market. As with other approaches, this method can be hybridized for even greater improvements in accuracy. For example, barometric readings can be combined with A-GNSS and beacon ranging measurements to further reduce vertical uncertainty.

Beyond the measurement technology, interfaces and database processes are already available in both carrier networks and already-deployed E9-1-1 systems. For most PSAPs, vertical location data could be accepted in the very short term by making a change request with a PSAP’s existing database management service vendor, and possibly also its computer-aided dispatching vendor.

To facilitate the integration of this technology into PSAP systems in financially disadvantaged areas, Congress could change the priority of \$115 million in previously-authorized and appropriated funding available under the Middle Class Tax Relief and Job Creation Act of 2012. Currently, that funding is placed \$25.635 billion down the statutory waterfall applicable to proceeds from the voluntary incentive auctions required by that Act. Without spending one new dollar, Congress could place 9-1-1 on an equal footing with public safety radio programs like FirstNet, FirstNet’s state and local implementation grant fund, and the NIST Public Safety Communications Research project, all of which are funded at the top of the waterfall. NENA urges the Committee to consider this change.

Question 4. In the written testimony, there is a fairly robust discussion of both the network-based and handset-based (GPS) technology currently used to locate people on wireless devices who call 911—and their accuracy rates. Are there other technologies on the horizon that may prove even more effective in locating people calling 911? If so, when should we expect to start seeing those technologies show up in consumer devices?

Answer. Yes. Four technologies show particular promise: Multi-constellation A-GNSS chipsets, Observed Time-Difference of Arrival (OTDOA) being deployed in LTE networks, terrestrial M-LMS beacon networks, and civic-address aware network/beacon systems. Additionally, hybrids of each of these technologies with existing and already-deployed positioning techniques can also yield improvements in several aspects of positioning performance.

Multi-constellation A-GNSS chipsets will allow devices to integrate ranging measurements from multiple satellite systems. Already, devices such as Apple's iPhone can utilize signals from both the U.S. NAVSTAR (or "GPS") system and the Russian Federation's GLONASS system. In the future, signals from the European GALILEO system and the Chinese Beidou system will also become available. These signals, along with new multi-frequency signals from the GPS constellation, will greatly increase the probability that an A-GNSS fix is available, the geometric quality of all fixes when additional satellite vehicles are in view, and the ability of multi-band receivers to compensate for certain atmospheric sources of positioning error. Chips suitable for use in handheld devices are already available with multi-band and multi-constellation capabilities, and are expected to be integrated into smartphone platforms as additional signal sources become available. Consumer availability of these features is likely within the 2–4 year timeframe, but signal availability is subject to government priorities and funding cycles in the U.S., the Russian Federation, the European Union, and the People's Republic of China.

OTDOA uses handset measurements of the differences between precisely-timed signals emitted by pairs of transmitters in a carrier's LTE network to calculate relative lines of position on which a handset must lie. With two or more pairs of transmitters (*i.e.*, at least three transmitters, total) this method can generate position fixes. This method is highly dependent on network geometry, however, and can be less effective where tower placement yields acute crossing angles for measured lines of position, such as in rural areas where towers are often placed along highways. As noted above, however, hybridization is possible, and OTDOA can be a very useful addition to a positioning suite, particularly where adding a high-power source such as a carrier's network signals allows for more robust indoor penetration. Hybrid OTDOA/A-GNSS fixes are expected to be significantly better than current-generation single-mode fixes, both in terms of yield and accuracy. This technology is rolling-out today, but its implementation will remain dependent on carriers' transition to Voice-over-LTE or VoLTE, a process which is proceeding slowly at present. Consumer availability of these features is likely within a 1–3 year timeframe.

Terrestrial Multilateration-Location Monitoring Service networks, or M-LMS systems, replicate the functionality (and often signal characteristics) of GNSS constellations using high-power beacons mounted on tall buildings, cell towers, and other tall structures. These beacons broadcast signals that can be used by handsets and networks to calculate extremely accurate location fixes, assuming a sufficient density and appropriate geometry of beacons. In the U.S., M-LMS services have licensed secondary spectrum rights in the 902–928 ISM band, and there are currently at least 6 licensees holding some combination of licenses in 176 market areas. One licensee, NextNav, has already begun deploying an M-LMS network in major population centers. M-LMS technology currently shows significant promise for providing highly-accurate indoor fixes as a stand-alone technology, and even greater promise as one component of a multi-technology hybrid location solution. Additionally, M-LMS systems also show the greatest promise for providing highly-localized barometric altimetry corrections to improve vertical-axis positioning information available to responders. Consumer availability of M-LMS capabilities is likely within a 3–5 year timeframe.

Civic-address awareness is a property of newer cellular network systems that rely on extremely small cells or "pico-cells," and of some WiFi or Bluetooth-based systems. For small cells, this technology replaces the current latitude/longitude/uncertainty regime with a more traditional (and more dispatchable) civic address regime by pre-associating a particular small cell with a particular civic address. For example, a carrier, business, or consumer, can install a small cell to improve cellular coverage in difficult environments like basements, dense office buildings, or stadiums. At the time of installation, the carrier or consumer configures the device with the civic address (*e.g.*, 123 Main Street) of the installation location, typically through a web interface (at least in the consumer/small business context). That address can then be entered in the local Automatic Location Identification database by the serving carrier, and sent in place of (or alongside) Phase II latitude/longitude/uncertainty data when a 9–1–1 call is placed from a device attached to the small cell. This allows 9–1–1 professionals to rely directly on the dispatchable address, rather than first converting from lat/long coordinates to an address and verifying the address verbally with the caller, saving precious seconds of response time. In a slightly different context, specially-provisioned location-aware WiFi or Bluetooth beacons could allow devices to signal the network when a consumer makes a 9–1–1 call from a known address such as a person's home, place of work, or a business commonly frequented by the public. This mode of operation would require a small conceptual adjustment to the FCC's rules, but would provide certain attractive benefits to the public safety community, by reducing our reliance on often uncertain positioning

measurements when immediately-dispatchable address information is available or can be determined based on reasonable inferences. Small cells with this capability are already available in the market, though there is some concern that public safety personnel may not yet be aware that the address information they generate is reliable. Likewise, beacon technology is already available from Apple and its partners, and will likely be available for other platforms soon. Consumer availability of this capability is, however, less certain, with likely timeframes ranging from 1–4 years.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. AMY KLOBUCHAR TO
TELFORD E. FORGETY III (“TREY”)

Question 1. For Mr. Forgety—The wireless industry has suggested that the solution to this problem is for 911 call centers to request updated location information from the providers or “rebid” the 911 calls in order to get that information. Can re-bidding alone completely solve the problem of untimely or inaccurate location information being delivered to the 911 call centers?

Answer. The determination of subscriber location and its transmission to PSAPs is a complex undertaking involving handset vendors, network technology providers, wireless carriers, database management service providers, local exchange carriers, 9–1–1 system service providers, call-taking equipment makers, and computer aided dispatching software developers. Because the available data could be explained by a number of possible causes, NENA cannot draw a clear conclusion as to whether rebidding alone can increase the fraction of calls for which PSAPs are able to retrieve Phase II location data to the required levels. Anecdotally, NENA has heard from several PSAPs in California and elsewhere that improved re-bidding practices implemented after the CalNENA filing have increased the fraction of calls for which Phase II data was received. NENA has not, however, heard definitively whether the reported increases showed all carriers to be in compliance with the FCC’s location accuracy requirements. For their parts, the major carriers continue to insist that they more than meet the required performance standards with their existing technologies and networks. Even if the new data shows continuing problems, it remains possible that other causes could be found, either in carrier networks or 9–1–1 systems. NENA intends to closely monitor available data from states and localities to ensure that neither carrier network performance nor other factors adversely impact the ability of our members and other 9–1–1 professionals to quickly and accurately locate callers.

Question 1a. How long does a rebid take for a Public Safety Access Point (PSAP)?

Answer. The time required for a re-bid, and its result, depends heavily on how long it is initiated after a caller sends the 9–1–1 call, and whether any prior rebids have been placed. For a first re-bid initiated more than 30 seconds after a call is placed, the response may be received almost instantaneously. In some cases, particularly where a re-bid is initiated early in the call, however, a re-bid may not result in the retrieval of updated location information (e.g., a Phase II fix, where only Phase I was available at the time the call was connected). NENA is working aggressively to educate and re-educate PSAP personnel on best practices for wireless E9–1–1 call handling to ensure that operational practices are well aligned with the real-world time parameters of wireless network location systems. In addition, NENA is conducting an on-going series of conversations with major wireless providers to ensure that the public safety community is kept abreast of changes and improvements to their networks which could motivate updates to those best practices.

Question 1b. What proportion of 911 calls will not be located accurately by rebidding?

Answer. NENA cannot say with any certainty what proportion of 9–1–1 calls would be located accurately if automatic rebidding were instituted in all PSAPs. Currently available data from California and other states or localities that have and have not implemented automatic rebidding is neither consistent nor sufficient in scope to draw a single conclusion. However, NENA is aware the California and other states and localities that have implemented data aggregation and analytics programs continue to collect large amounts of data on 9–1–1 system performance, including the relative fractions of calls for which Phase I and Phase II data are retrieved. As more data become available from PSAPs that have implemented automatic re-bidding, NENA will continue to review them, and to bring them to the attention of relevant parties such as carriers, equipment vendors, and, if necessary, the FCC, should the data indicate conclusively that carriers are not meeting their location performance obligations.

Question 1c. Would PSAPs need to upgrade their technologies in order to receive vertical as well as horizontal spatial location?

Answer. Standardized interfaces and database processes are already available in both carrier networks and already-deployed E9-1-1 systems to support vertical location information. For most PSAPs, vertical location data could be accepted in the very short term by making a change request with a PSAP's existing database management service vendor, and possibly also its computer-aided dispatching vendor.

To facilitate the integration of this technology into PSAP systems in financially disadvantaged areas, Congress could change the priority of \$115 million in previously-authorized and appropriated funding available under the Middle Class Tax Relief and Job Creation Act of 2012. Currently, that funding is placed \$25.635 *billion* down the statutory waterfall applicable to proceeds from the voluntary incentive auctions required by that Act. Without spending one new dollar, Congress could place 9-1-1 on an equal footing with public safety radio programs like FirstNet, FirstNet's state and local implementation grant fund, and the NIST Public Safety Communications Research project, all of which are funded at the top of the waterfall. Additionally, Congress could expand already-available grant and loan programs of the Rural Utilities Service. NENA urges the Congress to consider these changes.

