Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Wireless E911	)	PS Docket No. 07-114
Location Accuracy Requirements	)	

To: The Commission

REPLY COMMENTS

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SUMMARY

TruePosition submits these Reply Comments to present the FCC with additional data, test results, and real-world findings to assist the agency in adopting reasonable and prudent regulations that will promote indoor location accuracy for Enhanced 911 ("E911"). E911 services are critical to the health and safety of our Nation's population, and are heavily relied upon during an emergency. With this proceeding, the FCC will protect the lives and property of our country's citizens, and will aid local governments in the efficient and effective delivery of public safety services throughout the United States.

Many commenters in this proceeding agree that indoor location accuracy standards should be adopted without further delay. Public safety and service organizations, law enforcement and firefighting groups, and the emergency medical community all attest to the predominant use of wireless-only communications services for public safety. This rapid transition from wireline to wireless services has sorely taxed our Nation's existing 911 capabilities and calls for swift action. A regulatory fix for the glaring and growing public safety problem created by the use of wireless devices from indoor locations is needed now. The longer the FCC waits to adopt indoor location accuracy standards, the more difficult it will be to resolve this public safety problem. Indeed, as more and more E911 calls originate from indoor and urban locations, empirical evidence has shown that E911 indoor location accuracy will continue to erode unless and until the FCC adopts the indoor accuracy standards it has proposed in this rulemaking proceeding.

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REPLY COMMENTS

TruePosition, Inc., through its attorneys, and pursuant to Section 1.415(a) of the Commission's rules, 47 C.F.R. § 1.415(a), respectfully submits these Reply Comments in response to the Federal Communications Commission's ("FCC" or "Commission") *Third Further Notice of Proposed Rulemaking* ("*Notice*") in the above-referenced docket.[1]

I. STATEMENT OF INTEREST

TruePosition is an industry leader in mobile location technology, researching and creating solutions for situations that demand accurate and reliable information. TruePosition embraces this role, with more patents, technical expertise, and operational experience in wireless location systems and services than any other company in the world. The TruePosition Location Platform is deployed throughout the United States to support the FCC's Enhanced 911 ("E911") initiative. TruePosition has been designing and deploying high performance cellular geo-location solutions since 1992. TruePosition's nationwide coverage in the United States, and multiple deployments worldwide, affords it real-world experience that is unmatched in the industry. In short, with

[1] The deadline for filing Reply Comments in this proceeding was extended to July 14, 2014 by the FCC, 79 Fed. Reg. 33163 (June 10, 2014); hence, these Reply Comments are timely-filed.

respect to the technological questions raised by the FCC in this rulemaking proceeding, there are few companies extant better qualified to answer them than TruePosition.

II. OVERVIEW

The overwhelming response to the FCC's *Notice* makes it clear that requiring wireless service providers to locate wireless 911 callers on the horizontal plane within 50 meters for 67 percent of indoor calls within two years and 80 percent within five years of the effective date of adoption is technically feasible and a matter of public safety urgency. Commenters from many backgrounds, including public service and safety organization, 911 associations, law enforcement and firefighters, emergency medical services ("EMS") groups, and the broader medical community, all agree that a pervasive, nationwide shift toward indoor, wireless 911 calls necessitates immediate, substantial revisions to the E911 rules, such as those proposed by the FCC. These groups concur that a critical component of E911 is the goal of locating the most callers within the smallest search area as soon as possible.

The FCC's proposed 50-meter location accuracy standard will enable PSAPs to more accurately identify an E911 caller's location and dispatch first responders. This standard will form the basis for continuing improvements in indoor wireless 911-caller location accuracy. Further, as the FCC notes, a horizontal location accuracy standard paired with a vertical location accuracy standard will lead to increasingly accurate "dispatchable address" information to assist first responders.

The FCC's related proposal regarding the provision of vertical ("z-axis") location information within three meters accuracy for 67 percent of indoor calls within three years and 80 percent within five years, is also feasible. Comments from related industries agree that the FCC's z-axis proposal can be met through aggressive deployment of existing technologies, such

as barometric pressure sensors included in wireless handsets. Many commenters also highlight the need for a hybrid approach: to meet the combined horizontal and "floor level" accuracy requirements, wireless service providers will need to deploy a combination of network-based and handset-based technologies to supplement the information provided by satellite-based technologies.

A resounding message from many commenters in this rulemaking proceeding is this: E911 accuracy improvements are needed *now*. The longer the FCC waits to adopt indoor location accuracy standards, the more lives will be at risk as more and more emergency calls from wireless devices are placed from indoor locations. As wireless-only telecommunications becomes the norm for most 911 callers, the E911 system must swiftly adapt and improve to meet the public's reasonable expectations with respect to 911 calls placed from any phone at any location.[2]

TruePosition and others have submitted empirical evidence into the record in this proceeding that proves that technology is available today to meet the FCC's E911 indoor location goals. Public safety organizations attest that they are ready to receive and use the information that will be available to them under the FCC's proposed standards, they are ready to support the 911 community's progress towards the proposed goals. All that is lacking is a commitment from wireless service providers to begin working *now* to accomplish these critical public safety goals. TruePosition is ready and able to support all wireless carriers in meeting the FCC's public safety standards. These changes are needed now; any further delays will serve only to reduce the effectiveness of our Nation's emergency services.

[2] *See* Comments of the International Association of Fire Chiefs, PS Docket 07-114, at 1 ("IAFC Comments") ("Today, up to 80% of 911 callers use a mobile phone to report emergencies.").

III. THE FIFTY-METER LOCATION ACCURACY STANDARD AND TIMEFRAME ARE IN THE PUBLIC'S BEST INTERESTS

The goal of the FCC's proposed standards is to locate a 911 caller within the "smallest possible search ring."[3] The FCC's *Notice* states that the Commission "believe[s] that a search radius of 50 meters will provide meaningful information while being attainable in the near-term. A larger search ring, while easier to implement, would not yield sufficiently granular information to be of use to first responders."[4] Through its *Notice*, the Commission sought comments on its "proposed location accuracy requirement of 50 meters."[5]

Commenters responding to the FCC's *Notice* overwhelmingly agreed with the goal of locating a 911 caller within the smallest area possible; they concurred that a 50-meter standard would be useful and feasible.[6] Many commenters stressed the value of the 50-meter indoor safety standard as a public safety goal. Many organizations, including emergency number associations, public service and safety groups, and medical associations, as well as law enforcement and emergency services groups**,** support the FCC's proposed rulemaking. These groups highlight the need for improved 911-caller location accuracy, the availability of technology to meet the proposed standards, and the ability of the PSAPs to receive and use improved location information.

The clear consensus is that the 50-meter standard achieves a reasonable and attainable balance between the public's need for accurate location information to facilitate a timely and

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[3] *Notice* 17825, ¶ 39.

[4] *Id.*

[5] *Id.*

[6] *See, e.g.*, Comments of the National Association of Regulatory Commissioners, PS Docket 07-114, at 8–9 ("NARUC Comments") (calling for location accuracy standards that provide "sufficient accuracy to support x-y routing"); Comments of the National Emergency Number Association, PS Docket 07-114, at ("NENA Comments") ("NENA believes that the initial 50m location performance obligation, coupled with the proposed z-axis obligation, will dramatically improve the ability of public safety agencies to identify the building and floor from which a wireless 9-1-1 call originates.").

effective emergency services response, and the technological capability of wireless carriers to provide this information.[7] As one of the vendors that is capable of meeting these standards, TruePosition concurs that the 50 meter "safety ring" is achievable and is an important step in the right direction, not the ultimate goal. Indeed, the FCC observed that a 50-meter horizontal accuracy standard may be "insufficiently granular to provide room or apartment-level location."[8] Nevertheless, even those organizations that stress the importance of ultimately achieving a "dispatchable address" concur that the 50-meter standard is a "step in the right direction."[9] While the FCC's proposed standard may not provide perfect accuracy, it will certainly provide greatly improved accuracy—and many organizations were clear that improvements are needed *now*, even if the longer-term goal is to be able to locate callers at a specific apartment, office, or hotel room.

The Telecommunications for the Deaf and Hard of Hearing and joint commenters ("TDI") may have put it best when it stated that the "lofty desire for an ideal solution" should not "diminish the real and achievable near-term value of horizontal and vertical accuracy metrics that would dramatically improve the ability of first responders to rapidly locate distressed callers, particularly in indoor and urban environments."[10] That is particularly true given the ready availability of multiple technologies that will meet the FCC's initial indoor accuracy standards.

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[7] *See* Comments of Telecommunications for the Deaf and Hard of Hearing, Inc. ("TDI"), National Association of the Deaf ("NAD"), Association of Late-Deafened Adults, Inc. ("ALDA"), Cerebral Palsy and Deaf Organization ("CPADO"), California Coalition of Agencies Serving the Deaf and Hard of Hearing ("CCASDHH"), Deaf and Hard of Hearing Consumer Advocacy Network ("DHHCAN"), and Technology Access Program, Gallaudet University ("TAP – Gallaudet"), PS Docket 07-114, at 4 ("TDI Comments").

[8] *Notice* at 17834, ¶ 105.

[9] Comments of National Association of State 911 Administrators, PS Docket 07-114, at 11 ("NASNA Comments"); TDI Comments at 4–5.

[10] TDI Comments at 5.

Numerous 911 organizations have emphasized the critical and immediate need for an attainable indoor accuracy standard. More and more Americans rely predominantly on wireless or exclusively on wireless in their homes and other locations.[11] Commenters point out, however, that 911 services are often not following consumers into the home.[12] Indeed, some products sold as landline replacements come with warnings to use a landline, not a wireless phone, to call 911 in an emergency.[13] The proposed 50-meter standard will set an appropriate standard to benchmark, not halt, progress toward greater E911-caller accuracy.[14] This is a crucial step because "[i]mproved latitudinal and longitudinal locational accuracy is urgently needed as a first priority . . . ."[15]

Law enforcement and public safety organizations agree that a 50-meter standard is a useful and necessary public safety goal, but stress that the standard should be treated as a threshold or minimum accuracy requirement. The International Association of Chiefs of Police ("IACP") and the National Sheriffs' Association ("NSA), in joint comments, state:

> The proposed requirement of location accuracy within 50 meters for indoor wireless calls will provide a marked improvement over the current information available for indoor wireless callers. The commission correctly recognizes, however, that a radius of 50 meters is effectively the largest area that can be expected to be useful for location callers indoors. Larger search rings may

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[11] NENA Comments at 13 ("More than 40% of U.S. households are now wireless- only, and that fraction will continue to grow.").

[12] *Id.* (noting that as wireless-only and VoIP communications have grown, "the overall ability of public safety agencies to locate callers in distress has surely declined).

[13] Comments of Texas 911 Alliance, PS Docket 07-114, at 6 ("Texas911 Comments"). A website offering wireless replacement products "cautions that the consumer does not have a level of 9-1-1 service similar to a landline phone: 'EMERGENCY CALLS: Do not rely solely on your . . . Wireless Home Phone in an emergency situation. In an emergency, locate the nearest landline phone and call for help.'" *Id.* (emphasis added) (citing Terms and Conditions, *available at* http://www.straighttalk.com/wps/portal/home/shop/otherdevices/ShopHomePhones#).

[14] *See* NENA Comments at 6; *see also* Comments of the Boulder Regional Emergency Telephone Service Authority, PS Docket 07-114 ("BRETSA Comments") (supporting the FCC's proposed standards based on the CSRIC testing, but calling for continuing improvement).

[15] Comments of the Department of Emergency Management of the City and County of San Francisco, PS Docket 07-114, at 2 ("SFDEM Comments").

> encompass whole city blocks or apartment complexes, severely limiting the value of the location information to responding officers[16]

Similarly, the International Association of Fire Chiefs ("IAFC") calls the proposed 50-meter standard "[a]n appropriate near-term step to ensure that public safety has the best information available to carry out emergency response."[17] IAFC also states:

> Given the magnitude of this public safety threat, plus what appears to us to be improved indoor location accuracy available today, the IAFC concurs with the Commission that "the time has come" for specific, near-term indoor location accuracy requirements. The IAFC at this time sees little reason to delay much-needed requirements for further testing.[18]

The International Association of Fire Fighters ("IAFF") also concur, stating that the "proposed requirements will provide a valuable improvement over the current unacceptable limitations on indoor location accuracy, and represent a feasible near-term step to achieving the Commission's objective of ensuring the 'smallest possible search ring' for emergency responders."[19]

The health-care sector echoes the view of public safety officers, while pointing out the tangible, life-saving benefits that will be realized from adoption of the FCC's proposed standards. As various medical associations have pointed out, faster emergency medical care increases survival rates and decreases medical costs.[20] The American Heart Association ("AHA") in particular highlights the time-critical nature of cardiac arrest and

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[16] Joint Comments of the International Association of Chiefs of Police & the National Sheriff's Association, PS Docket 07-114, at 1–2 ("IACP & NSA Comments").

[17] Comments of the International Association of Fire Chiefs, PS Docket 07-114, at 2 ("IAFC Comments").

[18] *Id.* (citations omitted).

[19] Comments of the International Association of Fire Fighters, PS Docket 07-114, at 3 ("IAFF Comments").

[20] *See* Comments of the American Heart Association, PS Docket 07-114, at 1–2 ("AHA Comments").

other heart-related conditions, where a patient's chance of survival can decrease 10 percent every minute without care.[21]

The EMS community also stressed the importance of a 50-meter accuracy standard. Joint comments filed by the National Association of State EMS Officials ("NASEMSO"), the National Association of EMS Physicians ("NAEMSP"), the National Association of EMTs ("NAEMT"), and the National EMS Management Association ("NEMSMA") note the need for improvement in indoor 911-caller location, as more and more callers use wireless devices from indoors. The joint comments highlight the "undeniable link between improved location and improved response time" and call for rule changes to improve the reliability of the E911 system.

The American Association of Retired People ("AARP") highlighted the many tangible benefits that will accrue from taking immediate steps to improve the accuracy and speed of delivery of location information. AARP noted that the FCC's calculation of $92 billion in annual health savings benefits from improvements in location accuracy may be "overly conservative" given that the FCC's estimates were based "strictly on lives saved."[22] AARP cited statistics from the U.S. Department of Transportation to show that "improved response time" will help prevent "escalation of lesser illness/injuries into more complex situations."[23] Even without anything akin to the longer-term goal of "dispatchable addresses," AARP concludes that "[t]here is no question that more rapid treatment of non-fatal injuries will improve health outcomes."

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[21] *Id.* at 1.

[22] Comments of the American Association of Retired People, PS Docket 07-114, at 3–4 ("AARP Comments").

[23] *Id.* at 4.

From TruePosition's perspective as a solutions-oriented technology company, it makes zero sense to wait any longer for a "perfect" or "ideal" solution when technology exists today to achieve many of the goals that the vast majority of emergency service providers and users so clearly desire. Speed of delivery of emergency response services, and more accurate location of wireless 911 callers, can all be achieved within the next two years; these are empirically proven facts. The FCC's proposed standards are a positive step in that direction, and as explained below those standards can be met no later than two years from now.

IV. TECHNOLOGY TO MEET THE FCC'S PROPOSED STANDARDS IS COMMERCIALLY AVAILABLE TODAY

TruePosition has steadily maintained, and many commenters agree, that the technology to facilitate the FCC's proposed standards is available now. Under the FCC's proposed indoor E911 location accuracy standards, Commercial Mobile Radio Service ("CMRS") providers would be required to: "(1) locate callers within 50 meters for 67 percent and 80 percent of indoor calls within two years and five years of the effective date of adoption, respectively, and (2) provide vertical ("z-axis") data, within three meters accuracy, for 67 percent and 80 percent of indoor calls, within three years and five years of the effective date of adoption of rules, respectively."[24] As shown in greater detail below, multiple vendors have already informed the FCC that their technologies can meet the FCC's standards. Moreover, TruePosition has independently tested and verified that its technology, when combined with AGPS technology, can meet the FCC's proposed standards.

[24] *Notice* at 17825, ¶ 38.

A. Multiple Vendors Can Meet the Horizontal Standards

The FCC's proposed standards are reasonable and achievable; technology exists from more than one source that will allow all carriers to meet these standards.[25] The rulemaking record contains several examples and illustrations of the types of available or near-future technologies that carriers can employ to timely-meet the FCC's proposed indoor accuracy standards. Commenters have pointed out that these technologies may be used in various combinations to meet the Commission's standards.[26]

Many wireless and location technology vendors agree that the FCC's proposed standards can be met with currently commercially available technology. These commenters show that a hybrid approach to 911-caller location, utilizing multiple viable solutions, "will meet the Commissions proposed horizontal indoor location accuracy requirement within the proposed timeframe."[27] The comments filed in response to the FCC's *Notice* show that the wireless industry and the communications technology sector have been testing and developing indoor location technologies for many years.[28] The FCC's proposed indoor accuracy standards do not establish remarkably new, novel, or unattainable standards for indoor location accuracy. Rather, they reflect a reasonable effort to accelerate the deployment and improvement of currently-available location technology to match current and anticipated demands by consumers who now rely almost exclusively on wireless services for their public safety needs at indoor locations.

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[25] *See* IAFF Comments at 4–5 ("IAFF reiterates the position of the public safety community that updated indoor location accuracy rules are anything but premature and the voluminous record in this proceeding amply demonstrates both the technological capability and the urgent need to improve significantly over the untenable current status quo of "impossibly-large outdoor search rings and indeterminate indoor search rings."); IAFC Comments, at 2 (concurring that the technology to meet the FCC's proposed standards is available).

[26] *See* NENA Comments at 14–15.

[27] *See, e.g.*, Comments of Polaris Inc., PS Docket 07-114, at 5 ("Polaris Comments").

[28] *See, e.g.*, Comments of Rx Networks, PS Docket 07-114, at 3 ("Rx Networks Comments") ("With today's technology, determining location is not expected to be the limiting factor in meeting these objectives."); Comments of Intrado, PS Docket 07-114, at 2 ("Intrado Comments") (noting that the "location technologies under consideration have had and will continue to have significant improvements").

Tests conducted by TruePosition and other experts, as well as statements and evidence from commenters on this proceeding, concur that the FCC's standards can be met using existing technologies.[29] Further, these Reply Comments highlight the results of tests conducted by TruePosition and TechnoCom emulating the Communication Security, Reliability, and Interoperability Council ("CSRIC") indoor-testing protocol. The CSRIC working group showed that available technology came close to meeting the FCC's proposed indoor accuracy standards; more recent testing by TruePosition and TechnoCom confirms that with minor adjustments to existing technology the FCC's indoor accuracy standards can be readily met.[30] These tests affirm that the timeframes proposed by the FCC are reasonable and attainable. CSRIC results confirm that with modest adjustments to existing technology, the FCC's proposed indoor-location standards can be met within two years following their formal adoption. The results from TruePosition' ongoing testing and analysis are summarized and described below.

B. TechnoCom Testing Confirms that the Horizontal Standards Can Be Met Using Available Technology

In May of 2014, TruePosition hired TechnoCom Corporation, a Carlsbad, CA based location services testing and engineering firm, to conduct an indoor location accuracy test under the FCC's proposed indoor location accuracy standards. The testing was conducted in Wilmington, Delaware, applying the CSRIC testing methodology that TechnoCom previously employed on behalf of CSRIC, in an environment that largely duplicated the urban and suburban morphologies of the CSRIC Bay Area Test Bed. A copy of the complete TechnoCom test results was filed with the FCC on June 24, 2014.[31] The tests were similar in their environment and

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[29] *See, e.g.*, AdGen Telecom Group, *Meeting the FCC's Mobile Location Indoor Accuracy Requirements for 911 Calls*, White Paper (April 30, 2014).

[30] *See, e.g.*, NASNA Comments at 6; TruePosition Reply Comments, *infra*, at 11–15.

[31] TechnoCom, *TruePosition Indoor Test Report Wilmington, DE* (June 18, 2014) [hereinafter TechnoCom Test Report].

settings to testing that TechnoCom performed for TruePosition in February and March of 2013, reported to the FCC on March 28, 2013. The May 2014 TechnoCom tests, however, were broader in scope than previous tests, including more buildings and test points; TechnoCom's recent tests also employed the latest, improved UTDOA network-based location technology from TruePosition.

The recent tests focused on indoor-accuracy solutions for 3G technologies; therefore, some changes were made to TruePosition's UTDOA technology as compared to the 2013 testing that TechnoCom performed. In particular, signals from mobile handsets used in the testing (standard "off the shelf" mobile handsets were used throughout the testing) were located during High Speed Uplink Packet Access ("HSUPA") transmissions. These HSUPA signals result in a "powered-up" transmission from the handset during testing (that is, the handset very briefly operates at powers slightly higher than what would typically govern a standard voice call), to emulate what typically occurs during emergency voice calls on a standard GSM network such as those used by major wireless carriers in the United States.

Indoor testing was performed by TechnoCom in both urban and suburban environments in Wilmington, DE and its surroundings. The methodology and procedures established during the CSRIC III testing were emulated by TechnoCom throughout. Eight buildings of varying sizes, construction materials and use were selected by TechnoCom in each "morphology." In total, 62 test points were selected among the 16 buildings. All but one small suburban building had four test points in different parts of the building and at different depths from the outside world. In all cases, the test buildings and test points remained anonymous to TruePosition until the conclusion of the testing and delivery of all results.

The test configuration adopted in this testing had a yield of 100 percent by design. The Time to First Fix ("TTFF") was driven by the delay to transfer the high data rate HSUPA signals over limited bandwidth backhaul lines; to allow sufficient time to process those signals call latency was essentially fixed at approximately 26 seconds for all calls (it should be noted that in a real-world setting with temporary handset "power-up" call latency would return to levels traditionally seen with GSM networks, that is, typically less than 7 seconds[32]). These parameters were specific to the test setup and therefore did not enter into TechnoCom's evaluation; location accuracy and reported uncertainty were the main focus of their testing.

At the conclusion of these recent tests, TechnoCom reported as follows:

> The improvement in location accuracy observed in this May 2014 testing compared to the March 2013 test results is quite evident for both UTDOA and Hybrid AGPS/UTDOA. Reductions in the 67th and 90th percentile location errors approximately in the 40 to 60 percent range are obtained under very similar morphology and test point conditions. **The outcome is a current overall performance that readily meets the FCC's proposed location performance threshold for indoor wireless E911 at the 67th percentile. The demonstrated performance even comes very close to meeting the 50 meter threshold at 80%, which is intended for 5 years from adoption of the proposed rules.**[33]

A summary graph depicting the May 2014 indoor location tests is shown below:

[32] If advantageous, UTDOA could provide a quick location in the range of 3–4 seconds with adequate accuracy to enable x-y routing, which would effectively eliminate the misrouting of 911 calls to the wrong PSAP. Misrouted calls are not uncommon and a source of significant delay in emergency response time. *See* FindMe911 Coalition, *PSAP Survey on Wireless 911 Location Accuracy* (March 27–April 3, 2014), PS Docket 07-114 (April, 29, 2014).

[33] TechnoCom Test Report at 1 (emphasis added).

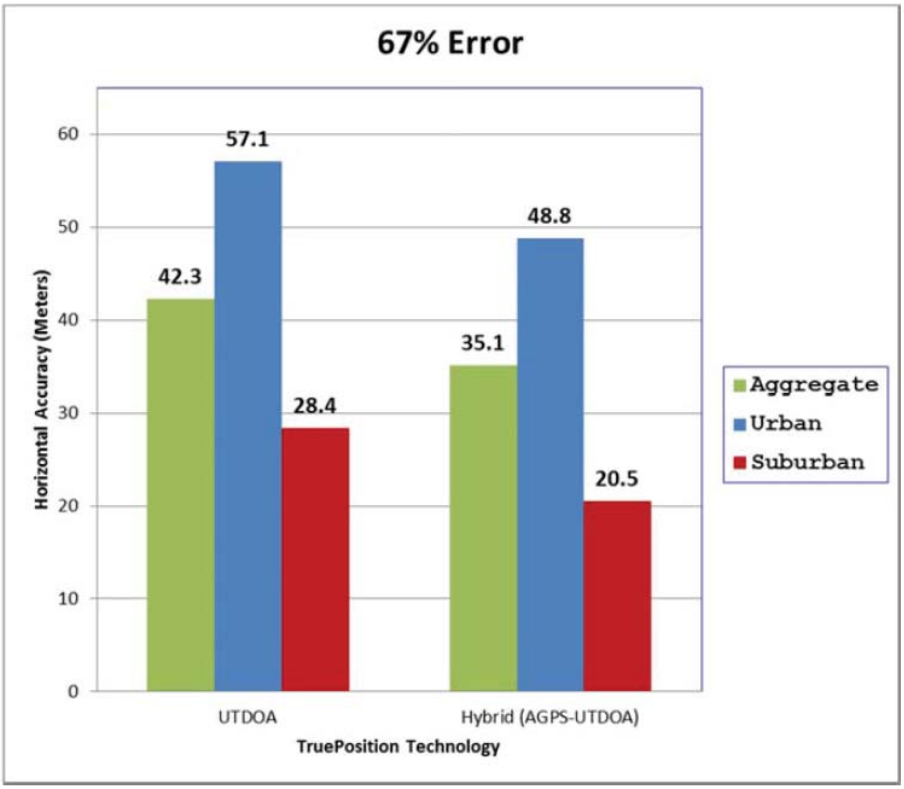

Figure 6.1-3 Indoor Accuracy Percentile Summary—Wilmington, DE

In short, without any modifications to TruePosition's "off the shelf" location system, and using standard mobile handsets, these test results proved that the FCC's proposed indoor accuracy standards could be met today. In many instances, the FCC's indoor accuracy standards were met using nothing but UTDOA network technology. When UTDOA technology was combined with AGPS location technology (the so-called "hybrid" solution) the FCC's standards were easily met and exceeded. This combination of existing network-based and handset-based technologies produced extremely accurate indoor location results in a "real world" setting, over an operational, commercial wireless network, not an experimental setting.

TechnoCom's test results thus confirm TruePosition's own, recent test results, reported to the FCC in its May 12, 2014 Comments in this rulemaking proceeding. Using network arrangements comparable to the ones employed by TechnoCom, and the CSRIC III testing

methodology, TruePosition's test results also showed that UTDOA technology on its own could meet the FCC's indoor accuracy standards today; UTDOA combined with AGPS location technology easily exceeded the FCC's proposed standards. The results of TruePosition's tests are depicted in the following chart:

	67%	80%
U-TDOA	50	77
A-GPS	120	242
UTDOA + AGPS Hybrid	43	65

Wilmington, DE, April 2014 indoor test results

As shown in these test results, the use of "triangulation-based" network design, using readily-available UTDOA equipment and standard mobile handsets that are on the market today, provided indoor location accuracy results that comply with the FCC's 50-meter standard for 67 percent of all calls. As carriers build-out their indoor location capabilities, the real-world results will only get more accurate; more receiver locations will lead to more accurate locations.[34]

C. Hybrid Solutions are Safer and Available Today

TruePosition has consistently stated that the optimal approach to meeting the public's need for accurate, indoor location information will come from not just one technology but a combination or "hybrid" technology approach.[35] By contrast, widespread erosion of the accuracy of Phase II *outdoor* location information springs largely from undue reliance by service

[34] A recent independent study shows that using a combination of existing handset-based and network-based technologies, every wireless service provider in the United States could meet the FCC's proposed indoor-location standards in the next two years. *See* AdGen Telecom Group, *supra* note 29.

[35] Comments of TruePosition Inc., PS Docket 07-114, at 2, 8,10–11 ("TruePosition Comments").

providers on just one technology, AGPS handsets.[36] Comments filed by the largest wireless carriers in this rulemaking proceeding express a consensus in favor of continuing that mistake. The carriers would prefer that the FCC wait for them to test and someday deploy AGPS handset and OTDOA "fallback" technology over their 4G networks before they should be required to take any steps to immediately address a widespread and verified public safety problem that was largely created by undue reliance on handset-based location technologies.[37]

The fact is that if wireless service providers were confident that this new combination of technologies would fix current 911 location problems, one would expect the record to be filled with at least some studies to prove that to be the case. Instead, there is simply no evidence anywhere in this extensive rulemaking proceeding to show that the combination of unproven OTDOA technology with inherently problematic AGPS technology will function any better over 4G networks than has been the case for the current combination of AGPS and inadequate fallback technologies over 3G networks. The widely-accepted consensus among technology experts (and reflected in the CSRIC studies) is that handset-based location technologies alone cannot be relied upon for accurate E911 location information inside buildings and throughout many outdoor locations in urban and suburban settings. Rather, what is urgently needed is an effective "hybrid" solution, one that "allows the maximum accuracy when a GPS-alone solution is not possible."[38] That solution is available now; we need not wait for unproven technology to fix this pressing public safety problem.

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[36] *See, e.g.*, Letter from Danita L. Crombach, ENP, President of the California Chapter of the National Emergency Number Association to Chairwoman Clyburn, Federal Communications Commission, on 9-1-1 Wireless Location Accuracy Issue, PS Docket 07-114, at 3 (Aug. 12, 2013); CALNENA Report at slide 2.3.

[37] *See, e.g.*, Verizon Comments at 2.

[38] Qualcomm E911 Location Accuracy Workshop Presentation at 2 (Nov. 18, 2013).

In addition to providing the improved accuracy required to meet the proposed rules, a hybrid solution employing handset-based technology measuring satellite signals ("AGPS") and network-based technology measuring terrestrial signals ("UTDOA") provides greatly improved reliability relative to either technology by itself. This approach would provide several layers of redundancy to achieve a very robust location system for end users with essentially no chance for system-wide failures. First, satellite redundancy allows AGPS locations to be computed even if a small number of satellites are suddenly down or obstructed. Similarly, location measurement units (or "LMUs") in a UTDOA system provide geographic diversity so that locations can be computed even if a small number of LMUs in a given geographic area are unable to perform their functions for any reason. Second, AGPS measurements are made by the handset (on downlink signals from satellites), while UTDOA measurements are made by a network of LMUs co-located at the cell towers (on uplink signals, the actual 911 call from phone), providing measurement and signal diversity.

By contrast, as currently implemented by the wireless carriers, if the GPS system fails, due to the lack of signal penetration or a catastrophic failure of the system itself, the fallback technologies (AFLT and RTT) cannot be relied upon to provide a Phase II location. It makes no sense from a public safety perspective to implement a hybrid system with an ineffective fallback technology, when the carriers can implement a technology, such as UTDOA, that is not only effective indoors when GPS signals cannot penetrate, but also outdoors (in all but the most rural settings) in the event that the GPS system goes down. Other proposals presented to the FCC by wireless carriers remain susceptible to system-wide problems. For instance, a downlink terrestrial method like OTDOA (in hybrid with AGPS) would concentrate all location measurements in the handset, introducing the possibility of a single point of failure.

The AGPS handset/UTDOA network hybrid solution selects the better of the two locations generated from each of the constituent location methods; hence, if either of the AGPS or the UTDOA systems is unable to provide a location for a given 911 call, the other technology is available to provide location level redundancy. Since the AGPS and UTDOA components are likely to be implemented by different vendors,[39] in the unlikely event of a catastrophic failure in one system, the other platform would remain available to provide system level redundancy.[40]

Handsets of various types and generations can easily be integrated into a variety of network-based technology solutions; the FCC need not pick "winners and losers" as the carriers are fond of claiming.[41] Rather, with the FCC's proposed E911 roaming and inter-connection requirements different technical solutions can be woven together.[42] The FCC will not be picking winners and losers; rather, it will be encouraging carriers and solution-providers to hurry-up and make 911 function properly indoors and outdoors before anyone else dies or is seriously harmed due to avoidable delays in emergency responses.

D. WiFi, Bluetooth, and WANs Will Not Be Helpful Anytime Soon

Mindful that there is no evidence that a combined AGPS and OTDOA location solution will be the panacea they are hoping for, some wireless carriers have lately been promoting alternative indoor technologies as a safety solution. In particular, they have been publicly touting the benefits of WiFi, Bluetooth, WANs and other unlicensed technologies to fix the problem created by widespread carrier reliance on handset technology.[43] While someday it may

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[39] Stand-alone UTDOA systems are available from at least 2 U.S. vendors, and UTDOA technology has the potential to be integrated into the base station and provided directly by the RAN equipment vendors.

[40] In addition, TruePosition, for example, provides 24/7 network monitoring and trouble resolution, and for the past two-years has had 99.999% uptime (excluding non-TruePosition related outages).

[41] *See* CTIA Comments at 22.

[42] *Notice* at 17843, ¶182.

[43] *See* T-Mobile Comments at 14 n.25; Sprint Comments at 17–18; Motorola Mobility Comments at 5.

be possible to integrate these non-carrier technologies into the Nation's public safety networks in a way that enhances safety for everyone, today there is absolutely no evidence that these technologies can promote 911 accuracy, even if the FCC had appropriate jurisdiction over the owners of these unlicensed and unregulated networks.

There is simply no evidence in this docket that any proposed 911 location solution based on these technologies can provide a dispatchable address or provide *any* degree of location accuracy. These technologies require capabilities in the handset which do not exist today to measure WiFi and Bluetooth signals and provide accurate location results in a control planed solution, which is the very essence of E911. These technologies also require network technology and infrastructure to support location for E911, which does not exist today. Also, there are at present no industry standards for location accuracy that apply to any of these technologies.

Moreover, unlike the current carrier-centric public safety networks, no single entity has control over the wildly differing infrastructures that are deployed inside buildings. A typical office building in any given city is occupied by numerous tenants, each with their own, different communications networks, all governed by wildly different security systems. WiFi nodes themselves are provided from multiple sources such as cable companies, wireless operators, individual people or families, and business enterprises, each of which have the freedom to reconfigure and move any time they wish. The FCC and PSAPs have enough difficulty getting a small handful of regulated, nationwide wireless carriers to cooperate and optimize the delivery of E911 location information in any given city or town. The alternative proposal they have proposed is riddled with technical and legal problems, which, assuming they could be overcome, surely will not help hundreds of millions of cellphone users anytime soon.

The enormously complicated effort that would be involved in even beginning to discuss how privately owned IP networks might be enlisted into the Nationwide public safety network may someday prove worthwhile, but, that undertaking cannot be accomplished soon enough to fix the very real and pressing public safety problems reported to the FCC throughout this rulemaking proceeding. A building-centric rather than carrier-centric attempt to fix the pressing problem of emergency 911 indoor location accuracy also will raise vexing legal questions that may take many years and many court challenges to resolve. Many commercial property owners will question whether the FCC has authority to require private owners of hundreds of thousands of buildings, and owners of privately owned/unlicensed "WiFi" and Bluetooth radio networks, to bring these private networks under the FCC's 911 regulatory regime. Carriers themselves have complained about 911 liability issues, and they have statutory and common law immunity from liability. And, if participation in the nationwide 911 system by building owners will be strictly voluntary, as some carriers have surmised, that will raise additional questions about how truly comprehensive and effective such a program could possibly be. In short, while one can understand from a cost-savings and risk-sharing perspective why wireless carriers would welcome shifting some or all of their 911 safety obligations to the owners of buildings and private networks, there are no legal or practical reasons why the FCC should consider such a proposal to be in the public's best interests for the foreseeable future.

V. VERTICAL LOCATION INFORMATION

Under the FCC's proposed indoor E911 location accuracy standards, CMRS providers would be required to provide z-axis data, within three meters accuracy, for 67 percent and 80 percent of indoor calls, within three years and five years of the effective date of adoption of

rules, respectively."[44] The FCC cited the most recent CSRIC test bed results, and "advancements in indoor location technologies with vertical capabilities," as well as the "growing use of smartphones with features such as barometric pressure sensors" to support its tentative conclusion that these standards could be met in the proposed timeframe.[45]

The record shows that there is an overwhelming need for z-axis information.[46] The value of the FCC's 50-meter accuracy standard will be enormously enhanced in urban areas in particular, when the 50-meter horizontal area can also include floor-level. To the extent technically feasible, horizontal information should be complemented with vertical location information. While the record in this proceeding is mixed as to how soon z-axis technology could be deployed, there is no question that public safety responders need to first get to the right building before they can find the right floor; hence, the 50-meter ring of safety standard is a crucial first-step toward the ultimate goal of "to the door" accuracy in multi-level buildings.

Vertical position information is a key component of a 911 caller's location, especially in urban areas. Public safety and 911 organizations almost unanimously embraced the FCC's vertical axis proposal. The Commission's proposed z-axis standards are therefore an important part of overall improvements to the E911 system. There are PSAPs that are already prepared to receive and use z-axis information.[47] Other PSAPs will be able to develop the ability to utilize this information in the same timeframe that the carriers have to provide it.[48]

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[44] *Notice* at 17825, ¶ 38.

[45] *Id.* at 17829, ¶¶ 71–73.

[46] *See* NENA Comments at 20.

[47] *See* Comments of the California Chapter of the National Emergency Number Association, PS Docket 07-114, at 2 ("CALNENA Comments").

[48] *Id.* ("The proposed timelines provide the wireless service providers and PSAPs ample time to update their equipment and systems.").

The International Association of Fire Fighters ("IAFF") in particular supports the provision of vertical position information. IAFF states that it can bring its expertise to bear and assist in mapping buildings for z-axis location accuracy.[49]

Further, many commenters agree that the technology to provide z-axis location capabilities is available on the market now. In its comments, NENA states: "Because there are now available multiple possible means of measuring and representing the z-axis position of a wireless 9-1-1 caller, NENA encourages the Commission to stand firm in the implementation of its proposed z-axis rules."[50] Several of these commenters describe a hybrid-technology approach and commercial location technologies.[51] Additionally, barometric sensors, already becoming increasingly prevalent in wireless handsets, can provide the information needed to meet the FCC's proposed standards.[52]

One commenter, Bosch Sensortec, states that "the current state of the art in barometric pressure sensors will allow for altitude determination of equipped mobile devices to within 3 meter accuracy for at least 67 percent of calls within three years, and for at least 80 percent of calls within 5 years."[53] Bosch also notes that "more than 120 million MEMS pressure sensors" were shipped to mobile phone vendors in 2013, without the presence of E911 regulations that may necessitate these sensors in mobile devices.[54] Thus, the incorporation of pressure sensors into mobile phones is driven by additional factors (Bosch notes "[i]ndoor navigation, health,

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[49] *See* IAFF Comments at 5.

[50] NENA Comments at 24.

[51] *See* NENA Comments at 23; Rx Networks Comments at 10–11; Polaris Comments, at 7.

[52] *See* NENA Comments at 24; Comments of Bosch Sensortec at 3 ("Bosch Comments").

[53] *See* Bosch Comments at 2.

[54] *Id.* at 6.

fitness, and other innovative applications"[55]), making the FCC's proposed requirement commercially, as well as technically, feasible. Similarly, Rx Networks notes that "[m]ulti-function sensors are increasingly incorporating a barometric pressure sensor as part of the suite of sensor inputs, meaning that there is no discrete incremental cost for incorporating it."[56]

There is no question that technology is available to meet the FCC's proposed standards, it is just a matter of more rapidly deploying a combination of network-based technology with more advanced handsets. As shown by commenters in these proceedings, the FCC's z-axis standards, and any required improvements in handset capabilities, are feasible. Indeed, the improvements are already underway. A combination of network-based technology, such as UTDOA, so that the caller's horizontal location can be quickly obtained from inside a building, combined with barometric pressure sensors in handsets, so that the caller's height above ground can be determined, will be able to meet the new standards in the timeframe proposed by the FCC. The manufacturers of barometric pressure sensors have already informed the FCC in this proceeding that they expect most handsets in the United States to be compliant with the FCC's proposed standards in the next two years. Vertical accuracy can be timely achieved and, as highlighted by the comments to the FCC's *Notice*, is of critical importance to our Nation's safety.

VI. COST/BENEFIT ANALYSIS

Given that technology does exist today that would help emergency responders more accurately locate 911 calls placed from indoor locations, the only issue keeping carriers from stepping forward to provide these solutions (with or without prompting from the FCC) must be

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[55] *Id.*

[56] Rx Networks Comments at 8. Rx Networks also states that "[w]hile some technologies also require the presence of and sufficient density of beacons, the availability of barometric pressure sensors in smartphones removes this dependency." *Id.* at 11.

the costs. In reality, the costs of deploying accurate indoor location technologies are quite manageable and well worth the benefits.

A. Health Care Savings

There are several ways to view the cost/benefits analysis of the FCC's proposed indoor accuracy standards. The FCC has aptly analyzed this issue in terms of health-care savings and safety of life and property.[57]

AARP convincingly argues that the FCC's health-savings estimates are far too low. In addition to the FCC's "lives saved" estimate of $92 billion *per year*, AARP cites Department of Transportation statistics to explain how the FCC's proposals, by promoting more rapid emergency responses, will likely lead to substantial cost savings through mitigation or avoidance of non-fatal health and safety incidences.[58] For example, AARP points to studies that show that health-care savings related to improvement in victim response times could be as much as $3 million *per incident*.[59] Certainly not every 911 call involves imminent threat to life, limb or property, but, even if a relatively small percentage of the more than 200 million 911 calls placed every year[60] can be more accurately located—speeding up emergency response times—the annual cost savings nationwide would be astounding.

It is critically important to keep these studies in mind in response to assertions by certain commenters that the FCC would be better served waiting for "address specific" solutions, rather than beginning to work on the 50 meter "ring of safety" standard. The intuitively obvious point is borne out by these empirical studies: by helping to speed the delivery of emergency services to

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[57] *Notice* at 17824, ¶¶ 32–33.

[58] AARP Comments, at 3–6.

[59] *Id.* at 5.

[60] *See* NENA, *911 Statistics*, NENA.org, https://www.nena.org/?page=911Statistics (last visited July 14, 2014) (compiling 911 statistics as of July 1, 2014).

the scene of health, fire and police emergencies, the FCC's standards will immediately equate to substantial savings in reduction of property damages and health-care savings related to human lives. It simply makes no sense at all to argue that the FCC should put off adopting more accurate location standards until sometime in the future, on the mere hope that wireless carriers will eventually figure out how to provide "to the door" accuracy for wireless 911 locations. Improving today's woefully inadequate E911 wireless location technologies will lead to immediate, tangible benefits for everyone.

B. Wireless Revenue Growth

The wireless industry's success at converting what is now close to a majority of Americans to "cut the wireless cord" and switch to wireless-only service has itself fostered considerable savings for carriers, which could and should be re-invested in the FCC's indoor location safety requirements. Consumers are paying a substantial premium for wireless phone service when compared to landline phone service, suggesting that most consumers already assume that wireless 911 services are at least as useful, prompt and accurate as older landline technologies.

In 2013, the average individual's cell phone bill was $71 per month before factoring in taxes and regulatory fees, a 31 percent increase since 2009, according to J.D. Power & Associates.[61] The wireless industry refers to "average revenue per unit" ("ARPU") as being in the neighborhood of $50 per month for typical customers, but those figures do not include handset subsidies, taxes, regulatory fees and other costs.[62] No matter whose wireless numbers you choose as the baseline, there can be no doubt that wireless customers today on average are

[61] *See* Brad Tuttle, *$47 a Month? Why You're Probably Paying Double the 'Average' Cell Phone Bill*, TIME (Oct. 18, 2012), http://business.time.com/2012/10/18/47-a-month-why-youre-probably-paying-double-the-average-cell-phone-bill/.

[62] *See* Plunkett Research, *Telecommunications Industry Overview*, Plunkett's Telecommunications Almanac 2014 (2013), *available at* http://www.plunkettresearch.com/telecommunications-market-research/industry-statistics.

paying more than landline customers for monthly service. The FCC recently estimated the average monthly landline rate to be roughly $30 per month, including the federal subscriber line charge ("SLC"); the flat rate for residential local service, mandatory extended area service ("EAS") charges; state SLCs; per-line state high cost and/or access replacement universal service contributions; state E911 charges; and state telephone relay service ("TRS") charges.[63]

This more-than-decades'–long shift from landline to wireless did not occur in a vacuum. The nation's largest phone companies stopped marketing landline services many years ago, while aggressively marketing higher-margin and higher revenue wireless services. While on the regulatory side major carriers have for years been waiting for the FCC to allow them to retire legacy landline technology,[64] they have pressed ahead with aggressive marketing campaigns that are evidently designed to convince customers to give up their legacy landline services in exchange for wireless services.[65]

The results of these efforts are summarized in the FCC's wireless industry annual statistics. Today, there are more wireless phones in service, over 330 million, than there are U.S. citizens. "Wireless only" households constitute over 40 percent of the U.S. population; the industry did not even have a category for this group in 2002. Annual wireless revenues in 2013 were over $185 billion. And, without any mandatory minimum service obligations (unlike landline service standards) the wireless industry grew from 140,000 cell sites to over 301,000 cell sites between

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[63] *See* Connect America Fund, WC Docket No. 10-90 et al., *Report and Order and Further Notice of Proposed Rulemaking*, FCC 11-161, 26 FCC Rcd. 17663, ¶ 36 (Nov. 18, 2011).

[64] *See* Order, Report And Order & Further Notice of Proposed Rulemaking, Report & Order, Order & Further Notice of Proposed Rulemaking, Proposal for Ongoing Data Initiative, GN Docket No. 13-5, GN Docket No. 12-353, WC Docket No. 10-90, CG Docket No. 10-51, CG Docket No. 03-123, WC Docket No. 13-97 (Jan. 31, 2014).

[65] Ian Paul, *AT&T Tempts Landline Users To Move to Wireless Phone Services with Contract-Free Offer*, TECHHIVE (March 30, 2013, 11:40 AM), http://www.techhive.com/article/2031426/atandt-tempts-landline-users-to-move-to-wireless-phone-services-with-contract-free-offer.html; *see also* Dameon D. Welch-Abernathy, *Verizon Wireless Home Phone Connect–Can It Replace A Landline*?, PHONEBOY BLOG (October 12, 2012), http://www.phoneboy.com/4245/verizon-wireless-home-phone-connect-can-it-replace-a-landline/.

2002 and 2012. Not surprisingly given these decade-long trends, the number of wireless 911 calls during the same timeframe more than tripled, from 139,000 per day in 2002 to over 400,000 per day in 2012, according to data collected by the Nation's largest cellular trade association.[66]

In short, consumers could surely be forgiven for expecting that the full-range of 911 public safety services that they depended on with their landline services, would naturally follow them when they were persuaded to "cut the cord" and switch to wireless. For their part, given that carriers evidently encouraged this widespread transition from wireline to wireless, carriers ought to view the FCC's indoor accuracy proposals as the natural outcome of a technology transition that the carriers themselves initiated.

C. Avoided Costs for Carriers

One of the perhaps unintended benefits of the FCC's indoor accuracy proposals is that it may help pave the way for many of the Nation's major switched-based telecommunications carriers to transition to an all-IP network. Wireless networks themselves today are essentially all-digital, all-IP protocol. This rulemaking proceeding provides the FCC and wireless service providers with an appropriate test of the carriers' ability to provide ubiquitous 911 services to all customers, using advanced technology networks. With E911 established in indoor as well as outdoor locations, carriers themselves will be able to more rapidly retire PSTN plant and equipment.

Cost savings for carriers will be enormous once carriers are allowed to "retire" their traditional circuit-switched, copper-loop networks. One knowledgeable observer of these matters has calculated that real estate cost savings alone for just one of the Nation's largest telecommunications carriers could be roughly $100 billion once the transition from circuit-

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[66] *See* CTIA, Wireless Quick Facts, ctia.org (June 2014), http://www.ctia.org/consumer_info/index.cfm/AID/10323.

switched to IP-based networks has been completed.[67] "The global telecom transition to HD voice and all-IP networks shrinks the footprint of required network equipment by as much as 90 percent. This liberation of floor space translates the $25 billion 'buildings' line item . . . into a $100 billion windfall. . . . . [A]ll-IP networks require both less equipment and far fewer points of interconnection between networks. The transition of the . . . core network to all-IP [has] already started emptying buildings, but most of the benefits await adoption of the IP-IP interconnects necessary to support HD voice."[68]

Of course, the transition from circuit-switched to all-IP, fiber loop networks will not be without network and infrastructure costs, carriers will have to invest in upgraded IP infrastructure. Nevertheless, the efficiencies gained in having an all-IP network, from something as simple as being able to house necessary network infrastructure in a fraction of the space, will lead to enormous savings for the Nation's largest carriers. These are empirical facts, not speculation. For instance, one of the Nation's largest traditional landline carriers requires on-going maintenance of over 5000 central offices; by contrast, Comcast's all-IP network supports 10 million Digital Voice customers from just five data centers.[69] IP connections utilize logical address assignments, a single fiber strand could support "any almost arbitrary number of end user connections."[70]

The conclusion to be drawn from all of this for the wireless world in general and the FCC's indoor E911 proposal in particular is apparent. The enormous cost savings that carriers are already realizing from moving their customers from landline to wireless networks need to be

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[67] Daniel Berninger, *AT&T's $100 Billion All-IP Network Real Estate Windfall*, Voice Communication Exchange, http://vcxc.org/att/ (last visited July 14, 2014).

[68] *Id.*

[69] *Id.*

[70] *Id.*

re-invested in basic public safety requirements such as indoor location accuracy. Consumers have already voted with their wallets in favor of wireless/IP based networks over traditional wireline networks. Carriers have already covered the vast majority of the U.S. with extensive wireless networks. The ability to deliver digital wireless messages over the air, rather than through old, mechanically-switched, copper-loop networks, has dramatically lowered the carriers' network costs. At the same time, wireless has become the most lucrative service offered by the carriers and has been for many years.[71] Under these circumstances some organizations have insisted that before carriers be allowed to "cut the cord" and move their customers off the old wireline networks, appropriate steps be taken to ensure that basic network applications, such as voice and 911, be firmly in place *before* the old networks can be retired.[72]

Even without nationwide deployment of the "IP transition," carriers have already saved themselves billions of dollars each year as they speed their customers' transition from wireline to wireless. It would take only a small fraction of those savings to deploy wireless 911 location technologies indoors within the FCC's proposed timetable. For those wireless carriers that do not already own wireline networks, there may be opportunities for shared networks and shared technology that will help them minimize the costs of meeting these critically-important indoor safety requirements.

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[71] *U.S. Wireless & Wireline Voice: Threats and Opportunities,2013–2018*, The Insight Research Corporation (February 2014). In 2002, the telecommunications industry reached a crossover point at which the number of mobile service subscribers surpassed those of fixed telephone networks—making mobile services the dominant means of voice communications. *Id.* At the close of 2002, there were 1.2 billion mobile customers around the world, compared with 1.1 billion fixed telephone lines. *Id.* The situation in the United States was similar, as U.S. wireless call volumes doubled from 2005 to 2011, rising from 1,130 billion MOUs to 2,296 billion MOUs—while wireline volumes declined from 1,136 billion MOUs to 512 billion MOUs. *Id.*

[72] Gauthem Nagesh, *FCC to Begin Acting on Phone-Network Upgrade*, WALL ST. J., (November 19, 2013); *see also,* AARP, *IP Transition and Consumer Protection: AT&T's Petition is the Wrong Path Forward*, *available at* https://prodnet.www.neca.org/wawatch/wwpdf/0318aarp-1.pdf

D. Costs of Meeting the Proposed Standards

As shown by the tests conducted by CSRIC, TruePosition and others, some level of indoor location accuracy is already available throughout the United States using existing technologies.[73] The adoption of the FCC's proposed indoor location standards would not require an exponential increase in capital costs to carriers. Rather, through a combination of network-based technologies, and some simple improvements to handset power levels for 911 calls, the FCC's indoor accuracy standards can be met through modest carrier investments in public safety.

Location network sharing, joint testing and certification, and other collective cost-sharing steps could easily bring those costs down even more. Just as they do so today with respect to E911 solutions, carriers would be free to decide, from town to town, how they would comply with the FCC's indoor accuracy requirements. Interconnection and roaming obligations, if adopted as proposed by the FCC, will lead to viral growth of comprehensive networks, not unlike the manner in which the Internet has expanded in speed and geographic scope through private investments in servers and additional computing power. Starting now means that incremental costs will become lower as more cities, towns, and wireless networks are brought on-line to this expanding indoor/outdoor public safety ecosystem.

At the same time, by launching this indoor safety initiative now, the FCC will have created incentives for technology companies to develop newer, less costly, and better location technologies. If the FCC adopts interconnection and roaming obligations, rather than having to build an entirely new nationwide network from scratch, new technologies (such as ones tested by CSRIC in San Francisco) could be brought into the existing indoor 911 network on a smaller scale, in specific geographic locations where demand and circumstances warrant deployment.

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[73] *See generally* CSRIC Working Group, E9-1-1 Location Accuracy: Indoor Location Test Bed Report (Mar. 14, 2013), *available at* http://transition.fcc.gov/bureaus/pshs/advisory/csric3/CSRIC_III_WG3_Report_March_%202013_ILTestBedReport.pdf.

For those wireless carriers that have already deployed network-based location technology, those receivers could be incorporated into a nationwide public safety network that would be adopted for use with 3G and 4G cellular handsets. To achieve the FCC's initial indoor accuracy requirements, each nationwide wireless carrier would need to install roughly 40,000 911 receivers, for a total of 160,000 for all four major carriers to cover the entire Nation. Sharing between the carriers would drive the total number down significantly. As carriers begin to deploy 4G handsets, the terrestrial network will complement handset technology to achieve effective and ubiquitous indoor location accuracy.

CONCLUSION

The commenters responding to the Commission's *Notice* affirm that improvements to the E911 system are needed now. The standards proposed by the Commission are technically and economically feasible today and are critically necessary for the safety and well-being of everyone. Concrete steps can and should be taken now to provide measurable levels of safety for everyone at indoor locations. For these and other reasons stated herein, TruePosition respectfully requests that the Commission proceed with haste to adopt the indoor location accuracy standards for E911 services proposed in its *Notice*.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that on this 14th day of July, 2014, a true and correct copy of the foregoing Reply

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