

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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

COMMENTS OF PRECISION BROADBAND LLC

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Precision Broadband LLC respectfully submits these comments in response to the Commission's March 15, 2019 *Fourth Further Notice of Proposed Rulemaking (Fourth FNPRM)* to improve wireless E911 vertical, or z-axis, location accuracy.¹

I. INTRODUCTION

Precision Broadband was founded in 2016 with the purpose of addressing today's technology challenges with 911 communications and caller location accuracy. The principals of Precision Broadband and its collaborating partners have extensive experience in facilities-based broadband networks, PSTN and VoIP telephone networks, mobile applications and E911 emergency services technologies.

Precision Broadband has been developing a technology that leverages facilities-based broadband networks to provide the same civic address, floor and unit location for 911 calls as landline telephone. This technology, referred to as the Fixed Broadband 911 System (FB911), is a lightweight system that is ISP, mobile carrier, device, and PSAP-friendly.² If implemented, the FB911 system would deliver accurate, dispatchable, and timely PSAP-call routing location

¹ *Wireless E911 Location Accuracy Requirements*, PS Docket No. 07-114, Fourth Further Notice of Proposed Rulemaking, FCC 19-20 (March 15, 2019) [Hereinafter, *Fourth FNPRM*].

² Precision Broadband's Fixed Broadband System, hereinafter referred to as FB911 system, comprises a series of software applications, interface modules, processes and techniques that work in concert with existing and emerging Internet Service Provider (ISP) broadband and 911 technologies and standards.

data from CMRS and non-CMRS devices by utilizing the broadband connections of 100 million homes in the U.S. (83% of households).³ It also adds a third network for 911 access - offering security, redundancy and failover capabilities. We believe the FB911 system could have the most significant near-term life-saving and economic benefit because it uniquely addresses the highest volume of 911 call origination locations (residential) and the locations with the lowest availability of landline telephones (multi-story, multi-tenant rental housing).

Precision Broadband has produced a working prototype of the FB911 system in collaboration with a facilities-based ISP, the Illinois Institute of Technology NG911 lab, and INdigital, a leading 911 technology systems provider. The prototype successfully demonstrates end-to-end 911 calls with accurate and timely locations. The FB911 system architecture and prototype have been socialized with Commission staff, NENA, state 911 agencies, and ISPs.

II. SUMMARY COMMENTS

The *Fourth FNPRM*, paragraph 12 seeks “comment on our proposed 3-meter metric... We acknowledge that a 3-meter metric is not always certain to yield floor level accuracy.” While Precision Broadband supports any improvements in 911 location accuracy, including <50-meters horizontal and ± 3 meters vertical, we strongly agree with the comments expressed by Commissioners Rosenworcel and Starks. Commissioner Rosenworcel stated that, “We should choose standards that without fail provide floor level accuracy. When police or firefighters show up in an emergency, ... They need a standard that tells them precisely where you are.”⁴ Commissioner Stark remarked that, “people need solutions that get help to them. Not close to

³ Leichtman Research Group, Inc., adjusted for residential broadband counts per public company financial reports. <https://www.leichtmanresearch.com/2-4-million-added-broadband-in-2018/> [hereinafter *LRG Broadband Research*]. (Last visited May 15, 2019).

⁴ *Dissenting Statement Of Commissioner Jessica Rosenworcel*, Mar 18, 2019 “Re: Wireless E911 Location Accuracy Requirements, PS Docket No. 07-114.” [Hereinafter: *Rosenworcel Dissenting Statement*]

them – but directly to them.”⁵ APCO reiterated its position in favor of floor-number designation in its ex-parte letter on April 22, 2019.⁶ In most multi-story residential environments, the FB911 system that Precision Broadband proposes can help accomplish these goals by delivering a complete civic address for a 911 call - including floor and unit.

Each alternative technology under consideration for providing an accurate dispatchable vertical location has advantages and shortcomings. Precision Broadband is offering a supplemental solution that would be optimal in situations where other technologies are limited.

The *Fourth FNPRM*, paragraph 14 seeks comment that the “proposed metric... apply only to mobile devices capable of delivering barometric pressure sensor-based altitude estimates.” The FB911 system does not require the user’s device to have a barometric pressure sensor, or any location sensor electronics, including GPS. In contrast to the other vertical location technologies being considered (device sensors, NEAD/WiFi proximity, metropolitan beacon network), the FB911 system derives the location of a smartphone based on its connection to a fixed broadband network at the time a 911 call is made.

In addition to supporting CMRS mobile phones, the FB911 system has the additional advantage of enabling many popular non-CMRS communication devices with the ability to access 911 with automatic horizontal and vertical location.⁷ These include tablets (60% of

⁵ *Statement Of Commissioner Geoffrey Starks*, Mar 18, 2019 “Re: Wireless E911 Location Accuracy Requirements, PS Docket No. 07-114”.

⁶ APCO Ex-Parte Letter Apr 22, 2019. “A z-axis metric of plus-or-minus 3 meters delivered in terms of height above sea or ground level is not actionable for Emergency Communications Centers. Carriers should be required to deliver dispatchable location information or, as a backstop, z-axis information in terms of a floor number.” <https://ecfsapi.fcc.gov/file/10422408330404/APCO-PSHSB%20meeting%204-18-19%20ex%20parte%20final.pdf>

⁷ Devices encompass any IP-enabled communications device capable of connecting to broadband networks including, but not limited to, smartphones, tablets, computers, smart speakers (Amazon Echo, Google Home, Facebook Portal), cameras (Ring Doorbell), connected appliances, and many Internet of Things (IoT) devices.

households), personal computers (80% of HHs), and smart speakers (21% of HHs).⁸ While these non-CMRS devices are being used to call, text, video chat, instant message and send data over broadband, they cannot be used to call 911 today.⁹

In her dissenting statement, Commissioner Rosenworcel stated, “the FCC rules governing 911 location accuracy ...were behind the times ...our rules were a hodgepodge of standards for indoor and outdoor use that reflected calling patterns from decades ago.”¹⁰

It must be acknowledged that, as the mobile phone has supplanted the landline telephone, there are new non-CMRS devices being used in place of the mobile phone. Such changes in technology and consumer behavior should be considered when defining today’s 911 rules. By ignoring alternate forms of widely adopted communication networks and devices, in the future we will say the standards defined in 2019 were obsolete at the time they were made.

III. RECOMMENDATIONS

Based on the analysis provided herein, we believe that the FB911 system should be included in the mix of solutions under consideration with respect to E911 location requirements, and therefore respectfully recommend that:

- Because the facilities-based ISPs are central to determining 911 location in the FB911 system, the Commission engage the ISPs in this effort to improve E911 location accuracy and access;

⁸ Tablets and Personal Computers from the *Precision Broadband LLC, 911 Consumer Experience and Opinion Study*, (July, 2018). Precision Broadband conducted an online survey of 250 US adults (18+) with Survey Monkey to understand consumer uses of, experience with and preferences for 911 service. (Jul 2018). [Hereinafter: Precision Broadband 911 Survey].

Smart speakers - NPR and Edison Research, *The Smart Audio Report*, Winter 2018
<https://www.nationalpublicmedia.com/smart-audio-report/latest-report/#download>.

⁹ References to the term “call” and “calling” herein encompass of all forms of multimedia communications, including voice, text, video, instant messaging, real-time text and data communications.

¹⁰ See *Rosenworcel Dissenting Statement*

- The Commission explore compensation models to incentivize ISPs to support E911 location services, whether through cost-recovery from CMRS providers, 911 fees, transactional services, or something else;
- The Commission consider rules to address the liability and customer privacy concerns of ISPs with respect to their role with E911 location services; and
- The Commission extend the existing definition of 911 services, or establish a new definition of 911 service that would permit ISPs that provide communications access services for “two-way voice communications services”¹¹ or “911 Voice Services”¹² to be able to provide E911 location services for both CMRS and non-CMRS devices.

We recognize that the Commission does not promote any specific technology. However, it is only by the rule-making authority of the Commission that the ISPs can be engaged to participate as part of the solution.

The facilities-based ISPs are uniquely positioned for the role we’ve described with broadband E911 location services. No other entity or over-the-top service can perform this function. We hope the Commission agrees that broadband, and the ISPs that provide broadband, are as vital for public safety as they are for communications, information, education, entertainment and commerce.

¹¹ *Amending the Definition of Interconnected VoIP Service in Section 9.3 of the Commission’s Rules*, GN Docket No. 11-117; *Wireless E911 Location Accuracy Requirements*, PS Docket No. 07-114; *E911 Requirements for IP-Enabled Service Providers*, WC Docket No. 05-196. *Notice of Proposed Rulemaking, Third Report and Order, and Second Further Notice of Proposed Rulemaking*, 26 FCC Rcd 10074, 10093, para 51 (Jul 13, 2011). [Hereinafter: *TRO-07-114*].

¹² *In the Matter of Implementing Kari’s Law and Section 506 of RAY BAUM’s Act*, PS Docket No 18-261 and *Inquiry Concerning 911 Access, Routing, and Location in Enterprise Communications Systems*, PS Docket No. 17-239. *Notice of Propose Rulemaking*, para.84. (Sep 26, 2018) [Hereinafter: *Kari’s Law and RAY BAUM’s Act*].

IV. FIXED BROADBAND 911 SYSTEM OVERVIEW

1. Mobile Phone (CMRS) Support

The *Fourth FNPRM*, paragraph 27 seeks comment “on the potential for development and deployment of other new or emerging vertical location solutions that could be used to meet the proposed Z-axis metric.” Precision Broadband offers such a solution.

Similar to landline telephone E911, the FB911 system leverages known network elements and databases to automatically acquire the location of a smartphone in real-time and then routes the 911 call to the location-serving PSAP. The FB911 system can direct calls to the PSAP through either the CMRS or broadband network.

The FB911 system consists of applications that work with existing broadband (ISPs), mobile carrier and 911 systems (ESInets, MPCs, VPCs, ALI, selective routers, PSAP call handling systems and GIS).¹³ Only application interface modules need to be installed at the borders between those networks. The FB911 system does not require changes to or replacements of existing communications standards, networks, hardware or consumer devices.

The FB911 system has three critical dependencies. First, the FB911 client application code must be on the user device (preferably in the operating system or firmware). Second, the facilities-based Internet Service Providers must participate. These include cable, telco, municipal, electric-owned and other wireline broadband ISPs as well as fixed wireless ISPs. Third, the phone must be connected to the fixed-broadband network when calling 911.

In the FB911 model, the role of the ISP is to only be a location service, not a “two-way communications service”¹⁴ or a “911 VoIP Service”¹⁵ as currently defined by Commission rules.

¹³ Emergency Services IP Network (ESInet); Mobile Positioning Center (MPC); VoIP Positioning Center (VPC); Automatic Location Information database (ALI), Geographic Information System (GIS).

¹⁴ See *TRO-07-114*.

¹⁵ See *Kari's Law and RAY BAUM's Act*.

Call routing and terminations from the callers to the 911 networks are handled separately by the CMRS providers or trusted third-party 911 interconnection service providers.

Other than initiating the call to 911, no user input is required.¹⁶ The FB911 system will supply the location from whatever fixed broadband service the device is connected to when the 911 call is made. The user of the device does not need to be a customer of, or have an account with any ISP for the FB911 system to work.

Unlike today's mobile carrier-supported WiFi calling, with the FB911 system, the consumer is not responsible for configuring and maintaining the location for their device.¹⁷ Similar to how landline telephone carriers are the database of record for landline telephone E911 location services, the ISPs, who in most cases also operate landline telephone carriers, are the database of record in the FB911 system.

2. Pervasive Connectivity

The FB911 system can cover nearly all residential broadband connections of the ISPs and the ISPs would be able to leverage existing provisioning systems and operations to support the system.

Because of the high-availability of broadband, Precision Broadband's FB911 system is especially suited to address residential multi-story/multi-unit housing structures in the "Top 50 Most Populous Cellular Market Areas (CMAs)".¹⁸ Nearly 98% of people living in urban areas (top 50 CMAs) have access to fixed broadband compared to the national average of 92%.¹⁹

¹⁶ The action of making or initiating a call as used herein, encompasses a person dialing on a keypad, clicking or pressing on a hyperlink in a browser, pushing a button on a device, hand gesture, voice command, biometric interface or a non-user event trigger action prompting the device to initiate the call activity.

¹⁷ Mobile carrier WiFi calling puts the responsibility on the user of the phone to input the address of his or her own WiFi/broadband connection before making a 911 call. See Appendix 1 - CMRS WiFi Calling.

¹⁸ *Wireless E911 Location Accuracy Requirements*, PS Docket No. 07-114, Fourth Report and Order, Appendix B (Feb 3, 2015)

¹⁹ *Inquiry Concerning Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion*, GN DKT No. 17-199, 2018 Broadband Deployment Report, Table 1, para 50 (Feb 2, 2018)

Connecting to home broadband networks over WiFi is typically seamless. When home, most consumers' cell phones are set up to automatically connect to their home WiFi/broadband service. For visitors whose devices are not connecting to the premise WiFi/broadband service, there are proven solutions that can be implemented to automatically connect these devices for 911 calling. For example, Comcast provides the capability for their own customers to automatically connect to each other's home WiFi through a second, public hotspot network ("xfinitywifi").²⁰ Cox, Comcast, Charter and Altice participate in Cable WiFi, an alliance that enables their respective customers to automatically connect their devices on each other's public WiFi hotspots.²¹

3. Non-CMRS Support: Solution For Today, Platform For The Future

One of its most important future benefits of the FB911 system may be in supporting non-CMRS connected devices. As tablets, smart speakers, computers, cameras and other connected devices are used for everyday voice, video, text and data communications, consumers naturally expect to connect to 911 the same way. In addition to addressing mass-market uses, enabling these non-CMRS devices for 911 supports important accessibility and Lifeline program needs. While enabling devices to connect to 911 through broadband opens new opportunities, we have also considered and planned for potential cyber security risks introduced as a result of expanding such access.

a. Accessibility Considerations

People with special needs such as the elderly, vision-impaired, speech-impaired, cognitively-impaired, or physically limited also use these same off-the-shelf, easy-to-use

²⁰ Comcast Xfinity WiFi. "Two WiFi networks. One for you. One for your guests." <http://wifi.xfinity.com/>

²¹ Cable WiFi <https://www.cablewifi.com/>

devices.²² Rather than being confined to specialized and costly accessibility equipment or small phones with challenging form factors, people with special needs should be allowed to use the same communication devices they already have to contact 911.

b. Lifeline Program Considerations

The *Fourth FNPRM*, paragraph 25 seeks comment “on how to ensure that vertical location protections extend to and include users of the Lifeline program...Those data points would influence the extent to which difficulties in achieving the metric over older and lower-end devices may pose an impediment to meeting the proposed requirement.”

The FB911 system would enable 911 access for low-end smartphones and many low-cost, non-CMRS devices without expensive, battery draining sensors. A family with only one phone would be able to afford an additional, inexpensive WiFi/broadband-only device for 911 purposes in the home. Such low-cost devices could be offered without a subscription service and benefit those with limited means, including people on the wireless Lifeline program.

c. Security Considerations

Enabling devices to connect to 911 services over broadband introduces new cyber risks capable of disrupting and disabling 911 operations. Cyber threats include malicious attacks (denial of service, malware, ransomware, swatting and location spoofing) as well as false alarms (human error and errant devices). The FB911 system security model incorporates gateways and various techniques, including artificial intelligence, to minimize such risks so that legitimate, intended 911 traffic connects to emergency networks.

²² The author’s 87-year old mother interacts daily with her Amazon Echo. Like many people her age, she suffers from many physical limitations, including impaired vision and mobility. Instead of fumbling with a telephone, she uses the Echo to call and receive calls from family members with the Alexa app. In an emergency, she would be hard-pressed to dial the keypad on her phone, or even find it if it is not close by. Being able to tell “Alexa” to call 911 could save her life or the life of someone else in her apartment.

4. Adding a Third Network for 911 Access

Finally, enabling the broadband network for 911 mitigates vulnerabilities in existing networks. Since 2014, there have been several notable 911-impacting outages, some resulting in significant fines levied by the Commission.²³ By enabling the fixed broadband platform for E911, a third location and access network for emergency services is established – increasing location accuracy, call routing, capacity, redundancy and reliability (Figure 1).

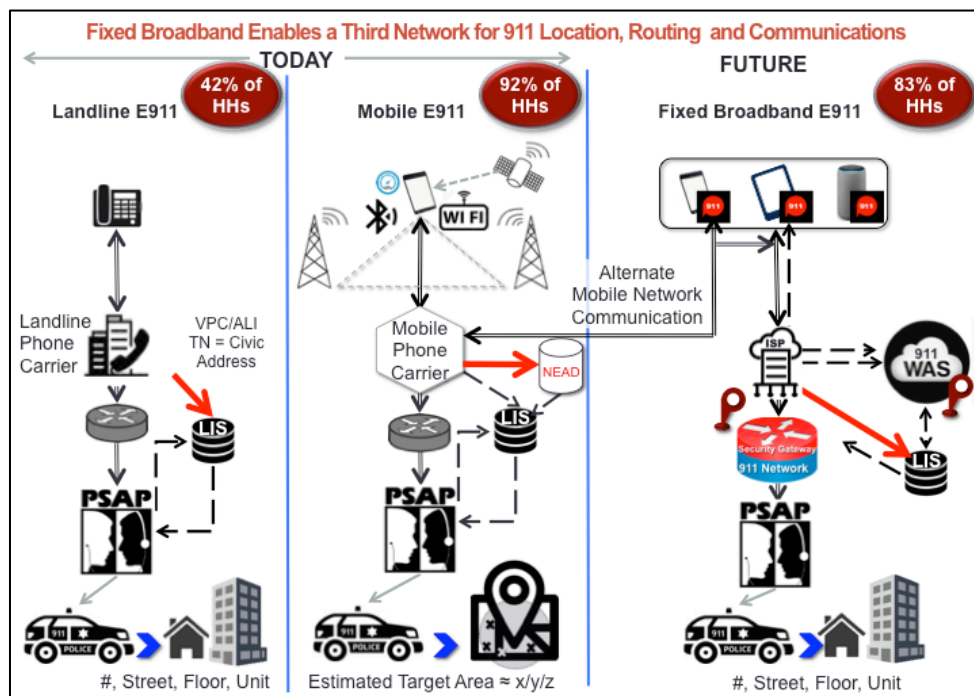


Figure 1

²³ - CenturyLink: December 27, 2018, CenturyLink experienced a 911-impacting outage that affected service in multiple states over a 24-hour period. The cause and customer impact has not yet been made public.
- AT&T Wireless: Two 911 outages in 2017. March 8th outage resulted in failed 911 calls from 12,600 unique users. May 1st outage resulted in 2,600 failed 911 calls. AT&T fined \$5.25 million.
- T-Mobile: - August 8, 2014, Two nationwide 911 outages totaling 3 hours. T-Mobile fined \$17.5 million.
- Verizon: April 14, 2014, Outage affecting 750,000 customers in California. Verizon fined \$3.4 million.
- Sprint. Between March and September 2014, hearing-impaired customers who used the wireless Internet Protocol Captioned Telephone Service (IP CTS) were unable to make calls to 911. Sprint fined \$1.2 million.

V. COMPARISON OF PROPOSED LOCATION METHODS

As previously stated, each method of acquiring the location of a wireless device referenced in the *Fourth FNPRM* has advantages as well as limitations. The location acquisition success of each alternative is dependent upon morphology, device hardware, building environments, databases and, in the case of NextNav, an additional beacon network.

1. Sensor-Based Applications

Applications that depend on GPS, tower proximity and barometric pressure sensors are superior when there are no local beacons (WiFi access points, Bluetooth). These methods also offer the best option when the device is on the move.

However, these sensor-based applications only provide an estimated target area (± 3 meters vertical), not a dispatchable civic address with floor and unit. Another limitation is that the sensors can rapidly consume the device's battery, which may cause the phone to become inoperable during an emergency.²⁴

2. WiFi and Beacon Proximity-Based Applications (NEAD, ELS, HELO)

Applications that rely on the proximity to known WiFi access points in addition to GPS have the advantage of producing very close location positions without the device actually needing to be connected to WiFi. Examples of this technology include databases of known pre-recorded access points like the National Emergency Address Database (NEAD) and dynamically updated crowd-source databases used with Google ELS and Apple HELO (including

²⁴ William Falcon & Henning Schulzrinne, *Predicting Floor Level for 911 Calls with Neural Networks and Smartphone Sensor Data*. "Continuously running the GPS and motion sensor on the background can have an adverse effect on battery life. Zhou et al. (2012) showed that GPS drained the battery roughly double as fast across three different devices." <https://arxiv.org/pdf/1710.11122.pdf>. (Sep 15, 2018)

RapidSOS).²⁵ These applications are 50% less accurate in dense urban morphologies (33 meter average horizontal error) than in suburban areas (22 meter error).²⁶ A 100-foot range in horizontal position is significant when trying to locate the correct unit in an apartment building.

The *Fourth FNPRM*, paragraph 28 asks, “can CMRS providers achieve dispatchable location and complete work on the NEAD on an accelerated timeframe?” The E911 Location Test Bed Dispatchable Location Summary Report calls attention to two significant impediments to achieving a successful and sustainable NEAD solution.²⁷ First, only Android mobile devices support the functionality required by the NEAD, not the Apple iPhone (half of smartphones in the U.S.)²⁸ Second, the WiFi access point database is sparse. The number of residential WiFi access points in the NEAD is inconsequential and may never be meaningful.

In order for the NEAD to function at scale, it requires the location of WiFi access points that the wireless carriers don’t own or manage. Cable operators service 61 million of the 100 million residential broadband connections in the U.S.²⁹ The cable operators have expressed serious reservations about supporting the NEAD with their customer WiFi access point data.³⁰

We concur with the cable operators’ concerns regarding “significant practical considerations related to collecting and formatting Wi-Fi access point data.” The cable companies do not typically manage consumer WiFi routers and do not maintain complete databases of where these devices are installed. This is because the WiFi router is not necessary

²⁵ Google ELS (Emergency Location Services) and Apple HELO (Hybridized Emergency Location) are technologies these companies have built into Android and iOS, respectively. RapidSOS, an independent third-party company, accesses 911 location data from these systems to make available to PSAPs.

²⁶ Apple, Inc., *Enhanced Emergency Data. Fast, secure location for emergency calls.* (Aug 2018) [Apple HELO]

²⁷ *E911 Location Test Bed Dispatchable Location Summary Report.* Prepared by ATIS Test Bed Program Management. [Hereinafter: *E911 Test Bed Report*].

<https://ecfsapi.fcc.gov/file/104260730612217/190425%20911%20Loc%20Tech%20Test%20Bed%20LLC%20Aggregated%20NEAD%20Based%20DL%20Summary%20Report.pdf> (April 2019)

²⁸ <http://gs.statcounter.com/os-market-share/mobile/united-states-of-america>. (Last reviewed May 19, 2019.)

²⁹ See *LRG Broadband Research*

³⁰ NCTA ex-parte letter May 13, 2019. <https://ecfsapi.fcc.gov/file/10513138760404/2019-05-13%20AS%20FILED%20NCTA%20NEAD%20ex%20parte.pdf>

for the ISP to provide broadband service to their customers. The consumer WiFi router creates a private network in the home and is not part of the public facing ISP network.

In addition to these ISPs not having accurate databases of the WiFi routers they provide their customers, they do not have any visibility into the WiFi routers their customers own. Because these operators offer to rent modems and/or WiFi routers for \$60 - \$156 per year, many customers opt to purchase their own.³¹ Even where the ISP provides a WiFi router, some consumers chose to buy their own to get better wireless coverage in the home.

All of these factors present considerable challenges to having a densely populated and sustainable NEAD that can make significant contributions to 911 location accuracy.

3. FB911 System

The primary advantage of the FB911 system is that when a device is connected to fixed broadband, an actual civic address (including floor and unit) can be provided just like landline telephone E911.

The FB911 system is mostly limited to fixed broadband locations where there is a one-to-one relationship between the broadband connection at the premise and the ISP's network.³² The FB911 system is ideally suited for 911 calls from residential locations where such a one-to-one relationship exists. The relationship between ISPs and most enterprise customers typically involve one ISP connection at the premise that in-turn, supports multiple connections on a local area network. In a commercial facility, the FB911 system-provided location could be valuable for 911 call-routing (see next section) while another location technology would be better suited for dispatching emergency personnel to the right location inside the building or campus.

³¹ Published monthly fees by ISP for renting modems (M), modems w/WiFi (MW) and WiFi-only routers (W): Comcast MW \$13; Cox MW \$11; Altice MW \$10; Spectrum W \$5; RCN W \$10; and Verizon Fios MW \$10.

³² Note: the 1:1 relationship is between the customer account at the premise and the ISP, not the person making the 911 call or the device used by the caller. The caller and the device do not need to have a relationship with the ISP that provides service to the premise or be a subscriber to any fixed broadband ISP.

4. Call-Routing Considerations

The *Fourth FNPRM* does not address location-based routing for 911 calls, however, it is relevant. Calls that have been misrouted to the wrong PSAP must be transferred to the right one, thereby delaying emergency response. This topic was covered in the FCC “Notice of Inquiry” regarding “Location-Based Routing for Wireless 911 Calls” in 2018.³³ The same location required for dispatch purposes is just as important for call routing, only in addition to needing to be accurate, it must be immediate. While the vertical location is not required to route calls, the timing and sequence of each data-point may impact 911 call handling at the PSAP and by first responders.

Device-based location technologies such as GPS, WiFi-proximity and/or barometric pressure sensors take too long to establish an accurate location in order to reliably route the call to 911. According to Apple, the “HELO process typically requires 8 – 22 seconds to produce a high-integrity fix, while 9-1-1 calls typically connect in 6 seconds or fewer”.³⁴ The benchmark established by the 9-1-1 Location Technologies Test Bed for the Stage Za (Altitude - Z-axis) is ≤ 30 seconds.³⁵

Tower proximity provides the most timely location data point for wireless call routing today. However, the PSAP associated with the closest tower to a phone is not necessarily the PSAP that serves the caller’s location. Such misrouted calls will need to be transferred to the local PSAP in order to provide assistance. Because the FB911 system acquires a location by database query in <6 seconds, a 911 call using this system can be first connected to the correct PSAP.

³³ *The Matter of Location-Based Routing for Wireless 911 Calls*. Notice of Inquiry, PS Docket 18-64. (Mar 23, 2018). [Hereinafter, *LBR911-NOI*]

³⁴ See *Apple HELO*.

³⁵ *911 Location Test Bed, LLC Report on Stage Z*, Further Enterprise Solutions <https://ecfsapi.fcc.gov/file/10803074728956/911-Location-Test-Bed-Stage-Z-Report-Final.pdf> (Aug 2018)

5. Summary Comparison of Location Methods



Hybridized Device-Based

- ◆ Target location algorithmically estimated – accurate, but may not be timely enough for routing (8-22 seconds per Apple for HELO).
- ◆ Horizontal position today: Avg. 22 -33+ meter range
- ◆ Indoors, outdoors, and mobile locations.
- ◆ Multiple device sensors required impacting battery life. NextNav would require construction of their Metropolitan Beacon System by market.
- ◆ Multiple, **fragmented** sources and formats. New location databases like NEAD must be populated and maintained, and only cover a portion of WiFi APs actively managed by service providers – not customer owned.

FB911 System ISP-Based

- ◆ Civic address location retrieved from ISP database of record - immediately accessible for call routing and dispatch.
- ◆ Horizontal **& vertical** civic address location.
- ◆ Indoors, fixed locations. Primarily residential. Requires broadband connectivity.
- ◆ Hardware agnostic. No device sensors or location electronics required. Enables lower cost devices, including non-CMRS devices.
- ◆ **Common**, single format. Highly reliable source location databases (ISPs) that include all customer locations whether customer premise equipment is provider-owned or customer-owned.

The FB911 system is not a substitute for other location technologies - existing or in development. It is complementary. The most optimal solution is that either the device, the network, and/or the PSAP system will ascertain which location data point from the various technologies available is the most accurate under a given set of circumstances (Figure 2).

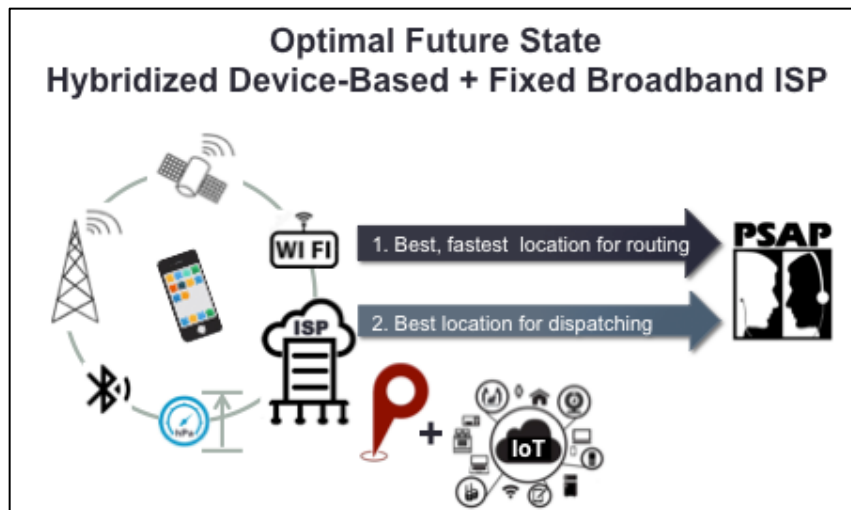


Figure 2

VI. PRIORITIZING SOLUTIONS – ANALYSIS OF RISKS AND OPPORTUNITIES

The *Fourth FNPRM*, paragraph 30 regarding the “Comparison of Benefits and Costs”, the Commission seeks comment on, “which Z-axis metric would allow us to achieve the anticipated level of benefits in the most cost-effective manner.... [and]...on the expected number of lives that would be saved if we required CMRS providers to identify floor level when reporting Z-axis information.”

In order to assess which solution(s) would yield the most impactful life-saving and economic benefit, we must consider where the greatest risks and opportunities are based on available calling options, calling locations, and the number of 911 calls expected from each type of location. Our analysis suggests that the most impactful solution(s) will expedite first-responder assistance to people calling 911 from indoor multi-story residential locations.

1. Calling Options by Location Type

First, we consider the availability of local assistance and calling options. In a commercial facility, there are likely more people available to call 911 and communicate the location than in a residential home. Furthermore, commercial locations are more likely to have landline telephones on multiple floors and in multiple locations on each floor. Calls from such landline phones will

have much improved 911 location data once the Ray Baum Act is implemented. The Ray Baum Act requires that 911 calls from multi-line telephone systems include a dispatchable street address, floor and room location.³⁶

In a multi-unit residential environment, however, there are fewer people to assist in an emergency and fewer landline phones. Many times, the person needing help is alone. When the person living in the unit is not alone, the person making the call may be a visitor who is unfamiliar with the building address, floor or unit number.

In nearly all cases, a mobile phone will be the only option to call 911 from a multi-story, multi-unit residential building. Seventy-four percent of rental housing units today are wireless-only with fewer than 26% having access to a landline telephone (Figure 3).³⁷ Most multi-story, multi-unit residential buildings consist of rental housing.

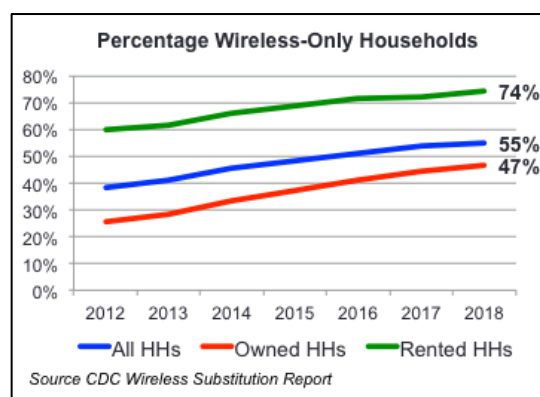


Figure 3

2. Call Volume by Location Type

We next consider from where most 911 calls are made. In July 2018, Precision Broadband commissioned a survey of 250 adults (18+) throughout the United States about their experience with 911. Twenty-eight percent of respondents reported making a 911 call in the two years prior with 68% of those calls made from indoors. Six times as many 911 calls were reported from residential homes than business locations (Figure 4).³⁸

³⁶ See *Kari's Law and RAY BAUM Act*, para. 56 and RAY BAUM's Act §506(c)(2).

³⁷ U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics, *Wireless Substitution: Early Release of Estimates From the National Health Interview Survey, January–June 2018*, Table 2, Page 7. (December 2018) available at <https://www.cdc.gov/nchs/nhis/releases.htm#wireless>.

³⁸ See *Precision Broadband 911 Survey*

If this survey is truly representative of the estimated 240 million 911 calls made each year,³⁹ then ensuring an accurate, dispatchable location for an estimated 140 million 911 calls from residential locations (versus \approx 23 million businesses) will be the most impactful.

When taking into account 911 call volume by location, access to landline phone calling options, and additional people available to assist those in need, we conclude that the improvements in mobile phone vertical location accuracy will be more significant in residential multi-story buildings than in commercial locations.

VII. CONCLUSION

Precision Broadband appreciates the opportunity to provide these comments and respectfully requests that the Commission seriously consider the recommendations made in Section III herein in support of an ISP-based fixed broadband E911 location system.

We welcome the opportunity to discuss our comments further with the Commissioners and Commission staff.

May 20, 2019

Respectfully submitted,



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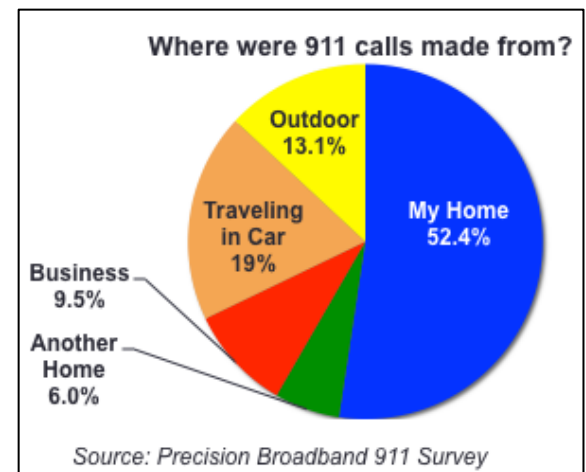


Figure 4

³⁹ NENA 9-1-1 Statistics. <https://www.nena.org/page/911Statistics>. (Last reviewed May 9, 2019).

APPENDIX 1 - CMRS WiFi Calling

Most major mobile carriers support WiFi calling today as a fallback when cell phone connectivity is unavailable. Users must first manually activate this feature on their device.

There are also niche wireless carriers like Google Fi and Republic Wireless that offer WiFi-first calling. Cable operators like Comcast and Charter are now offering mobile phone service as MVNOs. They are highly motivated to move calling traffic onto their broadband networks to improve their economics.⁴⁰

Calls to 911 (whether mobile network-first or WiFi-first) default to the mobile carrier's cell network. However, if the WiFi/broadband connection is the only option, the 911 call will be routed through the broadband network. Determining the location of such WiFi calls today is much more uncertain than any other connection to 911. The user of the phone must have the address of the WiFi/broadband connection pre-configured in the phone.⁴¹ The WiFi call is first answered by the mobile carrier's central 911 call center, not the local PSAP. Unless the caller can communicate a different address, first responders will be dispatched to the address stored in the phone regardless of where the caller actually is. A 911 WiFi call may not even be able to utilize tower proximity or GPS data for approximate location purposes.⁴²

The FB911 System would remove the uncertainty of 911 location accuracy associated CMRS WiFi calling.

⁴⁰ Telecompetitor: *Moffett: Comcast Verizon MVNO Plans Could Be Good for Both Companies*. <https://www.telecompetitor.com/moffett-comcast-verizon-mvno-plans-could-be-good-for-both-companies/> [Joan Engebretson October 24, 2016]. Multichannel News: *Comcast and Charter Should Let Verizon Build Small Cells on Their Networks: Analyst* <https://www.multichannel.com/news/should-comcast-and-charter-team-with-verizon> [Daniel Frankel Apr 15, 2019]

⁴¹ Republic Wireless "WiFi Access to Emergency Services" <https://help.republicwireless.com/hc/en-us/articles/115006055527-Emergency-Services-911-and-E911>. (Last reviewed May 6, 2019). Google Fi "Calls to 911 over Wi-Fi or data connection" <https://support.google.com/fi/answer/6174034?hl=en>. (Last reviewed May 6, 2019).

⁴² Consider a teenager baby-sitting for neighbors that live two blocks from her home. She does not know the address. If her only connection to 911 is through the neighbor's WiFi connection and the 911 address stored in her phone is her own house, first responders would be delayed in reaching her, if at all.